

Pursuit Operation - 1935-1936

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1935-36
ARMY
FEDERAL BUREAU OF INVESTIGATION
U.S.A.F.
HISTORICAL DIVISION
ARCHIVE BRANCH



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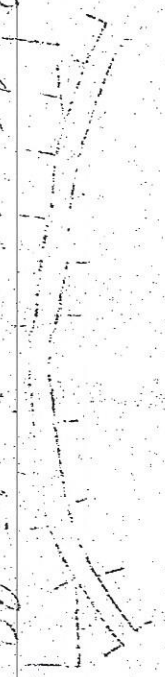
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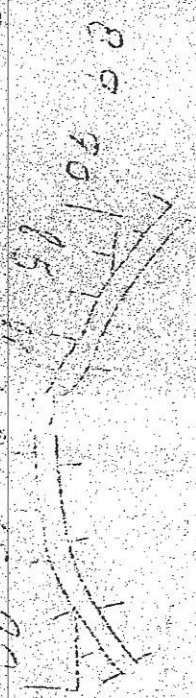
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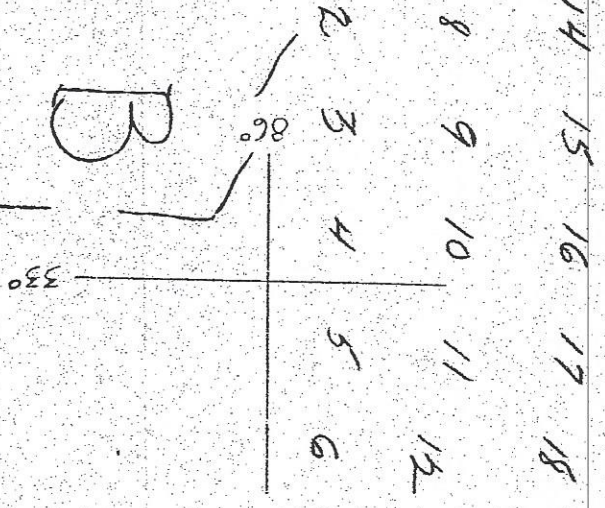
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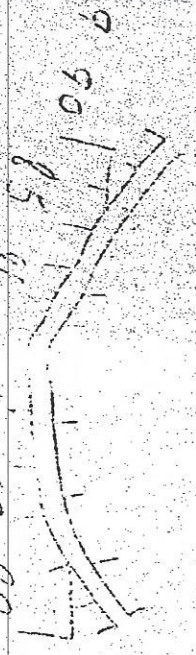
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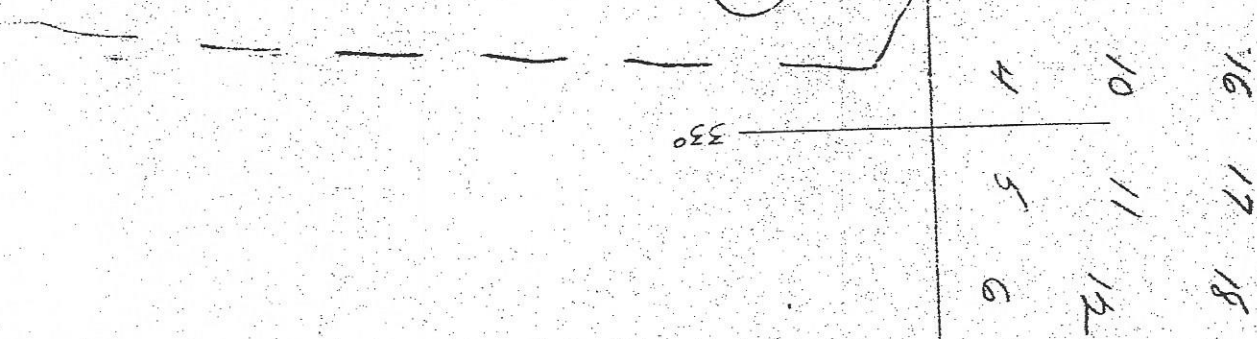
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THE AIR CORPS TACTICAL SCHOOL
Maxwell Field, Alabama
1935--1936

INSTRUCTORS FILE
ROOM

Course: PURSUIT AVIATION

MAP PROBLEM NO. 1

SECTION III

COMMENTS ON SOLUTIONS

Comments. Paragraph
7

7. COMMENTS. --The following comments apply to solutions as indicated by reference numbers on the students' papers:

1. Order for stations or take-off issued too early.
2. Reasons not clear or not stated.
3. The special situation (see Map Problem) indicates that the Reds have no more than one group available for offensive missions.
4. Blue pursuit would be unavailable for a period of an hour or more after take-off even if this Red bombardment formation is not attacked. No cut.
5. One pursuit squadron is not considered an effective force for opposing one bombardment group.
6. This unit is not included in the Blue Air Force.
7. All messages pertaining to the position of the hostile force should be promptly transmitted to pursuit.
8. The entire 1st Pursuit Group (Blue) is on the alert.
9. The Blue 1st Pursuit Group should have been employed for this interception.
10. Reasons for orders not given in sufficient detail.
11. Interception was not made far enough out.
12. Navigational directions are not transmitted to pursuit when the "Square" method is employed.
13. Interception made too far away for time allowed.

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14. The 2d and 3d Pursuit Groups (Blue) could not operate before dawn, 28 March. R.T.P.
15. An excellent solution.
16. Paper poorly written or arrangement poor.
17. To much repetition or unnecessary detail.

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THE AIR CORPS TACTICAL SCHOOL
Maxwell Field, Alabama
1935--1936

Course: PURSUIT AVIATION

CONFERENCE NO. 1

HISTORY AND DEVELOPMENT OF PURSUIT AVIATION

Prior to the beginning of the World War, aviation was regarded as an expensive and unreliable means of reconnaissance. Only a few enthusiasts were bold enough to predict its importance in future warfare.

General Von Hoepfner in Germany's War in the Air, describes the attitude of the German High Command as follows:

"In general, not any too much expectation was put on aerial reconnaissance. It was frequently estimated that after a few weeks none of our own and no hostile planes would be seen in the heavens. The performance of the fliers who reported comprehensive information daily, surprised the High Command, who doubted the details that were given and were willing to wait for confirmation through some other medium of intelligence."

In England, the situation was slightly different. In 1912, General Sir James Grierson said, "Warfare will be impossible unless we have the mastery of the air." A few aviation enthusiasts in England foresaw the necessity for aerial combat, for in February, 1914, the War Office published a memorandum prescribing flight tests and minimum performance characteristics for both single and two-seater fighting type airplanes. Thus the English accomplished a great deal of experimental work on the production of fighters before the other nations involved in the war were convinced of the necessity for providing this type.

In this country, machine guns were fired from airplanes as early as 1911, but aside from demonstrating the possibility of aerial gunnery, very little was done toward developing the airplane as a weapon of warfare. After the withdrawal of the 1st Aero Squadron from Mexico in August, 1916, the Commanding Officer, Captain B. D. Foulois, made lengthy recommendations for technical improvements in the equipment to increase its effectiveness for reconnaissance, but omitted any reference to developing equipment suitable for combat. This omission is most noteworthy because the World War had been in progress for two years at that time and because it is well known that General Foulois was an ardent believer in military aviation.

England, France, and Germany employed airplanes for reconnaissance from the very beginning of military operations. The reports of aerial observers, however, were seldom accepted as trustworthy unless verified by other means. In fact, the value of aerial observation was not fully appreciated until it was realized that a hostile aerial observer could reveal a plan of battle as certainly as the most accomplished secret agent. With this appreciation of the danger of hostile aerial

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observation, there arose the demand for denying hostile observation--which could be accomplished only by aerial combat.

A number of aerial combats occurred during August, September and October, 1914. These combats were the result of the aggressiveness of individuals rather than of military design, however. Pilots and observers equipped themselves with pistols and rifles for the purpose of destroying an enemy rather than for the denial of hostile observation. High commands on both sides published orders directing their pilots to avoid combat in order to obtain the desired information.

The combat reported on October 16, 1914, more than two months after the beginning of war, reveals the first deliberate design to deny freedom of action to hostile aircraft. The report follows:

"A Royal Flying Corps airman on a fast scouting monoplane, and carrying two rifles, gave chase to a hostile machine but lost sight of the enemy in clouds. Then a German Otto bi-plane came on the scene, a slow 'bus' but one having the engine behind and, therefore, if well armed, a formidable opponent. The English pilot obtained a position behind the enemy and when within sixty yards, he fired one rifle without result. His superior speed taking him ahead, he turned and again getting astern, emptied his magazine at the German, who began to descend. Then the Englishman stopped his engine and began a down glide while reloading. Unfortunately the magazine jammed, but he managed to insert four cartridges and to fire them at his opponent who disappeared into a bank of clouds. The Englishman followed but never saw him again."

Although his enemy escaped in convenient cloud banks, this report indicates that the English pilot "on a fast scouting monoplane and carrying two rifles" was undoubtedly employed for the purpose of destroying hostile aircraft in flight. Here also the beginning of aerial combat tactics is revealed in the statements that "The English pilot obtained a position behind the enemy", and "he turned and again getting astern * * *". Thus aerial combat born of the twin requirements (1) maintenance of aerial observation of the enemy, and (2) denial of hostile observation of friendly forces, came to be accepted by military authorities as not only possible, but extremely desirable.

Due to the fact that the English began developing work upon fighter types earlier than the other nations, they were better prepared for aerial combat in the early days of the war than were the other powers. Among the early fighters employed by the British were the Maurice-Farman pusher, the Morane bi-plane, the BE-2-C, the Martinsyde scout, the RE-5, the Bristol scout, the DeHaviland 2, the Vickers Gunbus (FB-5) and the FE-2 type.

It was found early in the war that the tractor type airplane did not permit of fire to the front due to the position of the propeller. For this reason efforts were directed toward developing the pusher type with the gunner mounted in the nose and equipped with a flexible gun. The FB-5 was an outstanding example of this type airplane and it was extremely successful in aerial combat in 1915.

From 1912--1914 French development had been directed toward producing high speed airplanes, thus a number of monoplane types were produced and were available at the beginning of the World War. Generally, however, these French monoplanes had undesirable flying characteristics and were not sufficiently strong to withstand the required maneuvers.

In Germany the authorities had restricted themselves almost wholly to the development of airplanes suitable for reconnaissance only. When the necessity for air combat was realized in the early fall of 1914, intense efforts were directed toward producing suitable types. In 1915 the Albatross, Aviatik, and the Fokker monoplane were produced. The performance of these airplanes was comparable to that of the French and British, but they were not produced in sufficient numbers to overcome the initial advantage of the English.

The production of specialized fighter airplanes led to a new problem; that of organizing and employing them correctly. Since these fighters were to support friendly observation and deny hostile observation, it was at first assumed that a number of fighters should be included in each observation unit as large as a squadron. It was assumed that the organization of composite tactical units would lead to close cooperation between personnel and would insure the presence of fighters in areas where reconnaissance was to be conducted. However, this composite organization was found to have a very serious weakness, after a few months' trial. This weakness resulted from the fact that the fighters, dispersed in small numbers among numerous units, were never sufficiently concentrated to achieve the effect of mass action. It was also found that the few fighters assigned to an observation squadron were unable to provide close support when opposed by hostile fighting craft. The British were the first to react to this deficiency, and during the fall of 1915 and winter of 1915--16, the Royal Flying Corps organized and equipped a number of fighter squadrons.

On the German side of the lines single-seater fighters were assigned to armies and groups of armies, in small numbers, for the purpose of defending both the observation airplanes assigned to those armies and the ground troops from the attacks of hostile aircraft.

Naturally, it was impossible to obtain an effective concentration of German pursuit at any given point under this system; in fact, the pursuit assigned to German armies was practically valueless. During the spring of 1916, Boelcke conceived the idea of organizing independent pursuit units for action wherever required in order to gain control of the air. The first squadron was organized and employed at Verdun. The Battle of the Somme, June 30--November 30, 1916, resulted in a complete change in combat tactics and organization in both the German and British Air Forces. From July 1 to September 15, the Royal Flying Corps so dominated the air that German observation was unable to operate effectively while British observation was able to carry out practically every mission assigned, with little fear of hostile aircraft. One report submitted by General Trenchard stated that for an entire week only fourteen hostile machines were observed crossing the line of trenches in the Fourth Army Area, while 2000 to 3000 British machines had crossed the same lines during that period. General Von Hoepfner states, with regard to this situation, that "One of the chief mistakes in the early weeks of the Battle of the Somme was the failure to recognize the importance of the single-seater pursuit planes. The Second Army (German) had few single-seaters and made poor use of what they had." In another place, General Von Hoepfner says, "Our pursuit and combat squadrons * * * were not suitable for this sort of mission and after having met with heavy losses they were obliged to give it up * * *. All this was due, doubtless, to our numerical inferiority and to errors in employment which cannot be denied."

The situation on the Somme became so desperate that on September 15, Boelcke was transferred from Verdun to the Somme. On the morning of the 16th he conducted his first patrol with five airplanes and succeeded

in shooting down five British planes with no loss to his own unit. During the next two months, Boelcke, personally, accounted for 20 British airplanes while his squadron was credited with a total of approximately 80 victories. The British had been operating with small units which broke up upon the first contact with the enemy. Boelcke, on the other hand, used larger units, which maintained some degree of cohesion throughout a fight. He was the first to teach teamwork in mass action. Although Boelcke was killed in an aerial collision in October, 1916, his teachings, of the value of concerted action by large numbers and of close teamwork by the individuals of small formations, were perpetuated by his former pilots and combat students. Among these former students was Richtofen, who became famous during 1917 and the early part of 1918 for his employment of large numbers of pursuit planes in concerted action. Richtofen's circus was transferred frequently wherever intense aerial activities developed and was never defeated as a unit. On the other hand, it inflicted serious losses on Allied aviation in every combat.

Summarizing methods of employment for pursuit during the World War, we have, in the beginning, the individual pilot acting largely upon his own initiative with regard to the area of his operations. Later, two-man teams developed where the lower man acted as "bait" for a more skilful team-mate flying above him.

During the Battle of the Somme, offensive patrols were conducted by designating definite patrol lines to be flown by small formations of pursuit. The Close Support method was also used during this battle. The Close Support method for employing pursuit required pursuit to fly in close proximity to the supported force. This deprived pursuit of initiative and aggressiveness.

In 1917 the barrage patrol was developed and used extensively. This form of employment was designed to deny certain areas to hostile aircraft. It consisted of the organization of a large pursuit force which conducted regular patrols through a great range of altitude around and over designated areas. The barrage patrol resulted in a tremendous expenditure of pursuit effort and did not accomplish satisfactory results. The exhaustion of pursuit from barrage patrols led to an attempt to conserve pursuit effort by employing fighting airplanes upon the alert. Under the alert method of employment, a few pursuit planes were sent into the air while the majority were retained upon the ground, the plan being that the planes on the ground would join those in the air after combat developed. Since pursuit combat is a matter of a very few minutes, it was found that the planes on the ground were usually unable to join those in the air before the combat was terminated.

Still another method of employing pursuit was developed for special situations. In the defense of London and of Paris, pursuit was kept on the ground until alerted by reports from distant observation outposts. It then took the air for the purpose of intercepting and attacking hostile aircraft approaching the defended area. This alert pursuit, once in the air, was unable to receive any further information of the enemy until the British employed radio receiving sets in pursuit airplanes in the spring of 1918. The majority of interceptions attempted by alert pursuit were unsuccessful, due to this lack of further information of the enemy.

Thus, at the close of the World War, there still existed a great deal of doubt and uncertainty with regard to sound methods of employment of pursuit. A few principles, however, had been developed and

were generally recognized as such. Among these principles were:

- (1) The value of surprise.
- (2) The desirability of teamwork in aerial combat.
- (3) The necessity for mass in order to obtain decisive results.
- (4) The necessity for developing the most improved equipment for pursuit use.
- (5) The necessity for employing highly specialized pilots in pursuit work.
- (6) The necessity for providing interceptor pursuit after leaving the ground, with information of the enemy.

Accepting these principles as being sound, we are in position then to develop technique and tactics for the employment of modern pursuit.

THE AIR CORPS TACTICAL SCHOOL
Maxwell Field, Alabama
1935--1936

Course: PURSUIT AVIATION

CONFERENCE NO. 2

THE PURSUIT AIRPLANE

The relationship between equipment and tactics in pursuit work is very close. While almost any type airplane may be employed for other missions, only a highly specialized type can accomplish the pursuit mission with any degree of effectiveness. This requirement for a high degree of specialization is not generally appreciated even among air men. It is usually assumed that a pursuit airplane is effective for any combat mission. However, the field of pursuit employment embraces such a wide range of altitude and so many varying combat conditions that it is impossible for any one type plane and power plant to perform satisfactorily under all probable conditions.

Pursuit has the mission of forcing combat, in the air, upon all types of hostile aircraft. Thus it may engage hostile pursuit, bombardment, attack or observation aviation. Opposed to hostile pursuit, the maximum of maneuverability may be required. Opposed to bombardment, maneuverability is not important, but speed, climb and the ability to fire accurately at long ranges are of great importance. Bombardment may be expected to fly at medium to high altitudes, so that climb and ceiling become important characteristics of pursuit designed to combat hostile bombardment. Attack aviation may be expected to present the same tactical problem as bombardment except that attack will operate at very low altitudes, thus eliminating the requirements for rapid climb and high ceilings. Corps observation will usually operate at medium to low altitudes and will employ maneuverable airplanes of medium speed. Here the requirement for high speed and rapid climb for pursuit may be eliminated. However, Army and G.H.Q. observation may operate at extremely high altitudes, as will most photographic airplanes, and opposing pursuit must have a fast rate of climb and high ceiling in order to deny freedom of action to these types.

During the World War, it was found, from experience, that certain types of pursuit planes had superior performance at definite altitudes. In the Royal Flying Corps, the Camel possessed the greatest degree of maneuverability at low altitudes, while the SE-5 was most maneuverable at high altitude. The British took advantage of these differing characteristics by arranging masses of airplanes with the Camels at low and intermediate altitude, while the SE-5s flew in support at high altitude. The Spad was able to withstand fast pull-out after a long dive; so pilots cruised the Spad at high altitude and invariably attacked from a fast dive. The Fokker D VII was able to stand on its tail for an appreciable time. German pilots took advantage of this characteristic by attacking from below the enemy.

After the end of the World War, the supercharger for both radial and Vee type engines was developed. Until about 1931, it was generally believed that the supercharger rendered a single type of pursuit

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airplane effective for combat at all altitudes. With the development of high-speed, monoplane bombers, however, it became apparent that a single type of pursuit airplane could not accomplish both the mission of engaging bombardment at high altitudes and a maneuverable type of observation or pursuit at low or intermediate altitude.

An attempt to provide a dual-purpose airplane, capable of performing both of these missions resulted in the production of the P-26 type. The P-26 is a low wing monoplane, super-charged, and has a minimum load factor of 12-1. Flown as an experimental type in 1931, it developed higher speed than any other military airplane in the world. Its climb and service ceiling were satisfactory. A quantity contract was negotiated for a large number of P-26's but the Martin type of bomber was developed before the first P-26's were constructed. This bomber, with a very low load-factor, developed speed approximating that of the P-26, thereby rendering the P-26 obsolescent. About 1933, the British produced two bi-planes, the Hawker and the Fairey, which had considerably greater speed than the P-26 and which were far more maneuverable. Other foreign countries followed suit, so that by the time the P-26 was produced in service quantities, it was exceeded in its performance by numerous foreign pursuit airplanes and was not comparable to the newer types of bombardment and attack airplanes.

Most textbooks include a table of characteristics for pursuit airplanes, arranged in the order of their relative importance. Such tables mean absolutely nothing unless the mission, for which the pursuit plane is designed, is stated. It must be realized today that no one type of airplane can conceivably accomplish all the missions pertaining to pursuit aviation. Generally speaking, these missions fall within two fields, interception and close combat. For Air Force missions, that is, for missions where the Air Force is acting independently of surface forces, interceptions will constitute the great majority of pursuit missions. We hear a great deal of discussion of a first phase in future warfare. It is assumed that during the first phase long-range aerial operations, directed against hostile airdromes and industrial centers, will be engaged in by all the combatant powers concerned in the war. Since these operations will be conducted at such ranges as to make it impossible for pursuit to take part, the only role open to pursuit will be to deny the penetration of hostile aircraft over friendly defended areas. Visualizing conditions which will probably exist in such a situation, we may assume that hostile bombardment will constitute the principal threat to those defended areas. However, it will be desirable to deny penetration of those areas to hostile observation also, since the enemy will depend upon his observation for the location of targets for his bombardment.

Both hostile bombardment and long-range observation will undoubtedly fly high and will employ airplanes with considerable speed at altitude. Therefore, defending pursuit must be equipped with an airplane capable of climbing at the greatest possible rate and also capable of attaining considerable speed in level flight at altitude. Since neither of the types of enemy aircraft named may be expected to engage in violent maneuvers, but rather will depend upon speed or numbers for defense, the interceptor pursuit type need not possess a high degree of maneuverability. For the same reason the strength factor of the interceptor type may be lowered far below that required for fighter type pursuit planes. The English realized that an interceptor would not be required to engage in violent acrobatics several years ago, and as a result, the English have produced bi-planes with a load-factor of 8 to 1 which out-perform our present monoplane interceptors. With regard to the question of lowering the load-factor, an argument is sometimes advanced that an airplane incapable of being put through the most violent acrobatics will operate to lower the morale of the pilots. Such an argument is absurd, because we have

today numerous types of bombardment, attack, observation, and transport planes which cannot withstand violent acrobatics. It should be clearly understood by everyone concerned, that the interceptor pursuit type is a very highly specialized type of airplane, designed for a particular purpose, just as the latest bombardment plane is designed for a particular purpose; that the interceptor type has distinct limitations which must be respected.

The armament for the interceptor should also be highly specialized. It should be equipped with long-range weapons, capable of attaining considerable accuracy beyond the ranges of the defensive weapons carried by bombardment. For this purpose, a cannon of not less than 20-mm caliber should be installed as the principal weapon. Supplementing this cannon, there may be one or more machine guns of .30 or .50 caliber for employment at close ranges in special situations. As additional armament, the interceptor should carry, normally, a minimum of 10 time-fuzed bombs of not more than 15 pounds weight each. Accurate sights should be developed and installed for the cannon and machine guns at all ranges and for dropping the time-fuzed bombs with the desired degree of accuracy.

It is apparent that this interceptor type airplane will not be suitable for engaging in combat with a highly maneuverable type hostile plane. For close combat between rival pursuit forces, or between pursuit and maneuverable observation types, an airplane with a high strength factor and the maximum degree of maneuverability is required. Also, the requirements for armament are different from that of the interceptor type. Large caliber guns, accurate at long ranges are not required here. The majority of the combats in this field will be of the maneuvering or dog-fight type. The objective of the pursuit pilot will be to kill the opposing pilot, and for this purpose a small caliber machine gun, with a high rate of fire, is the most desirable weapon. This field of pursuit employment relates almost altogether to the support of ground army operations. We have prepared elaborate plans for the mobilization and employment of four field armies. We actually have a sufficient number of National Guard and Reserve observation squadrons for assignment to these armies and to the corps composing the armies, but we do not have a single pursuit unit or pursuit airplane designed for the purpose of supporting army and corps observation or for denying hostile observation of the same types. The trend of development in pursuit equipment is more and more toward the highly specialized interceptor type, so that in the future it may be expected that the interceptor and the close combat types will be even less interchangeable than they are today.

In view of the high degree of specialization attained in airplanes of all other classes of aviation, the time has arrived when the all-purpose pursuit plane must be abandoned in favor of, at least, two types of highly specialized pursuit airplanes. To continue further the attempt to perform all pursuit missions with the single type airplane will inevitably result in the complete failure of pursuit to perform any of its assigned missions in a satisfactory manner.

At this point it is appropriate to discuss the two-seater pursuit plane and the proposed multi-seater battle-plane. A number of efforts have been made to produce a two-seater pursuit plane which would be more effective than a single-seater. Supporting this project there have been advanced any number of arguments in favor of the two-seater. To mention a few, there is the argument that only the two-seater can break off combat; that only a two-seater can engage hostile formations from level flight; that the two-seater is more effective offensively, because it is not required to maneuver for defense; that the two-seater can be built with much greater range than the single-seater; that it can be used as a reserve for the single-seater; that it can provide special support for other classes of friendly aviation.

Without going into a lengthy discussion of all these arguments, it should suffice to point out that the two-seater is a compromise, -- an attempt to combine in one vehicle both offensive and defensive fire power. Experience has taught that any compromise between two or more conflicting characteristics results in the production of an article which is less effective in one or both fields of activity than is an article designed exclusively for the highest degree of effectiveness in one field only. The two-seater pursuit plane is no exception to this invariable rule.

With regard to the proposed multi-seater battle-plane, we are told by the advocates of this project that the battle-plane can be built with considerably greater fire power, and with superior performance, than a contemporary bombardment plane. We also hear plans for maintaining a number of these battle-planes in the air over a defended area for the purpose of preventing the penetration of hostile bombardment. We hear other plans for assembling these battle-planes in aerial fleets with a view to laying alongside the hostile bombardment fleet or battle-plane fleet, and engaging in fleet actions with heavy guns. It has been found impracticable, if not impossible, to construct a battle-plane with superior fire power and greatly superior performance over contemporary bombardment types. The design of such a plane would be such as to permit its ready use as a bomber. The removal of the heavy armament and the substitution of bombs for this armament and ammunition load, would produce a bomber with flying characteristics greatly superior to those of any other bomber. Assuming that the enemy was able to do the same thing, -- both sides would then have bombers which could not be forced into combat by hostile battle-planes. The proposal to maintain the fixed defense of battle-planes constantly in the air, over defended areas, is most impracticable. It was proven on many occasions during the World War that airplanes could not maintain a fixed defense and that any attempt to do so invariably resulted in exhaustion of the defensive forces with little or no damage to the enemy. Such an attempt would also violate the principle of economy for these battle-planes would necessarily be expensive and a large number would be required to maintain a considerable force in the air at all times. The employment of expensive defensive planes is inconsistent with one of the principles which should govern pursuit development, that is, the principle of cheapness. The pursuit plane should be cheap, both in regard to monetary cost and to time and labor required to construct it. The loss of two or three pursuit planes in exchange for one hostile bombardment plane should result in an economic advantage for the defense.

The idea of aerial fleet actions is interesting, although there does not seem to be any prospect for such actions in the near future. The construction and employment of a very expensive airplane for the purpose of engaging in battle with a hostile airplane, of the same general type, cannot be justified from either a military or an economic viewpoint. An aerial combat, considered independently, with no relation to the action of other air or surface forces, has no point.

THE AIR CORPS TACTICAL SCHOOL
Maxwell Field, Alabama
1935--1936

Course: PURSUIT AVIATION

INSTRUCTORS FILE
CONFERENCE NO. 3

THE ROLE OF DEFENSIVE PURSUIT

The designation, "Defensive Pursuit", as used in the title of this conference is a striking illustration of the inaptness of accepted military terminology when applied to air force operations. Since ancient days, any military force or effort which was not designed primarily for the invasion of hostile territory has been classed as "Defensive".

In accordance with this ancient definition, Interceptor Pursuit is a defensive force, although its tactical employment is wholly offensive. In fact, it would be extremely difficult to conceive of a force more offensive in its characteristics. With no necessity for providing for its security in the air or for holding out a reserve, it is planned to employ every individual in the Interceptor unit for the offensive function of forcing combat upon hostile aircraft.

It is true that the anticipated combat between interceptors and hostile aircraft will begin over territory friendly to the interceptors but it may often occur that this combat will terminate over hostile terrain. However, it is not necessary to argue about the name applied to this class of pursuit since the role of the interceptor is so clearly defined as to readily distinguish it as a highly specialized class of aviation with distinctive equipment, tactics and technique.

Any study of this subject must necessarily consist of the consideration of the numerous factors which pertain to or determine the role of Interceptor Pursuit. Of these factors, the following will be considered in this conference:

- (1) Function
- (2) Physical location of units
- (3) Organization
- (4) Equipment
- (5) Factors pertaining to the interception of hostile aircraft.

The correct statement of the function of Interceptor Pursuit is, "To intercept and attack designated hostile aircraft flying within its range of action". It is unnecessary to include "the disorganization and destruction of hostile formations" as they are tactical objectives whose attainment is contingent upon interception and attack.

This functional definition is often incorrectly stated as follows, "To defend a designated point or area from the attack of hostile aircraft". In this case, the action of the pursuit force is confined to a limited area and to the strictly defensive attitude of attacking only the hostile aircraft which may attempt to penetrate into the designated area. The computation of the numbers of aircraft required for the local defense of a large number of areas, such as might be anticipated in a defense of the United States, results in a total far beyond the possibility of attainment.

The location of Interceptor Pursuit units depends upon the geographical location of the two hostile states.

Thus, in a war between states having a common boundary, we should expect to find Interceptor units located in a narrow belt paralleling the border and at sufficient distance from the border to accommodate the time and space factors required for timely interceptions. The distance between the border and pursuit airdromes depends upon the characteristics of hostile and friendly aircraft and the efficiency of the ground aircraft reporting service. In no case should pursuit airdromes be so advanced as to require the approach to the interception to be made from the rear of the hostile force.

The approach from the rear requires the interception to be made at a rate which represents the difference in speed between hostile and friendly airplanes--never a very large figure. On the other hand, the approach from the front of the hostile force permits an interception speed equal to the sum of the speeds of the two forces. While an exact head-on interception may never be attained in practice, the objective of the intercepting unit should be to make every approach at an angle less than 90° to the enemy's line of flight.

This principle pertaining to the angle of approach was not appreciated in the past and is not generally understood today. We still hear statements that it is necessary for pursuit to fly at altitudes thousands of feet above the enemy formation so that it can decrease the time required for closing to combat by diving down from the rear. A moment's reflection should convince anyone that superior altitude is not required if the approach is conducted from the front and the final closing to combat is effected by properly timed turns made in the vicinity of the hostile force.

Another error of the past was the belief that interceptions were facilitated by advancing pursuit airdromes as near the border or front lines as possible. The fallacy of this theory was clearly demonstrated in the 1931 Royal Air Force Maneuvers. The objective of these maneuvers was to test England's air defense installations, with particular attention to the ability of pursuit to make interceptions.

For this purpose, English pursuit units were located on airdromes beginning at the coast and extending back to the vicinity of London. The "enemy", represented by bombardment units of several types, was required to cross the coastline on each attempt at a penetration. The fastest pursuit squadron, equipped with the high speed, 215 miles per hour, Hawker "Fury" was based within sight of the Channel while slower units were on airdromes deeper in the interior. During maneuvers lasting two weeks, the squadron of Furies was unable to make a single interception before the "enemy" arrived over his target. One hostile Hawker "Hart" squadron, high speed 176 miles per hour, was intercepted before reaching its target on every attempt by units equipped with pursuit planes having a margin of speed less than ten miles per hour. All pursuit units operated under identical conditions except the one factor--distance of airdrome from the border or front.

This experience not only proved the fallacy of the theory that Interceptor pursuit units should be pushed as far forward as possible but provided the R.A.F. with valuable data for determining the depth of space required for timely interceptions. This space factor will be discussed in detail later.

In a war such as might require the defense of the United States against an enemy making his major effort by the attack of powerful air

forces, we may expect those forces to be concentrated in a definite area. This area may be as large as some of the European states but it will certainly have definite limits which can be established. The difficulties of maintaining communications, of command and supply will force considerable concentration of the hostile air force. The necessity for concentrating hostile effort upon a designated area of limited extent in order to obtain decisive results quickly will insure against the dispersion of hostile units over such distances as thousands of miles along our borders and seacoasts. There will be no point in having some hostile units in range of our Pacific or Gulf Coasts if the objective of the enemy is to paralyze the industrial area of the northeastern states.

This concentration of hostile forces will result in "fixing" the enemy so that his air attacks must come from one general direction. The proper location of our Interceptor pursuit units in such a situation will be in a narrow zone as far forward (toward the enemy's concentration area) as is consistent with the requirements for timely interceptions. This airdrome zone will be established so as to intersect the nearest line of approach from the hostile concentration area to our most vital area within his range. It will extend to each side of the nearest line of approach as far as the number of our Interceptor units will provide effective concentrations or geographical features will permit.

The location of Interceptor units in this manner will permit pursuit to concentrate in effective numbers against hostile formations and will enable all available interceptor units to expend their maximum combat effort. The employment of Interceptors for the local defense of numerous areas will result in such dispersion of forces that an effective force will not be available in any single area. On any given day, the majority of the Interceptor units defending local areas will have no combats while a few units will be required to engage greatly superior hostile forces.

The employment of Interceptors for local defense may be justified under certain special conditions. For instance, a state having but one vital area should certainly concentrate all of its Interceptor pursuit for the defense of that area. Thus, during the World War, German air attacks upon the British Isles were concentrated upon London and its suburbs.

In some situations it may be expected that the major hostile air effort will be directed against our airdrome areas, initially at least. The location of Interceptor units so as to facilitate the interception of hostile aircraft engaged upon missions against our airdromes will afford our Interceptors the opportunity for expending maximum combat effort. In any case the Air Force is of such vital importance and is so vulnerable when immobile upon the ground, that the minimum requirements for its security will necessitate the assignment of an Interceptor force of considerable size to that mission alone.

The organization of our present G.H.Q. Air Force is such that Interceptor pursuit is provided in numbers barely sufficient for satisfying normal requirements for the security of Air Force airdrome areas. No pursuit airplanes or units are provided for the general defense against hostile air attacks or for army cooperation. This deficiency in pursuit will have no ill effect if our counter-offensive force is successful in quickly destroying the hostile striking force and if there is no necessity for army operations. However, our counter-offensive may not be wholly successful or the army may be required to take the field. In either case a period of at least eighteen months will be required to correct the initial deficiency in Pursuit Interceptor and Fighter type airplanes.

At present, three pursuit groups composed of three squadrons each are authorized. An additional squadron for each group is assigned to school duty. For an emergency, we have available nine squadrons of pursuit.

Two pursuit groups are now assigned to Composite Wings, one each of bombardment and attack. Experience indicates that the assignment of pursuit to composite organizations provides no tactical advantage but results in such dispersion of pursuit forces that effective concentrations at any one point are impossible. However, the composite organization in peacetime does afford pursuit opportunities for training with other classes of aviation.

In order to obtain the maximum degree of effectiveness, it is believed that Pursuit should be organized in Wings consisting of three groups and groups of four squadrons.

The three group wing provides sufficient strength for long continued operations and, on occasion permits pursuit to engage in sustained action with large hostile concentrations by successive group attacks. The effect of engaging the enemy with fresh groups at intervals of fifteen to twenty minutes cannot fail to be cumulative. The enemy will be less able to resist each new attack.

For routine "Alert" duty, the Wing of three groups permits a rotation of groups on the alert so that repairs to equipment can be made while flying personnel are resting.

The Group of four squadrons provides sufficient mass strength for the majority of operations. Fewer squadrons would result in ineffective combats and more than four squadrons would result in providing an unwieldy group which could not find space for the engagement of all of its units. The four-squadron group also facilitates the simultaneous attack on hostile formations from four directions.

Experience indicates that the squadron of eighteen airplanes in three flights is the most effective squadron organization.

The subject of equipment was discussed in the conference on the Pursuit Airplane. However, for the sake of emphasis, the principal points with regard to the equipment provided for Interceptor units will be repeated here.

The Interceptor airplane must be able to climb at the maximum rate. It should possess high speed at altitude. It need not be highly maneuverable and does not require a factor of safety which will enable it to withstand violent acrobatics at high speed. Its armament should include a light gun of 20 to 25 mm. capable of delivering accurate fire at long ranges. Pending the development of such a gun, .50 caliber machine guns should be installed. The Interceptor should carry and be able to drop accurately a minimum of ten 15-lb. time-fuzed bombs. A load of twenty 10-lb. bombs would be preferable. The accessories to flight such as radio and oxygen should be provided. Above all, the Interceptor should be a small airplane, presenting the minimum target area to hostile gunners, and should be economical in construction, both with regard to cost in money and in time required for production.

The principal factors pertaining to the interception of hostile aircraft are:

- (1) Time
- (2) Space
- (3) Information of the enemy
- (4) Visibility.

The time factor affects the problem of interception at the following points:

- (1) Time required for the collection and transmission of information of the enemy and for issuing orders.
- (2) Time required for defending forces to leave the ground after receiving the order.
- (3) Time required to fly from defending airdromes to the point of interception.

The time values for the first and second operations may be reduced to minimum figures by intensive training of personnel and proper organization. During the Fort Knox Maneuvers, 1933, the average time required for the receipt of information of the enemy was more than two minutes while the time required for the take-off varied from five to fifteen minutes. For the Miami Maneuvers, 1935, messages pertaining to hostile aircraft were assumed but the average time required for the take-off was about four and one-half minutes. A comparison of these time values with those attained by units of the Royal Air Force shows how much can be accomplished by training and proper organization. An M.I.D. report on British Air Maneuvers, 1931, states, "Raid warnings are received and plotted in the operations headquarters within half a minute. The interceptor squadron would receive its instructions within three minutes of a raid's crossing the coast and would be in the air within five minutes". A careful study must be made of all the operations required for an interception with a view to reducing to the minimum the time required for each phase.

The time required to fly from Interceptor airdromes to the point of interception will vary with each mission. It is determined by such factors as the route, speed and altitude of the enemy, the location of pursuit airdromes with reference to the route of the enemy, and the speed and rate of climb of Interceptor airplanes. The reduction of this time value to the minimum consistent for effective operations results in the conservation of pursuit effort.

The space factor is the principal consideration in determining the location of Interceptor airdromes. The space factor is determined, principally, by the extent and effectiveness of the ground aircraft reporting service or alert net. Sufficient space must be provided between the Interceptor airdromes and the farthest points where information of the enemy will originate to accommodate all the time values necessary to making a timely interception of hostile aircraft.

The calculation of the space required for an interception is comparatively simple when all the time values, the performance of hostile and friendly aircraft, and the meaning of timely interception are known.

For illustration, assume that Interceptor pursuit desires to make a head-on interception of a hostile force flying 210 miles per hour, at 15,000 feet on a course which will bring it over the vicinity of the pursuit airdrome. The Interceptor can climb to 15,000 feet at an average rate of 2,500 feet per minute with a forward speed of 120 miles per hour. In order to comply with the tactical requirements for a timely interception, pursuit must make contact with the enemy 6 minutes before he arrives over the pursuit airdrome. Assuming that the total time required for receiving

information of the enemy, issuing the order to take off and for taking off is 6 minutes, we set up the following equation in order to determine the time required for pursuit to arrive at 15,000 feet: $6 \text{ plus } \frac{15,000}{2,500} =$

12 minutes. Of this 12 minutes, 6 minutes apply to the space factor, for during 6 minutes pursuit moves forward at the rate of 120 miles per hour. During the entire period of 12 minutes, however, the hostile force is approaching at the rate of 210 miles per hour. Therefore, in order to arrive at the value of the entire space factor, the following equation is set up: $(12 \times \frac{210}{60}) + (\frac{15,000}{2,500} \times \frac{120}{60}) = 54$ miles. Pursuit can make interception under the conditions named if information of the enemy originates 54 miles from the pursuit airdrome. However, the interception will occur but 12 miles from the pursuit airdrome which does not satisfy the requirement of 6 minutes for a timely interception. Six minutes at the enemy's speed is equivalent to 21 miles of distance. Assuming that the Interceptor's high speed in level flight at 15,000 feet is 270 miles per hour, it is apparent that pursuit must fly 2 minutes at this speed in order to make the interception 21 miles out instead of 12 miles; an increase of 9 miles in the space factor. During these 2 minutes the enemy will cover 7 miles. The total space requirement then is $(54 + 9 + 7) = 70$ miles.

An analysis of the assumptions made for the purpose of illustrating the method for calculating the space factor leads to the conclusion that several values may be altered by the training of personnel, and the production of improved equipment. Five minutes instead of six should suffice for the collection of information and the take-off of an Interceptor unit. The high speed of the Interceptor at 15,000 feet should be 300 miles per hour and can be obtained easily if a specialized Interceptor type rather than an all-purpose type of pursuit airplane is provided. The average rate of climb to 15,000 feet can be increased to 3,000 feet or more per minute by the same means. The Interceptor airdromes will usually be located well in advance of possible targets for hostile bombardment so that there will be no necessity for making interception 21 miles in advance of those airdromes.

In conclusion of this discussion of the space factor, it is believed that well-trained Interceptor units equipped with properly designed airplanes and operating on information furnished by an efficient aircraft reporting service can make interceptions consistently when located fifty miles from the outermost observation posts. Poorly trained units equipped with all-purpose airplanes may require one hundred miles for any interception and will be unable to make interceptions consistently.

There are two agencies which are capable of collecting and transmitting information of the enemy, aerial observation and the ground Aircraft Reporting Service.

Aerial observation has the advantages that it may extend out farther and that it will usually provide more accurate details regarding the type, altitude, and course of the enemy. However, if aerial observation alone is relied upon for information of the enemy, it is obvious that a prohibitive number of observation planes will have to be employed in order to thoroughly patrol all areas over which the enemy may approach. Aerial observation is of little value for such work at night and the transmission of its reports over considerable distances is uncertain and unreliable.

The ground aircraft reporting service, sometimes called the Antiaircraft Warning Service, the Alert Net, the Alarm Net, and Aircraft Warning Service, is able to operate both night and day and in any weather when flight is possible. Information from its observation posts is transmitted by wire and is not subject to interference by the enemy.

It is known that England, Germany, France and Italy have developed effective aircraft reporting services covering all areas where possible targets for hostile air attack are located. Of all these systems, the details of the English net are best known. However, the principal features of all the systems are similar. These features are:

- (1) The immediate location and report of hostile aircraft entering the net.
- (2) Periodic reports of the enemy by successive posts at frequent intervals.
- (3) The use of pursuit and ground guns to deny freedom of action to the enemy as well as for his destruction.
- (4) The coordination of all defense installations, both active and passive, under one authority.

The aircraft reporting service is the basis of successful air defense. Its value is stressed in a volume entitled, "Air Defense", by General E. B. Ashmore. It is necessary even if nothing but purely passive defense measures are contemplated and it is absolutely essential for the successful execution of offensive measures. Since it is the basic requirement for air defense, the organization and equipment of this service should receive priority over all other defense measures, even the production of Interceptor type airplanes.

The details of the organization of the aircraft reporting service and the technique involved in its operation will be discussed in the next conference.

Visibility affects the problem of making an interception less today than during the World War. Due to the fact that the progress of the enemy force will be reported at frequent intervals to the Interceptors by radio, it is believed that pursuit can make interception under any condition of visibility when the enemy will attempt to operate in force. Single airplanes may use clouds to shield their approach to a target and to escape attack but large formations will have great difficulty in locating and attacking a target except by flying in the clear for a considerable period of time.

CORPS FILE

THE AIR CORPS TACTICAL SCHOOL
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1935--1936

Course: PURSUIT AVIATION

CONFERENCE NO. 4

THE AIRCRAFT WARNING SERVICE AND ALERT NET

The use of the word "Warning" in the name of this service does not convey the proper meaning. While the service may warn, its basic requirement is to report accurate details with regard to hostile aircraft flying over the net. The use of the word "Reporting" in the title would convey a far more adequate idea of the requirements of this service than does "Warning".

The German Alert Net is somewhat different in organization to that of any other nation. Exposed to possible air attack from every direction, German air defense is planned on a series of concentric circles with defense areas prescribed by radial lines radiating out from the center of the country to the borders.

Observation--Listening posts are located at distances of 15 to 20 kilometers apart over the whole country. From 5 to 10 posts are connected by direct telephone lines to an Information Center while two or three Information Centers are connected to a central Intelligence Center. This organization completes the net for a single defense area or sector, but all defense areas are connected directly with General Defense Headquarters. General Headquarters directs the application of both active and passive defense measures in threatened areas.

The English net covers the industrial regions and centers of population of England and Scotland only. Its general shape is irregular but more rectangular than round. Its organization is practically the same as the German, except that more Observation-Listening posts are connected to each Information Center, about 15 to each Center. The Intelligence Centers are eliminated by connecting Information Centers directly to Defense Headquarters. There are no clearly defined defense areas since the objective seems to be the interception and destruction of hostile air forces penetrating toward the interior. As in Germany, air defense headquarters is charged with the conduct of all defensive operations, both active and passive. It controls all the agencies of defense, including Interceptor pursuit, ground guns, the Aircraft Reporting Service, searchlights, balloon nets, artificial smoke devices, the darkening of areas, the cessation of industrial activity in threatened areas, and the operations of fire, sanitary, and chemical squads.

Personnel for the operation of the Aircraft Reporting Service belong to the Observers Corps, a reserve military organization. The policy of assigning members of this corps to duties in the vicinity of their homes is strictly adhered to in so far as is possible.

A number of units of the Observers Corps are called to active duty annually for the operation of the net and other defensive measures.

P-3
36-270
4-13-36
km

during the period devoted to Royal Air Force Maneuvers.

The Italian Aircraft Reporting Service is organized to cover all the provinces of Italy except the marshy maritime provinces which contain no profitable targets for hostile air attack. Italian defensive measures are so detailed as to include the sandbagging of monuments and the protection of valuable works of art.

The latest reports on the French air defense system indicate that six areas only have been designated for defense and that the defense of each area will be an independent operation. This plan must result in the division and dispersion of available equipment and may lead to ineffective defense in one or all areas. Certainly an offensive effort can be prepared which will be able to overwhelm the defense in a single area. No recent reports on French defense measures are available and it is probable that this plan for the local defense of six independent areas has been abandoned in favor of a centralized system which will be able to concentrate defensive effort to resist hostile air invasion rather than to attempt to defend designated points from hostile air attack.

Explain the diagrammatic representation of an Aircraft Reporting Service for the Montgomery Area.

Explain the square and the round interception maps, pointing out the differences in technique involved in the operation of the two methods.

Explain the organization and technique for making night interceptions.

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Course: PURSUIT AVIATION

MAP PROBLEM NO. 1

SECTION		Paragraphs
I	Situation and Requirement.	1 - 4
II	A solution	5
III	Comments on solutions.	6

SECTION I

SITUATION AND REQUIREMENT

	Paragraph
General situation.	1
Special situation, as of 1:00 PM, 27 March	2
Special situation, continued	3
Requirement.	4

1. GENERAL SITUATION.--a. MAPS.--State of Alabama, U. S. Geological Survey, (1933), 1:500,000.

b. (1) The Mississippi--Alabama state line forms the boundary between two hostile states, Blue (east) and Red (west).

(2) Special situation (Blue).--At 1:00 PM, 27 March, the Blue First Army was opposed by a Red army on the line: Rosemary--Newbern--Uniontown--Lamison.

(3) The Blue First Air Force occupies airdromes in the area, Eufaula--Troy--Montgomery--Alexander City--Lanett. The 1st Pursuit Group occupies airdromes as follows: Group Headquarters, Maxwell Field; the 2d and 3d Pursuit Squadrons, Municipal Airport; the 4th Pursuit Squadron, City Airport.

(4) Blue has organized and is operating an Air Force Alert Net covering the entire state of Alabama south of the 34° parallel of latitude and east of the Red Army front.

c. The Red Air Force, of approximately the same strength and organization as the First Blue Air Force, has been located in an airdrome area in the vicinity of Jackson, Mississippi (not on Map). Reports indicate that the Reds are operating an alert net covering the entire state of Mississippi.

2. SPECIAL SITUATION AS OF 1:00 PM, 27 MARCH.--

a. Beginning at dawn, 27 March, the Blue First Air Force engaged in vigorous offensive action against the Red Air Force. All Red bombardment and attack airdromes were attacked by units of the Blue 1st and 2d Divisions. One Red bombardment and one attack group were not on their airdromes during the Blue attacks but severe losses were inflicted upon the other Red units. Blue attack and bombardment units suffered considerable losses from Red pursuit during these operations and will not be in condition to operate again before 6:00 AM, 28 March.

b. The Blue 2d Pursuit Group intercepted a Red attack group in Area B, and the 3d Pursuit Group intercepted a Red bombardment group in Area C during the morning, 27 March. Both Red groups were disorganized, but the two Blue pursuit groups suffered such damage that they will be unable to operate before dawn, 28 March.

c. The Blue 1st Pursuit Group engaged in no combats during the morning of 27 March, and is on its airdromes on the alert for interception missions.

3. SPECIAL SITUATION, CONTINUED.--Beginning at 2:00 PM, 27 March, a series of messages were received by Brigadier General A, Air Defense Commander, who was in Defense Headquarters, together with his staff, at Montgomery, Alabama. The following are extracts from those messages:

(1) "2:00 PM. Red bombardment group, javelin formation, 12,000 feet over Eutaw (Ala.) course 105°.

B, Observer
11th Obs. Group."

(2) "2:08 PM. Square B 85. 36 Red bombers, 15,000 feet, flying 105°.

Observer,
Alarm Net."

(3) "2:13 PM. Square A 78. 36 Red bombers, 15,000 feet, flying 105°.

Observer,
Alarm Net."

(4) "2:16 PM. Square A 72. 36 Red bombers 15,000 feet, leaving square. Course 105°.

Observer,
Alarm Net."

(5) "2:20 PM. Square A 60. 36 Red bombers,
15,000 feet. Course 45°.

Observer,
Alarm Net."

(6) "2:23 PM. Square B 49. 36 Red bombers
leaving square, 15,000 feet, course 45°.

Observer,
Alarm Net."

(7) "2:27 PM. Square B 39. 36 Red bombers,
15,000 feet, changed course from 45° to 120°.

Observer,
Alarm Net."

(8) "2:30 PM. Square B 32. 36 Red bombers
15,000 feet, course 120°.

Observer,
Alarm Net."

(9) "2:33 PM. Square B 25. 36 Red bombers,
15,000 feet, course 120°.

Observer,
Alarm Net."

(10) "2:36 PM. Square A 18. 36 Red bombers,
15,000 feet, course 120°.

Observer,
Alarm Net."

(11) "2:39 PM. Square A 11. 36 Red bombers,
15,000 feet, course 120°.

Observer,
Alarm Net."

4. REQUIREMENT.--a. Give in detail the actions taken and orders issued by Brigadier General "A", Air Defense Commander, between 2:00 and 2:40 PM, 27 March. Cover only such acts and orders as apply to the denial of hostile aerial operations and, if an interception is ordered, his reasons for issuing the order at that particular time.

b. If, in your opinion, interception should occur prior to the receipt of any particular message given in Special Situation (paragraph 3), disregard messages received later.

c. If combat between Blue and Red occurs, a final message should be included showing time, place and Red unit attacked. A form for this message follows:

(Time) (Blue Unit) Attacking (Red Unit)

Over _____ at _____
(Square or place) (Altitude) (Signature)

NOTE 1.--For this problem, Air Defense Headquarters will prepare and broadcast all necessary orders and instructions to the 1st Pursuit Group.

NOTE 2.--All pursuit airplanes have two-way radio sets.

NOTE 3.--A constant speed of 210 miles per hour will be assumed for pursuit units employed in this problem.

NOTE 4.--A delay of 5 minutes must ensue between the order for "Stations" and the execution of the Order, "Take off".

NOTE 5.--The weather is clear.

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Course: PURSUIT AVIATION

MAP PROBLEM NO. 1

SECTION II

A SOLUTION

A solution. Paragraph
5

5. A SOLUTION.--a. Upon receiving the radio message at 2:00 PM, Brigadier General "A" directed S-2 to note the position upon the map and to be prepared to plot the course of the Red bombardment group. He directed that all further messages relating to the Red force be relayed to Colonel "B", commanding 1st Pursuit Group, at his operations office. Then with S-2 and S-3, he awaited further reports of the hostile force.

b. At 2:08 PM, he directed Colonel "B" to order the 1st Pursuit Group to "Stations".

c. At 2:13 PM, he issued the following order to Colonel "B":

"Take off immediately. Intercept and attack the Red bombardment group reported over Square A 78."

He then directed that all further information relating to the Red group be radioed without delay to the 1st Pursuit Group in the air.

d. His reasons for ordering off the 1st Pursuit Group at 2:13 PM are as follows:

(1) The Red bombardment group has been flying a straight course aimed directly at Montgomery for 13 minutes. Apparently its objective is either the city of Montgomery or the airdromes of the 1st Pursuit Group.

(2) The enemy is well within intercepting range and the limit of delay for a timely interception has arrived.

e. The following messages pertaining to the interception of the Red force were received:

(1) "2:28 PM. Red bombardment formation sighted three miles south Thorsby. Will attack at once.

'B'
Colonel, 1st Pursuit Group."

(2) "2:30 PM. Blue pursuit attacking Red Bombardment formation two miles east Clanton.

Observer,
Alarm Net."

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ILLUSTRATIVE PROBLEM NO. 1

SECTION I	Situation and requirement.	Paragraphs 1 - 4
SECTION II	A solution	5

SECTION I

SITUATION AND REQUIREMENT

General situation.	Paragraph 1
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1. GENERAL SITUATION.--a. MAPS.--Special Map for Air Corps Problems, scale 1:500,000.

b. The general situation for this problem is the same as that described in the general and special situation for Map Problem No. 1. A resume thereof is as follows:

(1) Boundary between states.--The general line: Delaware Bay--Chesapeake and Delaware Canal--Susquehanna River--800 grid line forms part of the boundary between two states, Blue (north) and Red (south).

(2) Red declared war upon Blue 1 April. The Red Air Force began immediately the bombing of Blue industrial centers and rail communications. Red observation aviation has been active, deep in Blue territory, and over the Blue Air Force area. Red pursuit has been employed primarily to provide security for the Red Air Force on the ground.

(3) Blue retaliated, with her air force operating primarily against the Red Air Force. Blue Air Force observation aviation met with heavy resistance and incurred some losses in locating and photographing Red airdromes.

(4) Both Blue and Red have established effective aircraft reporting services, permitting their pursuit forces to operate in defense of their respective air force areas and establishments in their vicinity.

(5) Blue Air Force units are located as follows:

Headquarters: Paterson (630-890)

1st Air Division: In the area: Crosswicks
(590-795)--Frenchtown
(545-840)--Hillburn (620-
915)--Keyport (630-830).

2d Air Division: In the area: Frenchtown
(545-840)--Kunkletown
(510-880)--Huguenot (590-
950)--Hillburn (620-915).

1st Pursuit Wing: Wing Headquarters: Bethlehem
(515-850).

1st Pursuit Group: On squadron airdromes in
the vicinity of Allentown (510-850).

2d Pursuit Group: On squadron airdromes in
the vicinity of Quakers-
town (520-820).

3d Pursuit Group: On squadron airdromes in
the vicinity of New
Hope (560-815).

11th Observation Group: On squadron airdromes
in the vicinity of
Paterson (630-890).

(6) Red Air Force units have been located
as follows:

Red Pursuit Group area in the vicinity
of Springfield (360-620).

Red Pursuit Group area in the vicinity
of Herndon (340-650).

Red Bombardment Group area in the
vicinity of Orange (270-560).

Red Bombardment Group area in the
vicinity of Fredericksburg (330-565).

Red Attack Group area in the vicinity
of Culpepper (280-590).

Unoccupied landing fields in the
vicinity of Brandywine (385-615).

(7) Beginning at daylight, 12 April, the
Blue Air Force Commander undertook to bring about
decisive action against the Red Air Force by co-
ordinating the efforts of all units of the Blue

First Air Force. The Red bombardment groups at Orange and Fredericksburg, and the Red Attack Group at Culpepper were attacked. Rail communications leading into and within the Red Air Force area were attacked. The Blue 11th Observation Group continued intensive reconnaissance in an effort to locate and photograph additional Red airdromes. The Blue 1st Pursuit Wing conducted an offensive operation against Red pursuit in general support of the Blue Air Force operations, and provided security for the Blue Air Force.

2. SPECIAL SITUATION AS OF 6:00 PM, 12 APRIL.--a. Additional Red airdromes have been located and photographed at the following points:

Red Bombardment Group Area in the vicinity of Tyler (305-520).

Red Attack Group Area in the vicinity of Quantico (345-595).

The airdromes in the vicinity of Brandywine have not been occupied.

b. G-2 reports indicate that as a result of the operations of the Blue First Air Force on 12 April, the Red bombardment groups at Orange and Fredericksburg will be unable to resume operations within the next twenty-four hours.

c. Red observation aviation was active throughout the day of 12 April, over the Blue Air Force Area. Many of the Red observation airplanes were driven off and some destroyed by Blue pursuit.

d. Due to strenuous operations for the past few days, and in furtherance of the general plan, it is contemplated that no units of the Blue 1st and 2d Air Divisions will operate between daylight and 12:00 noon, 13 April.

e. At 8:00 PM, 12 April, all components of the Blue First Air Force received the formal field order for the operations of that force on 13 April. Extracts from this field order are as follows:

* * * * *

3. a. The 1st Pursuit Wing will maintain not less than two groups on the alert from 4:30 AM to 8:30 AM, and not less than one group from 8:30 AM to 12:00 noon, 13 April, prepared to deny hostile aerial operations in order to provide security for the Blue Air Force.

b. The 11th Observation Group will * * * * *

f. At 10:00 PM, 12 April, all units of the 1st Pursuit Wing received the formal field order for the operations of that force from 4:30 AM to 12:00 noon, 13 April. Extracts from this field order are as follows:

* * * * *

2. This wing will be on the alert from 4:30 AM to 12:00 noon, 13 April, prepared to deny hostile aerial operations in order to provide security for the Blue Air Force.
3. a. The 1st Pursuit Group will be on the alert from 4:30 AM to 8:30 AM. After 8:30 AM, it will remain in readiness.
- b. The 2d Pursuit Group will be in readiness from 4:30 AM to 8:30 AM. It will be on the alert from 8:30 AM to 12:00 noon.
- c. The 3d Pursuit Group will be on the alert from 4:30 AM to 8:30 AM. After 8:30 AM, it will remain in readiness.
- x. Units on the alert will operate only upon orders from these headquarters.

* * * * *

3. SPECIAL SITUATION, CONTINUED. --Beginning at 5:32 AM, 13 April, messages from observation posts of the aircraft reporting service, were received at headquarters, 1st Pursuit Wing. The following are extracts from these messages:

"5:32 AM, Red bombardment group, wedge formation ENTLERVILLE (340-805), 10,000 feet, course 17°."

"5:39 AM, Red bombardment group, wedge formation, 4 miles west of MILLERSTOWN (355-830), 13,000 feet, changed course to 33°."

"5:45 AM, Red bombardment group, wedge formation 3 miles east of PAXTONVILLE (365-865), 15,000 feet, course 33°."

"5:50 AM, Red bombardment group, wedge formation, LEWISBURG (380-885), 15,000 feet, course 56°."

"5:56 AM, Red bombardment group, wedge formation, JERSEYTOWN (410-905), 15,000 feet, course 56°."

"5:58 AM, Red attack group, column of squadrons, 4 miles west of HANCOCK BRIDGE (515-710), 200 feet, course 52°."

"6:00 AM, Red bombardment group, wedge formation, BENTON (425-915), 15,000 feet, changed course to 90°."

"6:04 AM, Red attack group column of squadrons, 3 miles east of WOODSTOWN (535-735), 300 feet, course 52°."

"6:06 AM, Red bombardment group, wedge formation, 2 miles west of NANTICOKE (460-915), 15,000 feet, course 90°."

"6:10 AM, Red attack group, column of squadrons CLEMENTON (560-750), 300 feet, course 52°."

"6:12 AM, Red bombardment group, wedge formation, 4 miles east of BEAR CREEK (485-915), 15,000 feet, course 90°."

"6:16 AM, Red attack group, column of squadrons, 1 mile southwest of PELBERTON (585-770), 300 feet, course 52°."

"6:18 AM, Red bombardment group, wedge formation, 3 miles east of TOBYHANNA (515-915), 15,000 feet, course 90°."

4. REQUIREMENT.--a. Give in detail the actions taken and orders issued by Brigadier General "B", commanding the 1st Pursuit Wing, and reasons therefor, from 5:32 AM, to 6:30 AM, 13 April. Cover only such necessary actions and orders as apply to the denial of hostile aerial operations.

b. If, in your opinion, combat should take place prior to the receipt of any of the messages given in Special Situation (paragraph 3), disregard those messages affected.

c. State time, place, and Red unit or units attacked by Blue pursuit, if such action is ordered. This information will be given as a message or messages from observation post or posts. A form of message is as follows:

_____ Pursuit _____
(Time) (Unit or units - state size)

Attacking Red _____ Over _____
(Unit - state what unit) (Place)

NOTE.--a. Brigadier General "B" has communications with all Blue pursuit group headquarters by both radio and direct wire telephone.

b. Blue pursuit airplanes have two-way radio (telephone in group and squadron commanders' planes). All other pilots have receiving sets only.

c. The weather is clear, with light northerly winds.

THE AIR CORPS TACTICAL SCHOOL
Maxwell Field, Alabama
1935--1936

Course: PURSUIT AVIATION

ILLUSTRATIVE PROBLEM NO. 1

SECTION II

A SOLUTION

A solution. Paragraph
5

5. A SOLUTION.--a. Brigadier General "B" received the message at 5:32 AM and directed S-2 to plot the course of the Red bombardment group. He also directed that all messages pertaining to Red aerial activities be promptly relayed to each Blue pursuit group on the alert. Then with S-3 and S-2, he watched the progress of the Red bombardment group on the map.

b. He noted the change in course of the Red bombardment group at 5:39 AM, and, together with S-2, made a study of time and space factors.

c. Brigadier General "B" received the message at 5:50 AM, noted the change in course, and issued the following order to the 1st Pursuit Group:

"Take off immediately, attack and destroy the Red bombardment group reported over LEWISBURG, 5:50 AM, 15,000 feet, course 56°."

He also directed that all further information relating to the Red bombardment group be radioed immediately to the 1st Pursuit Group in the air.

d. Brigadier General B's reasons for his above actions are as follows:

The Red Bombardment Group had made two changes in course since first reported over Blue territory. These changes in course had brought it into the zone of action of Blue pursuit, and a study of time and space factors indicated that if a timely interception was to be made, Blue pursuit must take off immediately.

Brigadier General "B" considered ordering off both pursuit groups against the Red bombardment group. He concluded, however, that he could wait at least ten minutes before ordering off the 3d Pursuit Group, as only one group could attack at a time. Also, the ordering off of the 3d Pursuit Group would leave no Blue pursuit on the alert.

e. At 5:52 AM, he directed S-3 to order the 2d Pursuit Group to go on the alert at 6:52 AM.

f. Brigadier General "B" received the message at 5:58 AM and issued the following orders to the 3d Pursuit Group:

"Take off immediately, attack and destroy the Red attack group reported four miles west of HANCOCK BRIDGE, 5:58 AM, 200 feet, course 52°."

He also directed that all further information relating to the Red attack group be radioed immediately to the 3d Pursuit Group in the air.

Brigadier General B's reasons for his above actions are as follows:

The Red attack group was within the zone of action of the pursuit. A study of time and space factors indicated that the 3d Pursuit Group must take off immediately in order to make a timely interception of this group.

g. The following messages from observation posts were received:

"6:00 AM, pursuit group attacking Red bombardment group over SUGAR NOTCH (470-915)."

"6:13 AM, pursuit group attacking Red attack group over BEDFORD (575-765)."