Part I:

The Aviation Section

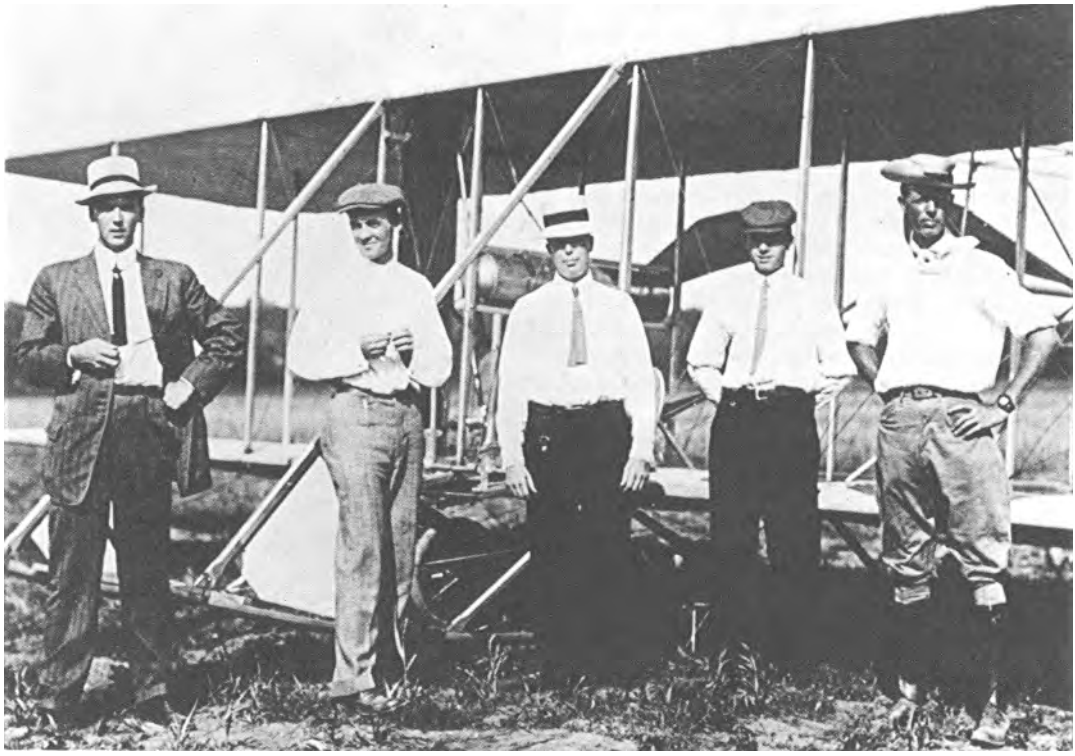
1914-1917

When the Great War began in August 1914, military operations with lighter-than-air craft had a history going back well over a century. The airplane, however, was a new and as yet relatively untried instrument of warfare. While European nations had spent considerable sums in recent years in building up air forces of both lighter- and heavier-than-air craft, the United States had lagged far behind.

In the United States, military aviation was under the jurisdiction of the Signal Corps, where the balloon section that had been established in 1892 had been expanded into an Aeronautical Division in 1907 to take in heavier- as well as lighter-than-air activities. In the first part of August 1914 the Army had fewer than 200 officers, enlisted men, and civilians in its aviation establishment. Of the 30 airplanes that had been obtained up to that time, one (the first one, purchased from the Wright Brothers in 1909) was in the Smithsonian Institution, and 21 had been destroyed in accidents or condemned.

Dissatisfaction with lack of progress and with Signal Corps jurisdiction over military aviation had brought on a congressional inquiry and "An Act to Increase the Efficiency of the Aviation Service." Passed by Congress, and approved by the President on 18 July 1914, this act left aviation in the Signal Corps but created a new section to be responsible for aviation matters. Among other things, it also authorized as many as 60 officers and 260 enlisted men for aviation duty.

Meantime, the Chief Signal Officer, Brig. Gen. George P. Scriven, had asked for $1,000,000 for aviation for Fiscal Year 1915, but Secretary of War Lindley M. Garrison had reduced the amount to $300,000, and Congress had cut out another $50,000. Thus the new Aviation Section began business with an annual appropriation of only $250,000, but that was twice as much as had been provided for the previous year.



Early U.S. military aviators:
(left to right) Capt. Paul W. Beck, Lt. Henry H. ("Hap") Arnold, Capt. Charles D. Chandler, Lt. Thomas D. Milling, and Lt. Roy Kirtland

1. Aeronautics in the Army
1913

Hearings on the "Act to Increase the Efficiency in the Aviation Service" centered on the question of organization. Considerable attention was given, however, to the purpose and function of aviation in the U.S. military establishment. The matter of organization had been taken up early in 1913 by Congressman James Hay (D., Va.), who introduced a bill to take aviation out of the Signal Corps. The bill ran into so much opposition, however, from the War Department and from officers closely associated with aviation that it had to be abandoned. But Hay did not give up. In May 1913 he introduced another bill to create an Aviation Corps which would be directly under the Chief of Staff and would be equal to other branches of the line of the army.

The House Committee on Military Affairs, of which Hay was chairman, held hearings on the new bill from 12 to 16 August 1913. The following were among those who testified: General Scriven; Henry Breckinridge, Assistant Secretary of War; Lt. Col. Samuel Reber, a signal officer and balloon pilot who was slated to become Chief of the Aeronautical Division; Maj. Edgar Russel, Chief of the Aeronautical Division; Capt. William Mitchell, who then was on duty as a signal officer on the General Staff and who had not yet learned to fly; 1st Lt. H. H. Arnold, Russel's assistant; Capt. Paul W. Beck, a pilot and the only officer who appeared before the committee in support of a separate aviation corps; and Riley Scott, a former Army officer who had been experimenting with bomb dropping and who, like Beck, thought that the airplane had a great potential for bombardment. Besides the chairman, the committee members mentioned in the extracts below were Daniel E. Garrett (D., Tex.), J. C. McKenzie (R., Ill.), Frank T. O'Hair, (D., Ill.), Frank L. Greene (R., Vt.), and Maurice Connolly (D., Iowa).

As a result of the hearings of August 1913, the committee struck out everything after the enacting clause and rewrote the bill, which later was enacted (Doc. 3), to provide for an Aviation Section in the Signal Corps. Following are extracts from these hearings in 1913.[1]

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Gen. Scriven [reading from a memorandum which he had among his papers] . . . Aeronautics and aviation in military affairs are merely an added means of communication, observation, and reconnaissance, and ought to be coordinated with and subordinated to the general service of information, and not be erected into an independent and uncoordinated service.

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The Chairman. Will you state briefly what are the functions of an Aviation Corps in time of war?

Gen. Scriven. Of course it is all theory. Little has been done offensively with aeroplanes in war, but they have done a great deal in reconnoissance work in maneuvers and the like, especially in France, a little in Italy, and they are trying to do something in Mexico. It seems that the thing divides itself into two different classes of work to be done. One is scouting and reconnoissance work by the fast flying machine, heavier than air.

The Chairman. How does that pertain to the Signal Corps?

Gen. Scriven. The results of reconnoissance work must be reported. The aeroplane is an adjunct to the Cavalry. It makes long reconnoissances and performs distance scouting. The cavalryman outlines his advance position, the aeroplane detects and observes him in the distance, and must send the information back instantly to the commander of the forces, and must do so by wireless.

1. Hearings before the Committee on Military Affairs, House of Representatives, *Aeronautics in the Army*, 63d Cong. 1st sess (1913).

The Chairman. How about the scouts sent out by the Cavalry, they have not to send back information in the same way?

Gen. Scriven. They also have the wireless to some extent; but the aviator must have his wireless man with him, and his observer must be able to manage wireless to be of much use. The aeroplane has also a fighting function, we presume: that is, the bomb dropping. Of this nobody knows much of anything, but we have theories. As to the dirigible, its management is most essentially Signal Corps work, so far as observation and reconnoissance work can be done by balloon. The dirigible is capable of hovering over a city or a command or whatever you like, constantly sending in reports.

Mr. Garrett. You say that both machines will carry wireless equipment?

Gen. Scriven. Yes, sir. The aeroplane probably will carry other means of communication, such as the dropping of dispatches and things of that kind. One of the main services of the aeroplane is that of reconnoissance and the collection of information.

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Mr. Garrett. In the recent wars, what has been the success of the flying machine?

Gen. Scriven. Well, there has been a little reconnoissance work done, but the reports are not very full, and the fact of the matter is, many of the flyers, of course, are not to be classed as experts, and certainly not as trained military observers. The Turk can not handle an aeroplane—I know that—and the other peoples recently at war probably can not do much with such a machine. Some volunteers, of course, from Europe appeared at the seat of the recent war, but the reports I have read are not very full, not very satisfactory, but an occasional reconnoissance has been made that has proved of value.

Mr. Garrett. The point I have in mind is this: Could any army contend with its opponents if they should have an aviation service?

Gen. Scriven. I do not believe for a moment an army could so contend except at a disadvantage, and the condition in the Philippines is a good illustration of the fact. Consider the island of Corregidor. If an enemy should land, say, at Subig Bay and the defense was provided with aeroplanes, I doubt very much if the attack could get ashore; they must approach with their transports loaded with troops, with their horses and guns exposed in going ashore, and the beach open to anything that might come over it, attack from overhead—an ideal condition for the dirigible and aeroplane, which by dropping nitrogelatin might stop the landing or at least disorganize the enemy's troops. Whatever may be thought regarding the danger of attack to a warship from overhead, there can be no doubt of the tremendous influence of overhead attack upon transports crowded with troops and upon small boats and shore landings. At best this is a time of confusion, or at all events extra hazardous, and when the enemy must be to some extent disorganized and not prepared or capable of resisting to the utmost the approach of aerial war machines, whether dirigibles or aeroplanes.

On the other hand, if the defense had none and the enemy landed and marched to the hills that overlook Corregidor with a few aeroplanes and certainly with a dirigible, it is difficult to see how it would be possible to hold the position if conditions are at all what they may be expected to be in the attack on this position.

The Chairman. Do you mean by that that the science of aviation has advanced to such an extent that any country that is going to war with some other country would be handicapped and at a great disadvantage unless that country had an aviation corps sufficiently experienced to contend with that of the other country?

Gen. Scriven. I believe so, most distinctly. If you look at conditions at the Panama Canal—I have happened to talk with Mr. Scott, well known throughout the world as having conducted some interesting experiments in bomb dropping [Mr. Scott later appeared before the committee], who has informed me that he has dropped 100 pounds of nitrogelatin, and I believe the record shows that 400 pounds have been dropped from an aeroplane. In talking of the Panama Canal, Mr. Scott remarked that he had questioned a flier who the other day passed over the Isthmus in regard to the canal as a target, and especially as to the spillway of Gatun Dam. It appears that the latter makes a very conspicuous target; so, no doubt, do other vulnerable points. Now, the question immediately comes up as to what would be the result of dropping 300 or 400 pounds of nitrogelatin on the lock or spillway. There is probably little difficulty in doing it, and should a foreign fleet anchored beyond the range of the guns of our fortifications, some distance out—say, 15 or 20 miles—aeroplanes may well be sent out and great damage to the canal done. Of course, nobody would expect to see the aeroplanes again, but the probability is that some of them would be effective. Now, if we have nothing to resist the air craft except land guns, it seems more than probable that some damage would be done and the working of the canal interrupted, especially if we have no air craft to resist that sort of attack.

Mr. McKenzie. How would you meet that attack?

Gen. Scriven. By aeroplanes and dirigibles.

The Chairman. Has the Ordnance Department succeeded in getting a gun that could be used on aeroplanes?

Gen. Scriven. The Krupp gun can do it. The Krupps have a gun that can be used against machines. The Ordnance Department has been experimenting, but I do not know that they have yet devised a gun.

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Mr. Breckinridge. . . . the vast amount of experimental work that has been done and the state of continuous development in which this matter of the service of information has existed during the last 50 years, and now exists, are such that all of the energy and capacity of a separate body, such as the Signal Corps, will be required. I am free to believe that the art of war since the Civil War, if it has

**Congressman
James Hay, Chairman,
House Committee on Military
Affairs.**

changed at all, has only changed in the service of information, and that the only thing that would make the Battle of Gettysburg different today from what it was 50 years ago would be that the work of each of the armies would be much better coordinated by the work of the Signal Corps, of which aviation would be merely a branch.

The Chairman. Mr. Secretary, may I ask what I asked Gen. Scriven, and that is what function does the Signal Corps perform, or, rather, what functions will the aviation corps perform that pertains to the Signal Corps, which is purely a means of information?

Mr. Breckinridge. This, for instance: the aeroplane goes out under orders, perhaps, of the commander of a screening brigade of cavalry which is protecting the advance of a larger body of mixed troops. Now, the aviator goes and gets his information; he is 20 miles away, and how does he get that information back? You do not transmit that information in the manner in which he came for it. He is 20 miles away, and he will send an instantaneous wireless message. Now, he will send that instantaneous wireless message and that message will be received by what? By another wireless outfit under the command of the Signal Corps, and thus the information reaches the commander of

the screening brigade of cavalry. As I say, that message will be sent back by wireless or wire or through some other agency of the Signal Corps. The transmission of that information from there to the commanding general of the army, who may be 100 miles away, will be through nothing but agencies of the Signal Corps until it gets there. Of course, the Cavalry gets information, but the Cavalry is not under the Signal Corps. The differentiation to be made is the result of experience. It is not a matter of logic. You could say, as a matter of logic, that because the Cavalry gets information the Cavalry should be under the Signal Corps, or you could say, as a matter of logic, that because the Cavalry gets information and is not under the Signal Corps, therefore no branch of the service that gets information should be under the Signal Corps. It is not a matter of logic, but a matter of experience.

The Chairman. What other service is it contemplated that aeroplanes or an Aviation Corps would render in time of war except to get information?

Mr. Breckinridge. At the present time the only established use that is proved for aviation is the expediting of the service of information and the getting of information.

The Chairman. But we are providing legislation not only for the present time but for the future.

Mr. Breckinridge. I would go so far as to say that for the immediate future 99 per cent of the value of aviation will be in the service of information. Now, I do not say that in the development of dirigibles which can carry 5 tons of lyddite or nitrogelatin or any other high explosive, they will not be able to perfect a device which will drop a ton of explosives in a vulnerable place. I can not say that the time will not come when a flock of dirigibles can come to England, if it is unprotected, and may hover in the air for 40 hours, as a dirigible can do, and destroy whole cities; but I do mean to say that, looking at it through the vista of the future with the largest powers of imagination with which we can conceive the probable future growth of aviation, and yet also looking at it from the viewpoint of legislation that is likely to be required, and taking the average development that will be experienced in the next 15 or 20 years in the Army, as far as we can see there ought not to be any separation, because this great development in aviation will not come in that length of time, particularly in this country, because we will follow rather than lead in its development.

The Chairman. We are far behind—

Mr. Breckinridge (interposing). We were the pioneers; we developed it. Wright was the first man to do it, but in the feeling of security that America has always had, and in that she may be somewhat justified, we have lagged behind other nations which immediately perceived the necessity of this thing from the military standpoint. If the aeroplane is never to be developed another inch, as Gen. Scriven has said, the nation that is without aviation will simply be overwhelmed by the nation that is equally as well prepared in other respects and is better prepared in the matter of aviation, because the question of victory or defeat, where the troops are anywhere near equal, will depend upon the question of information or the lack of information. I think that is all I care to say.

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Mr. O'Hair. What is the true function of the Aviation Corps?

Col. Reber. It is to receive and transmit information for the tactical commanders. For instance, the commander of a division desires to know what is going on in front of him. He has certain instrumentalities for gathering that information and certain instrumentalities for the transmission of that information. For example, his way of gathering it may be by Cavalry, screened Cavalry patrols, or Infantry patrols. There is a method for getting that information back. That information is transmitted back to the commander and he distributes it as he sees fit.

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The Chairman. . . . Capt Beck, we will hear you now. I wish you would state what, if any, experience you have had as an aviator, and to what arm of the service you belong.

Capt. Beck. Mr. Chairman and gentlemen of the committee, I am an Infantry officer and was detailed to aviation in January, 1911. My first experience with aviation was in January, 1910, when I was sent by the War Department, as its representative, to a large international meet which took place at Los Angeles. During that Los Angeles meet I had occasion to make a number of flights as passenger with Glenn Curtiss in his machine, which, incidentally, was not a passenger-carrying machine, but it was modified in order to carry me up, and with Capt. B. D. Foulois, who was flying a French Farman machine. During the course of the aviation meet it occurred to me that the aeroplane might be used as an aggressive factor in war, and following that the idea of dropping various and varying weights from the aeroplane to find out, first, whether or not the equilibrium would be changed because of this dropping, and, second, whether or not we could reasonably expect to strike an object on the ground. The largest weight that I dropped at that time was not in excess of 15 pounds. There was no change in the equilibrium of the machine. I found that the tables which I had roughly gotten up regarding the angle of dropping were totally inaccurate, which led me to perform a good deal of experimentation to bring out the proper tables.

The following November I was detailed by the commanding general of the western division to assist in the organization of a large aero meet at San Francisco. The people behind that meet were the most influential people on the coast, and they wanted to make something exceedingly large on account of the then fight between San Francisco and New Orleans for the Pan American Exposition. I simply bring that out to show the scope of the meet. I was made secretary on account of the experience I had had at Los Angeles, which, while small, at the same time was greater than anyone else on the coast had at that time. From November until January we worked up the details and the meet was held in January. During that meet I continued the experiments started before at Los Angeles. Lieut. Crissy, of the Coast Artillery, worked with me on the aggressive use of the aeroplane, and devised a bomb-dropping device which was worked from the aeroplane, and he also got up a set of tables which enabled him to determine with considerable accuracy where they would strike the ground at varying altitudes. Those experiments were successful to a height of 1,500 feet, showing conclusively that a weight up to 36 pounds could be dropped within 20 feet from an altitude of 1,500 feet. Understand, we were striving at that time to work out the basic principles. No one ever held for an instant that an aeroplane at 1,500 feet would be of any military value. We had to creep before we could walk, and we wanted to work out these things in order to arrive at the greater things which lay in the higher altitudes. Since that time ex-Lieut. Scott, of the United States

Capt. Paul W. Beck, a pilot and the only officer to appear before Hay's committee in support of a separate aviation corps

Army, has devised a bomb-dropping device which has been successful up to altitudes of 5,000 feet. I can not tell what his accuracy is offhand, but my impression now is that he dropped 14 projectiles from heights varying from 3,500 to 5,000 feet, and his largest miss was something like 30 feet from a given spot. I do not claim this to be absolutely accurate, but that is my impression.

The Chairman. Captain, that leads you to believe—

Capt. Beck. That leads me to believe that there is an aggressive use for the aeroplane.

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There are four fundamental uses for the aeroplane in war. One is for reconnoissance purposes; two, for fire control of Field Artillery and Coast Artillery; three, the aggressive use, and four, the occasional transportation use. Those things are not experimental; they have all been demonstrated. They have been demonstrated abroad, and if they have not been demonstrated here it is because our people have failed to grasp the situation. We are behind; in five years we have done nothing. . . .

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Maj. Russel. . . .

One of the best articles on the military value of the aeroplane has recently been written by Jacques Mortane, who as one of the greatest living authorities frequently advises the French military establishment. He brings out with a great clearness the overwhelming advantage of the aeroplane as an instrument of reconnoissance and report. He admits that its extensive use in offensive warfare by bomb dropping and machine-gun fire is as yet a matter of speculation. In these views he is supported by practically all of the conservative writers in the foreign services. To attempt to organize aviation on a basis of what it may be able to do some time is very unwise and, at any rate, premature.

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Mr. Green. When the aeroplane begins to be used for bomb throwing and machine-gun work it becomes then an instrument offensive and defensive, and that takes it out of the range of information transmission for all practical and general purposes, does it not?

Maj. Russel. As I have stated, there is a possibility of development in the offensive warfare utilization. It appears there has not been very much done as yet. No great accomplishment has been reported. It has some promise, but there have been no realizations of it. At present we can rely only on the aeroplane for obtaining and transmitting information.

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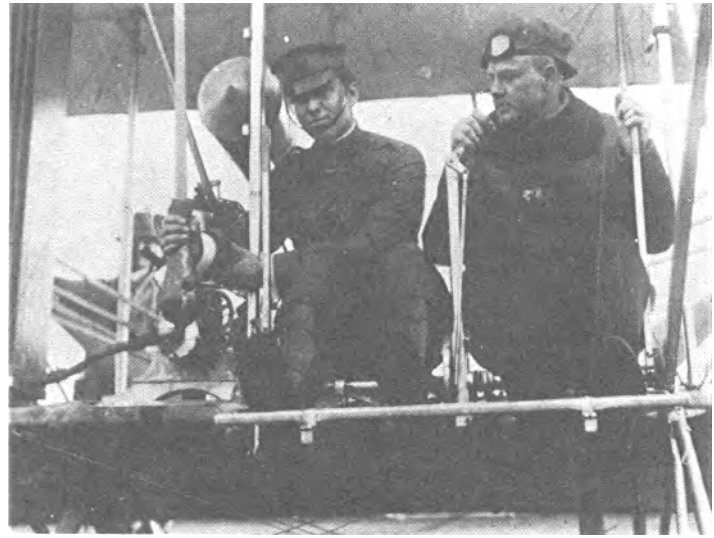
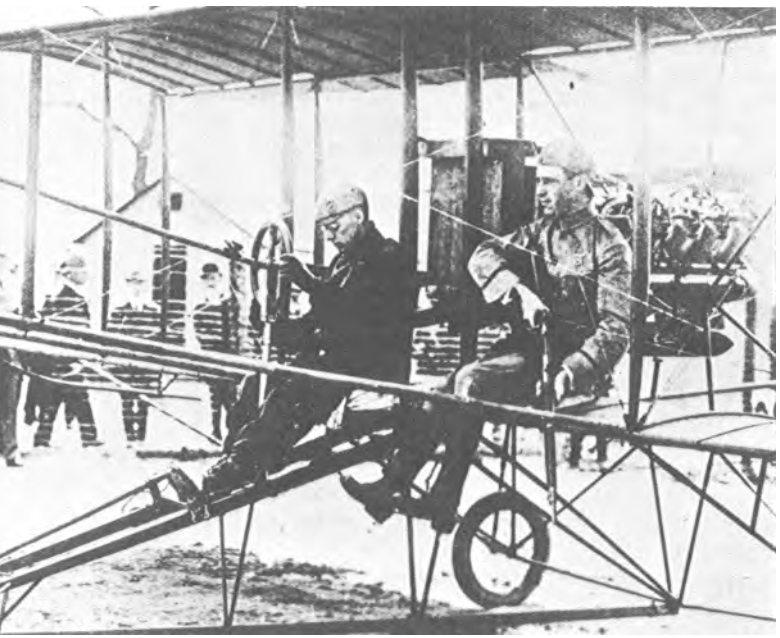
Capt. Mitchell. . . . This aeroplane business is pretty well understood in its relation to the military service; it is well understood by all of the great na-



Lt. Myron S. Crissy devised a bomb-dropping device and dropped the first bomb from a U.S. aircraft on 15 January 1911 at the Tanforan race track near San Francisco. Seated with Crissy is Phillip O. Parmalee, who piloted the Wright aircraft for the experiment.



Charles F. Willard, a Curtiss pilot, flew the Curtiss Pusher Biplane from which Maj. Jacob E. Fickel fired a rifle from an aircraft. The event took place during an air meet held in August 1910, at Sheepshead Bay, N.Y.

At right, Capt. Charles D. Chandler fired the first machine gun from an aircraft in flight on 7 June 1912. Thomas D. Milling was the pilot of the Wright Type "B" aircraft, but Lt. Roy C. Kirtland substituted for him in the pilot's seat.

tions—that is, it is well understood what it is good for. Now, if this thing were not any good at all, if we did not derive any advantage from it, it would not be of any use to do what we are attempting to do; but we all know that there is something in it, and that from the military standpoint it is a necessary and important adjunct to the military organization. We know absolutely that aeroplanes are valuable for reconnoissance service. Now, reconnoissance work means the getting of information in regard to the enemy and bringing it back to the person for whose use the information is intended. Aeroplane reconnoissance means finding out about the enemy; that is, getting information about large units and not little details about small detachments. We have troops for that purpose, but the aeroplane reconnoissance will be used for the purpose of securing information concerning large strategic combinations—the larger tactical movements—or the things useful for the commanding general to know. In other words, they will not be used to secure information respecting small details but of large tactical combinations. Now, the offensive value of this thing has not been proved. It is being experimented with—bomb dropping and machines carrying guns are being experimented with—but there is nothing to it so far except in an experimental way.

Some experimenters in Germany have dropped as much as 300 pounds of explosive from an aeroplane, and all that sort of thing; but, gentlemen, you should bear in mind that if you drop 300 pounds of explosive on one man, while it may tear that one man all to pieces, the effect will be entirely local. On the other hand, it might be used against bridges and it might be used against dockyards and storehouses; but at the present time all that is in the experimental stage. On the other hand, the aeroplane to be safe from fire directed from the ground must be over 4,000 feet altitude. That has been proved in Tripoli and in the Bulgarian war. That is to say, until that altitude is attained it is not safe from hostile fire, from the ground. We have got to be over 4,000 feet to be safe from that hostile fire. Now, gentlemen, with these conditions we know what organization we ought to have with the units of the Army we now have. We know that almost to the extent that we know what a regiment of Cavalry or a regiment of Field Artillery or a regiment of Infantry should be. Reconnoissance with the troops may be divided into two kinds—one strategical reconnaissance—that is, reconnaissance at a distance, to find out what the enemy's plans are away from the field of battle and the other is what we call tactical reconnoissance—that is, reconnaissance on the actual field of battle. We know that when an aeroplane is sent out alone on a mission it is apt not to get back—that is, the chances are that something is apt to happen to it—so it is the practice in this reconnoissance work to send out two aeroplanes. That would require two for tactical reconnoissance; and then if we have a strategical reconnoissance outfit, we will need two aeroplanes for that purpose. Now, for the purposes of tactical reconnoissance, suppose we are marching in this direction, for instance (indicating); we are reconnoitering the enemy's front for that purpose—that is, for tactical reconnoissance purposes—we need two aeroplanes for that service. At the same time we wish to get a line on the enemy's flank movements, and for that purpose we need two aeroplanes. Obviously, therefore, they ought to run in twos all the time. Therefore, as I said, we need two machines at least for each of these kinds of reconnoissance. We need two at least to reconnoiter ahead of the forces and two to reconnoiter in on a flank or other places for tactical purposes, and we need at least two for strategical reconnoissance, with a given force—say, a division of troops.

There is a third use for them which is very important in France on account of her present deficiency, as they believe, in the matter of artillery materiel. The Germans have recently developed a field howitzer which can probably get next to the French batteries. Consequently it is very important that they develop their field-artillery fire, and they have definitely worked out a system which is better than anything they had before and that is accomplished by means of aeroplane. That is a very important function—that is, the fire control of field artillery by means of aeroplanes. That is another element of use, and we would need a unit for that purpose. The French in their organization have that. The French, in their organization, have provided aeroplanes for the artillery commander. That is, the commander who handles that artillery has a given force of aeroplanes and they are assigned to each group. They assign machines for the purpose of handling the fire of a particular lot of guns. Their groups correspond to battalions in this country. In starting the organization in this country it seems to me that we have pretty definite things to go on. That organization ought to consist of one unit for strategic reconnoissance, consisting of two machines, and two units for tactical reconnoissance; that is, one unit for the front and one for the sides, or four machines. Then, we ought to have a unit for the field artillery fire control.

Now, in order that we may not overdo this thing, this organization ought to be thoroughly

considered. A certain number of aeroplanes have been recommended to constitute this unit, and that number is eight aeroplanes—two for strategical reconnoissance, four for tactical reconnoissance, two in front of the force, two on a flank, and two for field artillery fire control. Each of these aeroplanes must have two officers—one observer and one to do the flying—so that the minimum number in each machine would be two. Then, there should be one officer in command of each one of these forces and another to look after the property, making the number of officers necessary about 20; and of enlisted men in round numbers, 80 would be required for one of these units. Now the unit of Army organization is the division, because that is the smallest complete army in itself; it comprises all of the branches of the service capable of acting together, and, in round numbers, consists of 20,000 men. With the exception of our Civil War and with the exception of the war in the Philippines, where we had 60,000 men, all of our expeditions have been not to exceed that size, in one place. So it seems to me, in so far as our organization in this country is concerned, that our unit to be used with troops should be based on the division, because that is a little army in itself. . . .

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The Chairman. Do you think in course of time that the military by experience will be able to drop bombs with any accuracy?

Capt. Mitchell. Yes, sir; probably with great accuracy, but the effect would be the same as a high-explosive shell. We do not use that against personnel; we only use it against materiel—houses, buildings, etc.,—because the effect is local. Some of the people in the Russo-Japanese War had a thousand fragments of high-explosive shell taken out of their bodies. Its effect is entirely local. Against personnel we use shrapnel. This may be regarded as a short shotgun that is thrown in the air and explodes at the proper time and sweeps the ground for about 250 yards by 20 yards with a lot of heavy shot.

The Chairman. How about the machine gun?

Capt. Mitchell. It will probably never be any good for attacking personnel on the ground from aeroplanes; it may from dirigibles. To operate against other aeroplanes and dirigibles it will be used. On the other hand, it is thought in fighting aeroplanes they will try to ram each other as much as they can, and both get smashed up. That is a problem.

The Chairman. We would like to hear what you have to say about the possibility of the dirigible, how much they cost, and whether or not they are so important as to justify our Government in going into them.

Capt. Mitchell. We should keep up with modern methods. The cost of dirigible ballooning is tremendous. We have not the same problems that they have to deal with in Europe, but we should have a few; that is, one or two, and keep them up to date, so we will be capable of developing them if called on to do it. In Germany their idea is that they are the battleships of the air and will be able to carry a great amount of explosives and guns and at the same time reconnoiter. On the other hand, they are very subject to attack from these little hornets of the air—the aeroplanes.

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Lieut. Arnold. . . . I would like, if I may, to add a few remarks to some of the testimony given by preceding officers. In the first place, I would like to call attention to what has been done by aeroplanes and dirigibles in the Balkan war. Of course the information we receive now is very meager, and most of the information we have gotten is from consuls and considerable from military attaches, no official reports having come over as yet.

However, we do know that there was a naval lieutenant in a hydro-aeroplane—equipped with the bomb-dropping device invented by Mr. Scott, who was here yesterday—who located the Turkish cruiser that was creating so much havoc over in the Dar-

danelles. He made a cross-country flight of 180 miles out and 180 miles back and was fired on numerous times on that trip, but was not touched. He flew at an altitude of about 6,000 feet. In the Bulgarian Army, at the opening of the war, they had no aviation organization at all. They had four officers in Russia learning to fly and four machines under orders. Outside of that their aviation service did not amount to anything. So when the war broke out they had no experienced pilots whatsoever. But in spite of that fact they determined to organize an aviation corps and hired civilian aviators to enter the service, paying them a large bonus. Four or five of those aviators were crooks and did not develop at all; the others they used to train the officers. Up to about the 1st of December of last year they did not do anything at all, to speak of. At that time the aviation equipment was increased so that they had about 14 aeroplanes in use.

Between December 10 and January 1 it was known that there were a number of reconnoissance flights made and very valuable information turned in to the commanding generals of the different armies. There was a reconnoissance flight of 140 kilometers, at an altitude of between 1,100 and 1,200 meters, flying about opposing troops whose position they were able to reveal. They brought back very valuable information; just what the nature of that information was we do not know yet, but we know the flight was made and that they turned in a report to the commanding general. On the 11th another aviator flew over Preveza, with a passenger, and flew to a place 47 kilometers away, and brought back very valuable information as to the Turkish position. A short time later a flight was made over Janina to a place 75 kilometers away, at a height of 1,600 meters. This aviator threw down bombs, creating a veritable panic amongst the Turkish troops. Many hostile bullets tore the fabric, but the machine continued its flight unaffected. On the 28th of December a Greek army pilot officer made a flight over the fort of Bisani. He flew at an altitude of 2,300 meters, reporting observations concerning the garrison and the fortifications, which were considered of the highest importance by the Greek commanding officer. It is also known that at Adrianople aeroplanes and dirigibles were both used in going over the city.

Of course, their flight for reconnoissance purposes amounted to practically nothing, but these aeroplanes were equipped with the Scott bomb dropper, and dropped bombs on the city and set fire to it, which caused considerable damage.

. . . . . .

The Chairman. . . .

Capt. Scott, who has been in the Army and is now a civilian operator, is present, and we will hear him.

. . . . . .

The Chairman. You were at one time in the Army?

Mr. Scott. Yes, sir.

The Chairman. Did you do any duty as an aviator while in the Army?

Mr. Scott. No, sir. I took up aviation afterwards. I have made a special study of the aeroplane as an offensive weapon.

The Chairman. We would like to hear what your experience has been.

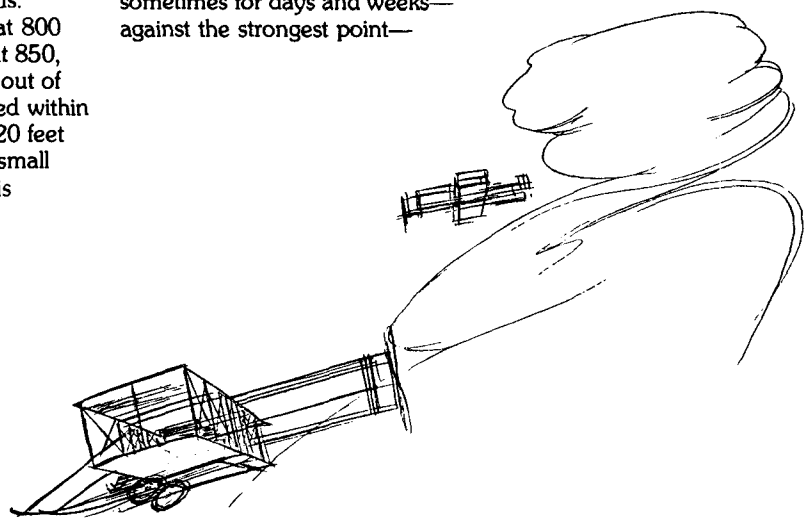
Mr. Scott. About 1908, when Mr. Wright was making his first flights, I came to the conclusion that the aeroplane would eventually become very important as an offensive weapon. The fact that you can get over an object to be destroyed and that you can see it from an aeroplane better than in any other way caused me to come to the conclusion, with proper application of scientific principles, that bombs or explosives could be dropped accurately, and I took up that study specially.

In 1911 a gentleman in France offered a prize for dropping dummy bombs on a target. The prize was 150,000 francs—half of that was available in 1912 and the other half in 1913. I already had an apparatus designed which, through the courtesy of Gen. Allen, I was able to test at College Park. I took the apparatus over to France and was fortunate enough to win the whole series of prizes. The heights from which the projectiles were dropped were 200 meters (about 656 feet) and 800 meters (about half a mile). Fifteen projectiles were dropped on each flight, the time being 50 minutes. The winning machine was able to place 12 out of the 15 projectiles within a radius of 10 meters—that is 33 feet, which would be a little over twice the size of this room—12 out of 15, each weighing 25 pounds.

The second test was at 800 meters—we really flew at 850, over half a mile, and 12 out of 15 projectiles were placed within a radius of 40 meters, 120 feet square, which is a very small portion of the side of this building.

The various tests made—the meet lasted from March until September and included hundreds of flights—and the accuracy attained, convinced me that projectiles could be dropped with a great deal of accuracy on any target from, say, a height of a mile, from 1,000 to 1,500 meters, a mile, or a mile and a quarter. I have been studying considerably the application of such a device, which I believe to be sufficiently accurate at the present time, and I firmly believe that the aeroplane will become a very important destructive weapon, much more so than we realize at the present time. It could be used, among other things, in a siege against a besieged place. There is always some key point like there was at Port Arthur and Adrianople, against which troops are fighting sometimes for days and weeks—against the strongest point—without any appreciable effort. In such a case, if I were the commanding officer, I would send up as many aeroplanes as were available, 20 or 30, each one carrying 500 pounds of high explosive, and rain that high explosive on this important point that they were trying to attack and just as soon as that was completed, then rush in the troops and storm the fortifications or the strong point, and I believe it would be very effective.

Mr. Connolly. In the event of using the aeroplane as a destructive means in modern warfare and you are up against another power presumably as well fortified with air craft as you are, then does not the warfare actually take place in the air, and would not their air craft protect their fortifications?



Mr. Scott. When you besiege a place the presumption is they are in more or less desperate straits, and in a case like Adrianople the outside force would have full opportunity to recoup their air force, and in this particular case I think you could presume that you would have the preponderance of aeroplanes, or that the enemy have none at all, but ordinarily the presumption would be that the two powers fighting would have equal forces, in Europe at least.

Another important use, I should think, would be against headquarters. Commanding officers can not be made in a day or a year. From my experience I think that a mile above the earth you can pick out with an eye very readily anything as large as a tent or an automobile, or wagon—anything like that can be seen very clearly on a clear day. I imagine an important use of the aeroplane would be picking out headquarters, the enemy's commanding general and important encampments like that, and by using shrapnel, a large shell weighing 500 pounds with high explosives, and being able to drop it within a square of 120 feet, I think you could make it very uncomfortable for the commanding general. I think that would be an important use of the aeroplanes. Against fortifications—I firmly believe that 500 pounds of nitrogelatin placed near a barbette disappearing gun carriage would put that completely out of service. If dropped on a mortar battery, I think it would temporarily at least put that out of order, and especially the range-finding system. The accuracy of these guns depends entirely on the range-finding system. These systems are screened as much as possible from the sea in the seacoast fortifications, but they can not be screened from the air, and I think it would be very readily put out of business, and when the range-finding system is put out of business the battery is put out of business, at least until it is repaired.

We have very elaborate fortifications to protect the large cities, especially New York. I can imagine an enemy's fleet of 20 or 30 vessels coming toward New York—our Navy may be in some other part of the seas—they just come outside of the range of the Sandy Hook guns, cruise around and send aloft 20 or 30 aeroplanes at a height of a mile, I do not see any way of bringing down an aeroplane except occasionally by accident—probably by accident one may occasionally be brought down—but the fleet would cruise out there and the aeroplanes would go over New York with incendiary bombs especially constructed to produce conflagration, probably a few high explosives but mostly incendiary bombs, and drop them over New York and produce such a conflagration that no fire department could cope with—in other words, make New York like San Francisco. I do not think Washington is too far off for a thing like that—Baltimore, Norfolk, Charleston, and Wilmington, the coast cities, would be vulnerable. The same way on the Pacific coast. Those things are in the future, but military people have to look into the future, and the ones who look far into the future are the ones who usually win out in the long run.

My particular hobby, the thing I have been studying about particularly, is the destruction of the Panama Canal. It has cost an immense amount of money. It is a lock canal, and there has been a great deal of discussion as to whether certain parts will hold up. The canal is about 50 miles across, I believe; that is, the center of the canal would be 25 miles from either sea.

Over in Europe, when dropping these bombs in the 800-meter contest, you were allowed

to drop any number, one or all of them, at the same time. In the other contests you had to drop one at a time, flying around and going over the target successively, but in the 800-meter contest several of the aviators, two of them to be accurate, just put their eggs all in one basket. One man, a lieutenant in the French Army, who had a light Farman machine, with a 50-horsepower motor, could not carry a passenger, and he dropped the bombs himself. He did not have a particularly scientific way; he just put his eggs all in one basket and dropped them at one time, believing that if he got in the right place he would win out. He did this day after day, and he told me the effect of dropping the bombs was hardly perceptible; that is, the stability of the machine was not affected. Of course it jumped forward and backward and the speed increased after releasing the weight. I have not any doubt that an aeroplane will be built heavy enough to drop from 500 to 1,000 pounds without any trouble whatever.

With the machine I used over there I would not hesitate to drop 500 pounds. I dropped 50 pounds a good many times, and I would have to touch the man on the knee to let him know it. You can build machines, I think, to drop 500 or 1,000 pounds of nitrogelatin, which is a very powerful explosive.

In war the object of the foreign nations is to destroy our greatest strategic point, which would be the Panama Canal, and they would put all their force against the canal. For some reason our fleet is not there, it has been defeated or it is protecting some other part of the coast—any way, they go there. No matter how strongly the canal is fortified, they do not come within range of the guns; they cruise out 10 or 30 miles. The distance to Gatun Dam or to the locks would be probably half an hour's fly. They send out their aeroplanes loaded with high explosives, say 20 or 30 of them, as many as they can send, hoping that some of them will get back; but in warfare we take chances, and if they destroyed the canal no doubt they would be willing to lose them all. They send them up and they are flying one after another, placing 500 pounds of nitrogelatin first on the spill-way and later up the Culebra Cut, causing slides. I think some of you gentlemen know the effect of an explosive on the earth, causing it to slide. I think the canal would be put out of business, probably in one hour or two hours, by an enemy with aeroplanes. That is, of course, my own personal opinion. We do not know the effect of an explosive dropped from an aeroplane, because it has never been done except in a small way. I firmly believe when the experiments are carried on in that direction that it will be found to be very destructive.

Mr. Connolly. Would it not be difficult to place bombs with precision at an altitude of 5,000 feet on account of the various currents that intervene between the air craft and the target?

Mr. Scott. From my experience, I think the wind does not make a great deal of difference, especially after the first bomb, if it is planed off. In the first place, you usually fly into the teeth of the wind, and at a very high altitude the currents would probably be compensating. I do not believe that the wind would have a great deal of effect if they were up a half a mile. I am speaking from experience.

Mr. McKenzie. You have spoken of danger to the Panama Canal from aeroplanes?

Mr. Scott. Yes, sir.

Mr. McKenzie. What is your idea of the way we should protect the canal, with air craft?

Mr. Scott. I am not able to answer that question at the present time. The only way to fight air craft is with air craft.

Mr. McKenzie. If it is true that the Panama Canal is in danger of being destroyed by the operation of air craft, then, in your judgment, is not the fortification of the Panama Canal a needless expense?

Mr. Scott. If air craft were all the defenders of the Panama Canal were going to contend

with, yes; but the fortifications are naturally placed there against the navies at the present time, primarily. I think the authorities should consider the air craft as a menace to the canal and not wait until that menace really develops—take it up now.

Mr. McKenzie. Pardon me, but according to your theory, if I understand you correctly, you would have a fleet of aeroplanes stationed at either end of the Panama Canal, and they would be of greater service in destroying an enemy's fleet than the fortifications?

Mr. Scott. I believe so; yes, sir. The authorities say that 500 pounds of nitrogelatin dropped on the deck of a battleship would have only a local effect. We do not know; it has never been tried. The proof of the pudding is in the eating and I think it should be done; that some old battleship or monitor should be made a target and that it should be done. A great many authorities say it would have a local effect. I do not believe it.

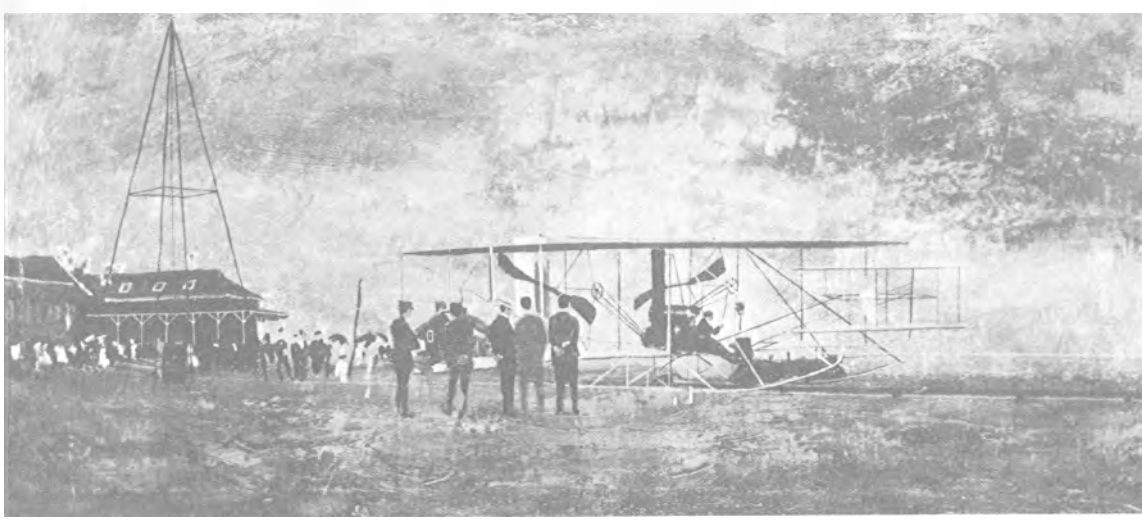
Mr. McKenzie. I understand one of the older battleships is about ready to go out of commission and that might be a very good experiment.

Mr. Scott. I believe in taking time by the forelock, and at the present time I think the aeroplane is of sufficient importance to warrant very serious consideration.

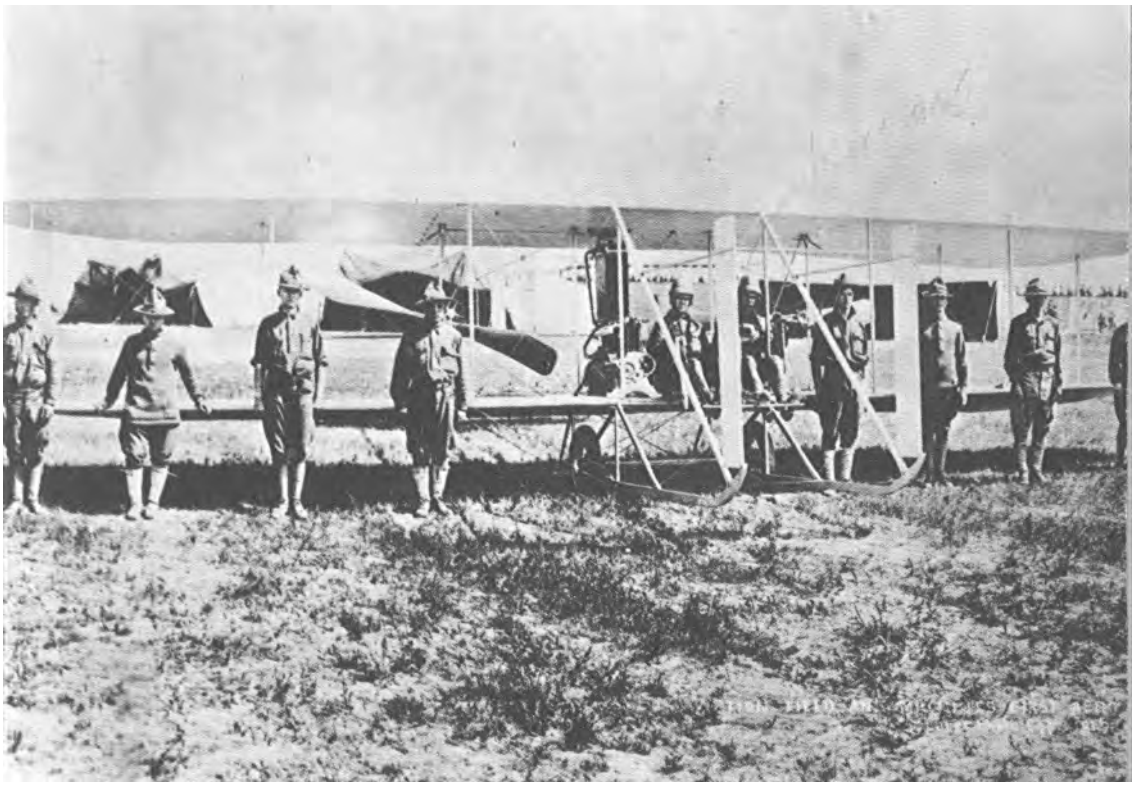
Mr. Connolly. Do you regard the air craft as a potential force in destroying battleships? From your experiments, it would seem reasonable that you could hit a battleship.

Mr. Scott. I think so. From the height of a mile, I should say 50 per cent of hits. There is a great deal of controversy as to the effect that a high explosive would have on the deck of a battleship, whether it would be local or cause very serious harm. That can only be proven by trying.

The Chairman. We are very much obliged to you, Mr. Scott. (Thereupon the Committee adjourned.)



First serviceman to fly—Lt. Lahm
(art by Richard Green)



1st Aero Squadron, Texas City, Texas, 1913.

2. Four-Squadron Plan

During the hearings of 1913 (Doc. 1), Scriven gave the committee a paper entitled "Suggested Organization for Aeronautical Work in the United States Army,"[1] which explained the basis for the first plan for the organization of units for tactical operations with aircraft. The first such unit, the 1st Aero Squadron, had been formed as a provisional organization at Texas City, Texas, on 5 March 1913 as U.S. Army forces on the border were being strengthened as a result of revolutionary disturbances in Mexico.[2]

. . . this office has convened boards of officers to discuss the necessities which confront us, and these boards, consisting of several experienced officers of the Signal Corps associated with practically all of the aviators on duty, have reported in effect as follows: Our military forces have been apportioned among six divisional commands. Since these are tactical units, and it has been agreed that a large aeronautical organization should be assigned as a part of each main tactical unit, the boards have reported that an organization called an Aeronautical Squadron should be assigned to each of these tactical units to serve therewith as a component part of such units for peace training or for service in war.

On account of the present reduced strength of such divisions, it has been recommended from economical considerations that at present we favor the organization of only 4 of the aeronautical squadrons, subdividing 2 of those so that distribution may be made of these subdivisions among the tactical units requiring them.

The four aero squadrons thus formed are to be placed at appropriate aeronautical centers, each commanded by a field officer and serving incidentally as a center of aeronautical instruction.

The organization and equipment of each of the aeronautical squadrons proposed is as follows:

It is customary to assign for the operation of an aeroplane two officers, who alternate in long cross-country flights as observer and aviator or pilot. It has been found by our experience, and abroad, that at least five enlisted men are required in the care, repair, and handling of an aeroplane. This personnel (two officers and five men) constitute the section necessary for the aeroplane. Two aeroplanes and their sections are proposed as the platoon; two platoons compose the company, and two companies, commanded by a major, constitute the aero squadron, the aero tactical unit proposed to be assigned to a division.

1. *Aeronautics in the Army*, pp. 120–122.
2. Maurer Maurer (ed.), *Combat Squadrons of the Air Force, World War II* (Washington, 1969), pp. 4–6.

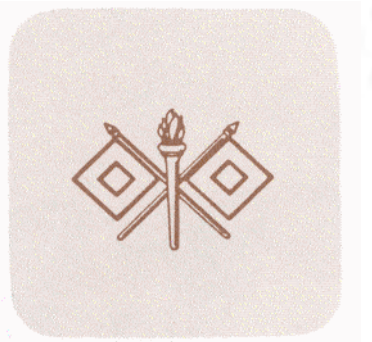
3. Creation of The Aviation Section, Signal Corps

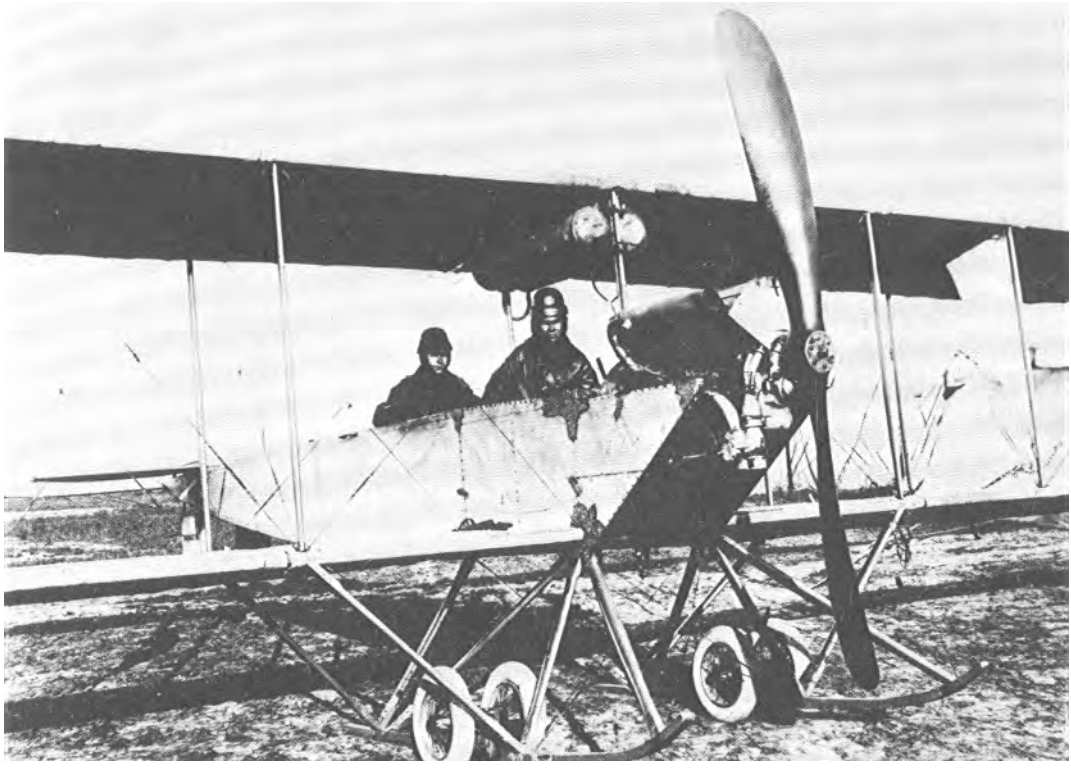
18 July 1914

. . . . . .

. . . there is hereby created, an aviation section, which shall be a part of the Signal Corps of the Army, and which shall be, and is hereby, charged with the duty of operating or supervising the operation of all military aircraft, including balloons and aeroplanes, all appliances pertaining to said craft, and signaling apparatus of any kind when installed on said craft. . . .[1]

. . . . . .





Shortly after the 1st Aero Squadron had been formed as a provisional squadron, Lts. Thomas D. Milling and William C. Sherman broke the U.S. duration and distance record, on 28 March 1913, flying non-stop, cross-country, from Texas City to San Antonio. On the return flight, on 31 March, they drew the first aerial map from an aircraft. The picture was taken upon landing at Texas City.

4. Field Service Regulations

1914

The position taken by Breckenridge and Scriven in the hearings of 1913 (Doc. 1) with regard to the function of aviation was reflected in the War Department's *Field Service Regulations* of 1914.[1] These regulations made infantry the principal combat arm of the U.S. Army, with artillery and cavalry as the principal supporting arms. Aviation, which was not mentioned in the section concerning the use of combined arms in combat, was given a reconnaissance mission that included strategic and tactical reconnaissance and observation of artillery fire. The only reference to a fighting role for aircraft was a single sentence relating to the use of aircraft in preventing aerial observation by the enemy. Though these regulations were altered in several instances between the time they were issued in 1914 and the end of the war in 1918, statements concerning the status and mission of aviation remained unchanged. Following are some extracts.

. . . . . .

11. Reconnaissance—Reconnaissance is the military term used to designate the work of troops or individuals when gathering information in the field. Reconnaissance begins as soon as the theater of possible operations is entered and continues throughout the campaign. No matter what other sources of information of the enemy may be available, reconnaissance must be depended upon to obtain the information upon which all tactical movements of troops should be based.

12. By Aero Squadron.—In forces of the strength of a division, or larger, the aero squadron will operate in advance of the independent cavalry in order to locate the enemy and to keep track of his movements. Contact with the enemy once gained will be maintained thereafter continuously.

13. By the Cavalry.—Reconnaissance in the theater of operations is best made by the cavalry, which from the beginning of the campaign seeks to determine the enemy's strength and dispositions. It protects its own army against surprise, screens its movements, and insures the safety and success of the troops of other arms. The defeat of the hostile cavalry, and its expulsion from the field are usually the best means to this end. As the opposing armies draw near each other, the cavalry endeavors to secure control of the ground between and bends every effort to that close and continuous reconnaisance of the enemy's forces that is vital to the success of the entire campaign.

. . . . . .

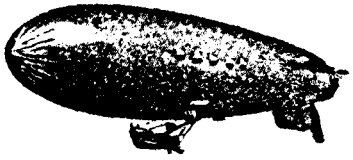
21. During combat the aero squadron will operate around the flanks and over and to the rear of the enemy's position, for the purpose of reporting his dispositions, the approach of reinforcements, or the beginning of his withdrawal from action.

. . . . . .

30. Employment of Air Craft.—Military air craft of all kinds will be employed under the direction of the commander of the forces to which they are assigned and the immediate control of the officer commanding the aero organization.

Balloons are classed as free, captive, and dirigible. Free balloons may be used to convey information from besieged places, the return message being sent by radiotelegraphy, carrier pigeons or otherwise. Free balloons are of little use for any other service, and are not very dependable on account of their uncertainty of movement. Cap-

1. War Department, *Field Service Regulations, United States Army, 1914, Corrected to July 31, 1918 (Changes Nos. 1 to 11)* (Washington, 1918). No changes are indicated for the passages printed above.



tive balloons may be used for tactical reconnaissance, for observation of artillery fire, and for signaling. Communication from a captive balloon to the ground should be by telephone.

Large dirigible balloons are of practical value for strategical reconnaissance and to travel great distances; they are also suitable for carrying a number of observers, radio equipment, machine guns, and considerable weight of explosives. Aeroplanes are more dependable for field service with a mobile army than dirigible balloons, as the latter require substantial shelter from winds while on the ground.

31. Reconnaissance by aeroplane includes strategical and tactical reconnaissance and the observation of artillery fire. Aeroplanes are also used to prevent hostile aerial reconnaissance.

Strategical reconnaissance by aeroplane is effective within a radius of 150 miles from the starting point, and is for the purpose of determining the position, strength, and direction of advance of the large elements of an enemy's forces, and also the character of the roads, railroads, streams, and the general military topography of the theater of operations.

Tactical reconnaissance by aeroplane is used both in attack and defense. It is extended in nature and does not involve minute examinations of very small localities or detachments. It is designed to discover turning and enveloping movements, the position and strength of the enemy's general reserve, artillery positions and movements of cavalry; also, from the movement of combat or field trains behind an enemy's position information may be gained as to whether certain parts of the line are being weakened or strengthened, or whether a retreat is contemplated.

For observation of fire of field artillery, aeroplanes are usually assigned to the artillery commander. They are especially useful against targets which are invisible from the position of the artillery officer conducting the fire.

Aeroplanes are safe from hostile fire at altitudes of 4,000 feet or more.

The results of reconnaissance are reported by radiotelegraphy, signals, and the dropping of messages.

Transmission of Information

36. Information is transmitted as follows:

1. By wire (telegraph, buzzer, telephone).
2. By visual signaling (flag, helio, night lamp).
3. By radio telegraph.
4. By messenger (foot, mounted, cycle, motor car, flying machine).

. . . . . .

Use of the Combined Arms

123. Infantry.—The infantry is the principal and most important arm, which is charged with the main work on the field of battle and decides the final issue of combat. The role of the infantry, whether offensive or defensive, is the role of the entire force, and the utilization of that arm gives the entire battle its character. The success of the infantry is essential to the success of the combined arms.

124. Artillery.—The artillery is the close supporting arm of the infantry and its duties are inseparably connected with those of the infantry. Its targets are those units of the enemy which, from the infantry point of view, are most dangerous to its infantry or that hinder infantry success. The greater the difficulties of the infantry the more powerful must be the artillery support.

125. Cavalry.—The cavalry, preceding contact of the opposing troops of the other arms, is engaged in reconnaissance of the enemy and of the terrain and in accomplishing such mission as may be assigned it. During combat it directs its activities to the support of the other arms and particularly toward insuring the success of the infantry as soon as that arm is fully committed to action.

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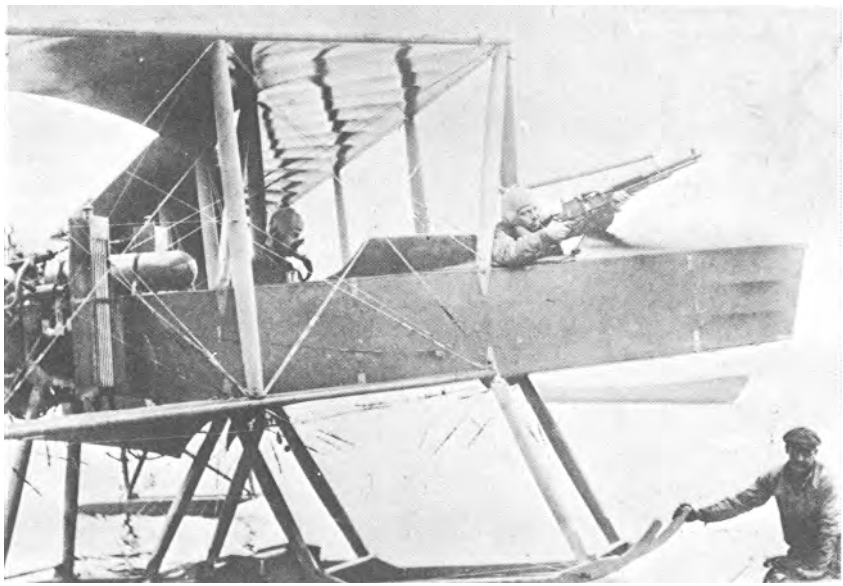
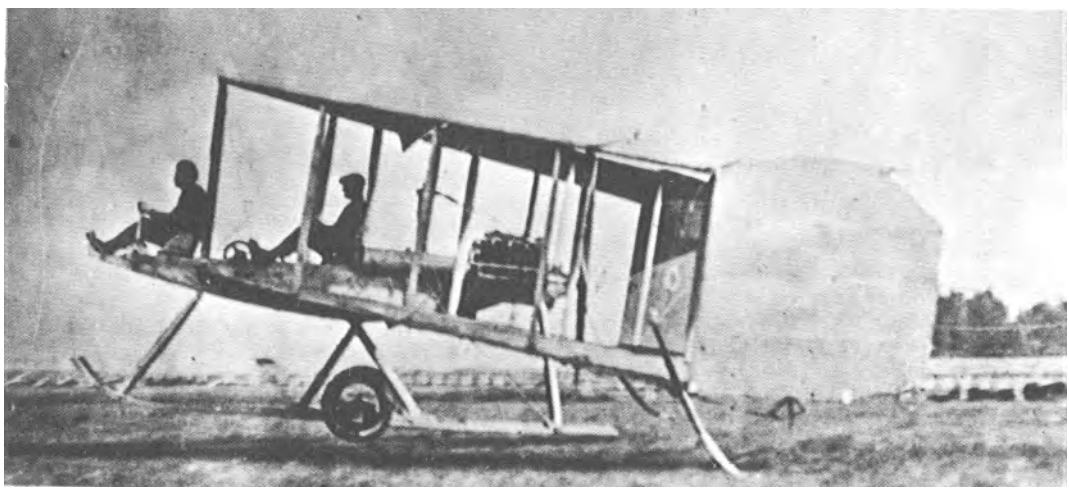




The Burgess-Dunne (above) was used by the Army in 1915. A tailless pusher, it was propelled by a Salmson engine, and it had sweepback wings (below).

5. Funds for Aeronautics (Fiscal Year 1916)

December 1914

When it came time to budget for Fiscal Year 1916, General Scriven asked for a little more than $1,000,000 for aviation. Secretary Garrison again imposed a cut, this time to $400,000. On 8 December 1914, Chairman Hay and members of the House Military Affairs Committee (D. R. Anthony, (R-Kan.); William S. Howard, (D-Ga.); Julius Kahn, (R-Calif.); and Kenneth McKellar, (D-Tenn.) questioned the Chief Signal Officer about how the money for 1915 was spent, about the $400,000 requested for 1916, and, among other things, about the use of aviation in the war in Europe. In the end Congress cut the amount to $300,000 (see Appendix A). Following are extracts from the hearings.[1]

. . . . . .

The Chairman. How many airships, aeroplanes, or biplanes have you on hand?

Gen. Scriven. We have on hand just now 11. Col. Reber is just placing an order for 8 more, and there are 2 training machines, so that we will have a total of 21 machines, and subtracting the cost of these orders that are now placed . . . we [will] have about $40,000 left for fiscal year 1915.

The Chairman. What do you propose to do with that $40,000?

Gen. Scriven. We have six months to run and we have to buy gasoline and oil, and we will have a thousand and one little expenses. An air machine is very much like an automobile. When you buy an automobile, then your expenses begin.

The Chairman. You expect to spend that for the upkeep and repair of the machines?

Gen. Scriven. For upkeep and repairs. Of course, if we have any of that appropriation left, and I hope we will, we will buy some more machines.

The Chairman. You have not a sufficient fund to buy more than the 21 machines you have already provided for?

Gen. Scriven. I have been thinking it over, Mr. Chairman, and I am in hopes that we may be able to squeeze out two or three more machines, making a total, with the 21 on hand, of 23 or 24 machines. If we can create four aero squadrons, like the one represented in that picture, of 8 machines each, that will give us 32 machines, and with that number we are quite well provided for an army of our size—32 machines in first line in commission. Then we should add 50 per cent of spare parts, or what really amounts to other machines, in the warehouses ready to put together, so that we will then have 50 machines, and then we shall be as well off in this respect as we need to be.

The Chairman. You only want to accumulate 32 machines?

Gen. Scriven. We only want to accumulate 32 machines in the first line and a reserve of 50 per cent because we have under the bill 60 aviator officers and we are only allowed 12 enlisted men for instruction in flying. The limit is therefore 72. If we organize 4 squadrons of 8 machines each that is 32 machines—each squadron is supposed to have 20 pilots and observers—4 squadrons would require 80 men, observers and pilots. That would constitute the necessary complement of men. Now we are allowed 60 officers. We will probably get these officers, because they are coming in very fast and they appear to appreciate the work. We should then require 20 enlisted men to make up the full complement of 800 men. If these can not be obtained it will be necessary to cut off some of the 4 officers comprising the commander and staff of each squadron, or an observer need not be sent out with every machine. At all events it will be possible to put 4 squadrons in the field fairly well manned and equipped.

But to the 4 squadrons of 32 machines should be added a reserve of 50 per cent of spare

1. Hearings before the Committee on Military Affairs, House of Representatives. *Army Appropriation Bill, 1916* (1914).

parts, because the machines require this for spare parts all the time. That would add 16 more machines to be purchased, as the spare parts should constitute an entire semblance not put together, so that in case of immediate necessity the spare parts could be assembled and replace broken machines in the field at once.

The Chairman. Of the $400,000 you are asking for, how much do you expect to spend for this purpose?

Gen. Scriven. I think I can give that exactly. We have 21 machines now and $40,000 left. The running expenses from now until July will be, I should say, about $25,000, which will give us $15,000 free and two more machines, which will make 23 machines. To make up the 32 machines we will have 9 macines to buy and to make up the reserve for the 32 machines, 50 per cent, 16, making it necessary to buy in all 25 new machines during the coming year to put the aviation squadrons into fairly good shape.

Mr. Kahn. Gen. Scriven, you stated to the committee that you thought if you could build up a corps of 32 flying machines it would serve your present purpose in proportion to our Army?

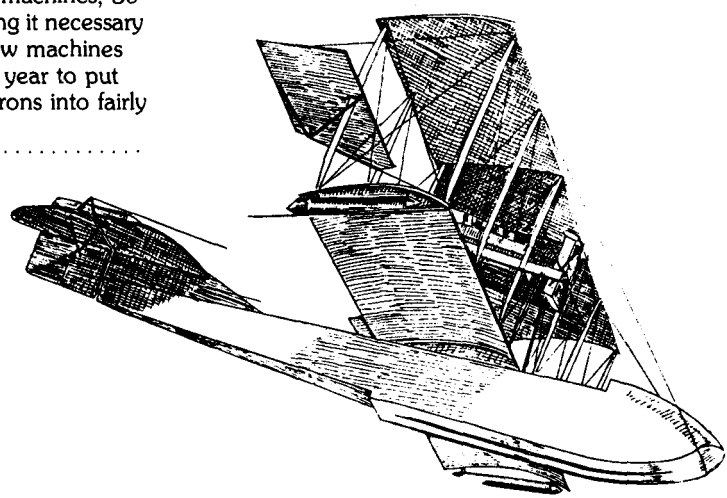
Gen. Scriven. I think so.

Mr. Kahn. Can you give the committee any data as to the number of machines that each one of the belligerent nations had at the outbreak of hostilities in Europe?

Gen. Scriven. Yes, sir; I can. I do not know how accurate it is, but it is the most recent thing on the subject I know of. It comes from a publication called the Clash of Nations published by Thomas Nelson & Sons, of New York, 1914. They give the number of aeroplanes for France, 500; dirigibles, 11. Russia, aeroplanes, 500; dirigibles, 4. Great Britain, aeroplanes, 250; dirigibles, 8. Germany, aeroplanes, 500; dirigibles, 20. Austria, aeroplanes, 100; dirigibles, 3. Italy, aeroplanes, 150; dirigibles, 2.

Mr. Kahn. So that your request is an exceedingly modest one in comparison with what they had when war broke out in Europe?

Gen. Scriven. I think it is a very modest one. I would like to go on and explain that a little further. The idea is to have four squadrons, three of them aeroplanes proper and one a squadron of hydro-aeroplanes. It must be understood that we require certainly eight machines (one hydro squadron) to be used in the Philippines, and especially for use in Panama, and also, as I think, in Hawaii.



The Chairman. What is your information as to the effect of the aeroplane service in the armies of the countries now at war?

Gen. Scriven. Mr. Chairman, I have pretty pronounced views on that.

The Chairman. I mean, what is your information about that?

Mr. McKellar. Are they doing any real service?

Gen. Scriven. They are the most tremendous implement for reconnoissance and for the gathering of information that modern war has ever seen, I think. I think they have changed, as I said in my annual report, not strategy, but the principles of grand tactics.

Mr. Anthony. It has not developed that they are of any practical value for offensive military purposes?

Gen. Scriven. No, sir; I believe not.

A man to make a cruise of 400 miles, across a course 200 miles each way, has to carry, we will say, 400 pounds of fuel and oil. He can not take an observer with him because that would add too much weight, and he goes alone. The amount of destructive material he can carry in the way of bombs or guns under these conditions must be small, as their weight makes any considerable supply of ammunition prohibitive, but in addition a pilot alone without help can hardly do any effective firing either with bomb or gun; and if 4,000 or 5,000 feet in the air, he can do little more than drop his shots broadcast upon the earth. We have recently tried bomb dropping at San Diego with three types of bombs, one weighing 25 pounds, one weighing 50 pounds, and one weighing 100 pounds. As a matter of fact, we did not use the 100-pound bomb. It has been estimated that our aeroplane carries about 25 to 50 gallons of gasolene for a flight of, say, 350 miles; but this depends upon current winds. At all events, the machine carries enough gasolene to stay in the air about four hours, and carries also an observer and a pilot, besides oil. So loaded it is estimated that one of our aeroplanes has a free lifting capacity of about 120 pounds. With a lifting capacity of 120 pounds and with each bomb weighing not less than 25 pounds—and a 25-pounder is not good for much, so that the bomb should be as large as 50 pounds to do any damage—of what value is the aeroplane as an offensive weapon?

Of course, I do not now refer to attack of aeroplane against aeroplane or aeroplane against dirigible, nor do I wish to be understood as saying that in a few isolated cases bomb dropping may not do harm, but only that as a fighting machine the aeroplane has not justified its existence, except aeroplane against other air craft.

As an implement for reconnaissance and as the far-seeing eye of a commander the aeroplane is superb.

Mr. McKellar. You say they are used for getting information. How can a man in the air, several hundred or several thousand feet above the country, running a machine get any information about what is actually going on down below?

Gen. Scriven. Not the man running the machine, but the observer.

Mr. McKellar. How does he get any information about what is going on down below?

Gen. Scriven. We can not say how he does it, but as a matter of fact we know he does it, because we know what they are doing in Europe. He also gives signals of what he sees.

The Chairman. General, I apprehend that the greatest use of the aeroplane so far in the war in Europe has been that the observer in the aeroplane has been able to signal to his side the position of the enemy.

Gen. Scriven. Yes, sir.

Mr. Kahn. And that supplements the work of the cavalry in that respect?

Gen. Scriven. It supplements cavalry and it leads cavalry. It gives the cavalry the point of objective to get in touch with the enemy.

The Chairman. And it also aids the artillery?

Gen. Scriven. Yes, sir; visual signaling is done in several ways. There is a smoke bomb which is dropped above the point to be indicated, also fragments of tinsel paper, which fall down from the aeroplane and in the sunlight gives a streak of light. From such signals the observer at the guns, who is constantly following the plane gets his range with the glass. This, if well calculated, gives him his range and his direction. I believe, too, that other signals of the wigway type are used. Indeed, the matter is not difficult—a flag thrown to the wind from the aeroplane, a smoke bomb dropped, a sudden rise or dip of the machine perhaps might serve the purpose.

Mr. Howard. The observer ought to be a very competent military officer.

Gen. Scriven. Yes, sir; he must be a trained man.

Mr. Howard. And a strategist?

Gen. Scriven. Yes. At all events, he should be able to interpret the movements of troops that he sees. We have tried, and I think successfully, the wireless with the aeroplanes, and by that means, through ground stations, should keep the commanding general constantly in touch with the movement of troops. If he (pointing) is sending a column over the hills yonder he can see through the aeroplane how far the column has gone and just what its position is. Hence he keeps in touch with the positions of his own moving troops and knows where they actually are, and not merely where they should be according to arranged plans.

In regard to the enemy, his airmen outline the latter's lines, see the movement of his troops, indicate his reinforcements. In fact, the whole game is open to a commander; the cards lie on the table.

Mr. Kahn. Gen. Scriven, I have seen it stated in some of the papers that the aeroplane is largely responsible for the indecisiveness of the battles that have been raging in northern France lately.

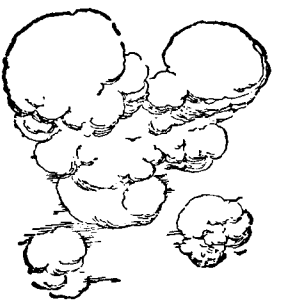
Gen. Scriven. I think that must be so.

Mr. McKellar. Has not the use of aeroplanes in the European war now going on been a distinct disappointment to those who believed that air craft would play an important part in warfare?

Gen. Scriven. Well, I think in one direction, that of destruction, such is the case; in another direction, that of information, their usefulness far exceeds the expectations and hopes of anybody. In reconnoissance work they have done more than anybody could have dreamed of. Gen. French's official reports show that. As far as aggressiveness and destruction are concerned, they have fallen far short of what we anticipated at the hearing a year and a half ago.

Mr. McKellar. The only destruction they have accomplished is that of helpless women and children?

Gen. Scriven. There has been no destruction of military importance, absolutely none, so far as I have observed. Their attack has inspired fear, but even that seems quickly to pass away.



Brig. Gen. George P. Scriven, Chief Signal Officer (1913–1917).

6. Scriven: The Service of Information
1915

In a circular on "The Service of Information" in 1915, General Scriven emphasized the importance of aviation as an instrument of reconnaissance and communication. At the same time, however, he recognized that the role of military aviation was expanding as aircraft were used for other kinds of operations in the war in Europe. Following is the section of the circular concerning the employment of aircraft.[1]

Air Craft

The signal corps is intrusted with the air service of the army—undoubtedly the most important, as it is the most recent, auxiliary in the collection and transmission of military information. Air craft are now employed for strategical and tactical reconnaissance and the prevention of reconnaissance by the enemy's air craft; for the direction and control of fire of the field artillery; for the destruction of the enemy's personnel and materiél by explosive and incendiary missiles and other means; and for the rapid transportation of superior commanding officers. The value of air craft and especially of the aeroplane, in the field of reconnaissance has been proved beyond the shadow of a doubt. Whatever may be the opinions of military men as regards the offensive importance of air craft and the present standing of the dirigible there is no longer a question as to the value of the aeroplane in rapid and long-range reconnaissance work, and of its power to secure and to transmit by radio, visual signal or direct-flight information of the utmost importance to armies in the field. So true is this that it seems probable the aeroplane and, to some smaller degree, all air craft have altered not the principles of strategy, which are immutable, but the theory and application of grand tactics. It now appears that the actual game of war is played openly with cards laid on the table, and opportunity no longer is given for inference as to concealed movements or for surprises, perhaps not even for the exercise of the high military quality of anticipation of the unseen movements of the adversary. It is now recognized that the possibility of brilliant and unexpected blows and surprises by enterprising commanders has been largely eliminated from modern operations of war by the information supplied by the aviators. It is proved that the modern air craft lays open to the field of mental view the whole visible area of the immediate theater of war and that the commander's vision reaches far beyond the limits of the actual sight of his marching troops. The air craft sees and indicates the larger operations of war and points out to the slowly moving men on the ground not only the object to be attacked or defended, but to reconnaissance troops, especially the cavalry,

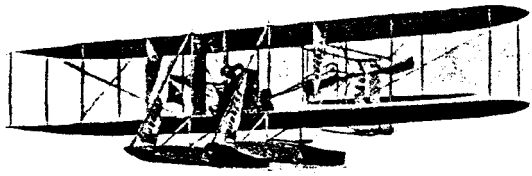
1. Scriven, *The Service of Information*, Circular No. 8, Office of the Chief Signal Officer (Washington, 1915), pp 21–23.

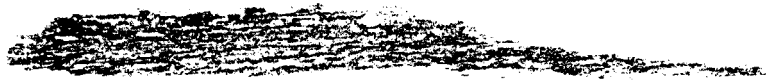
the objective to be sought, the localities to be searched, and the character of information to be obtained.

By no means does the air craft supersede, nor can it ever supersede, the work of obtaining detailed information which can be acquired only by close observation, by contact, and by development of the enemy's forces and positions. This remains the duty of the troops in the field; but the air craft does indicate to either commander the character, location, and general disposition of opposing forces, and of his own commands. Not only has it been proved that the aeroplane is invaluable in locating the position of the enemy, but it has especial value to a commander in finding his own troops, in keeping him informed when movements are taking place, and of the position of his flanks and center, his outposts, his cavalry, his artillery, of the positions attained by any detached body—in short, of keeping him constantly in touch with the locations and movements of all the units of his command under the changing conditions of war.

This much is proved, but it does not follow that the air craft curtails the work of reconnaissance of other arms of the service, the infantry, the signal corps, and, more especially, the cavalry. On the contrary, it extends the usefulness and power of all, for if the general field of reconnaissance is outlined, it is obvious that the cavalry or infantry can more readily strike its objective and more quickly and accurately obtain information regarding any particular point than if obliged unseeingly to search the whole field of operations for locations and forces regarding which an intimate knowledge is desired or contact expected. In other words, by aid of air craft, and more especially of the aeroplane, a reconnaissance by troops moves less in the dark, knows better what to look for and search in detail, and loses less time and effort in accomplishing the object sought. No move of concentration from flank or center, no envelopment of a wing nor reenforcement of a weak position should remain unknown to the adversary in the case where he possesses a thoroughly efficient flying corps. It would seem, therefore, that not only has the power of all reconnaissance troops been increased by the air craft, but also that the need and importance of the cavalry in reconnaissance work have not been lessened, but, on the contrary, have been greatly increased by them.

In addition to the influence exerted by air craft on grand



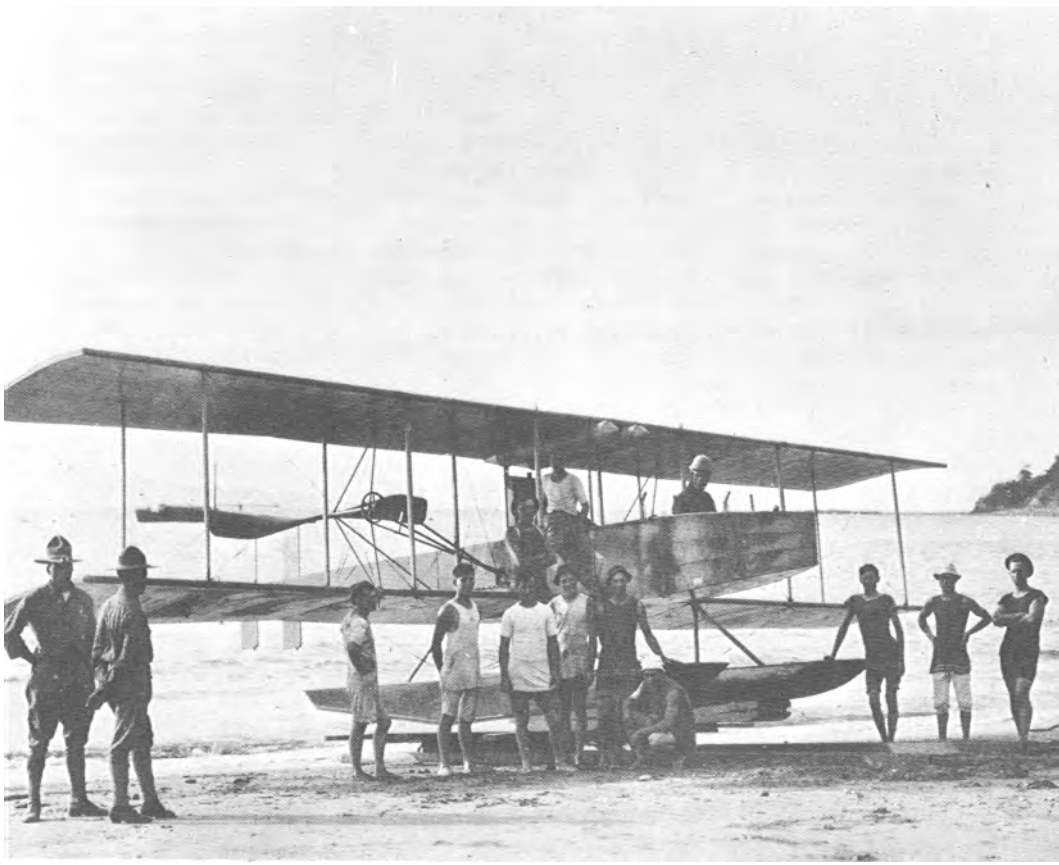


operations, events now appear to show that their value in more detailed operations is great and may increase in the future to enormous proportions. It is well established that the accuracy, value, and effect in service of field and siege artillery and, indeed, of the heavy guns afloat and ashore have been greatly increased by this agency. It may almost be said that guns are fought by means of the eyes of the aviator. So clearly has this been shown that there now appears a noticeable change in artillery practice. Instead of the old-fashioned system of range finding by trial fire or of observation from the battery or elevations near by, the exact range is now found with the help of aeroplanes, by signaling positions and noting the fall or burst of the shrapnel, and there can be no doubt that artillery-fire direction has been enormously increased in accuracy by the aeroplane, especially when the shrapnel burst can not be seen from below. Infantry fire has been largely improved in efficiency by the same means.

Besides influence of this character the aeroplane has undoubted use in the finding of concealed positions, in locating hidden howitzers or mortars, and in pursuit and rear-guard actions. It will be useful in the location of ships at sea or at anchor within defenses, possibly in the detection of submarines and submarine mines, and certainly in the enormous increased efficiency given to seacoast gun fire, and especially to the coast defense, the coast guard, and many other details of observation.

But the useful, approved, and most important work of air craft is to be found chiefly in reconnaissance and the collection and transmission of information in the theater of military operations. For this reason aviation must be reckoned as a vastly important branch of the signal corps of the army.

The use of the aeroplane as a defense against aeroplane attack and for the rapid transmission of commanding officers or important personages to destinations sought is, of course, obvious.



Signal Corps' Burgess-Wright seaplane at Corregidor Island in the Philippines, November 1913, Lt. Herbert A. Dargue in the cockpit.

7. Scriven: Annual Report for 1915

The section on aircraft in Scriven's *The Service of Information* (Doc. 6) was also used as an introduction to a chapter on aviation in the Chief Signal Officer's annual report for Fiscal Year 1915, extracts from which are printed below.[1] Reviewing events of the past year and noting the situation that existed in mid-1915, Scriven looked toward the future to an expansion of the aviation service to perhaps as many as 18 squadrons. At that time there was only one, the 1st Aero Squadron, which was made up of two companies, each with four airplanes for reconnaissance work. Developments in Europe, however, had indicated that squadron organization needed to be changed.

. . . . . .

. . . hereafter aeroplane squadrons should be composed of 3 companies, with a total of 12 machines to the squadron. Two companies should have 8 reconnoissance machines (4 to each company), and the third company should be made up of 2 rapid-flying machines for chase or transport purposes and 2 machines of the bomb-carrying or offensive type. Such are the conclusions reached from experience abroad.

. . . . . .

The organization and instruction of the personnel of the First Aero Squadron were completed during the year (at North Island) and the squadron sent to Fort Sill, Okla., for duty in connection with the problems of fire control and direction of the field artillery.

. . . . . .

The War Department has directed the maintenance of an aviation school and a squadron for land flying in this country, the stationing of an aero company at each of the following places: Corregidor, P.I.; Fort Kamehameha, Hawaii; Canal Zone, and when this has been accomplished, an increase of the force at Corregidor to a squadron.

Under this program the Signal Corps Aviation School will continue at North Island, in San Diego Bay, until a permanent site has been obtained. The First Squadron, now at Fort Sill, will proceed to San Antonio, Tex., in the early part of December, when it is expected that the buildings now being erected for its use on the old target range at Fort Sam Houston will have been completed. The personnel for the company designated for Corregidor is now at the Aviation School and its equipment is being purchased. It will leave for Manila at the close of the typhoon season of the present year. Steps are being taken to obtain and train the personnel for the companies intended for Hawaii and Canal Zone, and such of their equipment as is practicable to purchase from the appropriation for the current fiscal year will be procured. Sufficient funds have not been provided for in the current year's appropriation to purchase complete equipment for these companies. It is expected to send a company to Hawaii by next April and one to the Canal Zone when funds are available for the equipment of the organization destined for that station.

The estimate for the ensuing fiscal year has been prepared on the basis of the program prescribed by the War Department for utilizing the personnel authorized by the act approved July 18, 1914.[2] The total of this estimate is $1,358,000.

The recent war in Europe has emphasized the absolute necessity for an adequate aviation service, has illustrated in a most forceful way the dangers resulting from an inadequate supply of personnel and materiel, has

1. *Report of the Chief Signal Officer, United States Army, to the Secretary of War, 1915* (Washington, 1915).

2. The act which created the Aviation Section (Doc. 3).

shown that aeroplanes are invaluable for reconnoissance purposes, and that their absence from a combatant force has resulted in most serious disasters. Aeroplanes have proved their value in the direction and control of artillery fire, in preventing the operation of the aeroplanes of an enemy, and have been used with great effect against both personnel and materiel. The difficulties surrounding the creation of an adequate aeronautical service after the outbreak of hostilities have been vividly illustrated during the past year, and the great inconveniences and dangers resulting from the lack of adequate aeronautical personnal and materiel have been so forcibly demonstrated that comment is unnecessary.

The greater need at such a time, however, will be for trained men as pilots and observers. . . . The inadequacy of facilities for building aeroplanes and the manufacturing of their accessories has to a large extent been removed in this country. At the present time it is known that something more than 100 flying machines per month can be produced. While this supply might meet the needs of a small army, it would be totally inadequate in a great war. However, there can be no doubt that American manufacturers would arise to the occasion with a sufficiently large output. The training of men, therefore, is the crying need of the present time.

The number of officers and men now authorized by law is inadequate to the needs of the Army as it is at present organized. With one aero squadron per division, the present organization of the Army calls for five aero squadrons. The commissioned personnel provided by law allows a sufficient number of officers for three aero squadrons, as at present organized, while the enlisted strength is insufficient; and if the number of officers and men allowed by law should be organized into three aero squadrons there would be no personnel left for the conduct of the Aviation School.

The present war in Europe has developed three separate types of aeroplanes—the reconnoissance and fire control machines, the combat machine, and the pursuit machine. The aviation section possesses a satisfactory type of reconnoissance and fire-control machine and has taken up the question of the development of both the combat and pursuit types. For this purpose an item of $50,000 has been included for experimental machines in this year's estimates.

The organization of the aviation units in the foreign armies suggests a squadron of 12 machines as the basis for our organization, 8 of these machines to be of the reconnoissance type and 2 each of the pursuit and combat types. Our aero squadron as at present organized has sufficient commissioned personnel for this increase in the number of machines, but the enlisted personnel is deficient by 24 men to provide crews for the additional machines and drivers for the additional autotrucks. In case the Army remains at its present authorized strength, the personnel of the aviation section should be increased by 46 officers and 410 men to give sufficient personnel to supply five aero squadrons, one for each of the five tactical divisions at present organized in the Army, and to maintain the Aviation School. It is to be pointed out that there is need for at least one squadron for reconnoissance work in each of the three Coast Artillery districts in this country, and that a sufficient number of aeroplanes should be provided for fire direction and control for the Field Artillery on the basis of one aeroplane per battery, with one in reserve, or, in round numbers, six aero squadrons for this arm. This calls for the addition of nine

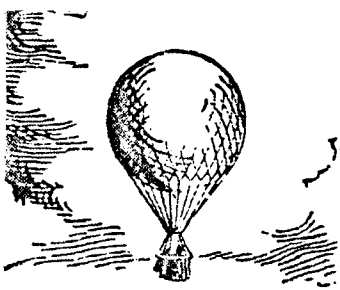
squadrons to those above mentioned.

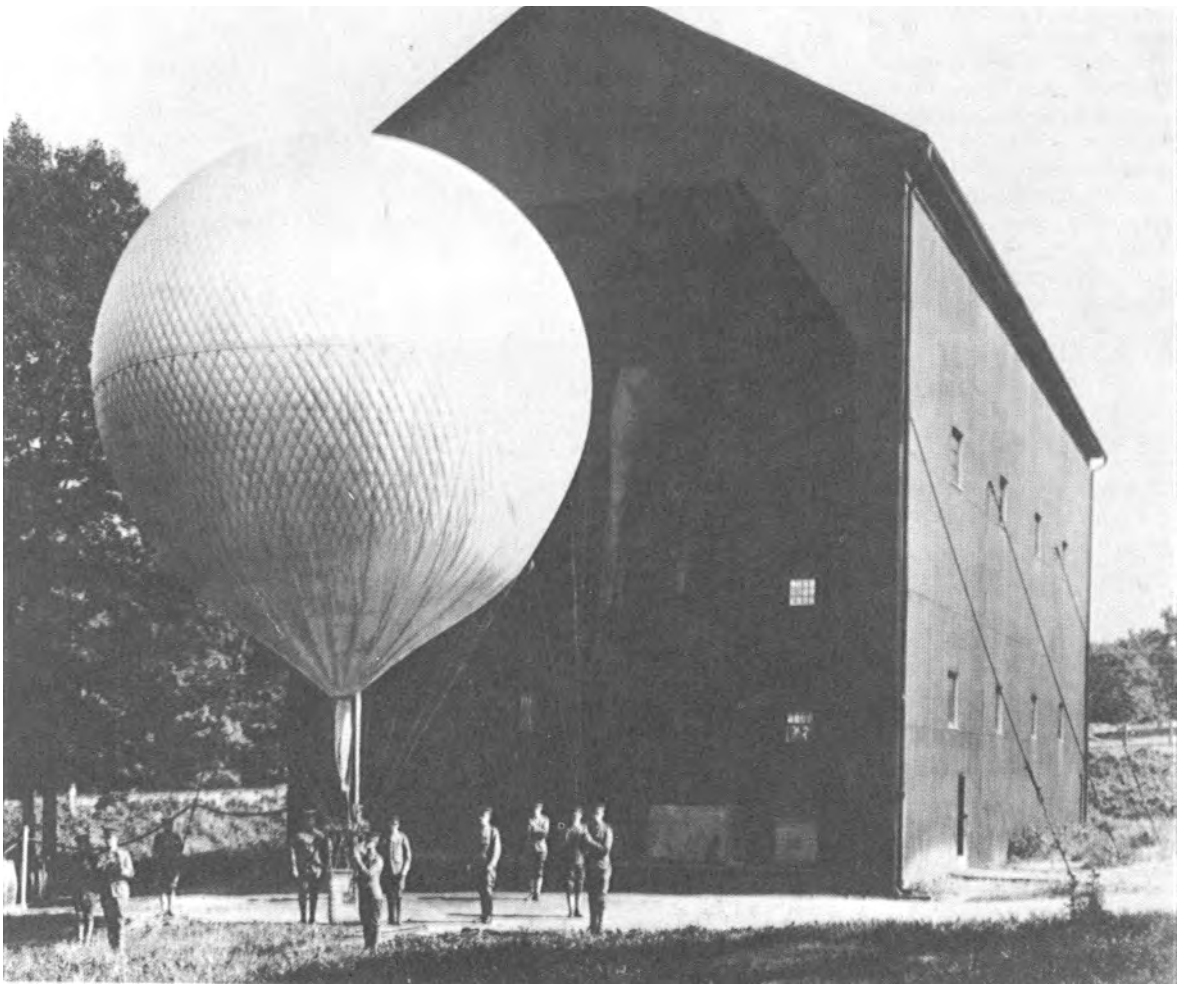
If the plan for the reorganization of the Army by the War Department, which calls for seven tactical divisions and five Cavalry brigades, be approved by Congress, provision should be made for 1 aero squadron for Corregidor, 1 for Hawaii, 1 for Canal Zone, 1 for each of the three Coast Artillery districts in the United States, 1 for each of the tactical divisions, and 5 for the Field Artillery, giving in all 18 squadrons, with a total strength of 368 officers and 2,360 enlisted men.

The total cost of the equipment necessary for these organizations will be $4,284,000.

Proposed organization of the aviation section for service with an Army of 180,000 men.

	Brigadier general	Colonel	Lieutenant Colonel	Majors	Captains	First lieutenants	Master signal electricians	First-class sergeants	Sergeants	Corporals	Cooks	First-class privates	Privates	Total enlisted
Mobile Army:														
18 aero sqs				18	171	171	90	144	270	594	72	792	324	2,286
Service of the interior:														
Administration		1	1											
Aviation school detachment				1	3	2		6	12	18	2	24	12	74
Total		1	1	19	174	173	90	150	282	612	74	816	336	2,360





A captive balloon inflated at Ft. Myer, Virginia, summer of 1908.

8. War College Division: A Proper Military Policy

1915

In March 1915 the Chief of Staff directed the War College Division of the General Staff to make a full study of "a proper military policy for the United States." In the report submitted to the Chief of Staff on 11 September 1915, the War College Division recommended a mobile army of 1,000,000 men prepared to take the field immediately on the outbreak of war. Of these, half should be fully trained, and the other half should have enough training to enable them to be brought to full combat readiness within three months. The 500,000 fully-trained troops were divided between regular army and reserve. For the regular army, the War College Division recommended 65 infantry regiments, 25 cavalry regiments, 21 field artillery regiments, 289 coast artillery companies, and, among other units, 8 aero squadrons. Five of the squadrons were for duty with five tactical divisions recommended for service in the United States; the other three were to be stationed in the Philippines, Hawaii, and the Canal Zone.[1]

The report of the War College Division was supplemented by a series of special studies which were published a little later. One of the studies was on military aviation, which is printed below.[2]

Military Aviation

I. Introduction.

1. Relation of Aviation to The Military Service

In this paper it is proposed to consider various aeronautical appliances in regard to their practical value in campaign, as shown by such data as are now available from the theater of war in Europe.

In its relation to the military service, aviation to-day may be regarded as embracing all aerial appliances, such as heavier-than-air craft, dirigibles lighter-than-air craft, and nondirigibles or captive lighter-than-air balloons, together with the personnel necessary for their operation and management.

2. Use of Aircraft on Our Coast and With Our Mobile Land Forces.

In considering this subject account should be taken, first, of the use of aircraft of various types along and beyond the coasts and frontiers of the United States upon the outbreak of war; second, the use of aircraft in the Army by the mobile forces; third, the use of aircraft by our oversea garrisons.

In addition to the battle fleet and units of the Navy designed to take the offensive on the high seas, the waters contiguous to the coast line of the United States are organized into naval defense districts. These cover certain sections of the coast line and contain patrol vessels, both surface and subsurface, and aircraft for reconnoissance purposes. These are essentially for the purpose of finding out and locating hostile vessels which are approaching the coast and of determining their strength, dispositions, and probable intentions.

Added to the strictly naval formations included in the naval defense districts, in time of war the United States Coast Guard (in peace under the Treasury Department) passes to the control of the Navy.

The Coast Guard, in addition to its boats and revenue cutters which will be utilized as patrol vessels, embraces the Life-Saving Service. The latter has stations more or less regularly distributed along the coasts which are connected by telephone lines. They are also equipped with visual signaling appliances to communicate from shore to ships. The Navy maintains a chain of radio stations along our coasts and over-sea possessions.

The naval defense districts become of great importance in case that the main battle fleets are defeated or in case they are operating at a great distance.

Notes

1. War College Division, *Statement of a Proper Military Policy for the United States* (Washington, 1915), p. 13.
2. War College Division, *Military Aviation* (Washington, 1916).

Therefore, when an enemy expedition breaks through the naval defense and approaches the coast with a view to forcing a landing the resistance to such an expedition becomes primarily a function of the Army.

The defensive formations of the Army consist of the harbor defenses and accessories and the mobile units. The harbor defenses consist of fixed and mobile gun defenses and mine defenses; also obstacles both on land and in the waters. The aircraft required in connection with the harbor defenses should consist of machines used for one or more of the following purposes:

(a) For reconnaissance—that is, to determine the strength, dispositions, and probable intentions of the enemy.

(b) For preventing hostile aerial reconnaissance.

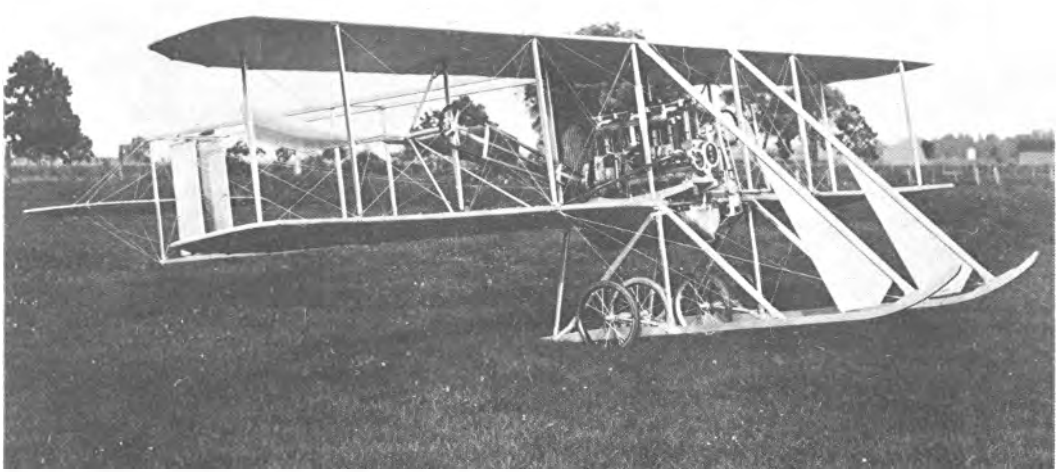
(c) For destroying hostile aircraft and for offensive work against enemy submarines and other vessels, including the interruption of enemy mining or countermining operations.

(d) For aiding in spotting the fire of Coast Artillery, both against ships and against any invading force that may invest the seacoast fortifications.

The number and character of the aircraft required depends on the locality, number of harbor defenses, their organization, strength, and positions. Each harbor-defense area, therefore, needs to be studied with this specific end in view, and should have radio apparatus not only for communicating with the Navy but also for communicating with its aircraft and with the units of our mobile forces.

In addition to the aircraft required with the harbor defenses themselves, aircraft are required with modern movable coast-defense armament employed as an auxiliary element of the mobile forces in defending the intervals between our fortified harbors and with units of the mobile forces.

The use of aircraft with the mobile units is a definite matter; each division requires one squadron of 12 aeroplanes. These are divided into three companies of four aeroplanes each, two companies having re-



Wright Model D Scout purchased by the Signal Corps in 1913. It was a single-seat pusher type aircraft propelled by a 6-cylinder, 60 hp, Wright Field engine.

connaissance and artillery observation machines and one company having two high-speed machines especially constructed for long-distance reconnaissance and for combating the enemy's aerial craft; two battle machines for the purpose of bomb dropping and offensive work against enemy material of all sorts. This is in keeping with the best practice that has been developed in the European war.

3. **Use of Aircraft At Over-Sea Stations**

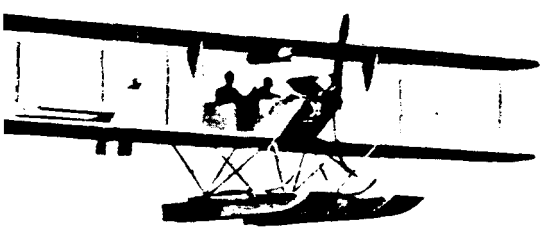
The use of aircraft with the Army in the over-sea possessions analogous to that mentioned above with the harbor defenses; and in addition, wherever mobile units of the Army happen to be, they must be provided with suitable aircraft. The defense of over-sea possessions constitutes a problem in itself, and these garrisons must be equipped not only with machines capable of reconnaissance over land but also with those capable of operations over water, with the power to alight in water—that is, hydroaeroplanes.

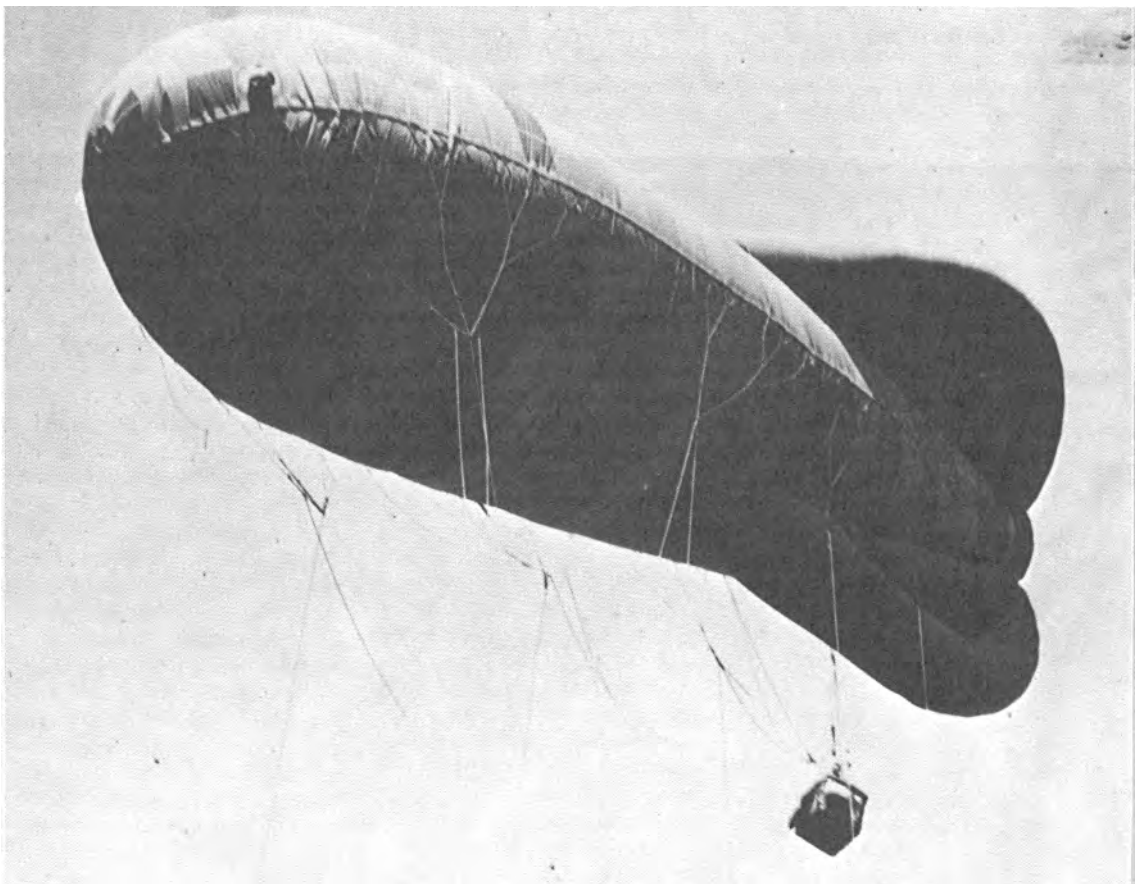
The type of machine to be used necessarily depends on the locality; for instance, in Hawaii practically all of the military machines would need to be hydroaeroplanes; in the Philippines and Panama a great proportion of them. To the Coast Artillery troops in the United States proper and in the districts around the Great Lakes the same considerations apply. It is believed that the main principles enunciated above should be followed, and that an estimate of actual machines and material, both heavier and lighter than air, should be made for all places.

II. General Types of Aircraft.

4. **Captive Balloons.**

For over a century captive balloons have been used by the armies of all the leading military nations. Their function has been one of observation; that is, to see what those on the ground were unable to see. They have therefore proved a useful means of observing and reporting the effects of artillery fire. Electrical means of communication greatly enhanced the utility of captive balloons, as it made communication instantaneous from car to ground instead of by the older way of raising and lowering written messages by ropes. In clear weather and on favorable terrain captive balloons are able to distinguish different branches of the service at a distance of 16,000 yards or about 9 miles. With the best glasses at the present time the field of observation is said to extend to 20,000 yards. In general, captive balloons of the "Sausage" or "Drachen" type are used by all the armies of the great nations. Along the French-German front in northern France these balloons are used in great numbers all along the lines. Their function is to observe the fire of artillery and keep watch of all movements of hostile parties within their field of view. They are connected with telephone directly with the batteries whose fire they are observing and with the headquarters to which they are attached. In many cases the captive balloons work in conjunction with aeroplanes. The aeroplanes by flying over the terrain where the hostile targets are located find out the exact position of those which the captive balloons have been unable to locate by themselves. When by means of signals the locations of the targets have been indicated to the observer in the captive balloon, the aeroplanes proceed to other duty. Aside from the use of the captive balloons in conjunction with aeroplanes,





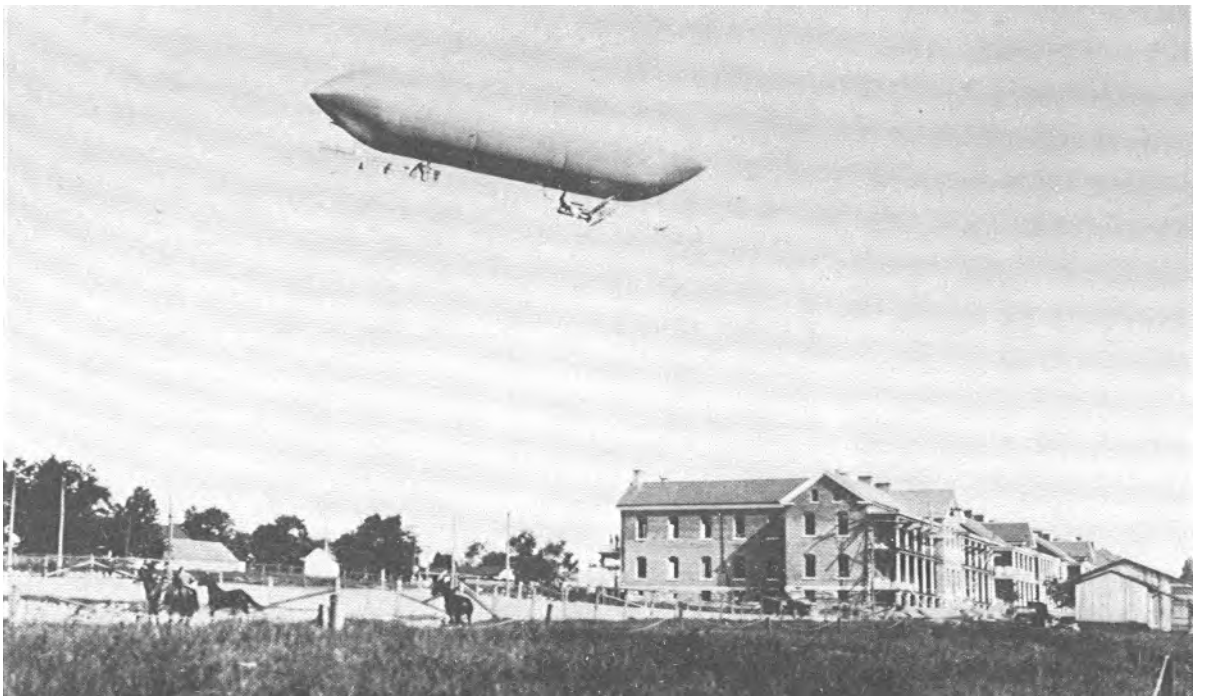
A Caquot or "sausage" balloon, a type of captive observation balloon widely used during World War I.

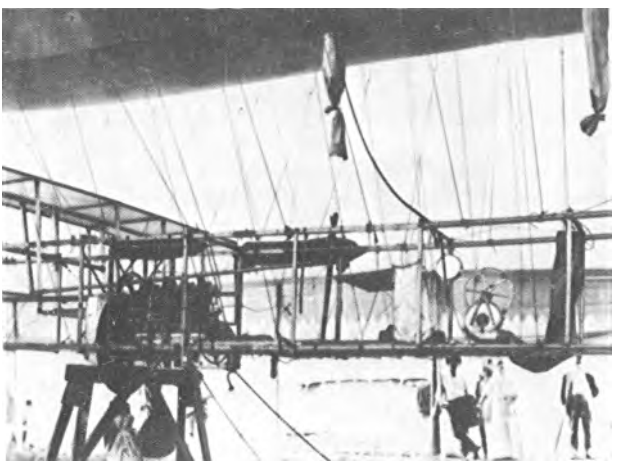
their duties are practically the same as they have been for many years or were in our own Civil War. Free balloons such as were used from Paris, for instance, in 1870 are now a thing of the past, their place having been taken by the aeroplane or the dirigible airship. All military captive balloons are now so constructed that their undersurface acts like a kite, thereby making them steady in a strong wind. To keep the envelope distended properly in the face of the wind, a wind sail is provided so as to transmit pressure to the rear part of the envelope by means of the wind itself. Captive balloons are used not only with the field forces, but also are especially useful in fortress warfare. The organizations which handle these balloons consist ordinarily of some 4 officers, 72 men for each balloon section.

5. **Dirigibles.**

The term dirigible, as applied to aeronautical appliances, signifies a lighter-than-air craft, which is equipped with engines and propellers capable of moving it from place to place. Dirigibles may be roughly divided into three classes: Non-rigid, or those whose envelope can be entirely packed into a small space when deflated, and that have no rigid framework of any kind; semirigid, or those that have a stiffening for a part of their length in order to enable the envelopes to maintain their shape to better advantage than the nonrigid; the rigid, which have a framework for the whole envelope that maintains itself continuously. All have been tried for the last 15 years. The nonrigid types have not given very good results, as they are too much dependent on the weather, due to distortion of the envelopes; the semirigid have given some satisfaction and have been largely employed. The advantage of the semirigid types is that they may be packed for shipment and reassembled much more easily than the rigid types; they can be deflated quickly and, consequently, are not so subject to complete destruction as the rigid types when anchored to the earth. On the other hand, they are not able to develop the speed that the rigid types, such as the "Zeppelin," are capable of.

Dirigibles and aeroplanes are frequently compared with each other as to their utility in general. As a matter of fact, they are two entirely different military accessories and are as different in many ways as is a captive balloon from an aeroplane. Dirigibles are able to stay in the air at any height for long periods of time. They are capable of running at reduced speed, can hover over localities for minute observation and to take photographs. They are able to carry several tons weight in addition to their passengers and crew. From the fact that they are able to remain stationary over a given place they are able to launch their projectiles with greater accuracy. Dirigibles in present war have been used both over land and sea. At sea they have carried out reconnaissance, have acted offensively against hostile submarines, have accompanied transports in order to observe the approach of hostile craft, have been used in mine laying, stopping and examining hostile merchant vessels at sea, and for bombarding hostile localities. The airships which have made the longest trips and developed the greatest efficiency thus far are the German "Zeppelin" rigid-frame type. These have repeatedly flown over England at a distance of at least 300 miles from their base, and have nearly always returned in safety. Some have been lost, however. Aeroplanes appear to be unable to cope with them at night. While dirigibles have not proved themselves to be a determining factor in combat, either on land or sea, they are being developed to the greatest extent possible, especially by the Germans, who have dirigibles of very great size. The principal features of this type are a rigid framework of aluminum, a number of drum-shaped gas





Signal Corps dirigible, *Baldwin Airship* #1, in flight at Ft. Myer, Virginia, summer 1908.

At right, *Baldwin's* motor.

bags, and a thin outer cover. Although the details of construction are not definitely known up to date, their length is about 485 feet, their volume about 900,000 cubic feet, their total lift over 20 tons, and their useful lift about 5 tons. They are driven by four motors of a total horsepower of about 800, which is applied to four propellers. Their speed is from 50 to 60 or more miles per hour and a full-speed endurance of over 100 hours, or more than 4 days. It is therefore evident that in good weather these airships have a radius of action of from 5,000 to 6,000 miles. Moreover, they are being constantly improved, and are probably capable of crossing the Atlantic Ocean. Crews of from 10 to 20 men are required for their operation; they are armed with bombs of various sorts, light guns, and are equipped with searchlights. They carry very efficient radio apparati, which have equipments for determining the directions from which radio impulses are being sent. In this way they are able to locate themselves at night or in foggy weather when the ground is invisible. They require very large and expensive hangars, gas plants, and equipments for their operation. When forced to make landings outside of their hangars, on account of their bulk, they are very difficult to handle in hard winds, and are liable to destruction thereby.

The best of the nonrigid and semirigid airships have a capacity of more than 800,000 cubic feet, a maximum speed of 50 miles per hour or less, and a full speed endurance of about 24 hours. As mentioned above, their great asset is extreme portability and cheapness as compared with the rigid type.

6. **Aeroplanes.**

Heavier-than-air craft made their appearance as military agencies in 1908, when the Wright brothers demonstrated thoroughly the possibilities in this respect. While many of the salient features of heavier-than-air machines had been worked out years before, it remained for the internal-combustion engine to really make mechanical flight possible. The military possibilities of aircraft of this description were appreciated immediately by the great nations. Large appropriations were made at once, notably by France and Germany for their development. At first England was slow to take up the matter, but in 1912 had gone at it thoroughly and was spending large amounts of money for their development. Italy, Russia, Japan, and the smaller nations of Europe and South America made liberal appropriations for obtaining the material and developing the personnel. Aeroplanes were used in a small way during the Italian campaign in Africa during the Balkan-Turkish War, and during the Balkan War. These nations had very little equipment and very few trained flyers. Wherever the aeroplanes were given the opportunity under average conditions they rendered efficient service in reconnaissance.

7. **Types of Aeroplanes.**

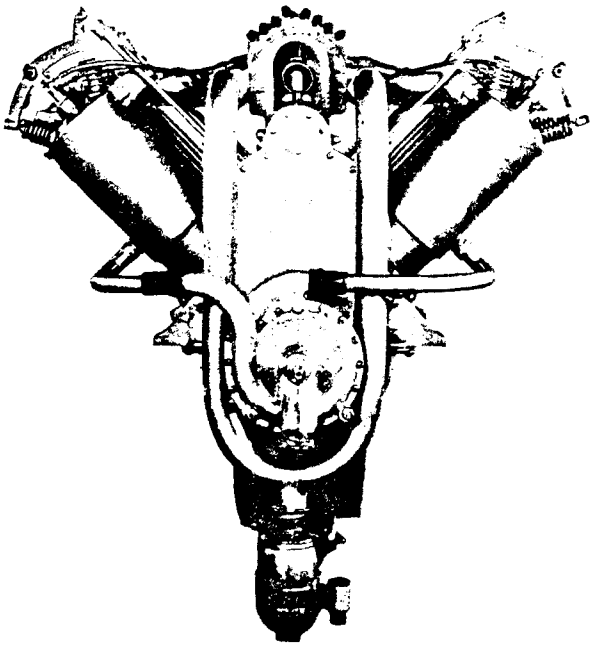
We now find aeroplanes consisting of three principal classes: (a) Scout or speed machines; (b) reconnaissance aeroplanes; (c) battle machines. The first are used for distant reconnaissance and combating the enemy's aircraft, the second for ordinary reconnaissance and the observation of fire of artillery, and the third for the destruction of enemy's material, personnel, or equipment.

8. **Requirements of Various Types of Machines.**

Great advances have been made since the war began in all these machines, all the details of which are not yet available. The following table, which appeared in the London Times of February 19, 1914, gives the approximate requirements of each type of machine at the beginning of the war. These general characteristics are still desired, but the radius of action and the speed have been considerably increased.

9. **Aeroplane Engines.**

As to material, the most important consideration in aeroplane construction has been the engine. Without excellent engines the best aeroplanes otherwise are of no service; in fact, may be a source of danger. In the countries where aeroplane development has made the most progress large prizes have been given for the development of suitable engines. At the same time, research and experimentation have gone on along this line at Government plants. Engines require frequent replacement. In fact, it is reported that after 100 hours in the air engines are "scrapped" and new ones installed. The plan found to give excellent results for the development of material is for the Government to have stations where experimentation along all lines is carried on. On the data furnished by these establishments specifications are made up for the construction of aircraft by private individuals and civil manufactories. If any parts, such as the engines mentioned above, need additional development, prizes are offered to stimulate construction and progress.



III. Functions of Aircraft.

10. **Height At Which Aeroplanes Must Fly.**

It was soon found out that to escape the fire of small arms, a height of about 4,000 feet above the ground had to be maintained. As soon as balloon guns were created this height had to be increased to 6,000 feet, at which height it is now necessary to fly in order to be reasonably safe from being hit by hostile projectiles sufficient to bring the machine down. At this height, 6,000 feet, small details of the terrain and small detachments of troops or material are very difficult to distinguish. On the other hand, large columns of troops, trains, railways, bridges, artillery firing, and sometimes in position, defensive positions of large extent, and things of that nature can be readily distinguished. Whenever it becomes necessary for the aircraft to fly at a lower altitude than 6,000 feet the chance of destruction by gunfire must be considered.

11. **Strategical Reconnaissance.**

Reconnaissance of this kind is strategical in its nature, the tactical reconnaissance of particular localities is still carried out by troops or captive balloons. In fact, it may be said that all strategical reconnaissance is now carried on by aircraft. The reconnaissance is carried out by an officer who requires considerable experience in order to be able to

Performances required from various military types.

	Light scout.	Reconnaissance aeroplane. (a)	Reconnaissance aeroplane. (b)	Fighting aeroplane. (a)	Fighting aeroplane. (b)
Tankage to give an endurance of.	300 miles	300 miles	200 miles	200 miles	300 miles.
To carry	Pilot only	Pilot and observer plus 80 pounds for wireless equipment.	Pilot and observer plus 80 pounds for wireless equipment.	Pilot and gunner plus 300 pounds for gun and ammunition.	Pilot and gunner plus 100 pounds.
Range of speed	50 to 85 miles per hour	45 to 75 miles per hour	35 to 60 miles per hour	45 to 65 miles per hour	45 to 75 miles per hour.
To climb 3,500 feet in	5 minutes	7 minutes	10 minutes	10 minutes	8 minutes.
Miscellaneous qualities	Capable of being started by the pilot single-handed.		To land over a 30-foot vertical obstacle and pull up within a distance of 100 yards from that obstacle, the wind not being more than 15 miles per hour. A very good view essential.	A clear field of fire in every direction up to 30° from the line of flight.	A clear field of fire in every direction up to 30° from the line of flight.

distinguish objects on the earth and assign to them their true military value. The pilot is either an officer or noncommissioned officer. The observer is always a trained tactical officer, because in reconnaissance of this nature an untrained person can not interpret the military significance of what he sees.

12. **Photography From Aeroplanes.**

Photography is utilized to the greatest extent possible in aerial reconnaissance. The devices are so arranged that they are capable of taking one or a series of views of a particular locality. The plates or films thus made are rapidly developed and are thrown on a screen by means of a stereopticon, when all details are magnified to any extent desired and details invisible to the naked eye are brought out plainly. These details are then entered on the maps of the officers concerned. As the height at which an aeroplane is flying can be taken from the barograph, and as the focal angle of the lens of the camera is known, a scale can easily be worked out and the views form good maps of the terrain photographed.

13. **Aeroplanes and Artillery.**

In addition to reconnaissance in general, aeroplanes have taken their place as a fixture for observing the fire of artillery. Due to the degree of concealment which artillery is now given, it is impossible to determine its location from the ground. The aeroplanes first pick up the targets, report their location to the field artillery, and then observe the fire of the batteries. By means of prearranged visual signals or radiotelegraphy the aeroplanes are able to indicate to the artillery where their fire is making itself felt. If artillery is insufficiently provided with aeroplanes, it is well established that an enemy so provided has an overwhelming advantage.

14. **Control of The Air.**

For this reason, among others, attempts to gain "control of the air" are made by belligerents at the inception of hostilities. This takes the form of offensive action by aeroplane against aeroplane. For this purpose machines known as "speed scouts" and "battle aeroplanes" have been developed. All the great European nations are now

equipped with them. The only way in which enemy aeroplanes can be effectively dealt with is by aeroplanes, because they are difficult targets for gunfire from the ground. To gain control of the air a great preponderance in number and efficiency of aircraft is necessary. So far in the European war, unless one side had a greatly preponderating number and quality of aeroplanes, they have been unable to obtain and keep control of the air. An excellent instance of obtaining control of the air seems to be furnished by the Austro-Germans when they initiated the campaign against the Russians in May, 1915. In this instance complete control of the air appears to have been obtained. The results to the Russians were disastrous because the Austro-Germans were able to fly at will wherever they wanted to, could pick up the location of the Russian masses, and make their movements accordingly, entirely unobserved by the Russians. In the fire of their artillery they had the advantage of being able to locate the Russian guns and observe their own fire while the Russians were powerless to do so.

In an article on "Recent progress in military aeronautics," published in the Journal of the Franklin Institute for October, 1915, Lieut. Col. Samuel Reber, Signal Corps, United States Army, sums up the question of machines for control of the air as follows:

> Experience has developed three types of aeroplanes for military purposes. The first, the speed scout, for strategical reconnaissance, a one seater, with a speed up to 85 miles per hour and radius of action of 300 miles and a fast climber, about 700 feet per minute; the second for general reconnaissance purposes with the same radius of action, carrying both pilot and observer and equipped with radiotelegraphy, slower in speed, about 70 miles per hour, and climbing about 500 feet per minute, and in some cases protected by armor; the third, or fighting craft, armored, and carries in addition to the pilot a rapid fire gun and ammunition and so arranged as to have a clear field of view and fire in either direction up to 30 degrees from the line of flight, the speed to run from 45 to 65 miles per hour, and the machine to climb about 350 feet per minute.

15. **Surprise Movements.**

It is often said that due to the use of aeroplanes surprises are no longer possible. Generally speaking, this is so, providing both sides are equally well equipped with machines and weather conditions are favorable. If, however, complete "command of the air" is obtained by one side, the chances of surprising the enemy are greater than they have ever been before.

16. **Bomb Dropping.**

In addition to their functions of reconnaissance, the observation of the fire of artillery, and the combat of hostile machines, both heavier and lighter than air, much time, thought, and ingenuity have been given to the subject of dropping projectiles. Bombs of various sorts weighing from a couple of pounds to 50 pounds have been tried. The most common ones weigh from 15 to 35 pounds. At the height at which aeroplanes are required to fly it is extremely difficult to hit an object with any certainty. Various devices have been used and tried for this purpose. The factors of height, speed, and wind, are almost impossible to compensate for entirely, up to the present time, so that consequently bomb dropping in general or the launching of projectiles of all kinds from aeroplanes has not attained great results in so far as the actual destruction of material or personnel is concerned. Advances along this line are constantly being made, however, but progress is slow. A special type of aeroplane has been developed for dropping

bombs and battle purposes. For bomb attacks on any locality these machines are sent in flotillas of from 30 to 60 machines, each of which is provided with from 5 to 10 bombs. They go to the locality and circle over it, dropping their projectiles. Against railways, roads, bridges, and hostile parks of various kinds, this method of attack has given considerable success.

IV. Organization of Aeroplane Units

17. Tactics of Aeroplanes.

As to tactical use aeroplanes seem to be approaching methods similar to those used by a navy. That is, first the speed machines reconnoiter to the front; they are followed by the battle machines, which in their turn clear the way for the reconnaissance aeroplanes; those assigned to the artillery stay right with their guns. Fortresses, harbor-defense works, and naval formations require special organizations of aeroplanes, some or all of which may be operated from the water. The organization, kind, and number of the machines and personnel required for this particular service depend on the special locality and mission of whatever formation the aircraft are to be attached to.

18. Development During European War.

The use of aeroplanes is gradually being developed from experience in the European war. Organization has been found to be one of the most important considerations; in general the organization has been into squadrons. The squadron is a tactical and administrative unit. It has a personnel consisting of pilots, observers, bomb droppers, mechanicians, chauffeurs, and drivers. Flying personnel has to be developed in the military service. Unlike chauffeurs, for instance, there are few in the civil population who can be drawn on. The few who fly are demonstrators, exhibition flyers, or sportsmen. They are very few in number and scarcely a military asset. In France the squadrons usually have six machines and two spares. They have the same organization of depots of resupply that other units of the armies possess. The squadrons usually consist of complete units of one kind of machine; that is, speed, reconnaissance, or fighting. These squadrons are usually assigned to an army, or more if the machines and personnel are available.

In general an aeroplane requires for its operation a personnel of 1 pilot, 1 observer, and 2 enlisted men, mechanicians, chauffeurs, etc.

In England 12 machines of different classes are assigned to a squadron.

19. Assignment of Aeroplanes to Artillery.

Many are of the opinion that machines with the personnel to operate them should be assigned permanently to artillery regiments so that they would be immediately available whenever action is required by the artillery. If they have to be obtained from a higher headquarters valuable time is often lost. It is believed that before long aeroplanes will be assigned permanently to regiments of artillery.

V. Development of Aeronautic Personnel.

20. General Line of Development in Europe.

In the development of their aeronautical personnel all nations have worked more or less along similar lines. At first these detachments were attached to the engineers. All the pilots and observers were officers, while the mechanicians and others were enlisted men. As the science developed and more and more machines became necessary the importance of this branch constantly increased until

eventually it formed a separate arm of the service.

Instead of officers only being employed in the flying of the machines noncommissioned officers began to be used as the pilots.

21. Officer-Observers and Noncommissioned Officer Pilots.

The observers were either trained staff officers or officers of particular branches when the reconnaissance being made especially concerned a certain branch. For instance, in the observation of artillery fire an artillery officer, for the inspection of a demolished bridge over a great river an engineer officer, or for the observation of the tactical or strategical dispositions of an enemy's troops a staff officer. Noncommissioned officers are now very generally used as pilots. All countries now at war have found that they have places for all the trained pilots they can possibly obtain. In general the units are commanded by officers and a certain number of the pilots are officers, but the bulk of the piloting is done by enlisted men while the officers are carried as observers.

On 27 May 1913 the War Department established the Military Aviator Certificate. Officers of the Army qualifying under rules approved by the Secretary of War received the certificate, and an insignia (at right) to wear on their uniforms.

22. Losses to Aero Personnel in War.

The losses to the flying personnel in war, when equipped with proper machines, seems to be less than that of infantry, cavalry, and artillery in the order named.

23. Development of Aeronautic Personnel in the United States.

In the United States the development has been along similar lines to those employed in Europe, with the difference that here a branch of the service existed that did not formerly exist in European armies. It was a development of the Civil War, i.e., the Signal Corps. This corps is charged with the transmission of information between the various units of an army; the captive balloons had formerly been assigned to it, and when the aeroplanes made their appearance they naturally fitted in. In this way all the agencies for the transmission of information are kept under one head, which should give not only the maximum amount of efficiency in such transmission but also obviate the necessity of creating a new arm of the service. The development of aero units in the United States has been slow for various reasons: First, on account of the fact that very little money has been appropriated compared to the sums appropriated in Europe. Second, the selection of the flying personnel has been limited to lieutenants of

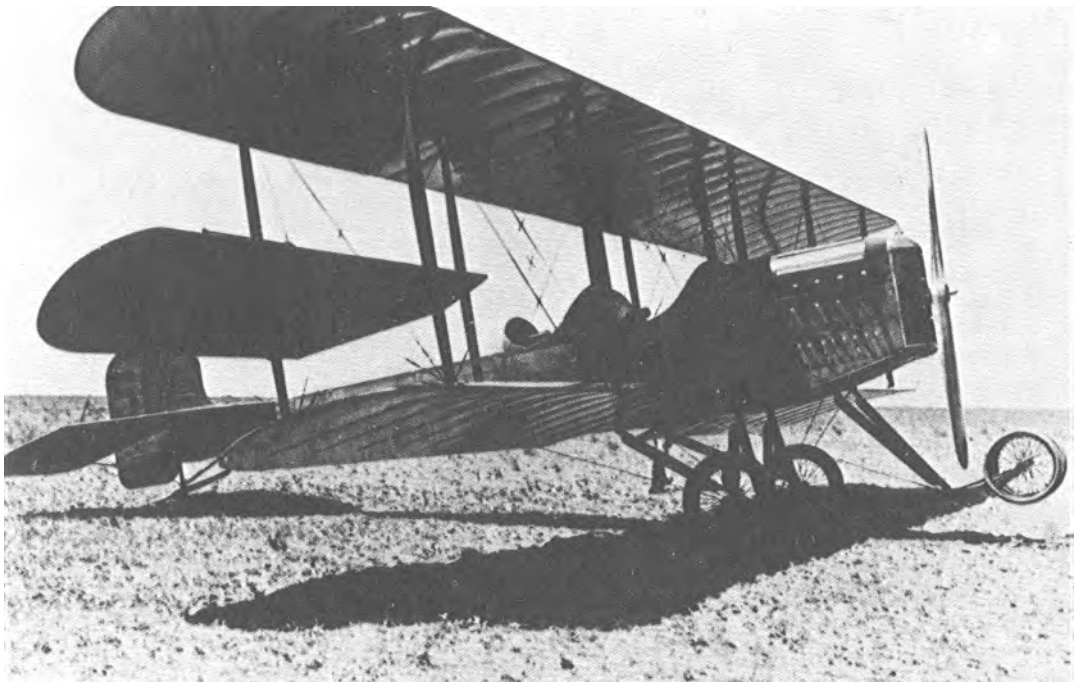
the Regular Army, unmarried, and below 30 years of age. This reduces the number of eligibles to a very small compass and does not give the results that are necessary. In the development of a flying personnel it is thought that, in addition to a certain number of officers obtained from the Regular Army as now provided for by law, pilots should be obtained both from among the enlisted men and from suitable civilians who enlist for that purpose. When they have proved their ability to be efficient pilots they should be placed in a special grade to be designated by a suitable name, such as "aero pilot, Signal Corps," for instance. This grade should be analogous to the grade of warrant officer in the Navy. When such men leave the service for any cause which does not interfere with the performance of the duties of pilot, arrangements should be made to obtain their services at once at the outbreak of war. The observers should be tactical officers who have received training. The present organization authorized for the aero squadrons in the United States provides that each one have 12 aeroplanes—8 of the reconnaissance type, 2 of the speed type, and 2 of the battle type. The personnel numbers 20 officers, 18 of whom are pilots. It is intended that staff and Artillery officers be used as observers. The United States squadron appears to be a well-balanced unit for work in this country, judging by the experiences obtained in Europe. It should be perfected as soon as possible and every effort made to give our Army the aircraft of all types needed for its use. Lieut. Col Reber, in this connection, says:

> We who in the beginning started the movement are now at the tail of the procession. We have no dirigibles, but very few trained men, and fewer machines. The manufacturing industry is moribund from the lack of business, and there is no future for it. We have no aerodynamical laboratories in which to study the problems, and no engineering courses, except one, in which to develop our constructors. The Government has not stimulated any advance in the design of machines or motors by competition for substantial reward. We have no national league, as in France and Germany, to assist the Government by private subscription and by public demand for the development of air power. The interest of our people in aeronautics at large is dead, and has been perhaps so lulled by a sense of false security and the belief that war will not come to such a vast and powerful Nation as ours; that it will not heed an oft-quoted maxim of the Father of our Country, "In time of peace prepare for war." In no particular is it more impossible to make up deficiencies after the outbreak of hostilities than in aeronautics. What is to be done?

Evidently a strong appeal should be made to Congress for suitable legislation.

24. **Scope of Needed Legislation.**

What is needed is legislation that will give means of obtaining a sufficient personnel of pilots, enough money to buy suitable machines including excellent engines, and the training of a suitable number of officer-observers. Provision should be made for the creation of captive-balloon units, and dirigibles of various types should be developed.



The Martin TT was a training plane used in 1915 at North Island, San Diego, California. The extra front wheels were added to keep the plane from nosing over.

9. To Increase the Efficiency of The Military Establishment

1916

On 1 May 1915, during the time the War College Division was formulating a military policy (Doc. 8), the American merchantman *Gulflight* was torpedoed by a German submarine. A week later, on 7 May, the *Lusitania* was sunk. Despite repeated protests from President Wilson, the sinkings continued; and as they continued, the need for U.S. military preparedness became more and more evident.

On 18 January 1916, the Chief Signal Officer, General Scriven, again appeared before Hay's Committee on Military Affairs, the subject being another bill "To Increase the Efficiency of the Military Establishment." The following extracts from the hearings are concerned mainly with Scriven's testimony in behalf of an expansion of the Aviation Section and his response to a question from Congressman Kahn about bombing operations in Europe.[1]

. . . . . .

The Chairman. You are asking for 73 additional aviation officers. I wish you would state the reason for that.

Gen. Scriven. In order to explain it thoroughly, I think it might be well for me to state to the committee the scope, as I understand it, of the aviation service which is needed at the present time. I will do that briefly, sir, and give you the figures in regard to that.

The organization of the aviation units in the foreign armies suggests a squadron of 12 machines as the basis for our organization, 8 of these machines to be of the reconnaissance type and two each of the pursuit and combat type. In case the Army remains at its present authorized strength the personnel of the aviation section should be increased to give the sufficient personnel to supply seven aero squadrons, one for each of the four tactical divisions organized for duty in the United States, three for over-seas garrisons, and a detachment for duty at the aviation school.

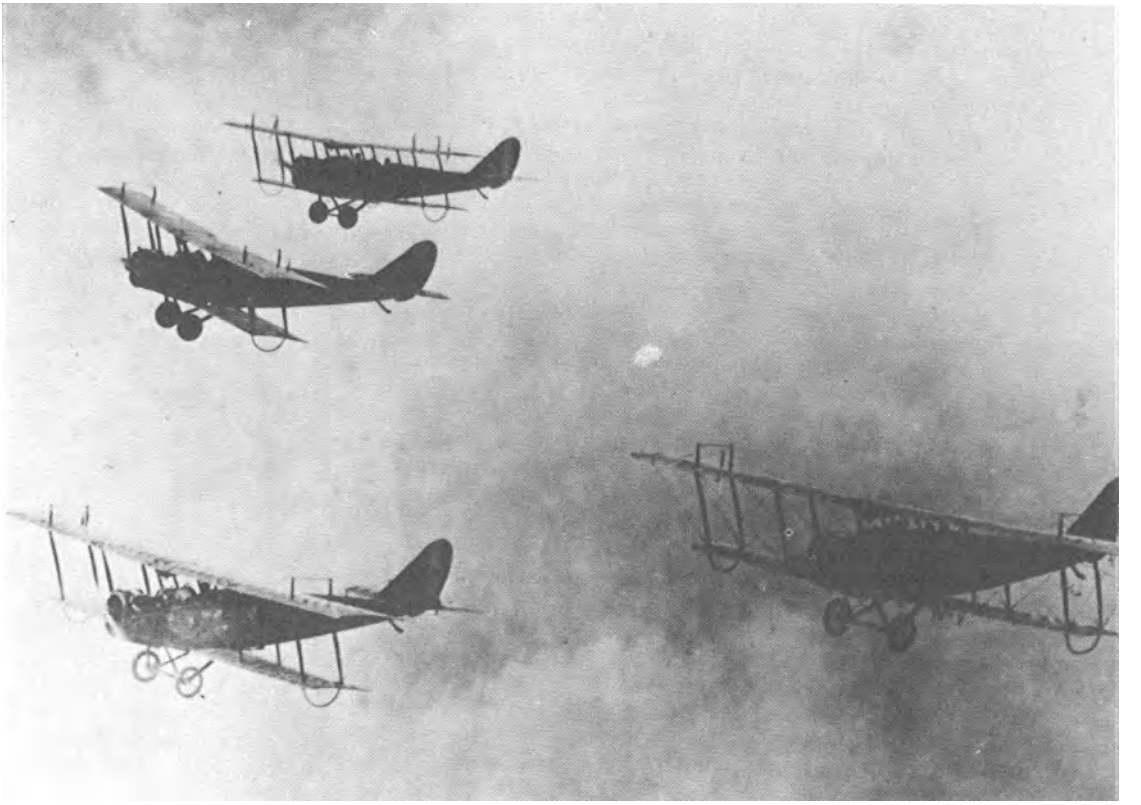
It is to be pointed out that there is additional need for at least one squadron for reconnaissance work in each of the three Coast Artillery districts in this country, and that a sufficient number of aeroplanes should be provided for fire direction and control of the Field Artillery on the basis of one aeroplane per battery with one in reserve, or, in round numbers, six aero squadrons for this arm. This calls for the addition of nine squadrons to those above mentioned.

While the above-mentioned force will give a personnel for a flying establishment in time of peace, a much greater number of officers and men will be required in time of actual hostilities. As a step toward getting the flying men necessary to meet war conditions, an aviation reserve corps should be created including citizen aviators, mechanics, and constructors of air craft. . . .

. . . . . .

I have said that the organization of the aviation units in foreign armies suggests a squadron of 12 machines as the basis of the present organization. We have heretofore had eight machines, which we have called squadrons. They have been scout machines. It seems desirable, in accordance with the present practice, to add a third company of four machines, two of which shall be what we call pursuit machines, capable of pursuing dirigibles or attacking aeroplanes, and two of them heavy

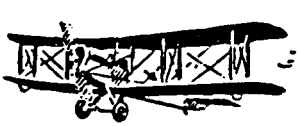
1. Hearings before the Committee on Military Affairs, House of Representatives, *To Increase the Efficiency of the Military Establishment of the United States*, 64th Cong, 1st sess, vol 1 (1916).



A formation of JN-3 aircraft, which were modified JN-2's used by the 1st Aero Squadron (late 1915 early 1916) at Fort Sill, Okla., and San Antonio, Tex.

carrying machines, which would be capable of carrying a considerable amount of ammunition in the shape of bombs, and which could be used for combat or destructive purposes. That makes the squadron as at present proposed 12 instead of 8.

Now, it is also, I think, to be accepted that an aeroplane is an expendable article. It is like ammunition used with the gun. It is subject to destruction, and therefore we must have 12 machines for replacement, and also a reserve of 12, so that a squadron consists of 36 machines. . . .



. . . . . .

As I have said, if the reorganization plan of the Army by the War Department, which calls for seven tactical divisions and five cavalry brigades, should be approved by Congress, provisions should be made for one aero squadron for Corregidor, one for Hawaii, one for the Canal Zone, one for each of the three Coast Artillery districts in the United States, one for each of the tactical divisions and five for the Field Artillery, giving in all 18 squadrons, with a total strength of 368 officers, counting 20 officers to a squadron and 6 officers for the school, with a total strength of 368 officers and 2,360 enlisted men.

. . . . . .

Mr. Kahn. Well, I have in my office here in this building a picture that was issued by the British Government calling for volunteers, with a legend on it that this was the damage done by a German dirigible; and according to that picture the wreckage was something terrific. Now, does the bomb dropped by an aeroplane accomplish the destruction that those heavier missiles accomplish? As I understand it, the dirigible can carry much heavier missiles.

Gen. Scriven. Oh, yes. Of course, the bomb dropped by the aeroplane is a very small matter; that is to say, it has very slight destructive power, because, so far as we know, they have not had the power to carry free weight enough to make it worth while. They can carry a bomb or two, but it is not much.

. . . . . .

The Chairman. There seem to be no further questions.

Gen. Scriven. May I say just one word before you go? In regard the first question you asked me, in connection with the Signal Corps at large, I have endeavored in this pamphlet here submitted to point out the need of a corps of information in modern armies, and I have endeavored to show how absolutely inadequate the strength of the Signal Corps is to meet those requirements. . . .

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Sen. George E. Chamberlain, Chairman, Senate Committee on Military Affairs, 1916.

10. Preparedness for National Defense

1916

Early in 1916 the Senate Committee on Military Affairs was holding hearings on bills for reorganizing the Army and for creating a reserve. The Chief Signal Officer, General Scriven, and the Chief of the Aviation Section, Colonel Reber, testified on 28 January. They were questioned by Chairman George E. Chamberlain (D–Ore.), and Sen. Thomas Benton Catron (R–N.M.).[1]

. . . . . .

Gen. Scriven. In the first place, I would like to emphasize, as far as I can, the growing importance of the service of information. I have endeavored to do this in a little pamphlet before me, which I think has come to the committee room. But the service of information has become so obviously important and of such paramount value in military operations, especially in the light of events abroad, that I think it is well to emphasize it as strongly as possible. The general officer or the commanding general of any force or any expedition who has not a service of information, as compared with the man who has, is like a blind man fighting one who can see, one who has all the information on current happenings and changing events before him upon which to base his actions.

The service of information is performed in these days, first, largely, in broad scope, by the aeroplane, which gives the general survey of the field, but must be supported by the other means of transmitting information now employed, such as, of course, the telegraph, telephone, what we call the buzzer, visual apparatus of various kinds, and largely, as is now pretty well recognized, by wireless telegraphy, or radio telegraphy, as it is now known. . . .

. . . . . .

The needs of the aviation section were gone into quite fully in the hearing before the House committee, and I understand that it will not be necessary for me to repeat what appears in the report of that hearing. I do, however, wish it to be fully understood that the aviation organization which is called for in the preceding table—that is, seven aero squadrons and a school detachment, has been reluctantly offered as absolute minimum in case the Army remains at its present strength.

The Chairman. You went into that in the House committee?

Gen. Scriven. Yes, sir. I asked there for 18 aero squadrons.

Senator Catron. What constitutes a squadron?

Gen. Scriven. A squadron as we had it consisted of two companies of four aeroplanes each—that is, of eight aeroplanes, all of which were intended for scouting purposes.

Senator Catron. How many men to a company?

Gen. Scriven. Under the old plan it was 90 to the squadron, but now it has been proved by events abroad that to these two companies of scout machines for general outlook over the country must be added a third company of four aeroplanes, two of which shall be rapid-pursuit machines to counterattack any enemy's air craft, and two heavy weight-carrying machines, armed with machine or other types of guns and capable of carrying a considerable weight of ammunition used for destructive purposes. So that a squadron properly organized now consists of 12 aeroplanes in the first line, 129 men and 20 officers.

Senator Catron. You mean 129 men in a squadron, or in each company?

Gen. Scriven. In the whole squadron. There are 20 officers and 129 men to the squadron, 6 officers to each company, which make 18, one squadron commander, who should be a major, and one adjutant and supply officer. But a squadron of 12 machines, in my opinion, is not enough. The organization is good as a fighting unit, but I think that for each machine you should count three—that is, one machine that is actually in use,

1. Hearings before the Committee on Military Affairs, United States Senate, *Preparedness for National Defense*, 64th Cong, 1st sess, pt 12 (1916).

one replacement, so that when the first is broken up or out of commission it can be at once replaced and a third aeroplane be kept as a reserve, not necessarily assembled, but ready to be used. As I see it, we should have one squadron in the Philippines, one in Hawaii, one in the Canal Zone, seven for use with the field armies—that is, one at the headquarters of each division and three squadrons for the use of the Coast Artillery—that is, one squadron for the North Atlantic, a squadron for the South Atlantic, and a squadron for the Pacific. To these 13 squadrons there should be added one aeroplane, with its replacement, for each battery of Field Artillery.

The Chairman. How many would that mean?

Gen. Scriven. That means 18 squadrons.

The Chairman. Of 129 men each?

Gen. Scriven. Eighteen squadrons of 129 men.

The Chairman. And 20 officers?

Gen. Scriven. Yes. . . .

. . . . . .

The Chairman. How many squadrons have you now?

Gen. Scriven. We have today, I think, 23 aeroplanes. Call it two squadrons. As a matter of fact, we have a squadron at San Antonio and we have the aviation school at San Diego, and then we have a company on its way to the Philippines.

The Chairman. That is three.

Gen. Scriven. I could hardly call it three.

The Chairman. Not three squadrons?

Gen. Scriven. No. Two squadrons by number; but better, one squadron and one company, and a school detachment.

The Chairman. You have not three, then?

Gen. Scriven. No, sir; not of the approved squadron organization. We have 46 officers and 243 men.

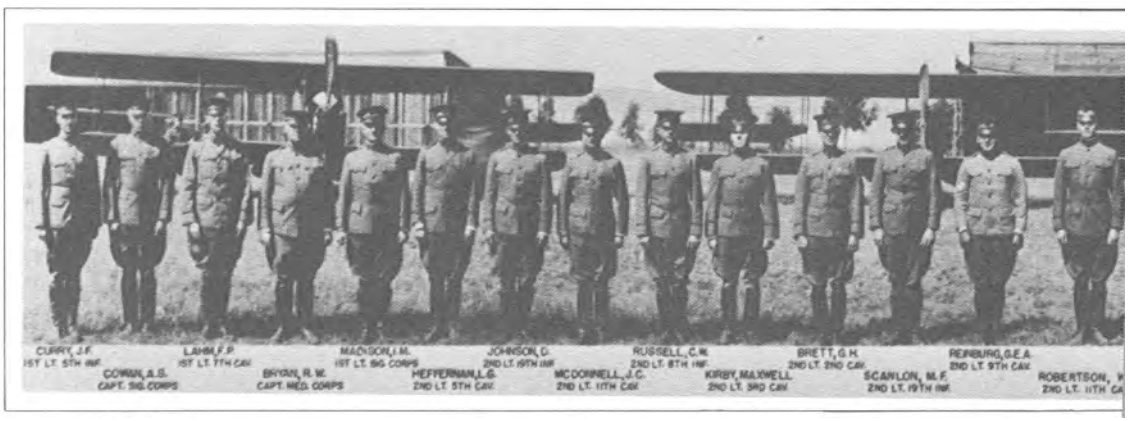
The Chairman. How many machines have you now?

Gen. Scriven. Twenty-three, and two awaiting acceptance tests.

The Chairman. How many do you need for 18 squadrons?

Gen. Scriven. I think we need 36 machines to a squadron. But, as a matter of fact, perhaps we will say 24 machines to a squadron would be well enough, though each unit in service should have a support of two machines, rather than of one replacement.

Officers of the U.S. Signal Corps Aviation School, North Island, San Diego, California, 1916. Thirteen of the 28 officers in the photo attained a general officer rank in later years.



The Chairman. You need 432, and you have 23?

Gen. Scriven. Yes; reckoning 24 to the squadron; or if you reckon 36 machines to the squadron, the total number of machines we should have is 18 by 36, or 648. The machines should be considered as expendable, for they are easily placed out of commission.

The Chairman. There must be a great number in reserve with the European armies?

Gen. Scriven. It is no doubt tremendous.

The Chairman. What does a machine cost?

Gen. Scriven. I think, roughly, $10,000, with the instruments, and so on.

The Chairman. I should think it would be almost as perishable as ammunition.

Gen. Scriven. No doubt, and should be so reckoned. Abroad they are getting tremendously powerful machines, and will undoubtedly be able to carry guns and missiles in sufficient quantity to do a great deal of destruction.

The Chairman. What do these Zeppelins carry?

Gen. Scriven. They carry several tons. The new ones I do not know about, but the old ones had a capacity of something like 4 or 5 tons free weight.

The Chairman. That is what the Germans are using for bombs?

Gen. Scriven. Yes.

Senator Catron. Can they drop their bombs with any accuracy?

Gen. Scriven. No, sir; they can not. They have small chance to hit what they are aiming at. They simply drop the bombs when and where they can.

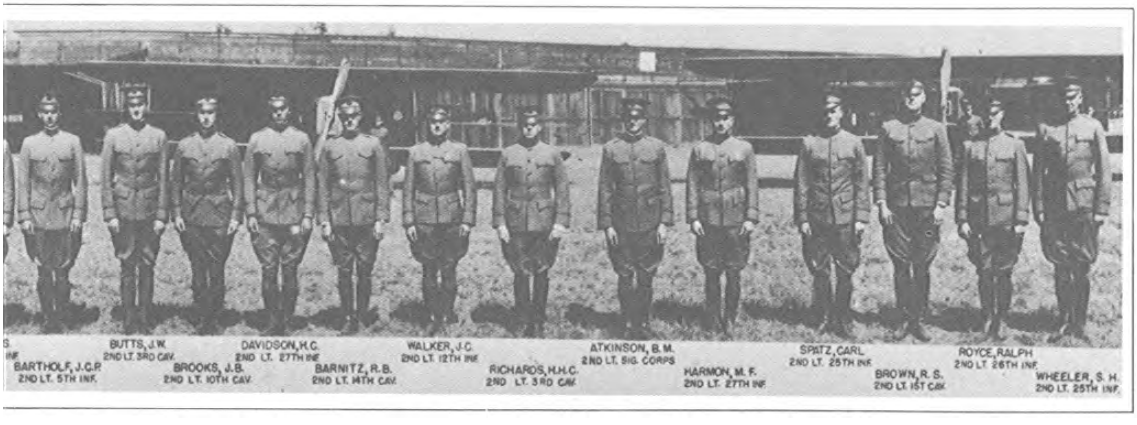
Senator Catron. And they have to get up about how high to be at a safe distance?

Gen. Scriven. Now, to be beyond the range of the powerful anti-aircraft guns, they must rise to at least 13,000 feet. This is probably beyond the ability of the dirigible.

Senator Catron. If they drop them while they are moving and their machine is not entirely steady, they would have all kinds of trouble about where their shots would go?

Gen. Scriven. They would.

Senator Catron. What are you doing in regard to improving your machines, or whatever you call them? Have you adopted any machine that is a standard machine, or are you open to getting better ones?



Lieut. Col. Reber. We are keeping abreast of the practice as developed at home and abroad, and every time any improvement is made we endeavor to put that in our machines. . . .

. . . . . .

Senator Catron. What machines are you using?

Lieut. Col Reber. Aeroplanes.

Senator Catron. What kind of aeroplanes are you using?

Lieut. Col. Reber. We are using a biplane tractor, two-seated scout machine.

Senator Catron. Any particular make, designated by the name of any particular person?

Lieut. Col. Reber. We have those machines made both by the Curtiss Co. and by the Martin Co.

Senator Catron. I suppose you have in them the advantage of every machine there is in the country?

Lieut. Col Reber. We try to get them.

Senator Catron. What is the greatest speed you can get out of one of those?

Lieut. Col. Reber. Do you mean the ones we have?

Senator Catron. Yes.

Lieut. Col Reber. I think about 80 miles an hour.

Senator Catron. It seems to me that over in Europe they have gotten more speed than that out of them.

Lieut. Col. Reber. But not out of the same type of machine we have.

Senator Catron. Do we need another type of machine?

Lieut. Col. Reber. We do, and the only reason we haven't it is because we haven't enough money to buy it.

Senator Catron. That was what my first question was addressed to, whether you were keeping abreast of the times, getting machines as efficient as those now being used in Europe, that would be efficient for and beneficial to the Army in its operations. You now say you have not got as rapid a flying machine as they have?

Lieut. Col. Reber. I might say this, that the average scout machine abroad, of the same type we have, has approximately the same speed as ours has. They have a faster type machine they have developed that we have not as yet been able to

buy, as it has not been developed in this country, although American manufacturers now are planning to build it, and they have offered to build some types which we expect to have tried out in the next two or three months. As a specific case, the Curtiss people are building and will have for exhibition and trial within about a month a fast machine, which will probably make 110 miles an hour.

Senator Catron. The paper stated some machines over there are making 110 miles an hour.

Lieut. Col Reber. That is a fact.

Senator Catron. Is that the greatest speed any of them has reached?

Lieut. Col Reber. No, sir. I think the fastest speed on record is a little over 126 miles an hour; but that is not a military machine. That was a racing machine.

Senator Catron. Where was that?

Lieut. Col. Reber. That was in France. In a Duperdussin mono-plane, Prevost made a speed of 126.59 miles per hour.

Senator Catron. As I understand, Gen Scriven, you claim you ought to have some additional machines, and particularly these very fast machines?

Gen. Scriven. Yes, sir; I think it is pretty well developed that if the aeroplane is actually used in war, there must be means of counterattack by aeroplane. An aero attack must be met by a counterattack, and a Zeppelin attack should be met probably by the fast aeroplanes.

Senator Catron. What is the speed of the Zeppelin?

Gen. Scriven. I do not recall anything higher than about 65 miles, whereas the aeroplanes have gotten up as high as about 125 miles an hour.

Senator Catron. What would be the particular benefit of the exceedingly fast machine in connection with the others?

Gen. Scriven. Like a blackbird attacking a crow. He can fly all around his enemy, get above him, fire projectiles at him, and has the advantage of always being able to manuever for position. Like a fast ship, he can keep out of the way of the other's guns, and make his own attack.

Senator Catron. Have these machines proven a success as scout machines?

Gen. Scriven. Our machines are very successful as scout machines.

Senator Catron. How do these machines inform the Army where a battery that may be firing against the troops is located?

Gen. Scriven. They do it by visual signaling, by dropping or displaying objects of various shapes and colors, by directional flying, by smoke bombs, signals from a Very pistol, and by wireless apparatus.

Senator Catron. You stated a while ago that they could wire out, but they could not receive a message.

Gen. Scriven. No; they can not hear. The aeroplane makes so much noise.

The Chairman. How accurate is photography from those machines?

Gen. Scriven. It has been very excellent.

The Chairman. At what elevation?

Lieut. Col. Reber. They have taken photographs from 12,000 and 13,000 feet.

Gen. Scriven. It is very good work. In making signals they have sometimes used little scintillations of silver paper.

The Chairman. They have a code?

Gen. Scriven. They have a conventional code.

The Chairman. Is there anything else you want to discuss, General?

Gen. Scriven. I have been thinking of the best means for obtaining a reserve of men who would be required in war for signal work, and also in regard to aviators regarding which I have made a suggestion, but that is in the House hearing. The question of a reserve of men and officers is going to be the most serious matter we have to face.

The Chairman. It all looks serious to me, General.

Gen. Scriven. I know. . . .

Woodrow Wilson, President of the United States during the formative years of military aviation.

11. National Defense Act of 1916.

The hearings in the House and Senate early in 1916 (Docs. 9 and 10) were steps toward the enactment of the National Defense Act of 1916. With the War College Division's study on military policy (Doc. 8) in hand, Secretary Garrison proposed a plan that included the creation of a Continental Army of 400,000 volunteers under federal control. The idea was approved by President Wilson and found support in the Senate. The House, however, favored a plan based on a large national guard. The President changed sides, Garrison resigned, and Newton D. Baker became Secretary of War. With some help from Pancho Villa, who raided Columbus, N.M., in March 1916, the preparedness measure finally cleared Congress and was approved by the President on 3 June 1916.[1] It provided for an increase in the regular army over a five-year period, quadrupled the national guard, established officer and enlisted reserve corps, and provided for a volunteer army to be raised in time of war. The regular army, after expansion over a period of five years, was to include 64 regiments of infantry, 25 regiments of cavalry, and 21 regiments of field artillery, which is what the War College Division had recommended except that the law provided one less regiment of infantry.

1. 39 Stat 166 (1916).

Each infantry regiment was to have 12 infantry companies (103 men each) organized into 3 battalions, plus 1 machine gun company, 1 supply company, and 1 headquarters company. Organization of brigades, divisions, and corps was authorized when needed.

The National Security Act of 1916 did not specify the number of aero squadrons to be formed or give any indications as to their organization and functions, but it did state that squadrons could be formed as the need arose. Further, it tied the aviation establishment to the division organization of the ground forces.

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SEC. 3. **Composition of Brigades, Divisions, and So Forth.**

The mobile troops of the Regular Army of the United States shall be organized, as far as practicable, into brigades and divisions. The President is authorized, in time of actual or threatened hostilities, or when in his opinion the interests of the public service demand it, to organize the brigades and divisions into such army corps or armies as may be necessary. The typical Infantry brigade shall consist of a headquarters and three regiments of Infantry. The typical Cavalry brigade shall consist of a headquarters and three regiments of Cavalry. The typical Field Artillery brigade shall consist of a headquarters and three regiments of Field Artillery. The typical Infantry division shall consist of a headquarters, three Infantry brigades, one regiment of Cavalry, one Field Artillery brigade, one regiment of Engineers, one field signal battalion, one aero squadron, one ammunition train, one supply train, one engineer train, and one sanitary train. The typical Cavalry division shall consist of a headquarters, three Cavalry brigades, one regiment of Field Artillery (horse), one battalion of mounted Engineers, one field signal battalion (mounted), one aero squadron, one ammunition train, one supply train, one engineer train, and one sanitary train. The typical army corps shall consist of a headquarters, two or more Infantry divisions, one or more Cavalry brigades or a Cavalry division, one Field Artillery brigade, one telegraph battalion, and one field signal battalion, and such ammunition, supply, engineer, and sanitary trains as the President may deem necessary. . . .

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SEC. 13. **The Signal Corps**.

. . . . . .

. . . Authority is hereby given the President to organize, in his discretion, such part of the commissioned and enlisted personnel of the Signal Corps into such number of companies, battalions, and aero squadrons as the necessities of the service may demand.

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Pancho Villa, Mexican bandit and revolutionary, raided American territory in March 1916. His actions led to Pershing's Punitive Expedition into Mexico, during which U.S. aviation gained the opportunity for field testing.

12. Funds For Fiscal Year 1917

April 1916

In October 1915 General Scriven requested $3,768,743 for aviation for Fiscal Year 1917. Since the estimate had been based in part on the plan for a Continental Army, which by April 1916 appeared to be doomed, Secretary Baker reduced the amount to $1,222,100. When Baker, accompanied by Capt. Charles S. Wallace, appeared before the House Committee on Military Affairs on 8 April 1916 for hearings on the 1917 budget, the questioning related more to the Punitive Expedition than to events in Europe. After Pancho Villa's raid on Columbus, N.M., the previous month, the 1st Aero Squadron had been sent to Columbus to join the Punitive Expedition headed by Brig. Gen. John J. Pershing. An emergency appropriation of $500,000 had been made, at Baker's request, on 31 March to purchase airplanes and other aeronautical equipment. In the hearings in April the committee wanted to know about the 1st Aero Squadron's activities and about the performance of the Curtiss JN-3 planes with which the squadron was operating.

Following are some extracts from Secretary Baker's testimony under questioning by Chairman Hay and members of his committee.[1] Between the time Baker appeared before the committee and the time the appropriation was passed in August, growing concern over the state of preparedness resulted in a huge increase in funds for aviation. The amount appropriated for 1917 was $13,881,666.

. . . . . .

The Chairman. Out of the $1,222,100 for the Aviation Section how many machines is it proposed to purchase?

Secretary Baker. The intended expenditures include the cost of supplying one and two-thirds squadrons at $233,400 each, to furnish sufficient equipment for the present authorized strength, making an aggregate of $389,000; then that also includes one additional aero squadron at $233,400, making a total for new material for the Aviation Section of $622,400.

An aero squadron consists of 12 machines, and this price is arrived at in this way. The 12 machines with 50 per cent of spare parts it is estimated would cost $144,000. The actual fact about the price of an aeroplane is that it is pretty widely variant, of course. It depends a good deal upon the type of machine and a good deal upon the manufacture.

The machines we have most recently bought for use in Mexico we are paying about $7,500. That is just for the machine. There is one manufacturer who claims to have the latest type of machine, and they cost $12,500 apiece. So that shows there is a somewhat wide variation in the price.

The object of the aviation section is to continue to develop a reconnoissance machine until we have an adequate reconnoissance machine, and then to undertake to add to the equipment some of the so-called war machines, which means slightly armored machines, machines with larger carrying capacity.

The intention is to have two squadrons of 12 machines with 50 per cent of spare parts, and the machines are estimated at $12,000 each, including the spare parts. Then there is an estimate to be added, in addition, for certain trucks, motorcycles, supply trucks, tank trucks, carrier trucks, machine-shop trucks, making up the entire equipment of an aero squadron, with 12 aeroplanes, and all the attendant and accessory trucks and parts, the total cost of one squadron being $233,400.

The Chairman. What are you going to do with the $800,000 that remains?

Secretary Baker. Of the amount that remains, Mr. Chairman, $288,500 is made up in this way: For replacing existing machines, $75,000; for maintenance, $50,000; for salaries of the civilian force, $27,500; for

experimental machines, $50,000; that is an experiment item for developing a better type. It has been recommended by the aviation section, and I think has the approval of such members of the General Staff as have considered it, that we ought to have in War Department a specific sum of $50,000 available for experimenting on aviation matters. The weak point in American aviation has been the motor, and it has been thought that the War Department could, after a competition in the development of an adequate aviation motor, perhaps, develop a type that would be satisfactory.

The Chairman. Then it is proposed only to buy 12 machines during the coming fiscal year?

Secretary Baker. No. The first figure I gave you was to supply one and two-thirds squadrons, which, with the squadrons on hand now—that is, one and one-third squadrons—would bring that up to three squadrons. That figure for supplying the one and two-thirds squadrons is $389,000. That would buy the one and two-thirds additional squadrons, and an additional squadron besides that is estimated for at a cost of $233,400, so that the intention would be to buy 32 machines.

The remainder of the $288,500 to which I was referring a moment ago is to be used in the following way: For experimental machines, $50,000; for motor competition, $50,000; for instruments and incidentals, $10,000; for one rescue sea sled, $8,000; for four motor trucks, $16,000; and for maintenance of transportation, $2,000. That makes a total of $288,500.

The Chairman. How many machines have you on hand?

Secretary Baker. I have a complete history here, Mr. Chairman, of all that has happened in the department in the way of buying aeroplanes, where they are, and what has become of those that are no longer anywhere. I do not want to take your time to go into details in regard to that history, but it seems to me to be rather interesting.

The Chairman. We are anxious to have a full statement in reference to that matter.

. . . . . .

Secretary Baker. The first machine the Army ever had was an original Wright, which was acquired in 1908. It is now in the Smithsonian Institution.

In 1911 we bought seven machines, three Curtiss, three Wrights, and one Burgess. The first Curtiss and the first Wright were condemned for further use in February, 1914, having lasted practically three years. The next Wright was destroyed by an accident in September, 1912, very shortly after its purchase. The Burgess machine was condemned in February, 1914, and the next Curtiss machine was also condemned in February, 1914. The next Wright was destroyed by accident in August, 1913, and the last of the Curtiss machines was condemned in June, 1914.

That was almost the initial year of real experimentation with heavier-than-air machines, and all of the defects that at first appeared were, of course, inherent in our machines, and they were finally condemned and destroyed.

In 1912 we bought 12 machines. All of them have either since been condemned or destroyed by accident. Of the latter class 9 were destroyed by accident in 1913 and 1914, of the machines bought in 1912. The others were condemned in June, 1914.

In 1913 we bought eight machines, adhering to the types originally purchased, the Curtiss, the Wright, the Burgess, and the Burgess-Dunne, and of those eight machines one is now in commission; one Burgess-Dunne. That was the new type of that year. The others have either been condemned or are out of repair. One of them is marked "out of repair," which means probably that it can be put into service with some spare parts added.

In 1914 we bought 11 machines. One of them is out of repair, five of them have been

condemned, and five are now in commission. That year we had an experiment in a new type of machine, known as the Martin machine. I comment on that only to show that new makers are coming into the art and the department is keeping up with them by experimenting with their types.

In 1915 we bought 20 machines—the Burgess, the Curtiss, and the Martin machines. The preponderating number bought that year was the Martin type. Of those, 2 have been condemned—2 Curtiss machines. The rest are substantially all in commission, making a total aggregate number purchased from the beginning of our experimenting in the art, of 59 machines and they are distributed as follows: One in the Smithsonian Institution, 32 have been destroyed or condemned, 3 are out of repair, and 23 are now in service as follows:

Four hydroplanes at Manila, 2 flying boats and 9 training machines at San Diego, and 8 machines with the expedition in Mexico, making a total of 23 machines. That does not account for the 8 machines bought this year which are now in process of delivery and experimental trial at Newport News.

. . . . . .

Mr. Anthony. What did we pay for the 20 machines we purchased last year?

Capt Wallace. Those machines cost from $7,000 to $10,000 each.

The Chairman. Heretofore it has been stated by the representatives of the Signal Corps that they were buying the best type of machine, and they told us they cost $10,000 apiece, and we appropriated in accordance with what they said they wanted. In other words, we practically gave them all they asked for for their aviation section.

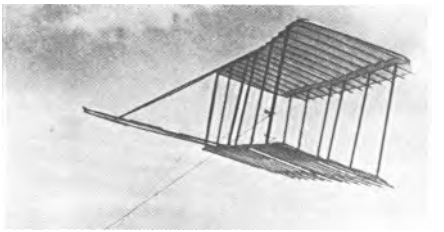
A great deal of criticism has appeared in the newspapers in regard to the kind of machines now in use not being machines that ought to be used, and we would like to know whether or not those machines that were bought in 1915 were the kind of machines that ought to have been bought for use in the Army?

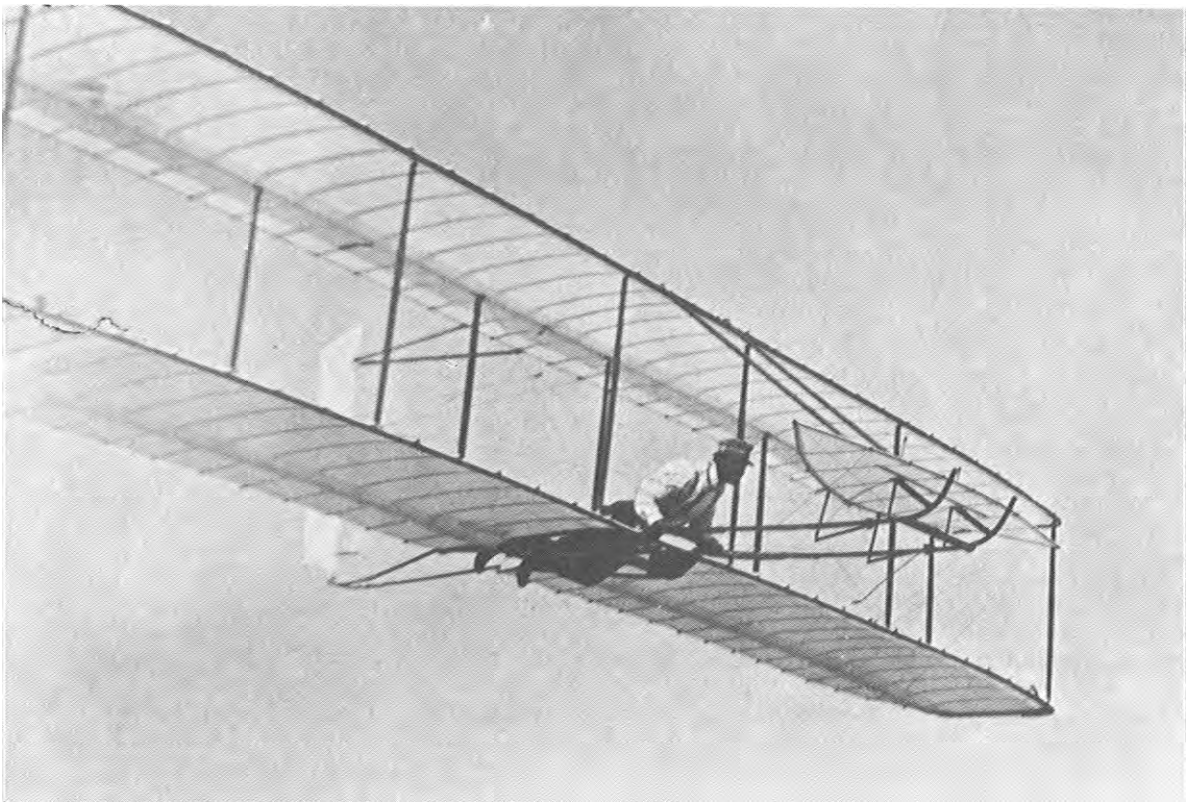
Secretary Baker. Mr. Chairman, I have given as much personal attention to that subject as was possible to give it in the limited time I have been in contact with the matter, and I want to say I am satisfied that the Army has bought as good machines as were made each time it has bought, but that in an infant art, undergoing very rapid development, the Army would hardly have a machine before some new development would be made that would antequate its machines.

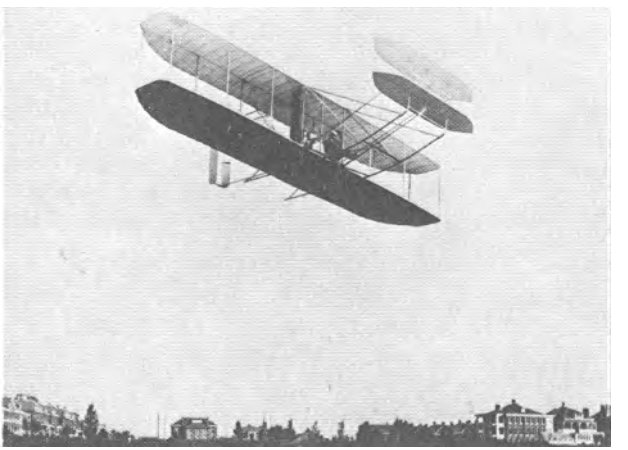
Perhaps the best illustration of that is what took place with Curtiss machine at the time we bought a number of machines known as the CURTISS J. N. 2. They turned out to be exceedingly dangerous machines. Nobody knew it beforehand; but there was some improper calculation of the wing area in those machines. Our men experimented with them and unhappily some of them lost their lives, not, probably because of the defect in the machine so much as because of the men's. I do not like to say lack of skill, but lack of experience of the men dealing with experimental machines, which increased the possibility of accident.

The net result of that was that our men very quickly put their finger on the defect, increased the wing area, and made what is known as the CURTISS J. N. 3, which, in the hands of competent aviators is regarded as good reconnoissance machine as there is. In other words, the makers have been experimenting, our Aviation Corps have been experimenting, and the combined experience of both has now been very lately increased by the experiences in Europe, so that we are approaching a development of a more stable type and model of aeroplane. I think the Army has always bought as good machines as there were to be had.

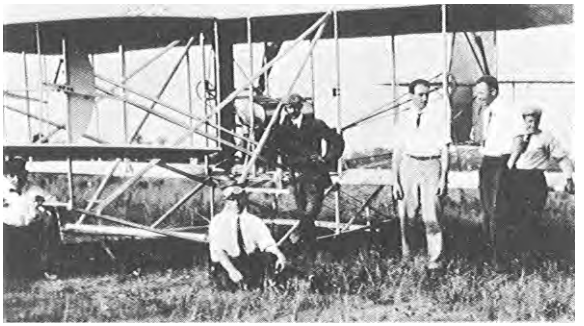
The Chairman. Mr. Secretary, are the eight machines in operation in connection with the expedition in Mexico being operated successfully?

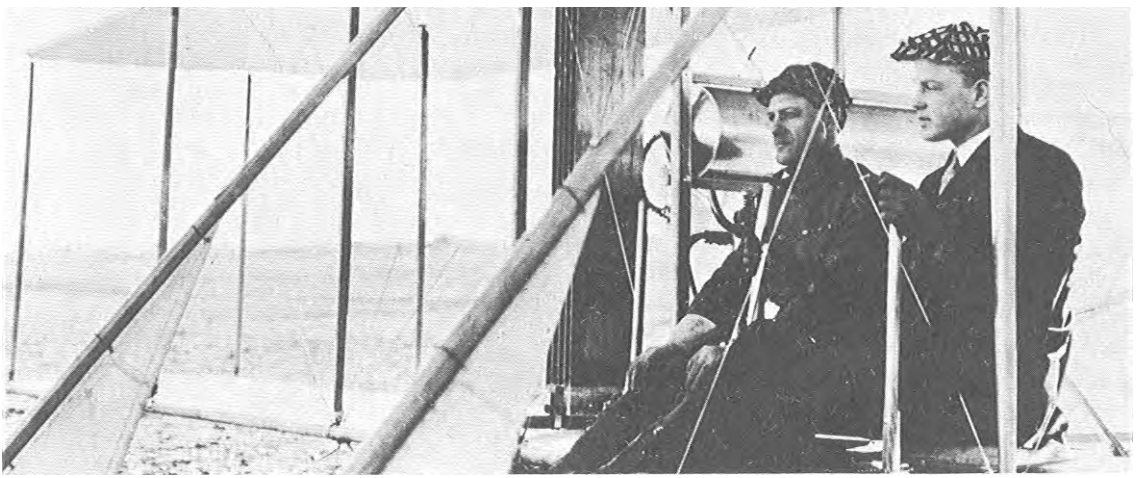


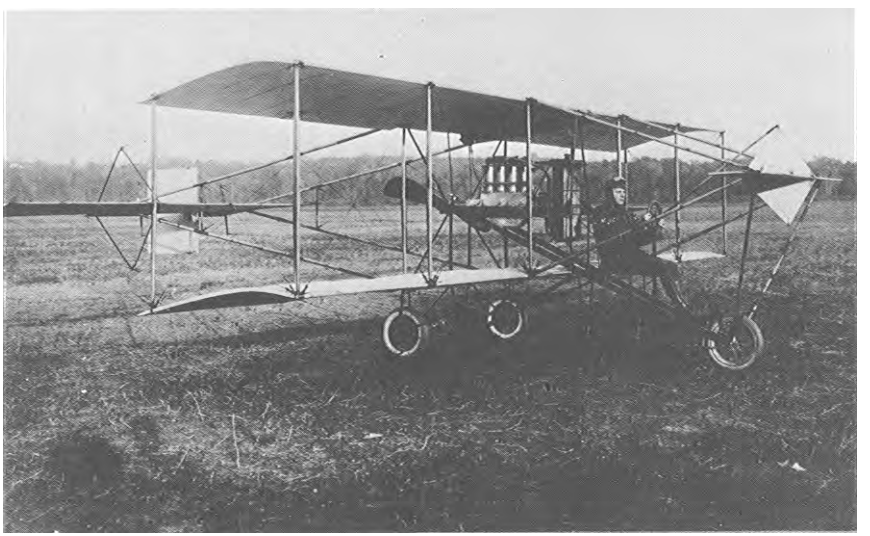




At the time of Secretary Baker's testimony before the House Committee on Military Affairs, powered flight itself was scarcely more than a decade old. In 1900 Wright brothers were still experimenting with kite gliders (top). In 1902 they were soaring on the Wright Glider at Kitty Hawk, N.C., (center), one year before their first successful powered flight. Five years later, the Army purchased from the Wrights the first military aircraft, Wright Type A, which Orville Wright flew in acceptance tests at Ft. Myer, Va., on 9 September 1908 (bottom).







The Wrights taught others to fly. Orville taught students at Montgomery, Ala., in 1910 (top). Army pilots, in turn, learned to fly from Wrights' students. Lt. Benjamin D. Foulois received instruction from Phil Parmalee (at the controls) in operating a new Wright Type B aircraft at Ft. Sam Houston, Tex., in February 1911 (center). Lt. Frank M. Kennedy, at the controls of a Curtiss Trainer at College Park, Md., 1911, learned to fly from Army pilots at the new Army aviation school (bottom).

Secretary Baker. They are being operated successfully, Mr. Chairman. That needs a word of explanation. The first aeroplanes that were made had the propellers behind the aviator, and when any accident took place, in the way of the machine stalling in going along, so much of the power would be used to secure added elevation that the machine would lose its forward motion and come to a standstill, except that it would be attempting to rise. The loss of the forward motion deprived it of the sustaining friction with the air, and the machine would stall and plunge head first down to the ground.

When that happened the great weight of the motor and of the propeller and the gear behind the aviator crushed him.

That led to the novel suggestion that the motor and propeller should be put in front. That is the so-called tractor type. All of the heavy machinery is in front of the aviator, and he is protected from the rushing air by a mica cage. That seems to have solved the problem to a great extent, and since that time there have been few fatal accidents, although there have been a number of falls. Apparently that machine is much more stable.

The young men in charge of it now say they are perfectly willing to take it up and turn over two or three times as long as they are 500 feet above the ground.

The Chairman. Is that the type which is now being used in Mexico?

Secretary Baker. That is the exclusive type. Those machines require a good landing place. One of the highly desirable qualities to develop in aeroplanes is that which will enable a machine to slow down very gradually so that the aviator can pick his landing place and land in a relatively small level field. In Mexico their landing difficulties are very great. The country is mountainous, and the landing is very difficult. For that reason when the eight machines went down there they met with a series of minor accidents, and at one time only two of them were in actual operation. At the present time six out of the eight are in operation.

Mr. McKellar. Mr. Secretary, is any real good being accomplished by them?

Secretary Baker. We are relying on them entirely for communication with the front.

. . . . . .

Mr. McKellar. Would you mind, if you are not prepared to give the information about it now, looking up the question of the separation of the aerial force from the Signal Corps?

Secretary Baker. I would be glad to do that.

Mr. McKellar. And give us the information about it?

Secretary Baker. Yes.

. . . . . .

Mr. Greene. I remember at the hearings when they instituted the Aviation Section, it was suggested that the Aviation Section has to work also in connection with the combatants, because they give back directions for firing, and all that sort of thing.

Secretary Baker. I think the most serious addition to your discussion is the fact that they are now devising a battle aeroplane which is in itself an offensive arm and that places a new phase on the whole thing.

Mr. Greene. That was suggested at the time.

. . . . . .

Secretary Baker. All the aeroplanes we now have and are proposing to buy are reconnoissance machines, and the machines in Mexico are doing what would be done by the wireless telegraph if the static conditions were not so bad.

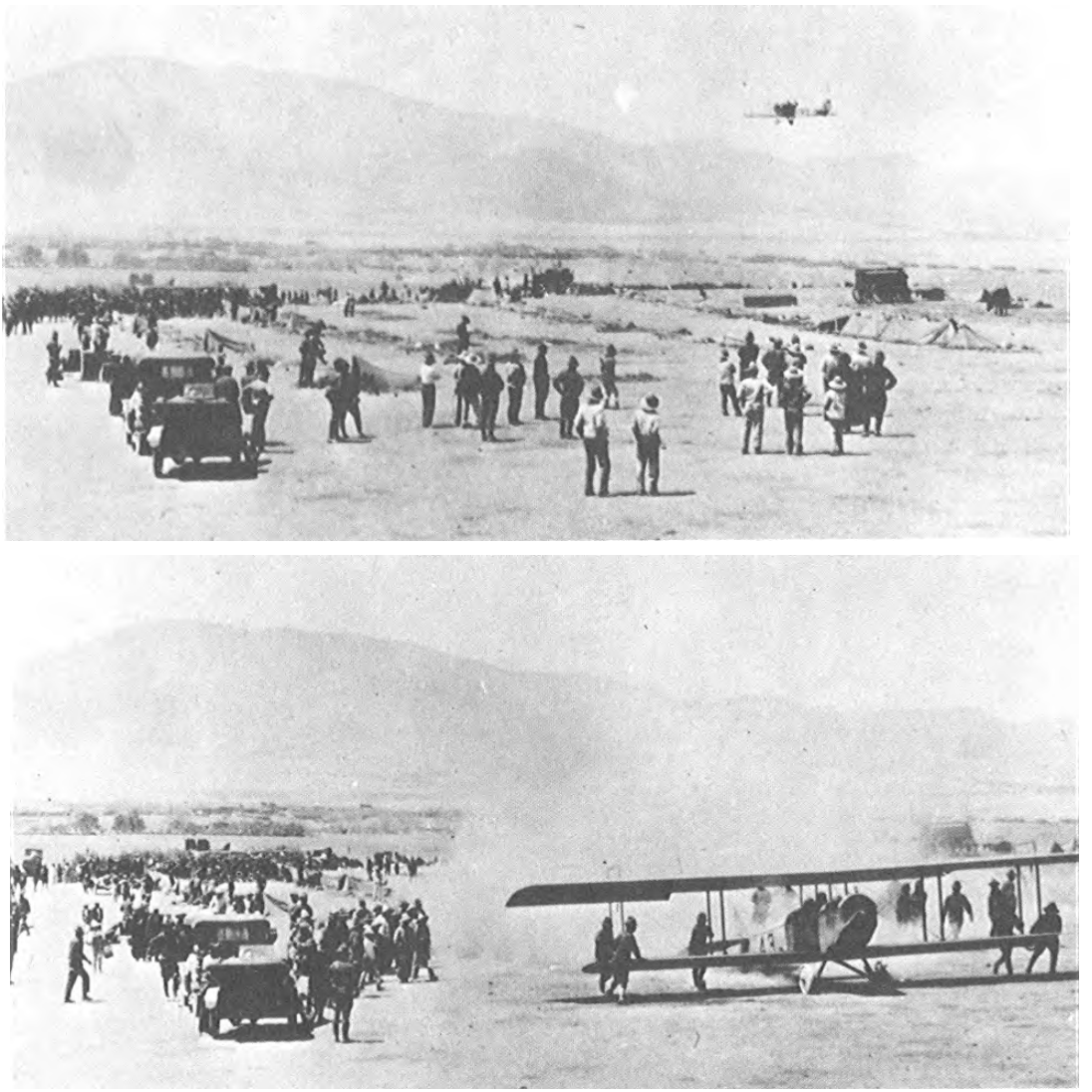
Mr. Shallenberger. What is the length of life of an aeroplane in war, the average length of life?

Secretary Baker. Ten days, I am told; certainly a short time.

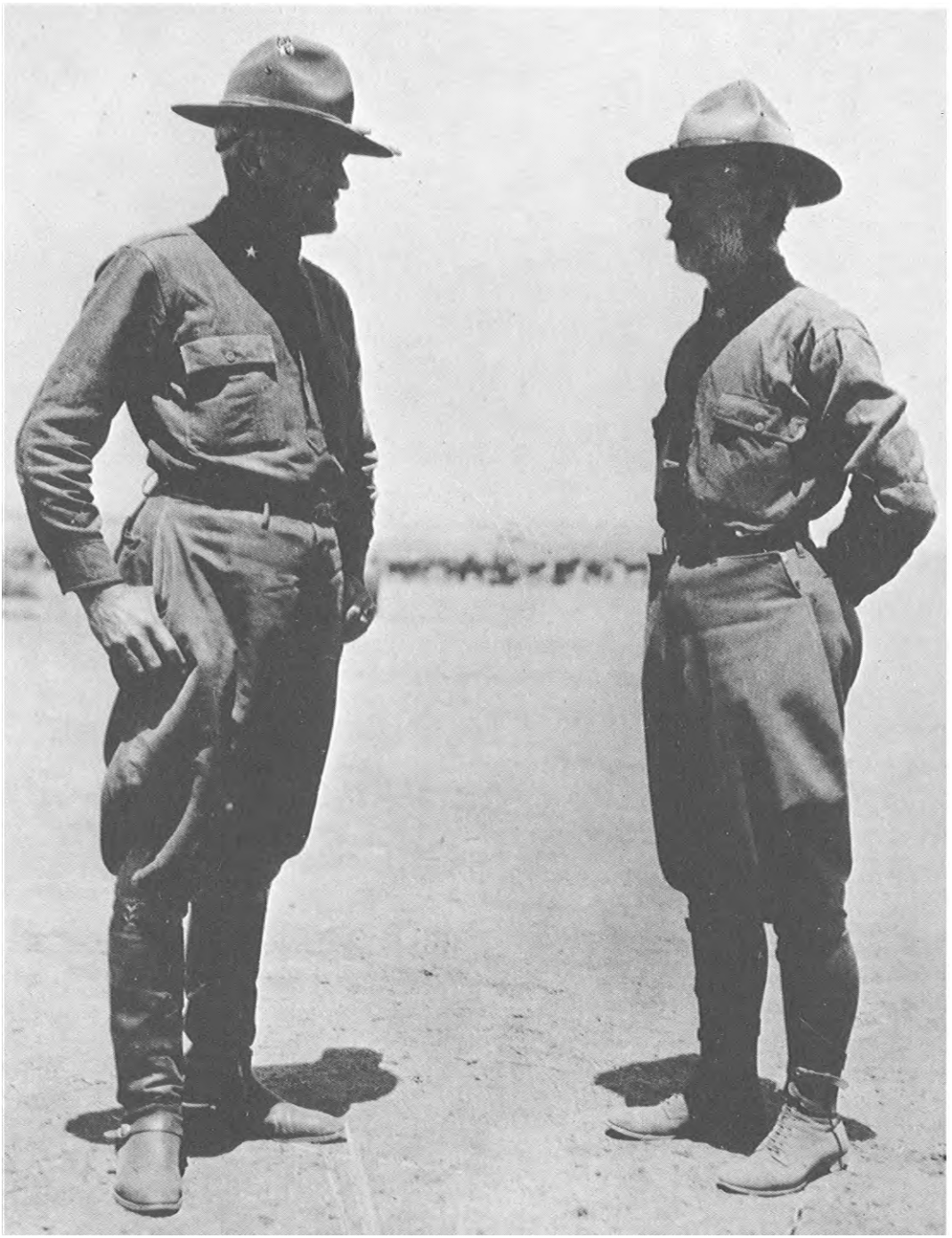
Mr. Shallenberger. If the machines in Mexico are now doing good service, it shows what they can do under war conditions, does it not?

Secretary Baker. They are hardly under war conditions. There are no antiaircraft guns in Mexico.

. . . . . .



Aircraft #43, landing in Mexico during the Punitive Expedition, was one of the JN-2's converted to JN-3 by expanding the top wingspan and otherwise stabilizing the aircraft.



Brig. Gen. John J. Pershing and Maj. John J. Ryan, the Chief Intelligence Officer on his staff, in Mexico, 1916.

13. Foulois: The 1st Aero Squadron in Mexico

1916

When Secretary Baker testified on 8 April 1916 (Doc. 12), he spoke well of the Curtiss JN-3, which the 1st Aero Squadron was using on the Punitive Expedition. There had been some minor accidents, he said, but six of the squadron's eight planes were now in commission. The Secretary's information, however, was out of date. Two planes had been wrecked on 20 March and another on 5 April. And by the 19th of the month only two would be left, and they would not be in serviceable condition.

The story of the difficulties the 1st Aero Squadron had in Mexico were recorded by the squadron commander, Capt. Benjamin D. Foulois, in a report completed at Columbus on 28 August 1916. The report is interesting and significant for what it has to say about the capabilities and employment of U.S. military aviation just a year before the United States entered the war. The major part of the report is printed below.[1]

Report of Operations of the First Aero Squadron, Signal Corps, with Punitive Expedition, U.S.A. for Period March 15 to August 15, 1916.

In compliance with Par. 1, S.O. No. 61, Southern Department, March 12, 1916, the 1st Aero Squadron, left Fort Sam Houston, Texas, on March 13, 1916 en route to Columbus, N.M., with the following personnel and equipment.

Personnel—Captains B. D. Foulois, T. F. Dodd, Lieuts. C. G. Chapman, J. E. Carberry, H. A. Dargue, T. S. Bowen, R. H. Willis, W. G. Kilner, E. S. Gorrell, A. R. Christie, I. A. Rader, 82 enlisted men, and 1 civilian mechanician. 2 Hospital Corps men, attached.

Equipment—8 aeroplanes, 10 trucks, 1 automobile.

Upon arrival in El Paso, March 14th, 1st Lieut. S. S. Warren, M. R. C., and one Hospital Corps enlisted man joined Squadron. Two additional trucks were also received from the Depot Quartermaster, El Paso, giving the Squadron, about 50% of its necessary motor transportation.

The Squadron arrived at Columbus, N.M., March 15, 1916, and started immediately to assemble aeroplane equipment. . . .

Aeroplane #44, Capt. Dodd, pilot, Capt. Foulois, observer, made the first reconnaissance flight into Mexico on March 16, 1916.

. . . . . .

March 19, 1916

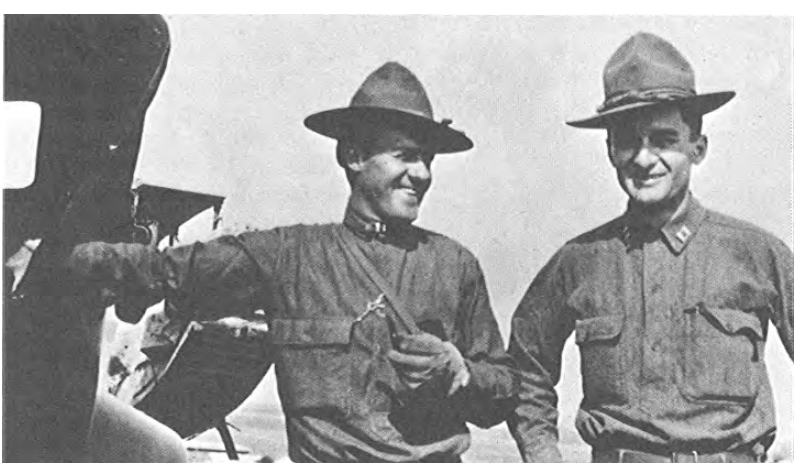
Telegraphic orders were received from the Division Commander at Nuevas Casas Grandes, Mexico, for the Squadron to proceed at once to Casas Grandes, Mexico, for immediate service.

. . . . . .

All aeroplanes of the Squadron, eight in number, were started in flight, from Columbus, at 5:10 p.m. One aeroplane was compelled to return to Columbus due to motor trouble.

Four aeroplanes landed at Las Ascencion, Mexico, on account of darkness. The other three became separated from the Squadron, in the darkness. One landed at Ojo Caliente, Mexico, one at Janos, Mexico, and another near Pearson, Mexico. This latter machine was wrecked upon landing.

1. The copy used is one bearing Foulois' name stamped in the signature block at the end of the report. It is a carbon copy that was acquired by Lt. Col. Ernest L. Jones and is now part of the Jones Collection in the Albert F. Simpson Historical Research Center, 168.65011-7A. The same folder also contains another version, more in the form of a narrative account than a formal report. This second version, which presumably was also written by Foulois, was printed, with five paragraphs (numbers 2-6) deleted, as Appendix B to Col. Frank Tompkins, *Chasing Villa* (Harrisburg, 1934).



Officers of the 1st Aero Squadron, San Antonio, Tex., prior to departure for the Punitive Expedition (l. to r., above): Lts. T. S. Bowen, J. E. Carberry, and C. G. Chapman; Capt. B. D. Foulois; and Lts. T. D. Milling and I. A. Rader.

Capts. B. D. Foulois (left) and T. F. Dodd stand next to the squadron's auto at San Antonio (bottom).

March 20, 1916

The four pilots who had landed at Las Ascencion proceeded south to Casas Grandes and reported for duty. The pilot, who had been compelled to return to Columbus, and the one who had landed at Janos arrived at Casas Grandes at approximately the same hour, this date. The pilot who had landed at Ojo Caliente reported in to Casas Grandes, several days later, having incurred slight damage to his aeroplane, which had to be repaired.

The aeroplane which had been landed near Pearson, was so badly damaged that the pilot abandoned it, and returned to Casas Grandes on foot.

Upon reporting to the Division Commander at Casas Grandes, instructions were received, to make an aero reconnaissance south toward Cumbre Pass, in the heart of the Sierra Madre Mountains, for the purpose of locating troops moving southward toward Lake Babicora. Aeroplane #44, Capt. T. F. Dodd, pilot, and Capt. B. D. Foulois, observer, proceeded south at noon, March 20. Proceeded about twenty-five miles, from Casas Grandes, but were unable to rise over the foothills of the Sierra Madre Mountains, due to constantly encountering whirlwinds and terrific vertical currents of air, which, on account of the low power of the aeroplane, effectually prevented the aeroplane rising to an altitude sufficiently high to allow of crossing the mountains, which at this particular locality, rise to a height of over 10,000 feet above sea level.

On this same date aeroplane #48, Lieut. T. S. Bowen, pilot, while making a landing was caught in a whirlwind, which completely wrecked the aeroplane. Lieut. Bowen, escaped with a broken nose, and minor injuries.

March 21, 1916

Orders received to locate troops under Colonel Irwin in the Galeana Valley. Aeroplane #44, Capt. T. F. Dodd, pilot, and Capt. B. D. Foulois, observer, located these troops at Galera Lopena, landed, and reported to Colonel Irwin. Returned to Dublan, with report from Colonel Irwin. As a result of this reconnaissance and report from Colonel Irwin, six trucks of this Squadron, loaded with supplies, were sent to Colonel Irwin's column.

March 22, 1916

Orders received to communicate with troops moving south on the Mexican North-Western Railroad, and Colonel G. A. Dodd's command in the Galeana Valley.

Aeroplane #42, Lieut. W. G. Kilner, pilot, Lieut. I. A. Rader, observer, and aeroplane #45, Lieut. J. E. Carberry, pilot, flew to the Galeana Valley, located Colonel Dodd's troops, landed and reported to Colonel Dodd. Returned to Dublan, with reports from Colonel Dodd, to Division Commander. Aeroplane #44, Capt. T. F. Dodd, pilot, Lieut. A. R. Christie, observer, and aeroplane #53, Lieut. C. G. Chapman, pilot, flew south into the Sierra Madre Mountains, in an endeavor to locate the troops, moving south on the Mexican North-Western Railroad. These aeroplanes were driven into the heart of the Sierra Madre Mountains, as far as the northern end of the Cumbre Pass tunnel, but due to terrific vertical air currents and whirlwinds, which at times drove the aeroplanes within twenty feet of the tree tops, the pilots were unable to cross the Sierra Madre Mountains, and were compelled to return to Dublan.

As a result of this failure to accomplish the reconnaissance as directed the Squadron Commander submitted the following memorandum to the Division Commander:

22 Mch. 16.

Memo for the Commanding General Punitive Expedition, U.S. Army at Casas Grandes, Mexico.

1. In view of the fact that the present aeroplane equipment of the First Aero Squadron is not capable of meeting the present military service conditions, it is urgently requested that the following number of aeroplanes, motors, and spare parts be purchased, if they can possibly be secured in the United States. It is further requested that this order be placed by telegraph and immediate delivery of all equipment, by express, be specified.

2. Aeroplanes—

(a) Two (2) Martin aeroplanes, Model S, with army standard landing gear, Hall-Scott 125 h.p. 6 cyl. motors.

(b) Two (2) Curtiss aeroplanes, Model R2, Curtiss 160 h.p. steel cylinder motors.

(c) Two Sturtevant aeroplanes, 140 h.p. Sturtevant motors.

(d) Two (2) Thomas aeroplanes, 135 h.p. Thomas motors.

(e) Two (2) Sloane aeroplanes, 125 h.p. Hall-Scott 6 cyl. motors.

All of the aeroplanes above to be completely equipped, and ready for immediate use.

3. The manufacturer to furnish one (1) spare motor for each two (2) machines purchased, and in addition the following aeroplane and motor spares:

Two (2) spare propellers.
One set lower wings, complete, with fittings and wires.
One landing gear complete.
One set tail control surfaces, complete, with fittings and wires.
Three (3) spare radiators.
Three (3) spare magnetos.

B. D. Foulois
Captain, Signal Corps,
Comdg. First Aero Squadron.

On this same date, a detachment was sent to salvage such parts of aeroplane #41, which was wrecked near Pearson on the evening of March 19, as were serviceable. This detachment returned same date, and reported that it had been fired upon, by Mexicans, in the vicinity of Pearson.

March 23, 1916

Received orders to communicate with Colonel G. A. Dodd's troops in the Galeana Valley.

Aeroplane #44, Lieut. A. R. Christie, pilot, aeroplane #45, Lieut. J. E. Carberry, pilot, and aeroplane #53, Lieut. C. G. Chapman, pilot, flew to El Valle, landed and reported to Colonel Dodd. These aeroplanes and pilots, were unable to return to Dublan, until March 25, due to high winds, dust storms, and snow storms. Detachment from Squadron proceeded to Pearson, Mexico, this date, and returned to Dublan, with such parts of aeroplane #41, as could be considerable serviceable.

The Squadron Commander submitted the following plan to the Division Commander, which contemplated the establishment of aeroplane and fuel bases in advance of Division Headquarters.

The JN-2 (converted to JN-3) in which Dodd and Foulois made the first reconnaissance flight into Mexico, 16 March 1916. Pershing's staff cars parked in rear.

Headquarters, 1st Aero Squadron, Signal Corps, Colonia Dublan, Mexico, Mar 30/16.

Memorandum for Chief of Staff, Punitive Expedition, U.S. Army.

1. Plans are herewith submitted for the most effective use of the 1st Aero Squadron, with its present equipment of six low powered aeroplanes.

Also other data in reference to same.

Plan I

Object: To maintain aero communication between Columbus, N.M.—Casas Grandes—El Valle and Namiquipa.

(a) Two aeroplanes, with sufficient commissioned and enlisted personnel and supplies to take station at El Valle. One aeroplane to fly from El Valle to Namiquipa every morning, returning the following morning to El Valle.

(b) Two aeroplanes to be assigned to maintain aero communication between Casas Grandes and Columbus, as follows: One aeroplane to leave Casas Grandes every morning, flying to Columbus without stop, and returning the following morning without stop.

(c) Two aeroplanes to be assigned to maintain aero communication between Casas Grandes and Namiquipa, as follows: One aeroplane to leave Casas Grandes every morning, flying to Namiquipa without stop, returning the following morning without stop.

The foregoing plan contemplates the *maximum use* of *all aviators* and *all aeroplanes*, for maintaining aero communication between Columbus—Casas Grandes—El Valle and Namiquipa only, and does not contemplate the use of aeroplanes for communication, south, east, or west of Namiquipa.

Plan II

Object: To maintain aero communication between Casas Grandes—El Valle—Namiquipa—and points south of Namiquipa (communication between Casas Grandes [and Columbus] to be maintained by radio-telegraph, motorcycles, and road transportation).

(a) Transfer entire Squadron of six aeroplanes to Namiquipa, maintaining fuel bases only, at Casas Grandes, El Valle, and an advanced fuel base south of Namiquipa, to be determined later.

(b) Upon transfer of Squadron to Namiquipa, the following assignment of aeroplanes to be made—(1) Two aeroplanes to maintain daily communication between Namiquipa and Casas Grandes—(2) Two aeroplanes to maintain daily aero communication between Namiquipa and El Valle—(3) Two aeroplanes to maintain daily aero communication between Namiquipa and points south, within effective radius of aeroplanes.

Plan III

(a) Upon establishment of effective radio-telegraph communication between Namiquipa and Casas Grandes, the following is recommended—(1) Discontinue the use of aeroplanes between Namiquipa and Casas Grandes except in emergencies—(2) Continue the aero communication between Namiquipa and El Valle, if radio-telegraph, motor cycles, or other means fail—(3) Concentrate all available aeroplanes at Namiquipa for daily communication between Namiquipa and advanced troops—(4) If communication between Namiquipa and El Valle is of secondary importance only and can be maintained by radio-telegraph, motorcycles, or other means of communication, the use of aeroplanes between these two points should also be discontinued, and every available aeroplane concentrated at Namiquipa for the purpose of maintaining communication south of Namiquipa.

Plan IV

(a) In the event that contact is gained with the enemy, it is recommended that every available aeroplane be concentrated at the front for observation and reconnaissance of the enemy, as far as practicable.

2. In connection with the foregoing plans, for *effective use* of the aeroplanes of this organization, the following is furnished.

The six aeroplanes now in use, have been subjected, for nearly ten months, to severe weather conditions, in Oklahoma and Texas, exposed to rain, high winds, and severe cold weather conditions.

As a result of these months of field service, all aeroplanes have been subjected to severe wear and tear. With the present extreme field service conditions every machine is liable, at any day, to be placed out of commission as unfit and too dangerous for further field service.

3. Further information is furnished to the effect that these aeroplanes are not capable of meeting the present military needs, incident to this expedition. Their low power motors and limited climbing ability with the necessary military load makes it impossible to safely operate any one of these machines, in the vicinity of the mountains which cover the present theatre of operations. These same limitations as to power, climbing ability, and weight carrying ability limit these machines to safe operations for a few hours each day, chiefly on account of the altitude and extremely severe atmospheric conditions encountered every day in the present theatre of operations.

4. The entire commissioned and enlisted personnel of this organization are exerting every effort to maintain all aeroplanes in the best possible condition for further field service, but even the united efforts of the entire technical ability in this command can not make these aeroplanes suitable for to meet the present military needs.

5. An urgent appeal is therefore made, that this organization be supplied, at the earliest possible moment, with at least ten of the highest powered, highest climbing and best weight carrying aeroplanes that can be secured and purchased in the United States.

With this new equipment, the present commissioned and enlisted personnel of this organization, will be able, under the present service conditions, to increase its effectiveness to this expedition at least five hundred percent.

B. D. Foulois
Captain, Signal Corps,
Commanding
1st Aero Squadron.

Plan III of the foregoing was approved and ordered put into effect, April 1.

Nine flights were made this date between Dublan, Galera Lopena, and El Valle, carrying mail and despatches.

March 27, 1916

Seven flights were made this date between Columbus, N.M., Dublan, and El Valle, carrying mail and despatches.

March 28, 1916

Reconnaissance flights made as follows—Aeroplane #43, Lieut. H. A. Dargue, pilot, from Dublan to Bachineva, Bachineva to Namiquipa, Namiquipa to Santa Ana, and return to Namiquipa. Aeroplane #53, Lieut. Chapman, pilot, from El Valle, east and south, for a distance of 110 miles returning to El Valle.

March 29, 1916

Six flights made this date by five aeroplanes, between Columbus, N.M., Dublan, El Valle, and Namiquipa, carrying mail and despatches.

March 30, 1916

Three flights made this date, with three aeroplanes, between Columbus, N.M., Dublan and El Valle, carrying mail and despatches . . .

March 31, 1916

Nine flights were made this date by four aeroplanes between Dublan, El Valle, Namiquipa, and San Geronimo, carrying mail and despatches. Severe rain, hail, and snow storms were encountered this date, causing several forced landings, away from the base at Dublan, until the storms had passed.

April 1, 1916

Nineteen flights made this date, by six aeroplanes, between Columbus, N.M., Dublan, Espindeleno, El Valle, Cruces, Namiquipa, San Geronimo, and Santa Ana, carrying mail and despatches.

Rain, hail, and snow storms were encountered on this date, causing several forced landings, until storms had passed.

April 2, 1916

Fourteen flights made this date by five aeroplanes, between Dublan, El Valle, Cruces, Namiquipa, San Geronimo, and Bachineva, carrying mail and despatches.

April 3, 1916

Six flights made this date, by four aeroplanes, between Dublan, El Valle, Namiquipa, and San Geronimo, carrying mail and despatches.

April 4, 1916

Four flights made this date by two aeroplanes, between El Valle, Namiquipa, and San Geronimo, carrying mail and despatches.

April 5, 1916

Seven flights made this date by four aeroplanes, between Dublan, El Valle, Namiquipa, and San Geronimo, carrying mail and despatches.

Aero Squadron headquarters changed to San Geronimo.

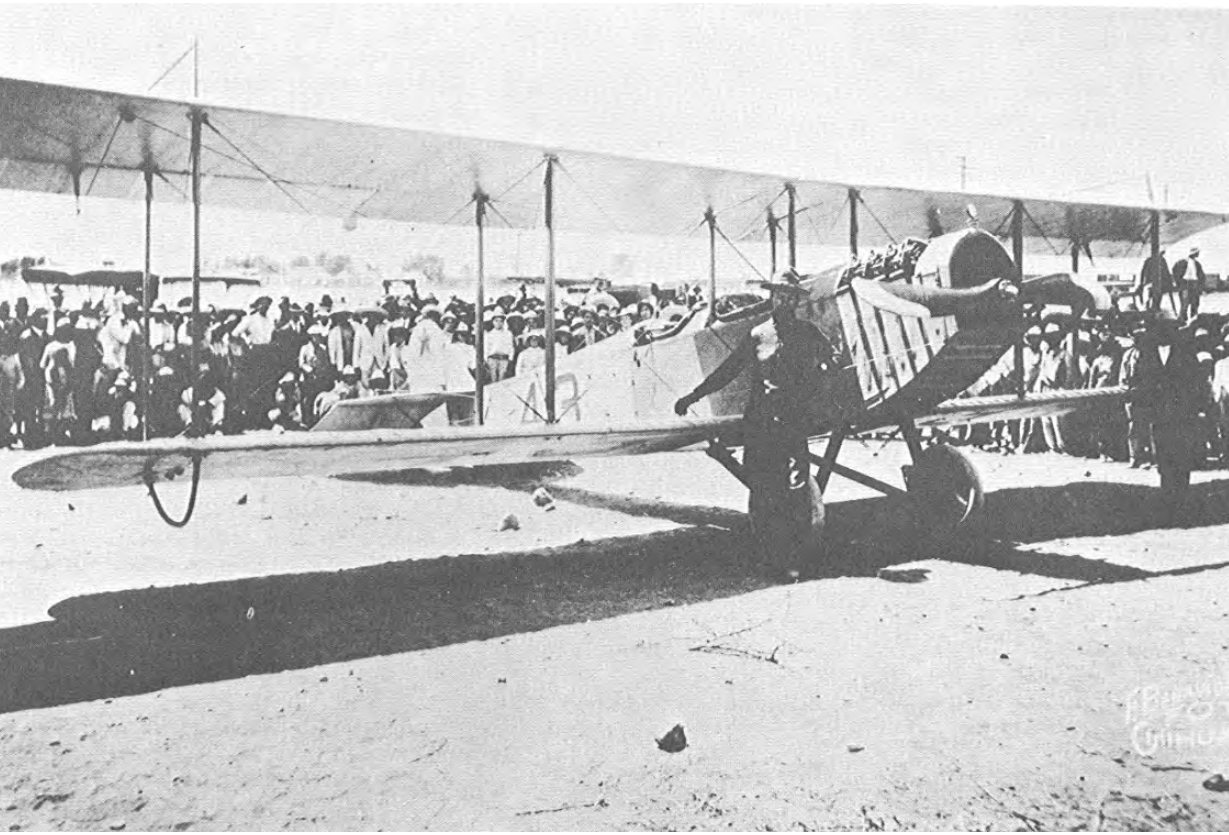
Orders received this date to locate Colonel W. C. Brown's column, reported in the vicinity of San Antonio. Aeroplane #43, Lieut. H. A. Dargue, pilot, Capt. B. D. Foulois, observer, left San Geronimo on this reconnaissance. Flew to San Antonio and located a pack train of Colonel Brown's column, returning toward San Geronimo. Landed aeroplane and received information that troops were proceeding toward Cusihuirachic. Flew to Cusihuirachic Canyon, and located troops entering Canyon. Landed and reported to Colonel Brown. Flew back to San Geronimo, with report from Colonel Brown to Division Commander.

April 6, 1916

Four flights made this date by three aeroplanes, between Namiquipa, San Geronimo, and Cusihuirachic, carrying despatches to troops. Aeroplane #44, badly damaged on landing at San Geronimo. All serviceable parts salvaged, remainder of aeroplane condemned and destroyed.

April 7, 1916

Aeroplane #43, Lieut. H. A. Dargue, pilot, and Capt. B. D. Foulois, observer, from San Geronimo to Chihuahua City with despatches for Mr. Marion H. Letcher, American Consul. Aeroplane #45, Lieut. J. E. Carberry, pilot, and Capt. T. F. Dodd, observer, from San Geronimo to Chihuahua City, carrying duplicate despatches to American Consul. Both aeroplanes arrived at Chihuahua City at same time, causing considerable excitement. By pre-arrangement aeroplane #43 was landed on south side of city, aeroplane #45 on the north side. Lieut. Dargue, in aeroplane #43, was directed to fly his machine to the north side of town in order to join #45. As he started off, four mounted rurales opened fire on the machine, at a distance of about one half mile. Capt. Foulois, having started into town, heard the firing, proceeded in the direction of the rurales and stopped their firing. Capt. Foulois was then arrested by the rurales and taken by them to the city jail, followed by a mob of several hundred men and boys. Enroute to the jail Capt. Foulois succeeded in getting word to an American bystander, requesting that he notify the American Consul of his arrival in the city and that the Consul take the necessary steps for the protec-



Lt. Herbert A. Dargue,
posing by his aircraft on 7 April 1916.
The picture was taken just after Dargue and his plane were stoned at Chihuahua City. He kept the photographer posing him as long as possible to avoid further violence from the mob.

tion of all aviators and machines that had arrived in the city. Upon arrival at the city jail and after considerable delay, Capt. Foulois succeeded in getting in touch with Colonel Miranda, Chief of Staff to General Gutierrez, Military Governor of Chihuahua. Colonel Miranda then took Capt. Foulois to see General Gutierrez, who soon ordered Capt. Foulois' release. Capt. Foulois, then requested that a guard be placed over the two aeroplanes, which request having been granted, Capt. Foulois, in company with Colonel Miranda, then proceeded to the north side of the city to locate the other three aviators and aeroplanes. Upon arrival at the landing place, only Lieut. Dargue, with aeroplane #43, was found. Lieut. Dargue reported that he had landed alongside of aeroplane #45; that Capt. Dodd had then proceeded into Chihuahua City to locate the American Consul and deliver his duplicate despatches; that after Capt. Dodd had left, a large crowd of natives, Carranzista soldiers, and officers, had collected and proceeded to crowd around the machine, making insulting remarks; that several natives burned holes with cigarettes in the wings of aeroplane #43; that others have slashed the cloth with knives, in several places, and extracted bolts and nuts on both machines. The two pilots left with the machines, Lieuts. Dargue and Carberry, felt that the mob would ultimately wreck the machines and decided to fly the machines to the smelters of the American Smelter and Refining Company, located about six miles from Chihuahua City. Lieut. Carberry got away safely without encountering any further difficulties. Lieut. Dargue, in aeroplane #43, got away in the midst of a shower of stones, thrown at him by the mob. He had only flown a short distance when the top section of the fuselage flew off and damaged the stabilizer, causing him to make immediate landing which he accomplished safely. He then stood off the crowd without further damage to the aeroplane or to himself until the arrival of the guard. Captains Foulois and Dodd spent the remainder of the day with the American Consul in arranging for supplies to be sent to the advance troops by railroad. Lieuts. Dargue and Carberry spent the remainder of the day repairing the damage done by the mob on the two aeroplanes.

April 8, 1916

Aeroplane #43, Lieut. Dargue, pilot, Capt. B. D. Foulois, observer, and aeroplane #45, Lieut. Carberry, pilot, and Capt. T. F. Dodd, observer, from Chihuahua City to San Geronimo with despatches from American Consul to Division Commander.

Orders received to move Aero Squadron base to San Antonio, Mexico.

April 9, 1916

Ten flights made this date, by five aeroplanes, between Namiquipa, San Geronimo and San Antonio.

April 10, 1916

Orders received this date to locate troops in vicinity of San Borja, Mexico.

Aeroplane #43, Lieut. H. A. Dargue, pilot, Capt. B D. Foulois, observer, reconnoitered the area from San Antonio to Ojo Azules—Ojo Caliente—San Borja—Santa Maria—Tres Hermanos—Satevo—Carretas and return to San Antonio. No troops discovered within this area.

Aeroplane #45, Lieut. J. E. Carberry, pilot, and Capt T. F. Dodd, observer, reconnoitered the area from San Antonio—Ojo Azules—Ojo Caliente—Santa Maria—Satevo—San Lucas—Santa Cruz—Manula—Santa Ysabel and return to San Antonio. No troops discovered within this area.

Orders received this date to move Aero Squadron base to Satevo.

April 11, 1916

Ten flights were made this date, by five aeroplanes, between Satevo—Santa Rosalia—San Lucas—San Antonio—Namiquipa—Dublan and Columbus, N.M.

Aeroplane #43, Lieut. H. A. Dargue, pilot, and Lieut. E. S. Gorrell, observer, flew from San Antonio, Mexico, to Columbus, N.M., making one stop at Dublan. Total distance 315 miles.

Aeroplane #53, Lieut. C. G. Chapman, pilot, on reconnaissance trip to Santa Rosalia (south of Chihuahua City, on Mexican Central Railway.) Upon landing at Santa Rosalia, Lieut. Chapman was taken by Carranza troops, to the Commanding Officer of the Carranza garrison. During his absence from the aeroplane, his field glasses, goggles, and considerable ammunition were stolen from the aeroplane by Carranza soldiers. . . .

April 12, 1916

Six flights made this date, by three aeroplanes, between Satevo—San Geronimo—Namiquipa and south toward Parral.

Aeroplane #53 Lieut. C. G. Chapman, pilot on reconnaissance flight south toward Parral, for the purpose of locating troops moving in direction of Parral.

April 13, 1916

Aeroplane #42, Lieut. I. A. Rader, pilot on reconnaissance flight south toward Parral, for the purpose of locating troops in direction of Parral. No troops located.

Four other flights this date, by three aeroplanes, between Satevo—Chihuahua City—and San Andreas.

Aeroplane #45, Lieut. J. E. Carberry, pilot, Capt. B. D. Foulois, observer, to Chihuahua City with despatches for the American Consul. Received first information regarding flight at Parral.

April 14, 1916

Aeroplane #43, Lieut. H. A. Dargue, pilot, Lieut. E. S. Gorrell, observer, on reconnaissance flight from Columbus, N.M. to Boca Grande—Pulpit Pass—Oaxaca Pass—Carretas—Janos—Ascencion and return to Columbus, N.M. Reconnaissance made for the purpose of locating a large Carranzista force, reported to be moving east toward our line of communications. No hostile troops were located within the area covered. Distance of flight 315 miles. American aeroplane record for non-stop flight with two men.

Aeroplane #52, Lieut. I. A. Rader, on reconnaissance flight south from Satevo, toward Parral, to locate troops in vicinity of Parral. Located Major Robert L. Howze's command in vicinity of Ojito, near Durango State line. Pilot was compelled to land on very rough ground, and damaged aeroplane.

Being in a hostile country, 100 miles from the nearest base, and unable to make necessary repairs, the aeroplane was abandoned, and the pilot proceeded with Major Howze's column.

Aeroplane #45, Lieut. J. E. Carberry, pilot, Capt. B. D. Foulois, observer, from Chihuahua City to Satevo with despatches from Mr. Marion H. Letcher, American Consul, and despatches from General Gutierrez, Military Governor of Chihuahua.

Capt. B. D. Foulois and 14 enlisted men, 1st Aero Squadron, from Satevo to Chihuahua City, in automobile and truck, with despatches for American Consul, and General Gutierrez, Military Governor.

Due to intense feeling in Chihuahua City over the clash between the American troops and troops at Parral, the Detachment of enlisted men was placed in concealment in the outskirts of the city. Capt. Foulois, accompanied by Cpl. Arthur Westermark (chauffeur) proceeded to the American Consulate, delivered the despatches for the American Consul and Military Governor, and left the City without difficulty. Returned to Division Headquarters, at Satevo, same date.

Lts. Herbert A. Dargue and Edgar S. Gorrell pose next to "Aeroplane #43" between reconnaissance flights in Mexico, 1916.

April 15, 1916

Aeroplane #43, Lieut. H. A. Dargue, pilot, Lieut. E. S. Gorrell, observer, on reconnaissance from Columbus, N.M., to Boca Grande—Pulpit Pass—Dublan—from Dublan to Namiquipa—from Namiquipa to Satevo. Total distance 415 miles, with two stops.

Three other flights made this date, between Satevo—San Antonio—and Namiquipa, carrying mail and despatches.

Aeroplane #42, dismantled, condemned and destroyed. Lower wings of this aeroplane placed on aeroplane #45, to replace wings damaged in flight to Chihuahua City.

April 16, 1916

Two flights made this date, between Satevo, San Antonio and Namiquipa, carrying mail and despatches. Division Headquarters moved to Namiquipa.

April 17, 1916

Two flights made this date from Satevo to San Antonio and Namiquipa. Squadron Headquarters moved to Namiquipa.

April 18, 1916

Two flights this date between Namiquipa and San Antonio, carrying mail and despatches.

April 19, 1916

Aeroplane #43, Lieut. H. A. Dargue, pilot, Capt. R. E. Willis, observer, on reconnaissance flight from San Antonio to Chihuahua City, for the purpose of taking photographs and reconnoitering all roads and approaches to Chihuahua City. Roads in vicinity of Chihuahua City were reconnoitered and several photographs were taken. While reconnoitering roads in the hills west of Chihuahua City, the aeroplane motor failed, causing a forced landing in the hills. The aeroplane was completely wrecked. Lieut. Dargue escaped uninjured, Capt. Willis was pinned under the wreckage, sustained a severe scalp wound and considerably bruised about the legs and ankles. As the aeroplane was completely wrecked, it was burned up, on the spot. The two aviators, with their personal equipment, started to walk to San Antonio, their nearest base, a distance of about 65 miles. After constant suffering and hardship, due to lack of food and water, they reached San Antonio, on April 21st. Stayed at San Antonio until April 23, when they proceeded by automobile to Namiquipa, and reported the results of their reconnaissance to the Division Commander.

April 20, 1916

Orders received for the Squadron to return to Columbus, N.M., to secure new aeroplanes. Of the eight aeroplanes taken into Mexico on March 19, 1916, but two were still in commission on this date. These two aeroplanes (nos. 45 and 53) were in such condition as to be unsafe for further field service.

They were therefore flown to Columbus, this date, and ultimately condemned and destroyed.

The Squadron personnel and transportation arrived at Columbus, N.M., April 22, 1916.

Upon arrival at Columbus, the Squadron received four new aeroplanes, which had been purchased from the Curtiss Aeroplane Company.

From April 23 to April 29, the Squadron was employed in testing these four new aeroplanes. Practical tests in flight with these machines demonstrated their unsuitability for Mexican field service, and they were declared unsuitable for such service.

On May 1, 1916, two Curtiss aeroplanes (R—2 type 160 horsepower) were received. By May 25, twelve of this type had arrived.

During the months of May, June, and July, constant troubles and difficulties were encountered with defective propellers, defective construction in aeroplanes and defective motor parts.

. . . . . .

Total number of flights made from March 15, 1916 to August 15, 1916:—540.

Total number of miles flown, from March 15, 1916 to August 15, 1916:—19,553.

Total duration of flights, from March 15, 1916 to August 15, 1916:—345 hours, 43 minutes.

. . . . . .

The Squadron Commander invites attention to the fact that the 1st Aero Squadron, S.C., is the first organization of its kind that has ever been used in active field service in the history of the United States Army. This command took the field with aeroplanes of very low military efficiency, and with less than 50% of its authorized allowance of truck transportation. Due to lack of aeroplanes with greater carrying capacity, all flying officers were continuously called upon to take risks in every reconnaissance flight made while on duty in Mexico. All officers, thoroughly appreciated the fact that the failure of their aeroplane motors, while flying through mountainous canyons and over rugged mountains, would invariably result in death. They also appreciated the fact that in a forced landing even if safely made, there was every possible risk of being taken prisoner by an enemy, whose ideas of the Laws of War are on a par with an uncivilized race of savages.

All officers, pilots, on duty with command, during its active service in Mexico, were constantly being exposed to per-

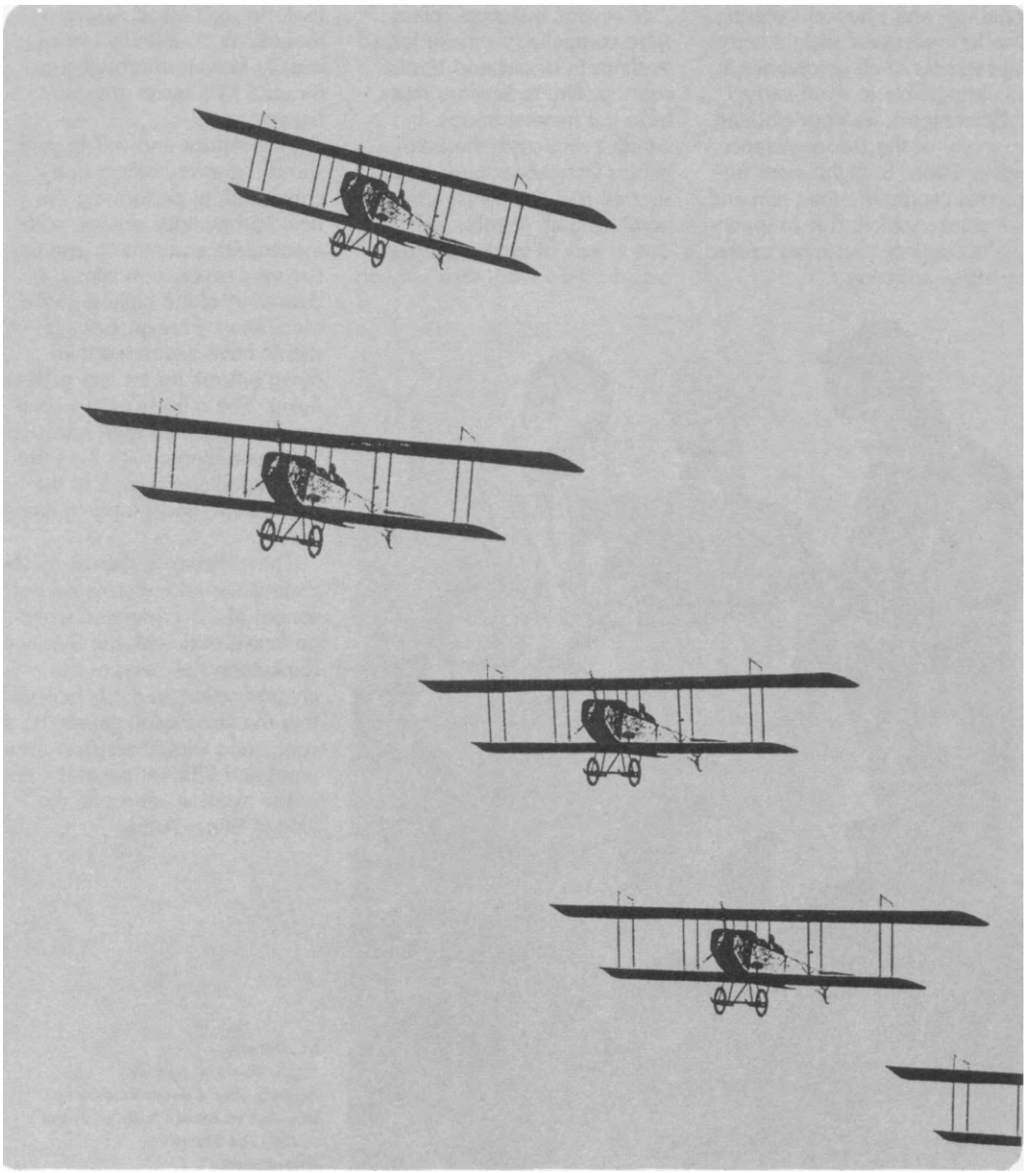
sonal risk and physical suffering. Due to inadequate weight carrying capacity of all aeroplanes, it was impossible to even carry sufficient food, water or clothing, on many of the reconnaissance flights. Pilots, in flight, were frequently caught in snow, rain and hail storms which, due to inadequate clothing, invariably caused excessive suffering.

In several instances, pilots were compelled to make forced landings in desert and hostile country, fifty to seventy miles from the nearest troops. In nearly every case, the aeroplanes were abandoned or destroyed and the pilots, after experiencing all possible suffering due to lack of food and water, would finally work their way on foot, through alkali deserts and mountains, to friendly troops, usually arriving thoroughly exhausted as a result of these hardships.

The earnest and willing spirit, shown by every officer in the command, in performing this new and perilous service, with inadequate equipment, and under very severe conditions, is deserving of the highest commendation. Foreign Governments have decorated their flying officers for far less perilous flying. The officers of this command considered their hardships and their service with the Punitive Expedition as part of the day's work, and simply in line of duty.

The experience gained by the commissioned and enlisted personnel of this command while on active duty with the Punitive Expedition has been of the greatest value, and it is believed that the knowledge gained by all concerned should result in more rapid and efficient development of the aviation service in the United States Army.

Lt. Dargue, Capt. Foulois, and Lt. Gorrell plan a reconnaissance mission to locate Villa's troops during the Punitive Expedition.



14. Scriven: Annual Report 1916.

With the first increments provided by the National Defense Act of 1916, the Aviation Section had personnel authorizations for 77 officers and 1,978 enlisted men effective 1 July 1916. In his annual report, dated 3 October 1916, General Scriven outlined plans for using these people to expand the tactical organization of the Aviation Section.[1]

. . . . . .

It is proposed to organize this force into . . . 2 aero squadrons, 2 aero companies; and a school detachment for duty at the Signal Corps Aviation School at San Diego, California. There were organized at the end of this fiscal year . . . 1 aero squadron; 1 aero company. . . . These organizations will be expanded into the units proposed.[2]

. . . . . .

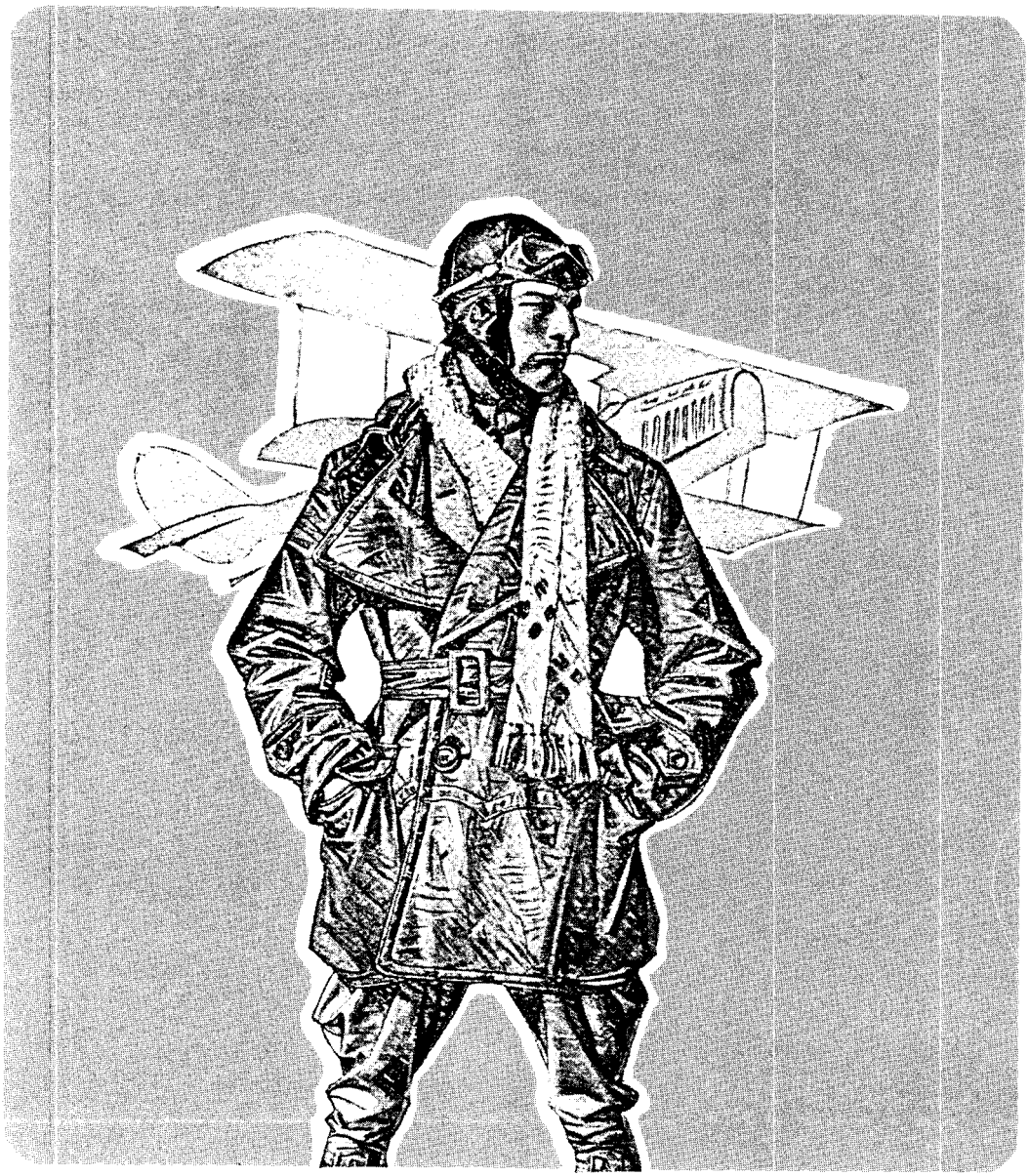
Two of the aero squadrons will be organized and stationed in the Southern Department; one aero company will be assigned to the Philippine Islands and one to the Canal Zone.

. . . . . .

An aero squadron is required for service with each division, or when divisions are operating as parts of a field army corps the squadrons may be detached from divisions and grouped under the immediate control of the field Army commander. The recommendation in my last report that aero squadrons of 12 machines be the basis of our organization has been approved, and existing Tables of Organization provide for three companies of four machines each for a squadron. A major will be in command of the squadron, with a first lieutenant as squadron adjutant and quartermaster; 2 master signal electricians; 2 sergeants, first class, 6 corporals; and 2 privates, first class, for duty with the headquarters and supply detachments. Each aero company has an authorized strength of 1 captain; 5 first lieutenants; 1 master signal electrician; 2 sergeants, first class; 5 sergeants; 9 corporals; 2 cooks; 14 privates, first class; and 6 privates.

1. *Report of the Chief Signal Officer, United States Army, to the Secretary of War, 1916* (Washington 1916).

2. The company was the 1st Company, 2d Aero Squadron, which was organized at San Diego on 1 December 1915 and sailed for the Philippines early in January 1916. Maurer, *Combat Squadrons*, pp. 15–16.



15. Funds for Fiscal Year 1918

January 1917

When General Scriven appeared for budget hearings early in 1917, his days as Chief Signal Officer were numbered. There had been dissension within the Aviation Section between the flyers and the non-flyers. There had been charges that non-flying officers had been drawing flight pay. Scriven had openly accused aviation officers of insubordination and disloyalty. In hearings the previous April (Doc. 12), Baker had informed the committee that Scriven would be replaced and the Aviation Section reorganized. To take Col. Samuel Reber's place as Chief of the Aviation Section, Baker had brought Lt. Col. George O. Squier back from London, where he had been military attache. Squier had taken charge of the section in May 1916, but that was just a temporary arrangement. He was slated to become Chief Signal Officer upon Scriven's retirement in February 1917. The committee was interested in what Squier, who accompanied Scriven to the hearing, had learned from conversations with British officials and from personal observation of aircraft in action on the battle front in Europe.

Wilson, re-elected President on 7 November 1916 on a peace platform, was having no success in bringing the war to an end. Rather, the nation seemed to be moving inevitably toward a war for which it was ill prepared. The performance of the 1st Aero Squadron in Mexico, when contrasted with events in Europe, had helped to reveal how far the United States had fallen behind in the development of military aviation.

For Fiscal Year 1918 the Signal Corps had requested $16,600,000, which was $2,300,000 more than it had received for 1917. When asked about the cause of the increase, Scriven explained that the amount for the "Signal Corps proper" was only $1,000,000, which was $100 less than the previous year. The remaining $15,600,000 was for aviation.

S. Hubert Dent, Jr. (D., Ala.), had become committee chairman following Hay's resignation to accept a judicial appointment. Congressmen Greene, Kahn, McKellar, and McKenzie were still members of the committee, which also included William Gordon (D., Ohio) and John Tilson (R., Conn.). In addition to Scriven and Squier, Maj. William Mitchell and Maj. Charles S. Wallace were present at the hearing on 5 January 1917.[1]

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Mr. Kahn. Have you been using any aircraft in connection with fire control?

Gen. Scriven. No, Mr. Kahn; I do not think I can say we have. There has been no general organized work in that direction, but there has been a little experimental work at Fort Sill with the Field Artillery, observations in the Philippines in connection with the coast defenses, and at San Diego some experiments looking to the detection of submarine obstacles.

Mr. Kahn. They are using aircraft for fire control very extensively on the European battlefields, as I understand it.

Gen. Scriven. It is absolutely essential, and we must come to it as soon as we can.

Mr. Kahn. How does it happen we have not done any of that?

Gen. Scriven. It is because we have not had the machines or the personnel.

Mr. Kahn. When you have the machines, do you expect to operate them in connection with the Coast Artillery, too?

Gen. Scriven. I have just recently submitted a memorandum to the General Staff, asking them to decide, in connection with the military policy of the United States, the locations of various aviation centers, schools, aerodromes, etc., according to the needs of the service, and

1. Hearings before the Committee on Military Affairs, House of Representatives, *Army Appropriation Bill, 1918*, 64th Cong, 2d sess (1917).

also the locations of airplane centers, in connection with the Coast Artillery defenses.

Of course you know we have just purchased a very large tract of land near Fort Monroe, costing $290,000, where there is to be established one of these centers and schools, and the Navy is coming in on that to some extent, temporarily. That will undoubtedly be an aviation center for the defenses of Chesapeake Bay. What the policy will be in regard to the locations for other squadrons of aeroplanes, so far as the Coast Artillery is concerned, I do not know. We plan the placing of squadrons in the Philippines, in Hawaii, and in the Canal Zone. They will be very largely used in connection with the Coast Artillery for defense.

Mr. Kahn. Do you expect to operate those aeroplanes?

Gen.Scriven. We must; yes, sir. The men we are training must operate them.

Mr. Kahn. You do not intend, as far as you know, to turn over any of your aeroplanes to the Coast Artillery, to be operated by the Coast Artillery.

Gen.Scriven. That is a question of policy for the future. . . .

. . . . . .

Mr. Kahn. How many machines have you purchased with the appropriation of last year, and how many have you obligated the department to purchase?

Gen.Scriven. I have the data in regard to that.

Mr. Kahn. Will you put that in the hearings?

Gen. Scriven. The total number of aeroplanes purchased or under order is 423. There have been 21 machines destroyed and condemned, and there are 27 out of commission. Of those in service 4 are in Manila, 30 at San Diego, 18 at Mineola, 7 at San Antonio, and 14 at Columbus and on the border, making a total of 73 in service. There are 302 machines under order but not delivered.

. . . . . .

Mr. Kahn. Have you had any occasion to revise your opinion which you gave last year as to the life of an aeroplane? I think you said the life of a machine in time of peace is about 10 months and in time of war about 7 days.

Gen. Scriven. No, sir. I think the use of an aeroplane is just like the use of so much ammunition. A machine goes up and comes down and may be smashed. If the machine goes along without an accident, I suppose anywhere from 6 to 10 months is about as long as you can expect it to last. It depends on the conditions under which it is used or maintained, climate, weather, service, and the like. They are very fragile, and it is very difficult to estimate their life exactly.

Mr. Kahn. Of course, the committee, I take it, is anxious to let the country know that, while we are willing to appropriate money for this purpose, the country ought also to know that the life of these machines is exceedingly short.

Gen. Scriven. It is very short. Take, for instance, the conditions as they exist on the border. An aeroplane goes up, meets with some unfavorable conditions, and comes down perhaps 30 or 40 miles away from any place where it can get any assistance. That is the end of the machine. On the contrary, if the machine came down at a place where repairs could be made, the broken parts may be replaced without difficulty.

Mr. Kahn. What do you mean when you say that is the end of the machine? Do you have to abandon it?

Gen. Scriven. We may have to abandon it if you can not get any of the parts you need. That would be especially true in case the machine came down in an enemy's country.

Mr. Kahn. How many of our machines have met with such a fate recently?

Gen. Scriven. There have been a good many of them which met such a fate down in Mexico. All of the first lot we sent down there suffered that fate.

Mr. Kahn. There was some question about those machines being fitted for the work you expected them to do, was there not?

Gen. Scriven. They were picked up and taken down there because they were all we had. They were taken down from Fort Sill and San Diego, where the conditions were different; but it was absolutely necessary to send them out as the days were those of war. They were low-power machines—90-horsepower Curtiss machines—and for that allotment the committee only gave us $300,000, which, as a matter of fact, extended over some 14 months.

Mr. Kahn. What is the average price of one of these flying machines?

Gen. Scriven. The machines which are proving very satisfactory now with the border troops at Columbus, communicating with Gen. Pershing, are 160-horsepower Curtiss machines.

Maj. Mitchell. The average cost is $12,000; $20,000 with the spare parts.

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Mr. McKenzie. Since we have done our flying with the aeroplane, what is your judgment about the practicability of the use of balloons?

Gen. Scriven. I think the captive balloon is very valuable. Of course, we know they have been using them on the Belgian coast and on the coast of France for observation purposes and very largely on the fighting fronts. Of course, they are limited in the altitude which they can reach. The free balloon is of no special value, as its use is exceedingly limited. As to the dirigible, I have never been much of a believer in it. The dirigible is six or seven hundred feet long, of enormous diameter, has powerful searchlights, guns, bomb-dropping devices, the ability to hover over a certain selected point, but it is vulnerable to attack from the aeroplane or from the ground and susceptible to weather conditions, and I can not see where the dirigible has ever done anything commensurate with its cost, or fulfilled the expectations of the people who believe in them. In fact, I do not believe in them at all. Of course, there may be times when such a machine as the dirigible might be of some service, but those times are so infrequent, and the chances of success are so remote, I do not believe they are worth having at their present cost.

Mr. McKenzie. Would you advise striking out the work "balloon" in the appropriation bill?

Gen. Scriven. Oh, no. Balloons are very important. Captive and kite balloons are absolutely necessary. The captive balloon is much more valuable than most people recognize. When I was military attache of the United States in Italy I saw a captive balloon being carried along with the cavalry at a trot. It makes a very fine observation station.

Mr. Kahn. Germany is the only country which uses the Zeppelin type of dirigible, is it not?

Gen. Scriven. Yes, sir. I believe the English have tried the dirigible. Col. Squier is rather more in favor of the dirigible than I am. As far as I can see, the longer this war continues, the less the Zeppelin is proving its value; but, of course, that is an individual opinion.

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The Chairman. How are the aeroplanes armed?

Gen. Scriven. That is another question that is very difficult of solution. They are carrying now merely the service rifle and pistol. Some men think that a short riot gun, a shot gun, should be used; others think that a gun of the Lewis type or some other such type may be well used.

The Chairman. You have not equipped them with the machine gun at all?

Gen. Scriven. Oh, yes; experimentally, we have tried some. We have used the Lewis gun, but they are not mounted. The Lewis gun weighs only 27 pounds, and can be used from the shoulder. It is a very good gun.

Mr. Kahn. Are they all armed with Lewis guns?

Gen. Scriven. There are some down there; 14, I think.

Mr. Kahn. Have you ever used any other machine gun, except the Lewis gun?

Gen. Scriven. The Benet-Mercier gun was used. We tried it out. I think there are some down there now. We have tried them all out thoroughly.

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Mr. McKellar. The first item is on page 7 of the bill, "Signal Service of the Army," a very comprehensive item. Will you explain to the committee, in general, exactly what you are doing in carrying out the provisions of that item?

Col. Squier. Yes, sir. Last year you remember that we had $300,000 as the appropriation, and then you gave us an emergency fund of $500,000 in March or April, on account of the Mexican situation; and then it was suddenly increased from those small amounts until, on the 28th of August, the Army appropriation act was signed, and we got under that act $13,281,666. In other words, gentlemen, beginning the year with the small amount of $300,000, we suddenly got a large amount of money with which to carry on the development of the Aviation Service.

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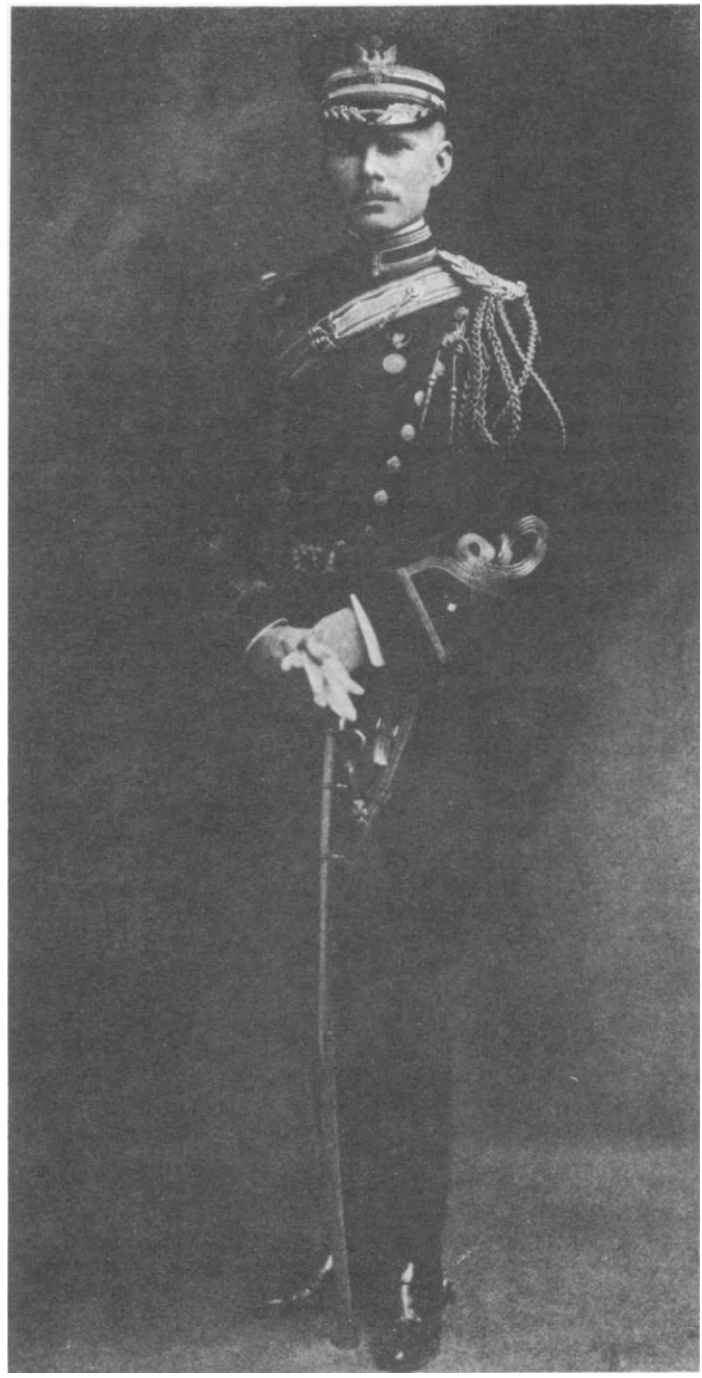

Lt. Col. George O. Squier, Officer in Charge of the Aviation Section, Signal Corps (1916–1917). Later (1917–1923) in the rank of first brigadier and then major general, he served as Chief Signal Officer.

Col. Squier. . . . The equipment we are getting now is as good, I am sure, as this country can produce, and it is improving very rapidly. We are having very few accidents, and there are very few forced landings. Our troubles are now disappearing, because we have better equipment. I think I may say with considerable satisfaction that we have very few accidents of any sort at our schools now. The figures with regard to that are really astonishing.

Mr. Kahn. If it is not too much trouble, will you put them in the record of this hearing?

Col. Squier. I will be glad to do so. . . .

. . . . . .

Flying Record, Army Air Service, Signal Corps Aviation School, San Diego, Cal., Jan. 1 to Dec. 26, 1916.

Total number of flights	7,087
Total time in air (hours and minutes)	3,356.56
Distance tranveled (miles)	251,775
Fatalities	None.

Col. Squier (continuing). We have been confronted by the fact that there has been no buying market for aeroplanes in this country, and, of course, without a buying market, you can not develop an engine or an equipment. Consequently, we were very much behind Europe, which, under the spur of the war, has gone forward in a marvelous way along these lines. The flying movement abroad is simply prodigious; and any questions you may wish to ask me about that I will be very glad to answer, provided my answers are not to go into the record or to become public. I have had unusual opportunities to follow the flying movement abroad, because I have been the military attache to London for the past four years, and I have been privileged to see a good deal at the front. Naturally, I must be very circumspect in anything that I may say here in regard to the present war.

The Chairman. Do you mean that you do not want to speak of that unless we go into executive session?

Col. Squier. Certainly, because whatever I have seen has been under diplomatic privileges.

The Chairman. All right. . . .

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Col.Squier. . . . . We hope to have seven squadrons for the Regular Army developed, or nearly so, with materiel and personnel by the end of the year. Of those seven squadrons four will be for the four departments; three will be for over-sea service—in the Canal Zone, Hawaii, and the Philippines.

Mr. Kahn. For the sake of the record, will you state again how many machines are in a squadron in the aviation service?

Col. Squier. The unit of this service is the squadron, which consists of three flights of four aeroplanes each, or a total of 12 aeroplanes in a unit. It will perhaps clear the atmosphere a bit if we bear in mind two ideas which will help us to make a proper estimate about this whole subject; and I will tell you the way it appealed to me from the beginning and the method that I used.

Before leaving England I made inquiry on two points: Very generally I made inquiry as to how many aeroplanes should be assigned to each mobile unit or division of an army. I considered that if I knew that it would be a great help. Second, I made inquiry as to what was the cost of one aeroplane maintained in the air per year.

So I made it my business to inquire of the Government officials and others and tried to get an answer to those two questions, because they are fundamental questions.

I found that the allowance of aeroplanes per division of the mobile army is one squadron of active aeroplanes in the air whenever the commanding officer wants them. That does not mean that each division of a large army would have its own squadron, by any means; it means that the average would be according to that formula. If,

then, any mobile army has six divisions, we know just how many squadrons we ought to provide.

The other important consideration is the price of keeping aeroplanes in the air for a year. I found in Europe, or in England, from separate sources, as near as they could guess it—of course, it is more or less guesswork, because you may have a series of accidents in a day that will wipe out whole squadrons—that the figure is about $50,000 a year, or £10,000 a year, to keep an aeroplane in the air. So that 12 aeroplanes in a squadron would cost $600,000 a year for maintenance.

Mr. McKellar. Have you given the original cost of the aeroplanes?

Col. Squier. I am coming to that. So that the unit squadron, which will produce 12 flying aeroplanes in war, wears out an aeroplane, on the average, every three months; and 4 aeroplanes are therefore required to keep 1 aeroplane in the air all of the time; so that you would have 48 aeroplanes in a squadron used up in war per year. In peace it is less, of course, but not so much less as you would imagine, because an aeroplane is a fragile thing, and it wears out very quickly. The life of an engine is only about 300 hours, roughly, and you would have to have several engines for each aeroplane, and the engine is an expensive part of the aeroplane, costing about $50 per horsepower.

So that I can say that the basis we are now working on is that the original cost of a squadron for a division, with all its equipment, which includes this book (indicating) full of accessories, the number of which would surprise you, is $800,000, roughly; and to maintain that after you got it is $600,000 per year, which is $50,000 per machine per year in the air.

. . . . . .

I have said, then, that with the appropriation you have given us, we propose to equip, as far as we can, seven squadrons for the Regular Army, and we will probably have pretty well under way six reserve squadrons which will be used temporarily, at least, in connection with coast defenses, in such manner as the War Department may decide. These machines have already been ordered for coast defense, bids have been called for, and if the committee desires to see them, the specifications are here (indicating).

There will be 6 of these squadrons, in addition to the 7; for the Regular Army that would be 13 in all. And for the next fiscal year we propose to maintain those 13, and add 4 more at a cost of $800,000 each, maintaining those 13 at $600,000 each. Those figures I gave you before. If you will bear those figures in mind, it will be easy to get a general idea of what we are doing. We feel very much encouraged as to the personnel also, and have inaugurated—

Mr. Greene (interposing). $800,000 you say is the original cost?

Col. Squier. Yes, sir; for the unit, the squadron.

At present the President has authorized for the aviation section for the present year 1,800 men; he has authority to do that. . . .

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There has been authorized by the War Department for the next year no less than 3,200 men; the personnel for the squadrons for the Canal Zone and for Hawaii, and for the completion of the squadron at Manila—the officers to command them have already been selected, and the supply officers have already been designated, and the men themselves who are to go have been selected, very largely, with the view of keeping the two elements of personnel and equipment side by side. There are something like 200 of these men at the San Diego School; 50 of them will be sent to Panama and 50 to Hawaii.

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I have given you then, Mr. Chairman, our hopes for this year, namely, seven squadrons for the Regular Army, four of

which are to be in this country and three for the over-sea possessions; and six reserve squadrons for the Coast Defense; those six squadrons would be, speaking generally, two near the city of New York, say, one in Chesapeake Bay, one near Boston for instance, one near San Francisco, and one in the Seattle district.

The machines are all bought, or under contract; the personnel is largely in hand for those; and two of the new squadrons for the Regular Army will be formed at San Antonio; all four of the Regular Army squadrons will be in the Southern Department at present, because there is the active border duty. Later some may be assigned to other departments. But the urgent base for us now is San Antonio, Tex.; and as one squadron is completed and ready, it goes out, and another one is formed.

The Chairman. Let me ask you this question in that connection: The squadrons that you will use for the posts will be under the jurisdiction of the Signal Corps, will they?

Col. Squier. Yes, sir; it is all under one head.

The Chairman. And the use that they may be devoted to in directing fire will be under the Signal Corps?

Col. Squier. Yes, sir. I may say, Mr. Chairman, that we regard the air service as being designed and provided for the whole of the Army; and in my judgment that is very wise at present, because you can look at the whole problem and spend the money with the greatest economy in that way. There may come a time afterwards when you may want to segregate the bookkeeping part of it. I have an open mind upon the subject—if there is to be any question of authority between committees of Congress.

Mr. Kahn. Is that done largely in Europe in the belligerent countries? Is it one service?

Col. Squier. Yes, sir; the air service in Europe is one central service. It is then assigned to any service that they may wish; for instance, to "spot" artillery fire. The way they use the aeroplane is that certain aeroplanes will be assigned to certain batteries; and they do it by numbers, and you can see them go to those batteries and perform that service for that day, and then return to their stations with their squadrons.

Mr. Kahn. They are sent out by the Signal Corps?

Col. Squier. Yes, sir; by the aviation service.

Mr. Kahn. And they report to a certain battery commander?

Col. Squier. Yes, sir. Of course, they are all under the general.

Mr. Kahn. Yes; I understand.

Col. Squier. It is like you send a doctor to a general, and he is under the general's command, but is in a separate service for technical training and equipment.

. . . . . .

Mr. McKellar. Here is a subject as to which I think you could tell us a good many things we would like to know. As I understand it, when you went down on the border, all the machines that you had failed to come up to what was required of them; in other words, you could not fly over mountains?

Col. Squier. Yes, sir; that is correct.

Mr. McKellar. And you have to abandon those. Now, in the purchase of these 306 that are contracted for, have you secured by these contracts such machines as can fly over mountains, or can fly to almost any height? Will you just state how that is?

Col. Squier. My answer is that the present squadron with the punitive expedition is fully equipped with suitable reconnoissance machines, which I am satisfied are the best that this country can produce now; and with every auxiliary part that is needed for its service, including automatic Lewis machine guns, rifles, automatic cameras, incendiary bombs, demolition bombs,

wireless, etc. There is a base at Columbus, N. Mex., capable of repairing anything that happens, within reason, and it is self-supporting, so that we do not have to devote any attention practically to it at this end of the line. We have a propeller factory right there, and they make their own propellers there to suit the dry climate and the heat.

. . . . . .

Mr. Kahn. These [aerial] battles are all fought with machine guns?

Col. Squier. Absolutely. On that point I might add the angle of view of the machine gun as it appears to our Aviation Section. If you will eliminate the demolitions, for instance, where you drop bombs, or the incendiary bomb, and take the pure case of a fight between aeroplane and aeroplane, it would appear that what we want is not a large gun with a few number of rounds, but a small-caliber gun with a large number of rounds, for the following reason: You get the upper berth and come at the opponent by gravity, shooting through the propeller, and you only have a very short time in which to shoot. You then go by him at the rate of a hundred miles an hour, and you come back again, if you are faster than he is. So that if you had a large gun with only one shot and did not hit him at all, your shot would do no good; but if you had the same weight of lead in a hundred shot you would be more apt to hit him; and the aeroplane is so vulnerable at present, that he would be disabled as much by that small shot as by the large one.

Mr. Kahn. And do they ordinarily aim through the propeller?

Col.Squier. They ordinarily aim right through the propeller and the pilot sits right back of the propeller, they aim the whole machine; they do not aim the gun; they just pull a string to fire and aim the machine itself. The point is this, that you can only have a certain weight of lead on the aeroplane.

Mr. Kahn. Yes; I understand.

Col. Squier. And you can have that in one big shot, or a lot of little shots; and you can not carry an extra man, because he weighs so much; you must fix it so that this same man must do it; you can not take up an extra man just to shoot a machine gun, because the extra weight would be so much. And you would be going by the other machine at perhaps 120 miles an hour, and you want to hit him with one of those shots, and not to miss him. So you want a multiple machine gun, or something by which you will not be likely to miss him as you pass; you do not have much time to fire; then you go by and begin maneuvering again and repeat the operation.

So that, as a general thing, we are against larger guns for aeroplanes; but I am speaking now about a machine that goes up and fires in the air at another aeroplane.

Mr. Kahn. Are there many American aviators using those machines in the various armies in Europe?

Col. Squier. There are in France a considerable number, as you know.

Mr. Kahn. Yes.

Col. Squier. They are known as the "American legion" or something of the kind.

Mr. McKellar. Are you an aviator yourself?

Col. Squier. No, sir. I have ridden as a passenger frequently, but I am not a driver. It is not the policy; in fact, I am too old to drive. The driver is, in war, a man under 30 years old, usually; it is a young man's job; there is no question about that.

Mr. Kahn. That is true also of the mobile army, the infantrymen?

Col. Squier. Well, it is particularly true in this. In fact, I can tell you that, in a residence of several months with an army in war, I have never found a single actual flier that was over 24 years of age at that time. Well, the only point I want to make is that it is distinctly a young man's job.

The Chairman. How close do these machines come to each other in a fight?

Col. Squier. They have actually rammed each other. It is a most thrilling thing to watch them; in fact, there is no use reading novels any more; real life is more interesting; it is simply wonderful to see them.

Mr. Greene. Col. Squier, I understand that the theory of this combat in the air is to gain control of that territory, for the other purposes for which the aeroplanes are subsequently to be used in it?

Col. Squier. Yes, sir.

Mr. Greene. The fighting itself has no particular military object?

Mr. Gordon. Well, it is to kill the other man.

Mr. Greene. Well, to kill him, but it is in order to get control of the air zone?

Col. Squier. Yes, sir.

Mr. Tilson. Reconnaissance and fire control is what you are looking for?

Col. Squier. Yes, sir. In fact, the only way they know now about the maze of trenches along that line, which any human being could not go over, is by taking photographs of each zone from aeroplanes and matching them together each day. Without that they could not tell the new pieces of trench dug during the previous night.

Mr. Kahn. Control over the air is just as important as control over the sea?

Col. Squier. And after this war the armies, in general, will disband or shrink, but the air service is going to stay where it is and go on. They realize it is an asset that is going to remain, and not shrink or disband. All we learn in this war about aerial navigation will be applied to the uses of civilization in the peace which follows. It is one point of permanent gain, at any rate, and that is why this country is safe in putting money into it.

(Thereupon, at 1:30 o'clock p.m., the committee adjourned. . . .)

. . . . . .

When Germany resumed unrestricted submarine warfare at the beginning of February 1917, the United States broke off diplomatic relations. Then came the Zimmermann note, the arming of American merchantmen, the sinking of American ships, a call for a special session of Congress, and, finally, on 6 April 1917, the declaration of war against Germany.

Meanwhile, on 5 February 1917, the Signal Corps was asked to estimate requirements for an army made up of the regulars, the national guard, and 500,000 volunteers. The estimate submitted on 16 February included $48,666,666 for aviation proportioned to the rest of the army. On 21 March Secretary Baker called for another estimate, this time with 1,000,000 volunteers. Using the same formula, the Signal Corps came up with $54,250,000 for aviation. During this time estimates for aircraft production had mounted to 3,700 a year. In such exercises, the major concern apparently was production, with little attention being given to how the planes were to be used. The aircraft industry of the United States was not then geared up to any such production, even if the government had known what kinds of planes it needed for combat service.

For several years officials of the War Department, the Signal Corps, and the Aviation Section had lamented the secrecy that prevented them from learning about the latest technical developments in aircraft production in Europe. There was plenty of information available, however, to indicate that the major belligerent powers had made great progress in developing not only aircraft but also doctrine and tactics for the employment of their

growing airpower. Britain, France, and Germany had recognized the importance of air superiority and were using their aircraft for counter-air operations, bombardment of strategic and, more often, interdiction targets, close support of ground forces by bombing and strafing, strategic and tactical reconnaissance, both visual and photographic, adjustment of artillery fire, and for informing infantry commanders of the location and movements of their troops.

Although there was some awareness in the United States of these developments in the use of airpower, aviation in the U.S. Army was still regarded as being principally a service of reconnaissance, with plans for expansion of tactical strength being based on the addition of one squadron for each additional Army division. On 6 April 1917, however, the Aviation Section was ill prepared to carry out even the limited function it had been assigned for field service in time of war.

When the United States went to war in April 1917, the aviation service of the U.S. Army consisted of the 1st Aero Squadron, which had been formed in 1913 and had served with Pershing in Mexico; the 1st Company, 2d Aero Squadron, which had been formed in December 1915 and sent to the Philippines the following January; the 7th Aero Squadron, formed in February 1917 for duty in the Canal Zone; and the 6th Aero Squadron, organized in Hawaii in March 1917. Three other squadrons, part of a seven-squadron program, were in various stages of formation in the United States.

For these units, and for administration, training, and other activities, the Aviation Section had about 130 officers (flyers and non-flyers, airplane and balloon pilots, reservists and retired officers on active duty as well as regulars) and a little over 1,000 enlisted men. No one seems to know for sure how many airplanes the Aviation Section had (about 200? less than 300?), but all sources seem to agree that not one of the planes was suitable for combat service, not even reconnaissance.

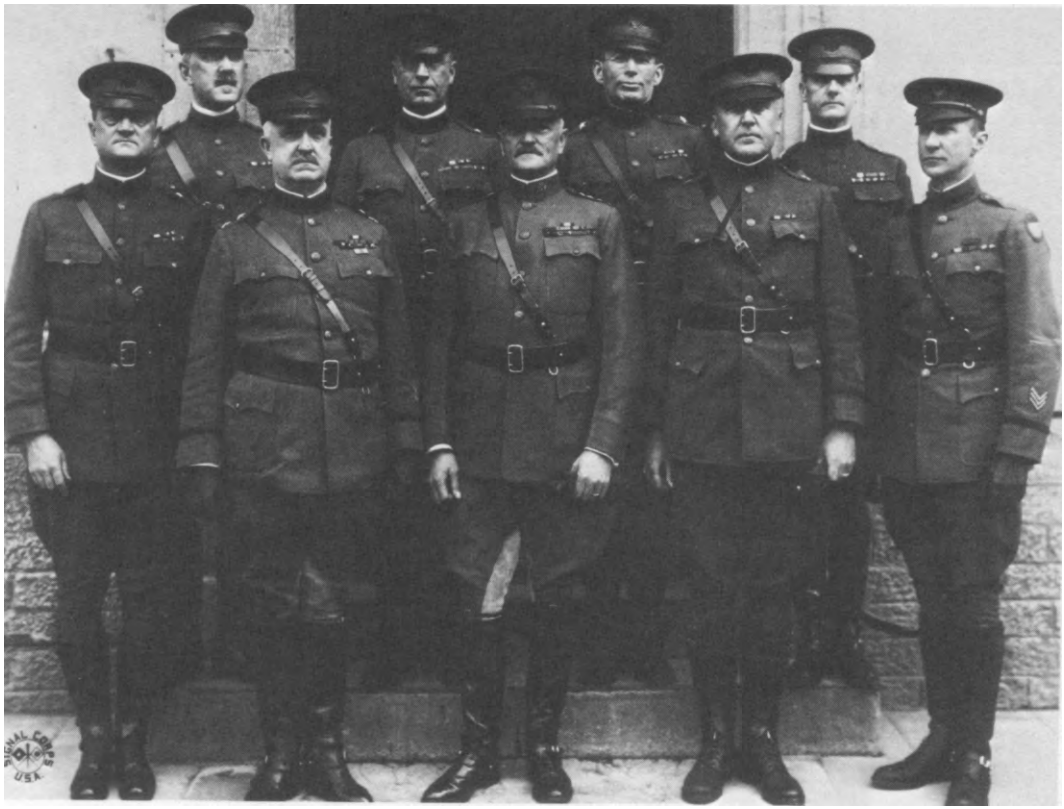
Thus the United States went to war without an air force worthy of the name, and without any well formulated ideas, much less plans, for building and employing such a force in battle.[1]

1. The history of the U.S. Army's air service in the period prior to America's entry into the war is traced in considerable detail in USAF Historical Study 98, *The United States Army Air Arm, April 1861 to April 1917* (USAF Hist Div, 1958).

Part II: Plans and Programs

April 1917—February 1918

In the days immediately following America's entry into the war, much effort was devoted to plans for the development of an air force for wartime service. In Washington the concern was with production, construction, and training, with little attention being given to how airpower would be used in battle. As events developed, planning for the employment of U.S. airpower in Europe was left largely to General Pershing, his staff, and his Air Service, which was a separate service and not part of the Signal Corps of the AEF.



Gen. Pershing with his World War I staff: First row (l. to r.): Brig. Gen. Harold B. Fiske, Maj. Gen. James W. McAndrew, Gen. John J. Pershing, Brig. Gen. Fox Conner, Brig. Gen. George V. H. Moseley; second row: Brig. Gen. Avery D. Andrews, Brig. Gen. LeRoy Eltinge, Brig. Gen. Dennis E. Nolan, and Brig. Gen. Robert C. Davis.

The production program involved the assembly of American-made planes in France. French women participated in this task at the Air Service Production Center #2, Romorantin.

16. 12,000 Plane Program

29 May 1917

The development of an aviation program in Washington was given a new direction and greater impetus by a cable received on 24 May 1917 from Premier Alexandre Ribot of France. Ribot proposed that the United States form a flying corps of 4,500 planes, with personnel and material, for service in France in 1918. The cable was based on a French study for a U.S. air force of 60 groups for strategical operations. Half of the groups were to be pursuit and half bombardment, with each group being made up of 6 squadrons of 12 planes each [Docs. 7 and 23]. Since the cable did not specify pursuit and bombardment, officials in Washington assumed that the number covered all aviation and made plans accordingly.[1]

The Joint Army-Navy Technical Aircraft Board quickly translated Ribot's proposal into the following plan.[2] With provisions for replacement and reserve craft, the plan called for the production of 12,000 airplanes during the first half of 1918 for service in France. To this were added more than 5,000 training planes. The plan was to concentrate on the production of training and reconnaissance planes in the United States and obtain fighting and bombing planes from the allies. Funding for production was included in $640,000,000 appropriated by Congress in an act signed by the President on 24 July 1917 for a large expansion of the Aviation Section.

Washington, D.C.
May 29, 1917.

From: Joint Army and Navy Technical Aircraft Board

To: Secretary of War.
Secretary of the Navy.

Subject: Report of Board

1. The Board met at 10:15 A.M. at the call of its president.

2. Present: All the members.

3. The French Government, on May 24, 1917, requested the United States Government to cooperate with the French Aeronautics, and form a flying corps of 4,500 airplanes, personnel and material; such flying corps to be available for active service in France during the spring campaign of 1918.

To meet the foregoing request, the needs of the United States Army for service airplanes and engines, to be used in Europe, are as indicated [see table below]:

In order that the United States Government may meet the request of the French Government, immediate steps should be taken to start the manufacture, in the United States, of the above airplanes and engines.

B. D. Foulois
Major, Signal Corps, U.S.A.

V. E. Clark
Captain, U.S.A.

A. K. Atkins
Lieutenant, U.S.N.

J. G. Hunsaker
Asst. Naval Constructor, U.S.N.

J. H. Towers
Lieutenant, U.S.N.

E. S. Gorrell
Captain, Signal Corps, U.S.A.

Approved:

Newton D. Baker
Secretary of War.

Josephus Daniels
Secretary of the Navy.

Service Airplanes and Engines (Latest Types)
(To be produced between January 1, 1918, and June 30, 1918).

Types	Airplanes		Engines		Cost
	Fighting line	Reserve	Fighting line	Reserve	
Reconnaissance & artillery control	3,000	1,000	6,000	2,000	
Fighting	5,000	1,667	10,000	3,334	
Bombing	1,000	333	2,000	666	
Total	9,000	3,000	18,000	6,000	
Grand Total		12,000		24,000	

1. The statements concerning the Ribot cable and its interpretation follow I. B. Holley, Jr., *Ideas and Weapons* (New Haven, 1958), pp 41–46, supplemented by Ministere de la Guerra, *Les Armees Francaises dans la Grande Guerre*, Tome V, Vol 2 (Paris, 1937), pp 48–51.

2. In Gorrell's History, A–1, pp 11–12.

Brig. Gen. Edgar Russel (at the time a colonel) was Chief Signal Officer, AEF, and president of a Board of Officers appointed in June 1918 to make recommendations on aviation matters in France. (sketch by Joseph Cummings Chase)

17. Mitchell: Air Policy

13 June 1917

Two days after the Ribot cable, Pershing assumed command of the AEF in Washington. Sailing for Europe on 28 May, he stopped in England before going on to France. When he arrived in Paris on 13 June 1917, one of the people on hand to greet him when he got off the train at the Gare du Nord was Lt. Col. William Mitchell, Aviation Section, Signal Corps, U.S. Army. Mitchell, who had left Washington on 17 March, had been sent to Europe as a military observer with orders to investigate the status of French aeronautics. His first stop in Europe had been Spain, where he heard the news that the United States had declared war. He had set out immediately for Paris, and during the following weeks he had talked with French officials, visited French factories and aeronautical schools, toured the French front, flown over enemy lines with a French pilot, visited Royal Flying Corps units in France, talked with their commander, Maj. Gen. Hugh Trenchard, and, among other things, had set up an office for the U.S. Air Service at 25 Avenue Montaigne in Paris. That office, he informed Pershing's Chief of Staff, Lt. Col. James G. Harbord, in a memorandum dated 13 June, was "ready to go ahead with any project determined upon by the Commanding General."[1]

Mitchell also had prepared for the Chief of Staff two papers dealing with American air policy and organization. Harbord referred them to a Board of Officers appointed on 19 June to make recommendations on various aviation matters. The board was made up of Col. Edgar Russel, Chief Signal Officer, AEF, president of the board; Mitchell, the senior aviation member; Maj. Townsend F. Dodd, Aviation Officer, AEF; Maj. Marlborough Churchill, Field Artillery; Maj. Frank Parker, Cavalry; and Capt. Joseph E. Carberry, Aviation Section, Signal Corps. Churchill and Parker were members of a U.S. Military Mission, headed by Lt. Col. James A. Logan, that had been in France for some time. Carberry, who served as recorder for the board, had arrived in France only a short time earlier for flight training. Mitchell's papers on policy and organization were received by the board at its third meeting, on 26 June 1917.[2]

1. Exhibit C (Duty Performed by Major Wm. Mitchell, Aviation Section, Signal Corps, dated 13 Jun 17) to Mitchell, Memo for C/S, AEF, subj: Aeronautical Organization in France, 13 June 1917, in Gorrell's History, A-23.

2. The proceedings of the board are in Gorrell's History, A-23.

Memorandum for the Chief of Staff, U.S. Expeditionary Forces.[3] *From: Major*[4] *Wm. Mitchell, Aviation Section, Signal Corps*

1. Now that the United States Military participation in France is assured, it seems to be an opportune moment to consider what policy should be adopted with respect to the aeronautical service.
2. The opinion is advanced that, if a sound policy is adopted to begin with, results will follow quickly and surely. If, on the other hand, a halting policy is adopted, the air service will fall far short of what it is absolutely required to do in modern war. The decisive value of this service is difficult to appreciate at a distance from the field of military operations. It should be an independent arm as artillery or infantry.
3. Aeronautical functions divide themselves into strategical and tactical phases:

a) The tactical function, basically, is to insure observation for the fire and control of our own artillery. To accomplish this, airplanes and balloons observe the fire while others fight off hostile aircraft which attempt to stop it.

This kind of air work has been done now for three years and is well understood. There is attached hereto a copy of the note of General Trenchard (commanding British aviation in France) on this subject, which was written in September 1916, and is as sound today as it was then (Appendix "A").[5]

b) The strategical phase (which has received a very limited application, but which is being seriously considered by all belligerents and is not dealt with in General Trenchard's note) applies to the air attack of enemy material of all kinds behind his lines. To be successful, large combatant groups of airplanes must be organized, separate from those directly attached to army units.

It is with this class of aviation (strategical) that the United States may aid in the greatest way and which, it is believed if properly applied will have a greater influence on the ultimate decision of the war than any other one arm.
4. There is attached hereto the French General Staff's request for what may be termed strategical aviation units (Exhibit B).[6] The first thing to be determined is whether it is to be adopted or modified.

. . . . . .

(Signed) Wm. Mitchell.

3. In Gorrell's History, A-23.

4. Mitchell had been promoted to lieutenant colonel effective 15 May 1917.

5. This appendix has been omitted. The document was published in Mitchell, *Memoirs of World War I* (New York, 1960), pp 105–109. An extract appeared in Andrew Boyle, *Trenchard* (London, 1962), pp 186–188.

6. This exhibit, which has been omitted, was dated 6 May 1917. It is an extract from the document on which the Ribot cable was based. (See Doc. 23 for further reference.)

Maj. Gen. Sir Hugh Montague Trenchard, General Officer Commanding Royal Flying Corps in the Field when the United States entered World War I. (from a drawing by Francis Dodd)

"Billy Mitchell."

18. Mitchell: Aeronautical Organization

13 June 1917

Memorandum for the Chief of Staff, U.S. Expeditionary Force.[1]
From: Major Mitchell, Aviation Section, Signal Corps.

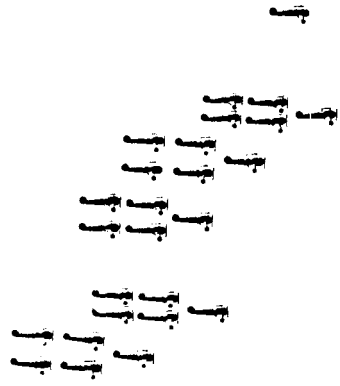
1. United States aeronautical participation in France naturally divides itself into two classes:

A. The air squadrons with the American units themselves, such as the divisions, army corps or armies, in accordance with the manner in which the army is organized and employed. The aeronautical units for this service will be attached directly to the troops in the same way, for instance, as the field and heavy artillery are. They always will comprise divisional air squadrons and balloon companies, and may consist of pursuit and bombardment squadrons in addition. Their entire object is to facilitate the work of the division, corps or army. They should be organized progressively.

B. Based on the theory that no decision can be reached on the ground before a decision has been gained in the air, the French General Staff has requested, that in addition to the Aviation Units which form a part of the American troops coming to France, there be organized a number of large aeronautical groups for strategic operations against enemy aircraft and enemy material, at a distance from the actual line. These units would be bombardment and pursuit formations and would have an independent mission, very much as independent cavalry used to have, as distinguished from divisional cavalry. They would be used to carry the war well into the enemy's country.

. . . . . .

(Signed): Wm. Mitchell



1. In Gorrell's History, A-23.

Maj. Townsend F. Dodd (taken while he was captain).

19. Dodd: Aviation Work

18 June 1917

Maj. Townsend F. Dodd, who had served with Pershing in Mexico, accompanied Pershing to Europe as Aviation Officer of the AEF. Enroute to Paris he spent several days in London, talking with the U.S. Military Attache, Col. William Lassiter, and with various British officials. His report on those conversations, submitted to the Chief of Staff, AEF on 20 June 1917, included a note outlining what needed to be done.[1] The Chief of Staff sent Dodd's report to the Board of Officers, where it was received at the first meeting, on 21 June 1917.

Aviation Work Necessary for the Successful Prosecution of the War

The following is a brief synopsis of the most important details of aviation work necessary for the successful prosecution of the war.

I. The first thing to be determined is the results that the American Air Service, in connection with the Allied Air Service and the Allied Armies, is to accomplish.

The results called for by paragraph I are briefly as follows:

a) The unchallenged supremacy of the air on the different fronts, the major consideration being given to the Western Front.

b) The development and maintenance of an aerial offensive force that will be able to carry the war two hundred or more miles behind the German lines. This force, when first available might properly be considered for use strictly for the attack upon military features, such as arsenals, factories, railways, etc. but should also be sufficient to act as a reprisal agent of such destructiveness that the Germans would be forced to stop their raids upon Allied cities.

c) This offensive arm would, of course, be of great value on and immediately behind the German lines in connection with land warfare.

. . . . . .

Notes

1. In Gorrell's History, A-23.

20. Churchill: Liaison with Artillery

21 June 1917

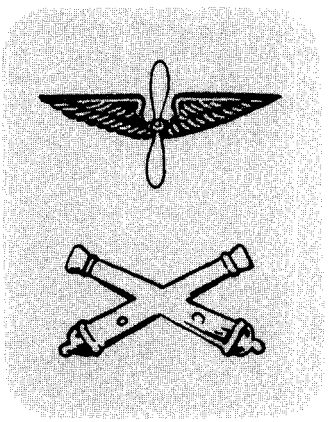
At the first meeting of the Board of Officers on 21 June 1917, Churchill submitted two memoranda, one dealing with liaison with the artillery, and the other concerned with air superiority as it affected artillery.[1]

Aerial Observation in Liaison with Artillery.

Informal notes for the Board of Officers convened by Par. 4, S.O. 11, Hqrs. A.E.F.., June 19, 1917.

I. ***GENERAL PRINCIPLES.*** The basic idea in connection with aerial observation in liaison with artillery concerns the fact that artillery is today partially blind and partially impotent without efficient aerial observation.

Such being the case, it is evident that connection between the artillery and the air service cannot be too close and that there must be established a complete professional and moral liaison between the two arms. The aerial observer must be an artillery officer, trained in principles governing the conduct of fire, and perfectly familiar with the capabilities of his own arm; but he must live and work with his comrades in the Air Service.



1. In Gorrell's History, A-23.

Maj. Marlborough Churchill, a Field Artillery officer, served on the Board of Officers appointed by Gen. Harbord to advise on aviation matters.

21. Churchill: Air Superiority

21 June 1917

Notes to Justify the Statement that Military Success Depends Upon Superiority in the Air.[1]

1. If the enemy is master of the air, the artillery cannot conquer the ground which the infantry is to occupy.

2. Even though the ground be conquered, if the enemy regains mastery of the air at the time of the attack, the progress of the infantry advance cannot be known or controlled. In this case liaison is lost and success becomes a matter of chance.

3. To conquer the ground, the artillery must:

a) Know, by means of aerial reconnaissance and photography:

x) the exact nature and location of the enemy's batteries and works;

y) the exact amount of success attained at each period of the preparation;

z) The moment at which the artillery preparation is finished.

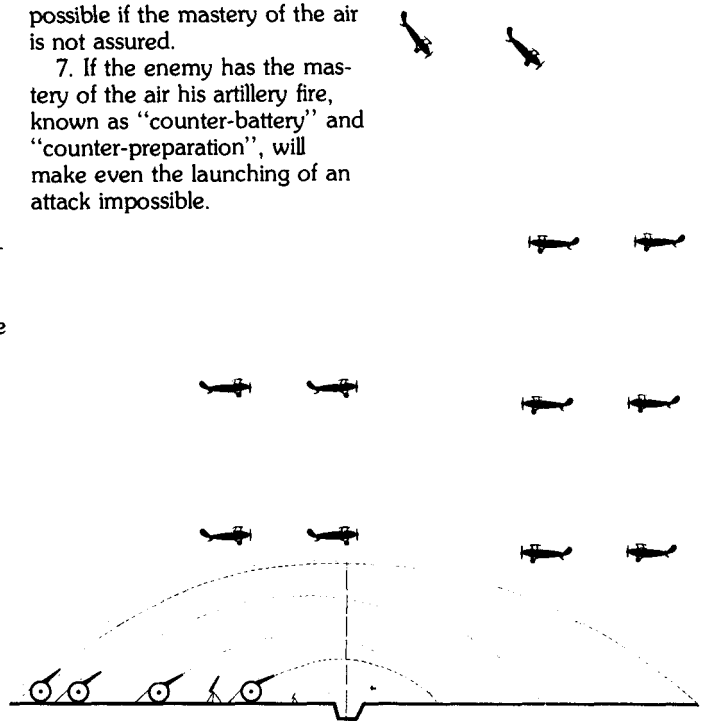
b) Be able to adjust its fire upon targets by means of accurate information furnished by well-trained aerial observers.

4. To follow and direct an infantry attack, a general must maintain liaison by means of low flying airplanes.

5. Without air superiority, the artillery is both blind and impotent so far as counter-battery and destruction fire are concerned.

6. The accuracy and efficiency of artillery fire depend upon proper identification of targets and accurate adjustment. In modern war both these are impossible if the mastery of the air is not assured.

7. If the enemy has the mastery of the air his artillery fire, known as "counter-battery" and "counter-preparation", will make even the launching of an attack impossible.



1. In Gorrell's History, A–23.

Maj. Frank Parker, a Cavalry officer, also served on the Board of Officers to advise on aviation matters in France.

22. Parker: The Role of Aviation

2 July 1917

The minutes of the fourth meeting of the Board of Officers, held on 29 June 1917, state that "Major Parker was directed to submit a report on the tactical role of aviation." Born in South Carolina in 1872, Parker was a graduate of the U.S. Military Academy in the Class of 1894. He was commissioned in the Infantry but soon transferred to the Cavalry. He had served as military attache in Latin America, cavalry instructor in Cuba, and member of the U.S. Cavalry Board, and had attended service schools in France on three occasions before being sent to France as a member of the U.S. Military Mission in 1916. In April 1917 he became U.S. liaison officer at French General Headquarters. Later he would command a brigade and then a division in battle in France, and eventually he would retire as a major general.

Parker's wife, Katherine, was the daughter of Frank S. Lahm, the American aviation enthusiast who had resided in Paris for many years, and the sister of Frank P. Lahm, a U.S. cavalry officer who had won the James Gordon Bennett International Balloon Race in 1906, and had been the first U.S. Army officer to fly in a Wright airplane. At the beginning of July 1917, Frank P. Lahm was a major in charge of the Aviation Section's balloon school at Omaha, Nebraska.

The proceedings of the Board of Officers state that, "A report was read by Major Parker on the role and distribution of tactical units . . .," at the fifth meeting, on 2 July 1917. Parker's report,[1] which became Exhibit N to the board's proceedings, and which is printed below, is interesting not only for its ideas on the role of airpower but also because its authorship generally has been attributed to another officer. With a new title, "General Principles Underlying the Use of the Air Service in the Zone of Advance, A.E.F.," and with only a few minor changes in the text, the report submitted by Parker was published in a *Bulletin of the Information Section, Air Service, A.E.F.*, with a preface attributed to "Wm. Mitchell, Lt. Col., A.S., S.C., A.C.A."[2] (see Doc. 35). Thus Parker's report became Mitchell's "General Principles."[3]

The Role and Tactical and Strategical Employment of Aeronautics in an Army.

ROLE.

Military Aeronautics comprise all means of aerial activity which an Army employs to assist it in obtaining victory.

Military Aeronautics are divided into:

A. Aviation, or heavier than air formations.

B. Aerostation, or lighter than air formations.

A. AVIATION.

Aviation is divided into two general classes:

I. *TACTICAL AVIATION*, or that acting in the immediate vicinity or directly attached to organizations of troops of all arms.

II. *STRATEGICAL AVIATION*, or that acting far from troops of other arms and having an independent mission.

1. In Gorrell's History, A-23.

2. A.C.A. was the abbreviation for Air Commander, Advance.

3. Primary and secondary sources seen by the editor do not indicate what contributions, if any, were made by Mitchell or others in the preparation of the report assigned to, and submitted by, Parker.

I. Tactical Aviation.

The object of *tactical aviation* is to assist troops in combat. All aviation elements themselves must be ready to fight to accomplish their mission.

Tactical aviation consists of:

A. *Observation aviation*

B. *Pursuit aviation*

C. *Tactical bombardment aviation.*

A. *OBSERVATION AVIATION* is carried on essentially by division squadrons.[4]

OBSERVATION AVIATION consists in:

1. Reconnaissance by eye and by photograph of the enemy's positions and works of all sorts, and the results of all attacks against them.

2. The adjustment of artillery fire.

3. Keeping superior command in liaison with the infantry during attacks by means of wireless, optical signals and horn.[5]

B. *PURSUIT AVIATION* is carried out by pursuit squadrons whose primary object is offensive combat. The mastery of the air is obtained by air battles.

PURSUIT AVIATION consists in:

1. Destruction of enemy aeronautical materiel and personnel by combat in the air.

2. Creating diversions by attacking enemy personnel and material on the ground.

These operate to prevent observation on the part of enemy aeronautical elements, to prevent hostile air incursions into friendly territory and to create a diversion against hostile elements.

C. *TACTICAL BOMBARDMENT AVIATION* is carried out within about 25,000 yards of the line or roughly within the extreme zone of long-range artillery.

Its object is:

1. To assist in the destruction of enemy materiel of all sorts;

2. To attack hostile personnel both during the day and night, so as to undermine their morale.

3. To attack hostile aerodromes so as to force hostile airplanes to arise and accept combat.

II. Strategical Aviation.

The mission of *strategical aviation* is independent.

Strategical aviation consists in attacking enemy elements, whatever their nature, at a distance usually more than 25,000 yards from friendly troops.

The object is to attack the supply of an enemy army,[6] thereby preventing it from employing all its means of combat. This may be accomplished by:

1. Destroying enemy aircrafts, air depots and defensive air organization.

2. Destroying enemy depots, factories, lines of communications and personnel.

The organization for this purpose whose role is entirely offensive and whose radius of action extends beyond that of tactical aviation, should be:[7]

1. Pursuit squadrons for fighting enemy aircraft.

2. Day-bombardment squadrons for bombing enemy aerodromes to make hostile airplanes rise and accept combat, and to carry out long-distance reconnaissances.[8]

3. Night-bombardment squadrons for destroying enemy elements and lines of communications.[9]

4. The Bulletin (Vol. III, No. 132, 30 April 1918) says: ". . . by observation squadrons."

5. Bulletin: . . . by means of electrical and physical means.

6. Bulletin: The object of strategical aviation is to destroy the means of supply of an enemy army. . . .

7. Bulletin: The organizations for this purpose . . . are: . . .

8. Bulletin: . . . accept combat, to carry out long-distance reconnaissance, and to attack personnel and material on the ground by gun-fire.

9. In the Bulletin was inserted an additional unnumbered paragraph: Bombing is carried on in the day-time primarily for reconnaissance. It is carried on at night for destruction.

B. AEROSTATION.

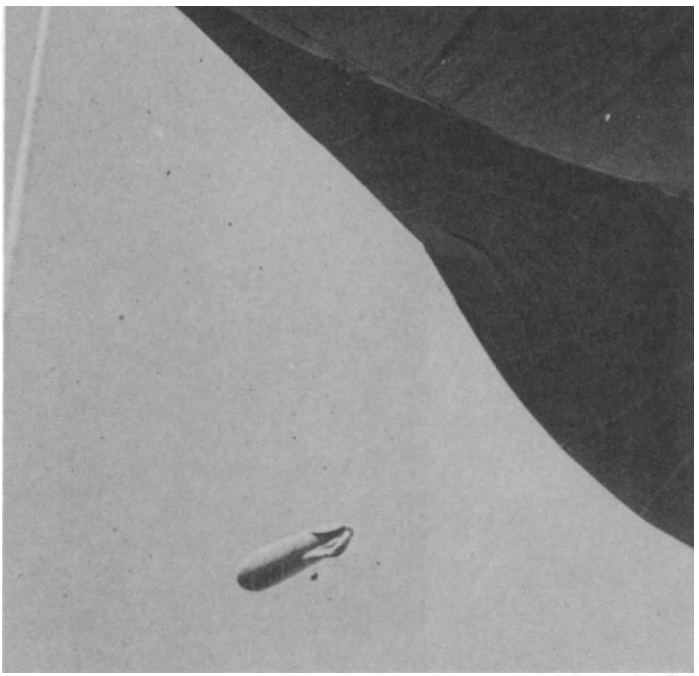
AERONAUTIC UNITS consist of:

1. Observation balloons.
2. Dirigible balloons (these are not being considered at present in connection with U.S. Aeronautics in France).
3. Observation balloons, from[10] an elevated fixed station from which powerful glasses may be used and constant communication maintained by telephone with the earth.

They are used for:

1. Adjustment of fire of artillery.
2. Observation of combats.
3. Observation of elements in and behind hostile lines.

Airplanes and balloons have closely related missions and are therefore placed under one direction.



Observation balloon.

TACTICAL EMPLOYMENT.

The method of operation and tactical handling of air forces with divisions,[11] army corps, armies and groups of armies is prescribed from time to time in orders,[12] for instance see Annex II, Regulations concerning a General Offensive, dated December 16, 1916 (French).

10. There may have been a typographical error in the original or in the copy included in Gorrell's History. In the Bulletin the word is "form."

11. In the Bulletin, "divisions" was omitted.

12. In the Bulletin, the remainder of the sentence was omitted.

Capt. Joseph E. Carberry served as the recorder for the Board of Officers.

23. Board of Officers: Recommendations

4 July 1917

A draft of the proceedings of the Board of Officers was presented at the sixth meeting, on 3 July, for revision. The following day a revision was approved, and the board adjourned, *sine die*.

Recommendations[1]

The Board believes that it is now a cardinal principle in warfare that *a decision in the air must be sought and obtained before a decision on the ground can be reached.* Absolute and unchallenged superiority in the air can perhaps never be attained although possibly it may be attained for short periods of time; but experience of three years' war has amply shown that the side which can at critical times dominate the enemy in the air has taken the first, if not the vital, step toward victory.

As a preliminary to the study of the specific recommendations which follow, the board recommends most strongly a careful study of Exhibit N,[2] a memorandum outlining the role of aviation in modern war, with specific reference to the problem now awaiting solution in France.

Proceeding to the specific recommendations required, the Board was ordered to report on the following, which it will discuss in order, concluding the entire proceedings with a series of proposed steps on which action is most strongly urged, to the end that the recommendations herein contained may receive prompt attention:

The board was required to make recommendations on the following:

(a) A complete aviation project for the U.S. Army in France.

(b) The complete organization of the air service, including the manufacture and supply of equipment.

(c) The establishment of depots, repair shops and parks.

(d) The establishment of schools.

(e) The distribution of tactical units and their duties.

An aviation project will embrace two phases of air development, strategical and tactical (See exhibit N).

STRATEGICAL AVIATION.

Based on the letter of the French Commander-in-Chief to the Minister of War, May 6, 1917 (See Exhibit H)[3] which states that the United States should aim to furnish 30 groups of 6 squadrons (pursuit), and 30 groups of 6 squadrons (bombardment).

The estimated number of officers and men required for this project is 20,000 Officers and 110,000 Men.

TACTICAL AVIATION.

The tactical development will follow the development of the American land forces in Europe, and the personnel required to carry out this program can be calculated from the proposed tables of organization (Exhibit I).[4]

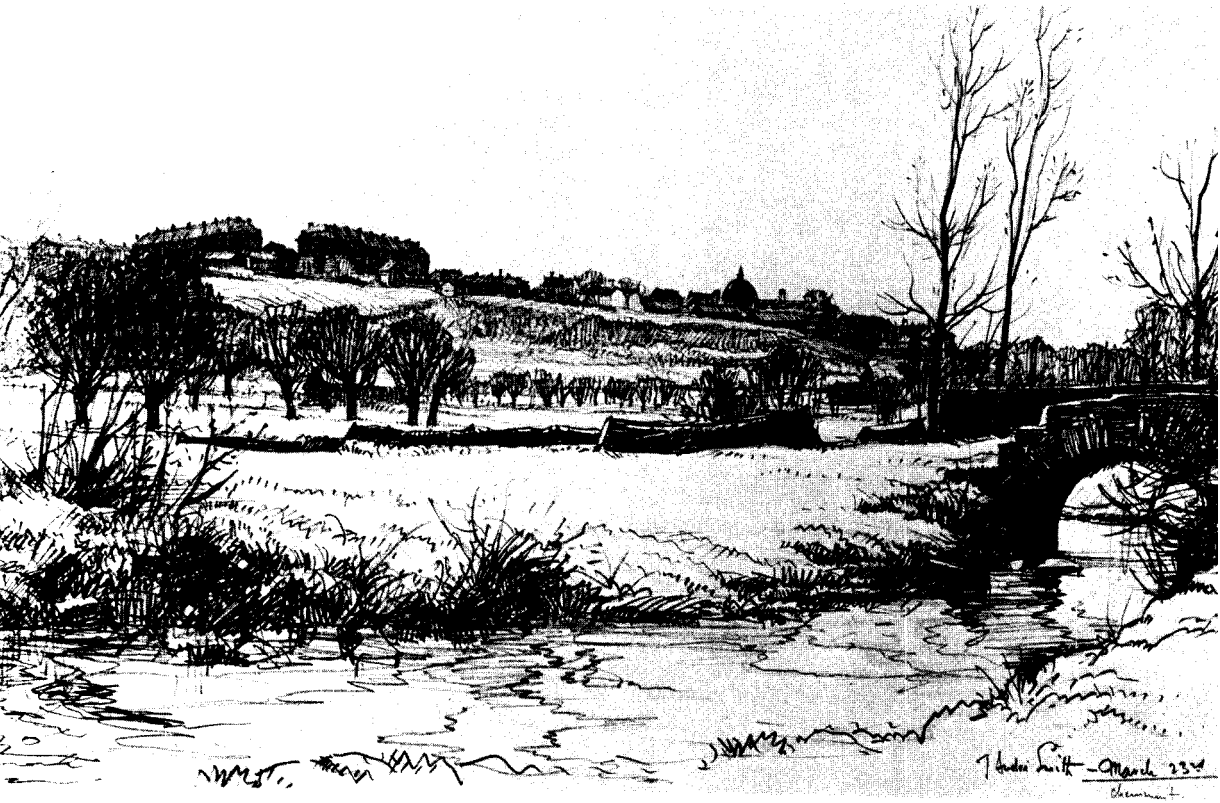
For each Army Corps there should be 141 officers and 1340 men.

On the basis of 10 Army Corps, this means

1,410 Officers
13,400 Men

The total air personnel will approximate 23,000 Officers and 125,000 Men. .....

1. In Gorrell's History, A-23.
2. Exhibit N was Parker's report on the role of aviation (see Doc. 22).
3. Omitted.
4. Omitted.



**Chaumont, France,
site of Pershing's Headquarters, AEF, during
World War I. (sketch by J. Andre Smith)**

24. Duties of the Chief of Air Service

5 July 1917

On 30 June Mitchell replaced Dodd as Aviation Officer. The duties of the position, which were to be changed to Chief of Air Service, were set forth in a general order assigning duties to the various staff officers of Headquarters AEF. The Headquarters had two major divisions, the General Staff, and the Administrative and Technical Staff, with the Chief of Air Service being in the latter.

Headquarters, A.E.F.
France, July 5, 1917.

General Orders,
No. 8.

The tables hereto attached show the present distribution of staff duties of the Headquarters of the American Expeditionary Forces. . . .

The distribution of staff duties in the headquarters of divisions, army corps and other commands subordinate to these headquarters will conform in principle to the distribution of duties shown in these tables.

. . . . . .

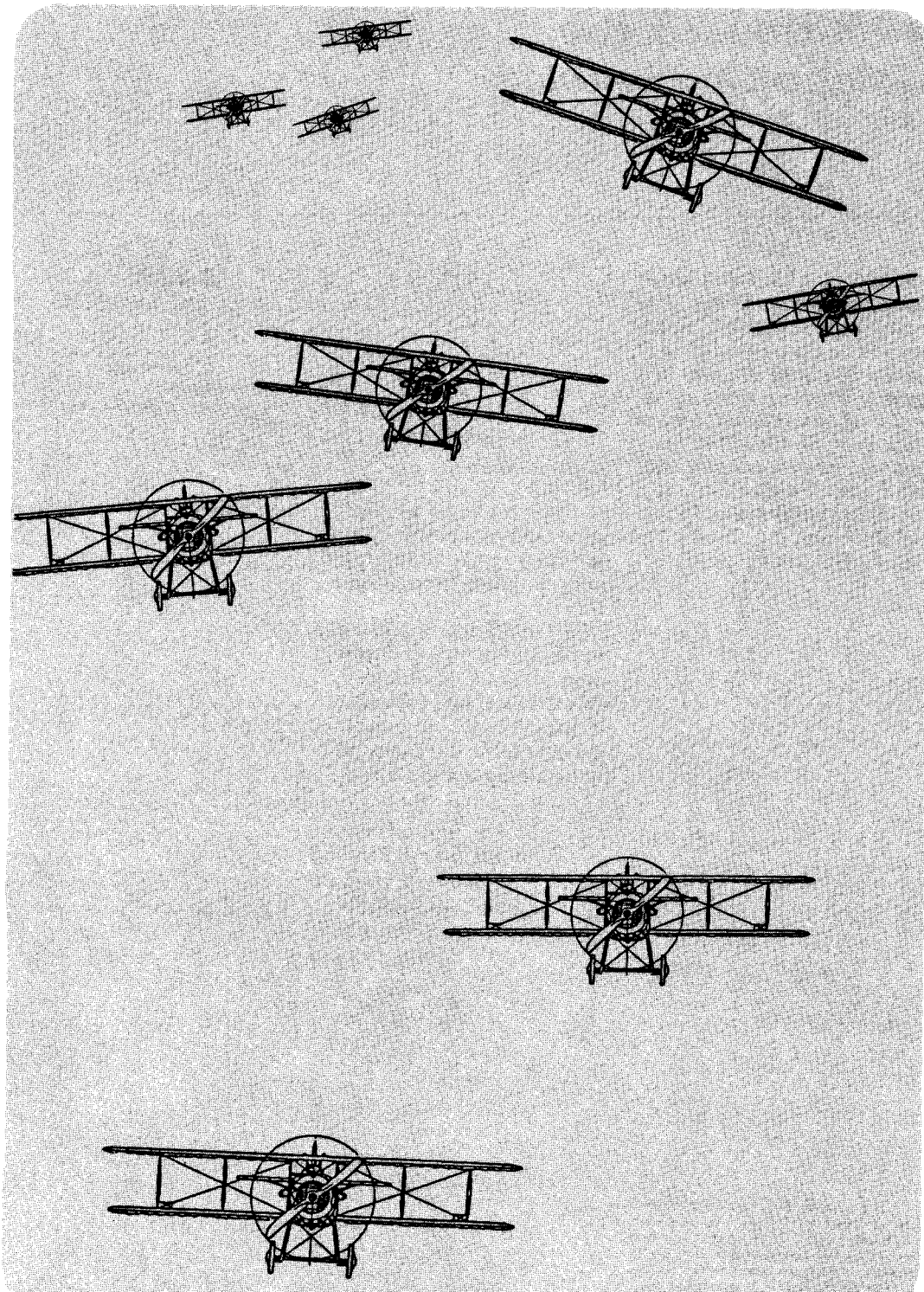
By command of
Major General Pershing:

James G. Harbord,
Lieut. Col. General Staff,
Chief of Staff

Table IV.
Technical and Administrative Services

(Air Service)
Aviation and aero station.
Enlisted and commissioned personnel of aviation units.
Material.
Organization.
Instruction.
Aerial reconnaissance observation and photography.
Aerial combat and bombing.
Etc., etc.[1]

1. The second, fifth, and eighth items were dropped and a new one—Airplanes and balloons—was added at the beginning when the duties were revised in G.O. 31, 16 February 1918, at the time Services of Supply was established with jurisdiction over the administrative and technical services of the AEF.



25. 59-Squadron Plan

10 July 1917

On 10 July 1917 Pershing forwarded to Washington a plan for the tactical organization of the AEF.[1] Known as the General Organization Project (GOP), this plan had been developed jointly by the Operations Section of his headquarters and a board of officers, headed by Col. Chauncey Baker, sent to France by the War Department to look into matters relating to the organization, armament, and equipment of troops. In the GOP, which was based on an army of about 1,000,000 men, aviation units were assigned to the army and to each of the army's corps but not to divisions.[2] The total number of aero squadrons in the GOP was 59, of which 39 were observation, 15 pursuit, and 5 bombardment (see Appendix B). Following are extracts from the GOP.[3]

Headquarters American Expeditionary Forces, Office of the Chief of Staff, Operations Section

July 10, 1917.

REPORT ON ORGANIZATION

(Modifications resulting from general conference included herein.)[5]

1. BASIS OF STUDY

In preparing the attached tables of organizations the Operations Section has considered the provisional organization prescribed for the first division ordered to France, definite projects presented by the French Army, Headquarters and British Army Headquarters in France, and has taken as the basis of the study a total force of about 1,000,000 men in France. This force includes not only the combat elements, but also those necessary to main these combat forces.

. . . . . .

F. C.
H. A. D.
A. B. B.[4]

A force consisting of about one million men has been taken as a basis for the following reasons:

(a) A thorough study of the subject of organization could not be made without considering a balanced force, complete in all the weapons and services essential to modern war.

(b) An Army is the smallest unit fulfilling the conditions included in -a-.

(c) The operations of the American forces in France must, for many reasons not discussed herein, include offensive action on a large scale. To carry this

1. The transmittal was dated 10 July, but the memorandum by which Pershing formally approved the project was dated 11 July.

2. In the AEF the infantry was organized into platoons of 58 men (commanded by a lieutenant), with 4 platoons to a company (captain), 4 companies to a battalion (major), 3 battalions and a machinegun company to a regiment (colonel), and 2 regiments and a machinegun battalion to a brigade (brigadier general), the other arms being organized in a similar fashion. Two brigades of infantry and one of field artillery, plus engineer, signal, and other troops, constituted a division (major general). In the GOP the army was organized into five corps (major general), each with four divisions (major general).

3. In Gorrell's History, A-23, also A-7.

4. The staff committee on organization consisted of Lt. Col. Fox Conner, Maj. Hugh A. Drum, and Maj. Alvin B. Barber.

5. This was a conference of members of Headquarters AEF and members of the Baker Board.

action out on a front sufficient to produce results commensurate with the endeavor, there must be available 20 combat divisions for the operations.

(d) With 20 combat divisions as a basis, the Corps and Army troops and necessary Line of Communications troops were determined.

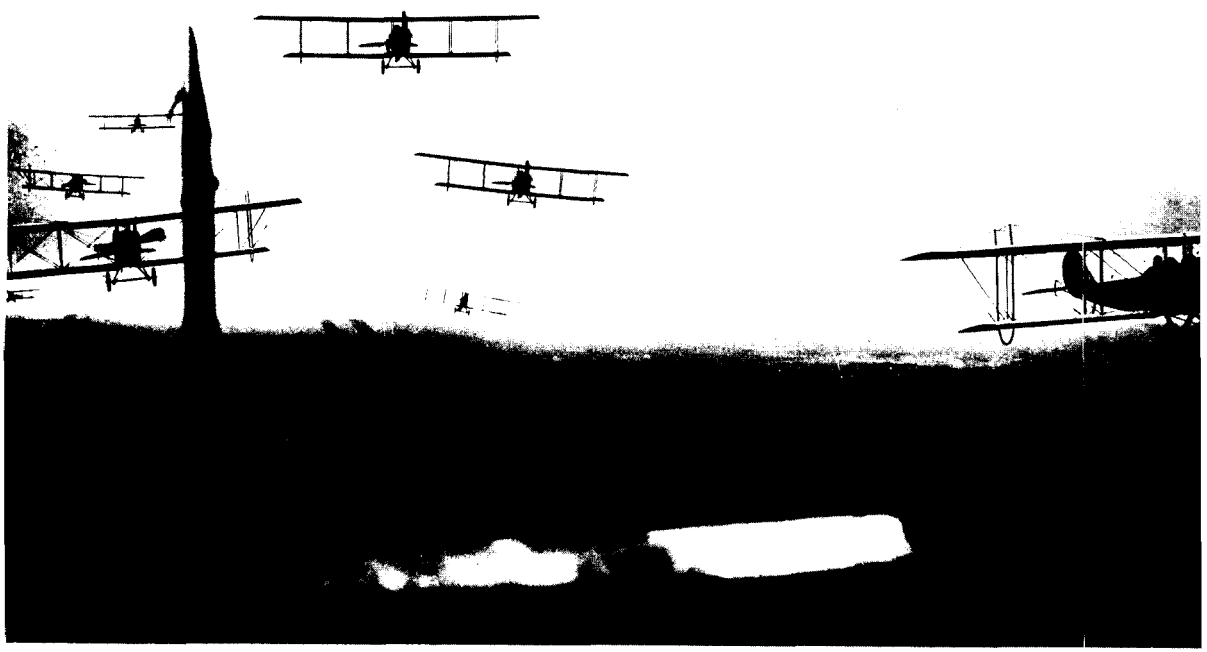
It is evident that a force of about one million is the smallest unit which in modern war will be a complete, well balanced, and independent fighting organization. However, it must be equally clear that the adoption of this size force as a basis of study should not be construed as representing the maximum force which should be sent to, or which will be needed in France. It is taken as the force which may be expected to reach France in time for an offensive in 1918 and as a unit and basis of organization. *Plans for the future should be based, especially in reference to the manufacture etc. of artillery, aviation and other material, on three times this force, i.e. at least three million men. Such a program of construction should be completed within two years.*

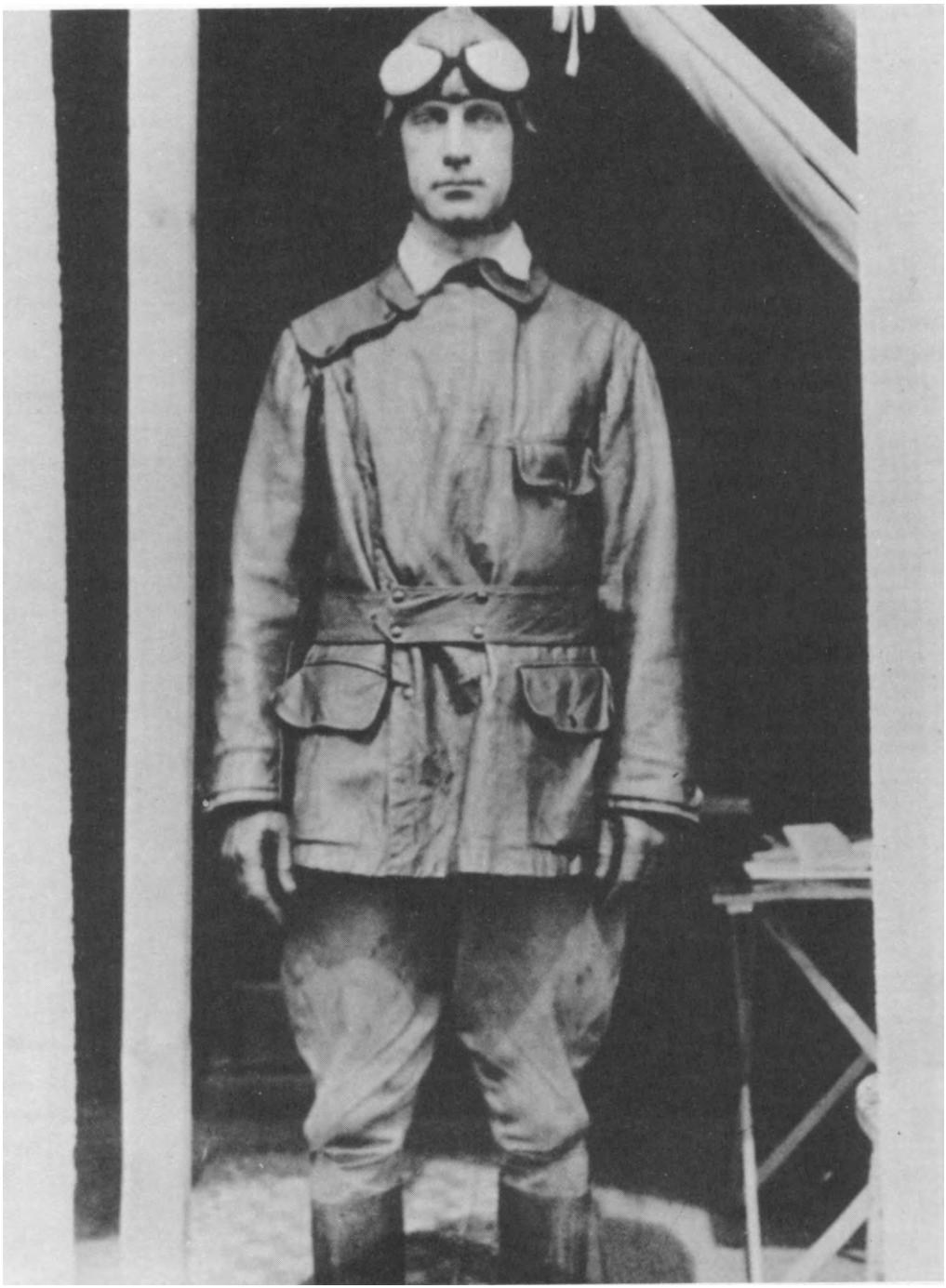
Table III
A Corps (4 Combat and 2 Replacement Divisions.)

	Approximate Strength
Headquarters	350
Combat Divisions	100,000
Replacement Divisions	44,528
Corps Troops	
Aviation Troops:	
1 Comdr. & Staff	15
2 Squadrons (Pursuit)	350
3 Squadrons (Art. Service)	500
1 Section, Photographic	150
1 Section Meteorologic	150
1 Aviation Park Co.	104
3 Balloon Cos.	468

Table IV.
Army Headquarters and Army Troops.

		Approximate Strength
Headquarters	Commander, Staff and Hq. Details to be subject to future study.	150
Aviation	1 Commander and Staff	1,600
	5 Squadrons—pursuit 5 Squadrons—Bombardment.	
	24 Balloon Cos. Service with heavy 24 Squadrons Artillery of Army	
	2 Sections, meteorological 3 Sections, photographic	300
	16 Park companies	1,000





Maj. Raynal C. Bolling

26. Bolling Report

15 August 1917

Maj. Raynal C. Bolling, a New York corporation lawyer who had organized the first aero squadron in the National Guard, was sent to Europe by the War Department in June 1917 with a group of military and civilian engineers and technicians to gather information for the production of airplanes and other aeronautical equipment. His report, like that of the Board of Officers, advocated an air force of fighting and bombing planes over and beyond the aviation that would be assigned to the various elements of the ground forces. In bombardment, Bolling distinguished between operations conducted during the day and those carried out at night, as is indicated in the following extract from his report.[1]

45, Avenue Montaigne, Paris, France.

August 15, 1917.

FROM: Major R. C. Bolling, S.O.R.C.

TO: Chief Signal Officer of the Army, Washington, D.C.

SUBJECT: Report of Aeronautical Commission.

1. The Aeronautical Commission under my charge left New York on the steamship "Adriatic" June 17, 1917, landed at Liverpool June 26, 1917, proceeded to London, remained there about a week, proceeded to France and to Paris, remained there about two weeks, proceeded thence to Italy, remained there about ten days, returned to Paris and remained there about ten days. Thereafter the party was divided according to new instructions and duties. . . .

. . . . . .

C. American Production Program.

There is general agreement here in the opinion we have formed concerning the governing principle for our American production program. That opinion is as follows:

First:—The United States must provide itself with all airplanes and engines required for training purposes in America.

Second. The United States must next provide the airplanes and engines necessary for use strictly in connection with the operation of American Forces in the Field. . . .

Third. After these first two considerations comes the American program of putting into the field next year air forces in excess of the tactical requirements of its Army in France. It is greatly desired that the United States shall do this. Such air forces should consist of fighting airplanes and bombers. The fighting airplanes are divided into two classes:

(a) Airplanes with fixed engines.

(b) Airplanes with rotary engines.

Both types appear to be essential. We all hold the opinion that the rotary engine is much less reliable and has much less length of service than the stationary engine; but for certain purposes it appears to be indispensable. The bombing airplanes may be divided into day and night bombers.

Day bombing presents much greater difficulties than night bombing because it cannot be conducted successfully by slow

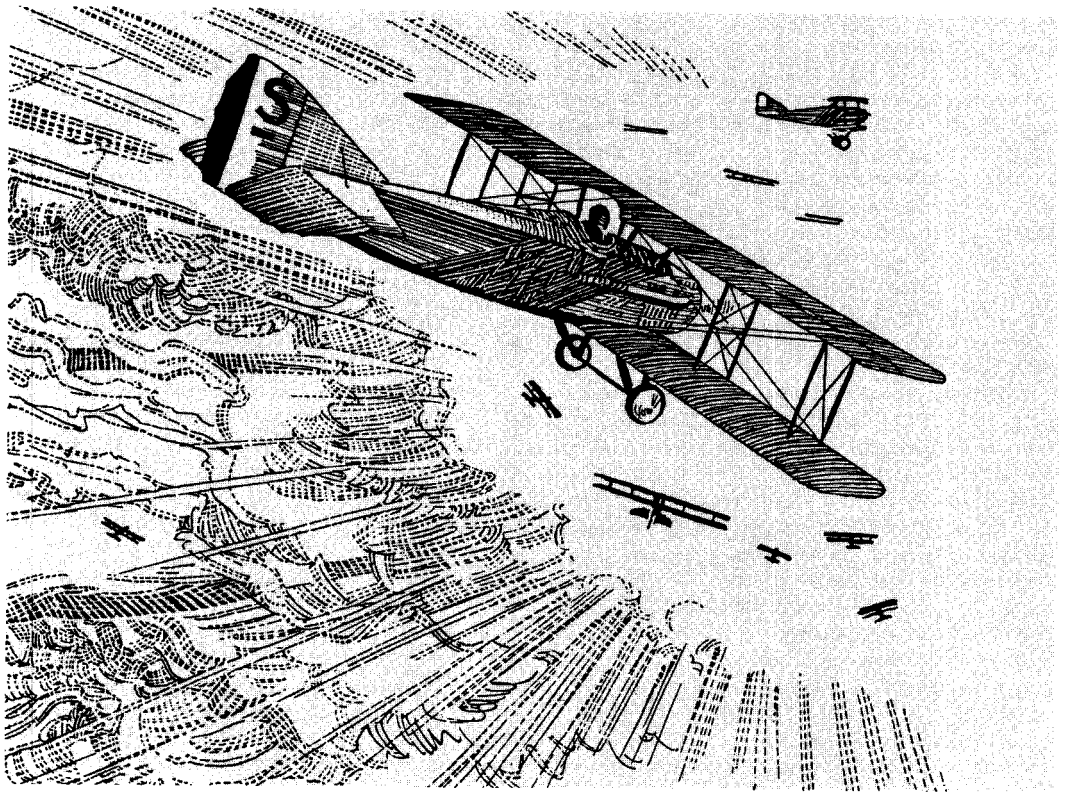
1. In Gorrell's History, I–1, pp 80–88.

machines with great bomb carrying capacity, if the enemy have in the air any number of fast fighting machines or have great numbers of anti-aircraft guns effective at great altitudes. If it should be possible to drive from the air practically all the enemy fighting machines, day-bombing would become much more effective. Night bombing permits to [?] use large airplanes without great speeds but with great bomb-carrying capacity. There is practically no effective means of preventing night-bombing. Therefore, its possibilities appear to depend almost entirely on the number of suitable airplanes which can be provided. From the military standpoint these possibilities are very great and extremely important. Could night bombing be conducted on a sufficiently great scale and kept up continuously for a sufficient time, there seems good reason to believe that it might determine the whole outcome of military

operations. Up to the present time, the trouble seems to have been that all bombing has been carried on intermittently and sporadically because of the lack of attention to the subject and provision for large enough numbers of the right kind of airplanes. In this connection, it may be well to compare the situation with artillery bombardment. While I speak with some diffidence on such a subject, all I have been able to learn indicates that intermittent and sporadic artillery bombardment produces but small results notwithstanding the great size and accuracy of modern bombardment artillery.

When definite and important results are desired, artillery bombardment must be made systematic and continuous and tremendous quantities of high explosives must be used on the selected objectives. This seems to be exactly the situation which exists with respect to airplane bombardment. There seems every reason to believe that it can be made of vital importance if very great numbers of airplanes carrying great size and numbers of bombs can be provided and used continuously and systematically.

To determine the proportion of airplanes of different types for United States production we have recommended the following rough method of calculation which seems to give results that check up pretty well with the views over here: First deduct from the total number of airplanes it is considered possible to produce the number required for use in direct connection with the military forces. That number can only be determined where it is known what will be the size of the military forces at any given time and that number varies only in proportion to the size of the forces. By this deduction having obtained the number of airplanes within your capacity of production which can be used independently of United States military forces, we recommend that this number be apportioned as follows: About thirty seven and a half percent should be fighting airplanes divided equally between fixed and rotary engine fighters. About twenty five percent should be day bombers and about thirty seven and a half percent should be night bombers. Of course, it is impossible to establish any proportions which are likely to be entirely correct because it is impossible to tell what will be the air conditions at any given portion of the front at any given time. For example, the enemy may have a larger or smaller number of fast fighting machines requiring that we have a larger or smaller number of these machines and permitting our use of a smaller number of day bombing machines.



27. 260-Squadron Plan

18 September 1917

Although the GOP (Doc. 25) included troops for the Service of the Rear (later, Line of Communications, still later, Services of Supply),[1] it did not indicate what kinds of troops would be needed or how they were to be organized. These details were provided in September 1917 by the Service of the Rear Project (SORP). Headquarters AEF used the SORP to add 201 aero squadrons for strategic aviation, which had been omitted from the GOP. This was done to bring AEF planning more into line with production plans made in the United States following the receipt of the Ribot cable (see Doc. 16). With the addition of 201 squadrons to the 59 in the GOP, the total went up to 260: 120 pursuit, 80 observation, and 60 bombardment. Extracts from the SORP, approved by Pershing on 18 September 1917, are printed below.[2]

L.R.E.
S.H.
A.B.B.[3]

Headquarters American Expeditionary Forces, Office of the Chief of Staff, Operations Section

September 6, 1917.

MEMORANDUM FOR
Chief of Staff

Subject: Services of the Rear and Lines of Communication.

1. The Commander in Chief's letter, dated July 10, 1917, transmitting to the War Department the A.E.F. General Organization Project (G.O.P.) states, in paragraph 3, "Recommendations as to Lines of Communication troops will be submitted later."

. . . . . .

4. The basis of the projects submitted herewith is identical with that of the G.O.P., i.e., a force of 20 fighting and 10 replacement (base and training) divisions with Corps, Army, G.H.Q., and L. of C. troops. The total estimated strength of this force, including service of the rear and L. of C. troops, was given in Table 2, G.O.P., as about 1,100,000 men. It is now found that the following modifications in this estimate must be made:

(a) The forward services are to be increased by 55,590 men, of which 6,560 signal troops are to be added to the total strength of the 30 infantry divisions, 1,038 ordnance personnel are to be added to the army troops and 47,992 aviation personnel are to be added to the Army troops. The increase in the divisional signal troops is necessary on account of the adopted signal corps personnel for infantry regiments. The increased ordnance personnel is due to the inadequacy in the G.O.P. estimate. The addition to the aviation personnel consists of strategical units, all of which are not strictly necessary for the American

1. These designations apparently are correct although an "s" often was added to "Service" in SOR and to "Line" in LOC and dropped from "Service" in SOS.

2. In Gorrell's History, A-23, also A-12.

3. Col. Le Roy Eltinge, Lt. Col. Stuart Heintzelman, and Lt. Col. Alvin B. Barber.

forces herein considered, but are to be used on the fronts occupied by our Allies as well as on our own. It is necessary, however, to consider them in preparing a project for the service of the rear and in formulating a shipping program. With the

Totals for Aeronautics.

Front—Tactical

	Total Personnel
5 Corps	8,255
Army	15,123
Total Tactical—all recommended by A.E.F. organization Project of July 11, 1917, except 13 Park Cos. of strength of 1352	23,378

Front—Strategical.

41 Observation Squadrons	7,093
105 Pursuit Squadrons	18,165
55 Bombardment Squadrons	10,670
15 Balloon Companies	3,120
73 Park Companies	7,592
Total Personnel	46,640

Rear

Hq. Air Service L. of C.	50
Research, Finance, Purchase, Inspection and Provision of Personnel	295
Training and Replacement	24,066
Repair and Salvage	10,400
Housing of Material and Personnel	2,600
Reserve of Mechanics, etc.	12,272
Supply and Assembly	5,200
3 Port Depots × 104	312
3 Port Balloon Companies × 208	624
	55,819

Recapitulation

Total Strength—Tactical	23,378
Total Strength—Strategical	46,640
Total Strength—Service of Rear	55,819
Grand Total	125,837
Total Service Planes—exclusive of Training and Replacement Planes	4,680
Total Balloons—exclusive of Training and Replacement Balloons	57 in service 87 spare.

above additions the total of divisional, corps, army and G.H.Q. troops, including base and training divisions, amounts to 998,795 men. This figure includes the noncombatant organizations pertaining to divisions, corps and armies.

Kirby Walker
Lt. Col. Cav.,
Acting Chief of Section

Brig. Gen. William L. Kenly, Chief of Air Service, AEF (August–November 1917), inspects gondola.

28. Command in the Zone of Advance

10 October 1917

In August 1917 the activities of the Air Service, AEF were divided between the Zone of Interior, where Col. R. C. Bolling was placed in charge, and the Zone of Advance, where Col. William Mitchell was placed in command. About the same time, Brig. Gen. William L. Kenly was named Chief of Air Service, AEF. Mitchell's authority was outlined in the following order.

Headquarters, A.E.F.
France, October 10, 1917.

General Orders
No. 46.

. . . . . .

II. 1. Under the direction of the Chief of Air Service, all Air Service units and personnel serving in the Zone of Advance are placed under the command of the Air Commander, Zone of Advance, who is charged with their proper administration, instruction, discipline and employment.

2. Command of the Air Service, Zone of the Advance, includes:

Tactical Air Units, assigned to armies and corps.

(a) Formation and equipment of units formed in the Zone of the Advance.

(b) Technical supervision and inspection.

(c) Supervision of tactical employment.

(d) Supervision of instruction in the Zone of the Advance.

Strategical Air Units not assigned to armies and corps but attached directly to these headquarters.

(a) Formation and equipment of units formed in the Zone of the Advance.

(b) Tactical employment.

(c) Technical inspection.

(d) Instruction in the Zone of the Advance.

Air Depots and Parks in Zone of the Advance.

(a) Technical supervision and inspection.

Air Schools in Zone of the Advance.

(a) Supervision of instruction.

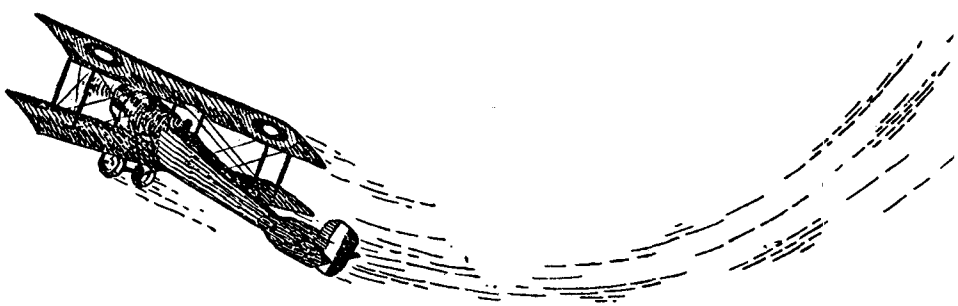
Liaison With the Air Services of Allied Armies.

This liaison is to be maintained under the direction of the Chief of Air Service by means of liaison officers detailed at the request of the Commander in Chief.

. . . . . .

By command of
General Pershing:

James G. Harbord.
Brigadier General,
Chief of Staff.



On behalf of the British Government, Gen. Sir D. Henderson, K.C.B., decorates Col. Edgar S. Gorrell with the "Companion of the Distinguished Service Order."

29. Gorrell: Strategical Bombardment

28 November 1917

When Maj. Edgar S. Gorrell[1] became Chief of the Technical Section, Air Service, AEF, on 15 August 1917, he became responsible for initiating purchases for all kinds of equipment and supplies that the Air Service would need during the following year. Investigating and attempting to anticipate requirements of materiel for bombing operations, he made a study of the bombardment situation and from that formulated a bombardment plan for the Air Service, AEF. That plan, printed below,[2] was to be characterized many years later by Maj. Gen. Laurence S. Kuter of the U.S. Army Air Forces as the "earliest, clearest and least known statement of the American conception of the employment of air power.[3]

Brig. Gen. Benjamin D. Foulois, who became Chief of Air Service, AEF on 27 November, not only approved the plan but made Gorrell, who had been promoted to lieutenant colonel, the head of Strategical Aviation, Zone of Advance, AEF. As events developed, however, Gorrell's bombardment plan could not be carried out. Gorrell explained why in the "Early History of the Strategical Section" which he wrote in January 1919 as part of the "History of the Air Service, AEF."[4] Extracts from the history of the section are presented below as a sequel to the plan.

A. Plan

I. Introduction.

(a) Three and a half years of War finds us in a position in which movement either by land or by sea is rendered vastly difficult and expensive. On the sea the Allies' superiority keeps the Central Power's above-water ships inactive, while on land, where Allied and enemy trench systems face each other from sea to boundary on the western front, movement can only be obtained over short distances by vast concentration of artillery, without which the infantry cannot advance. The speed with which the infantry can advance is determined by the speed of movement of the artillery, and even a minor operation demands a heavy toll of life and material.

If the conduct of the War is to be seriously affected in the near future, a new policy of attacking the enemy must be adopted.

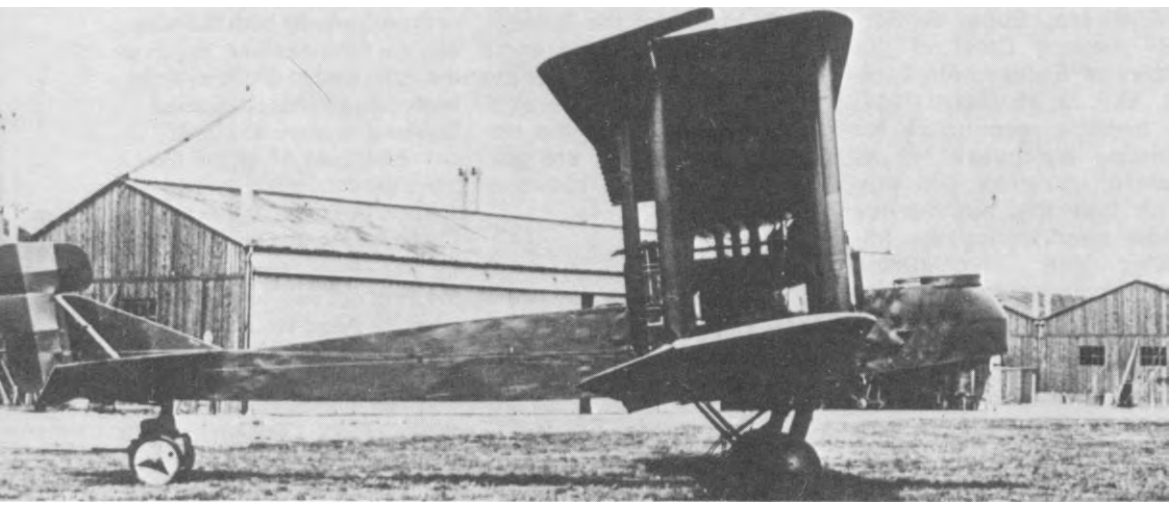
(b) Apparently both the Allies and the Germans have begun at the same time to conceive of the immense importance of aerial bombing, and we find in all countries, both Allied and German, the conception of the immensity of such a problem and the beginning of a preparation for a bombing campaign. Judging from our own knowledge of what the Allied countries are doing and from the report of Allied spies in the German territory, the Allies are far behind the Germans at the present moment in preparation for next year's bombing campaign. We constantly receive reports from our spies and agents in the German territory, indicating an increase in the size of many German factories—to be specific, indicating that about 25 German airplane factories have extended and increased facilities for output and increased number of employees—and our information even goes to show that portions of the Zeppelin Works have been prepared to build bombing airplanes. It is certain that Germany is concentrating on the manufacture of the Gotha airplane, to be

1. For biographical data see the Introduction to the first volume in this series.

2. In Gorrell's History, B-6, pp 373-390.

3. Kuter, "Air Power—The American Concept," [c. 1943,] photostat of typewritten copy in AFSHRC 167.6-50.

4. The history of the Strategical Section is in Gorrell's History, B-6, pp 371-401.



Germany's Gotha bomber.

supplemented by pursuit airplanes. The recent activities of the German forces in bomb-dropping, especially by night, have been an indication of her probable use of these bomb-dropping airplanes next year; and the bombs which she is now using have also been an indication of the type of bomb she will attempt to drop upon the Allied forces.

(c) The German Lines are so situated that bomb-dropping is a very easy problem for the German forces, compared with bomb-dropping for the Allied forces; and judging by the character of the airplanes Germany is building for bomb-dropping, together with the realization both sides have apparently come to—namely that to affect the armies in the fields it is necessary to affect the manufacturing output of the countries—we can readily see that next spring and next summer the Allies will be visited by bomb-dropping airplanes, both by day and by night and will be confronted with the enemy's superiority in the air and with a bomb-dropping campaign against them that will tend to wreck their commercial centers, to say nothing of the moral effect of such bomb-dropping against the inhabitants of the Allied countries.

(d) This scheme which Germany is apparently talking of inflicting upon the Allies is the same as the Allies have recently been talking of inflicting upon Germany; but the difference between the two is simply that the German words are being rapidly turned to deeds, while the words of the Allies lack deeds to back them. Therefore, it becomes of paramount importance that we adopt at once a bombing project to be immediately put into force and carried out with all vigor at the quickest possible moment, in order that we may not only wreck Germany's manufacturing centers but wreck them more completely than she will wreck ours next year.

(e) German shells are being fired at Allied troops and positions over a large area of the Front; but the manufacture of these shells is dependent upon the output of a few specific, well-known factories turning out the chemicals for them, so we can

readily see that if the chemical factories can be blown up, the shell output will cease, to a greater or lesser degree dependent upon the damage done these chemical plants. The same is true of airplane output; the large Mercedes engine plants and the Bosch magneto factories are located in the same city, and if bombing airplanes raid this city of Stuttgart and can inflict damage on one or both of these plants, the output of German airplanes will cease in proportion to the damage done.

(f) Many of these points could be gone into at length, but it is not necessary here for the advantages of bombing manufacturing centers is recognized without debate.

II. Division of bomb-dropping.

(a) Aerial bomb-dropping is divided essentially into two classes, tactical and strategical.

(b) Tactical bomb-dropping is becoming better known every day as the War goes on; and the results obtained by the Handley-Page squadrons in the vicinity of Dunkerque, as well as the bombardment against Dunkerque by the Germans, have more than indicated that wonderful results could be accomplished along tactical lines, should aerial bomb-dropping be really carried out in a manner which some of its ardent advocates have urged for a long time. The necessity for tactical bomb-dropping is evident and will come about as such a matter of course that it is not treated in this paper since the idea of this paper is solely that of strategical bombing against commercial centers and lines of communications, with a view to causing the cessation of supplies to the German Front.

(c) By strategical bomb-dropping is meant, in the larger sense of the word, bomb-dropping against the commercial centers of Germany. An army may be compared to a drill. The point of the drill must be strong and must stand up and bear the brunt of the much hard work with which it comes into contact; but unless the shank of the drill is strong and continually reinforcing the point, the drill will break. So with the nation in a war of these days, the army is like the point of the drill and must bear the brunt of constant conflict with foreign obstacles; but unless the nation—which represents the shank of the drill—constantly stands behind and supplies the necessary aid to the point, the drill will break and the nation will fall. The object of strategical bombing is to drop aerial bombs upon the commercial centers and the lines of communications in such quantities as will wreck the points aimed at and cut off the necessary supplies without which the armies in the field cannot exist.

(d) When we come to analyze the targets, we find that there are a few certain indispensable targets without which Germany cannot carry on the war.

III. German targets to be attacked.

(a) The first question to consider in an air offensive against German industrial towns is the question of objectives, and these can be divided into four main groups, following the general division made by English experts on this same subject.

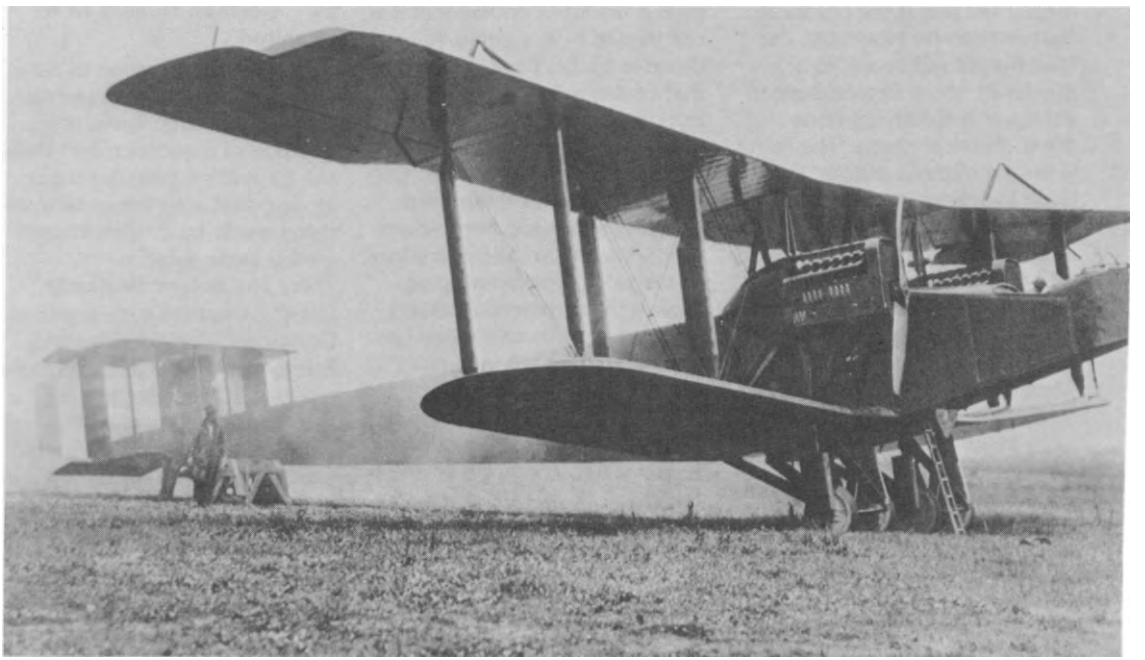
(b) The first, or Northerly group, comprises such towns as Dusseldorf, Crefeld, Elberfeld, Essen, and other German towns grouped in their vicinity. For short this may be called the *Dusseldorf group.*

(c) The second group is a collection of objectives, the center of which may be taken as Cologne. This we will call the *Cologne group.*

(d) The third and most important group comprises Mannheim and Ludwigshafen and also the manufacturing industries in the vicinity of Frankfurt, such as the Meister-Luciuc Works at Hoechst, and the Casella Works on the far side of Frankfurt. This we will call the *Mannheim group.*

(e) With the forces which the Allies will have available during the spring and summer of 1918, it is not wise to operate further south along the Rhine than the Mannheim group, except to make feints and infrequent raids against Karlsruhe and Rastadt.

(f) A fourth group of targets enter as a part of a logical scheme for destroying German



British Handley-Page bomber

ammunition works and these have special value for the reason that on days, such as often occur, when weather conditions prevent the airplanes from reaching targets in the Rhine Valley, bomb-dropping raids can nevertheless be made against targets in this fourth group. We will call this fourth group the *Saar Valley group*, which comprises the numerous steel works of this Valley.

IV. Base of operation

(a) Having chosen, as generally outlined above, the German objectives it becomes necessary to consider from what bases they are to be attacked. Two large bases have been used in the past; one from the Ostende region, the other from the region in the vicinity of Toul. These two may be compared as follows:

(b) If the Ostende region is to be taken as a base or center of our operations, the following disadvantages will have to be considered. These disadvantages are inherent in the terrain and cannot be removed. Although it is true that the first two groups—namely the Dusseldorf and the Cologne groups—may be attacked from the Ostende base nearly as easily as from the Toul base, yet the other groups will be entirely out of the question. Furthermore, the Germans will be entirely aware of these facts and therefore, for the purpose of defense, they will know the limitations of the chosen objectives of each and every one of the raids that we may attempt to make; whereas in operating from the Verdun-Toul base, the Germans will never know for what particular objective the raid is intended and hence must be proportionately extravagent of airplanes for defensive purposes. Furthermore, such concentration of airplanes as Germany effects for defensive purposes against our strategical bomb-dropping raids, means the subtraction of this number from her airplanes in tactical use over our Front. The following figures roughly show the distances involved and the advantages of choosing a base:

(c) There is another disadvantage against the Ostende base, and that is the disadvantage inherent in weather conditions. Past records show that there are only a certain number of days, very far apart, on which it is possible to raid at the distances which are involved in reaching the first three groups of targets mentioned: British estimates show that these good days do not number more than four or five per month and that only during the summer months. There will, however, be a large percentage of days when short raids can very easily be made. From the Ostende base there are practically no targets against which short raids can be made to injure Germany's manufacturing centers; while from the Verdun-Toul base, the Saar Valley with its enormous steel works offers exactly the type of target which the Allies urgently desire to destroy; and therefore on days when raiding at long distances on Germany's Rhine Valley targets is impossible, short raids against the Saar Valley are feasible and sometimes several raids per day can easily be made.

		Distance	Go and Return	Extra mileage in excess of shortest mileage
From **Ostende District**	Dusseldorf straight	186	372	:32
	Dusseldorf by Maastritt	206	412	:72
	Cologne straight	185	370	:70
	Cologne by Maastritt	192	384	:84
	Mannheim	280	560	:360
From **Souilly**	Dusseldorf straight	170	340	
	Cologne	150	300	
	Mannheim	150	300	:40
	Frankfort	170	340	:20
From **Toul**	Dusseldorf	190	380	:40
	Cologne	170	340	:40
	Mannheim	130	260	
	Frankfort	160	320	

(d) It has sometimes been advocated that raiding might be done across the northern border of Belgium, in order to permit pilots who fail because of engine failure to land in Holland. But such an agrument is a myth rather than a reality. If the Allies are constantly performing raids from the Ostende base across Holland, we might find ourselves in a rather awkward diplomatic situation, and therefore any scheme to deliberately violate the neutrality of Holland is untenable. If neutrality laws be not violated, raiding from the Ostende base against German targets becomes extremely difficult because of the increased length of flight necessary.

(e) Apparently there is only one base from which operations should first be begun, and that is the base which we may call, for the purpose of reference, the *Verdun-Toul base.* It is suggested that we begin operations against the German targets with our airplanes operating from this Verdun-Toul base, and, as the number of airplanes in commission increases, that we spread out from this base as a center on either side, as conditions may indicate best, until, as a climax, airplanes may be used from all portions of the Allied lines to concentrate against the German targets which it is hoped to destroy:—the Rhine Valley targets being the targets for clear day operations and those at hand being attacked on days when it is impossible to reach the Rhine Valley.

(f) In this base known as the Verdun-Toul base, there are really two bases: one roughly on a quadrilateral bounded by Pont St. Vincent, Toul, Void, and Vezelise. This for short we will call the *Toul group*; and its rail-heads will be Pont St. Vincent and Toul, with main depot and park at Toul. The second group will be in the district whose center is Souilly, and the rail-head, park and depot will have to be chosen in accordance with details to be taken up later on.

(g) The first concentration of airplanes is suggested for the Toul base, and those to be used next for the Souilly base. As the number airplanes increases, they can be divided proportionately between these two bases until such time as we have a sufficient number to extend in either direction from these bases and to use airdromes along other portions of the line. In the location of airdromes it is to be kept in mind that any German concentration against our airdromes would deplete our aerial forces, and, therefore, our aerial squadrons must be scattered about the country in the most advantageous manner to prevent their depletion by bomb-dropping raids on the part of the Germans. Furthermore, the existence of numerous airdromes about the bases hereinbefore indicated will increase the difficulties of German intelligence and, therefore, will render less difficult the protection of our airdromes from German aerial raiding.

V. Choice of systems or raiding.

(a) There are two large systems of aerial bomb-dropping. One is what is known as daylight bombing; the other is night-time bombardment. There are many arguments both in favor of and against each kind of bomb-dropping, but it goes without saying that our efforts should be directed against the German objectives both by day and by night, giving the Germans no rest from our aerial activities and no time to repair the damage inflicted. In this project it is proposed to commence this bomb-dropping with day-light bombardment solely because of the question of availability, since deliveries on our daylight bombardment airplanes will take place prior to deliveries on our large night bomb-dropping airplanes of Caproni and Handley-Page types. This will lend itself readily to our final project of both day and night bombardment, since our pilots will be receiving training in aerial navigation over Germany during the day, while we are waiting for the arrival of our night-time airplanes.

VI. Difficulties to be encountered which necessitate immediate preparation.

(a) There will be considerable difficulty in instructing the pilots in the art of navigation when going very long distances, and course of instruction must be immediately established in the flying schools for obviating this difficulty.

(b) The ordinary map of Germany in existence is not sufficient to permit green pilots to find their way across Germany and home again in safety, and therefore the preparation of a special map of Germany must be begun at once, following the indications which the Army Air Service is prepared to submit to the Topographical Section of the Intelligence Division of the Army. This special map was that contemplated in a letter to the Chief, Intelligence Division, A. E. F., dated November 12, 1917, subject "Aviation Maps for the American Army", signed by Brigadier-General Kenly, requesting the preparation of such a map.

(c) Weather conditions along the Rhine Valley permit of raiding only during special times of year—these being mainly in the late spring, the summer, and the early autumn—and therefore if bomb-dropping against German commercial centers is to be feasible during the year 1918, preparations must be begun at once in order that we may be ready in time to take advantage of the weather.

(d) As indicated above, our advices show that Germany is already preparing a large bomb-dropping against the Allies. The existing program of Allied production of airplanes is on too small a scale to manufacture a sufficiently large number in time for 1918, and therefore a decision should be made immediately to undertake this bomb-dropping campaign in order that the necessary impetus may be given to the production of airplanes to permit their receipt in time for such a campaign.

(e) Assuming that each effective machine in commission performs four raids per week—which, considering the short distance from our chosen bases to the Saar Valley targets, is not too optimistic—the total output of bombs heretofore contemplated for next year on a basis of past aviation, when bomb-dropping was not seriously considered, must be increased to meet the demands of next year. This increase can be easily effected if a decision is made, and made now, to consider such a bomb-dropping campaign. Hence the necessity of an immediate decision for strategical bomb-dropping next year, in order that bombs may be ready when weather conditions permit the commencement of such a campaign.

(f) Considering the 50-pound bomb as a standard for calculation purposes, we find that two bombs will pack into a case about 2′6″ × 1′3″ × 2′9″; or, about 120 cases of bombs may be placed on a railroad truck. In the quantities contemplated, the bombs will have to be dumped into ammunition dumps in the open and provision should be made as soon as possible to provide underground bomb dumps in order that we may not have the regrettable experience of seeing our bomb dumps blown up as recently was the case at Dunkerque, where the Germans instead of attacking airdromes attacked the bomb dumps and rendered the bombing airplanes useless because of having destroyed their bombs. Furthermore, in this question of bombs, the technical sections of the Allies must design water-tight plugs, so that such bombs as are kept in the open or in underground dumps may be protected from weather conditions, thus necessitating keeping only the fuses and detonators in covered water-proof magazines. When handling such a large output of bombs as will be necessary for next year, we must consider that the following operations will be necessary: detonators and fuses must be put into the bomb, the fins must be screwed on, the bombs must be transported to the airplanes, and must then be

loaded upon the airplanes. Working with such large quantities it is clearly necessary to commence immediately to train special armament personnel in the loading and handling of bombs. This is not a difficult question, but needs to be undertaken at the earliest moment. Another point in the bomb question is the transportation of the bombs by rail from the seaboard to the point desired, and, when we consider that only about 240 bombs can be transported on an ordinary, average, flat-car we see that the transportation of sufficient bombs for a strategical campaign in earnest against the German targets becomes a large problem and one which the railroad authorities must take immediate steps to meet. This problem is not insurmountable nor difficult if steps are taken now and without delay.

(g) The next question of difficulty is that of sheltering the airplanes. During certain parts of the year, with luck, our airplanes should last roughly three months when kept in the open; but during the other portions of the year, as, for example, the rainy season, experience in Mexico shows that airplanes last only about two weeks; while French advices received about two weeks ago show that airplanes kept in the Toul region in the open, in the fall, or in other bad seasons, last only about 8 days. It becomes at once apparent, therefore, that every attempt must be made to shelter the airplanes; otherwise the replacement of airplanes due to lack of shelter becomes an enormous problem. For this purpose the United States is making provision to ship hangars to Europe with the various squadrons. Assuming the hangars arrived at the seaboard, the question of transporting them to the bases in the vicinity of Toul (or to wherever else the airplanes may be when they are at the Front) in sufficient numbers becomes rather difficult. Two thousand daylight bombarding airplanes of the DH 4 type would require about 500 Bessonneau hangars. Since about 10 railroad trucks are required to transport four Bessonneau hangars, we see at once that for even as small a number of airplanes as 2,000 we should require 1,250 railroad freight cars to transport these hangars. America is planning to adopt individual tent hangars, but the problem of transportation remains roughly the same as in the consideration of the Bessonneau hangars.

(h) Since the bases are chosen in the vicinity of Toul and are in the country where it becomes rather cold in the winter time, it will be necessary to provide shelter for the personnel. This amount of shelter will depend upon the size of the force involved. Due to the population of the country we cannot safely count upon billeting more than approximately one-third of our aviation personnel, and therefore the remaining two-thirds must be provided for, say, perhaps in standard French barracks which, under conditions prescribed by regulations, will accomodate 90 men per barrack. The question of figuring the housing necessary becomes one of mathematics, as the force increases in size, but it is necessary to commence now, owing to the scarcity of material for building purposes, in order to obtain sufficient barracks or sufficient housing facilities by the time that the airplanes are ready for the bomb-dropping campaign next year.

(i) Having chosen our first bases from which the airplanes will commence operation, it is necessary to choose landing fields, after the Italian system of one about every ten miles, from the point of assembly of American airplanes to our probable positions at the Front; to indicate on each landing field the portions where airplanes may land without smashing; and to erect wind-vanes to indicate the direction of the wind. These will be easy to keep up after they have once been established; but the labor of locating these fields and marking them should be undertaken immediately, since it is one of the small points which is essential for success next year.

(j) There are very few places in the vicinity of the entire Verdun-Toul bases where one can

land, and therefore details should be out at the present moment choosing these landing places and marking them so that they may be used either as airdromes or as landing places for machines in distress.

(k) The weather in the Rhine Valley does not by any means follow the weather on the French side of the Vosges mountains, and experience has shown that it is not satisfactory to rely upon existing weather reports as they are today predicted. Meteorological officers should, therefore, be sent out at once to study weather conditions in the Rhine Valley between now and next spring and summer, and reports should be received from our agents in Germany to assist in the calculations of probable weather conditions.

(l) Our Intelligence Section of the Army Air Service will have considerable work to do in the preparation of the necessary data for such a strategical bombing campaign as herein contemplated, in order that fully up-to-date information may be had on all targets and in order that proper maps may be prepared and proper instructions given to the various commanding officers and even to the individual pilots and observers.

(m) Any system of raiding such as contemplated herein means carefully prepared and timed plans, and in order that they may be carried out without defects, telephonic communications must be established between the various headquarters of groups and squadrons. This is a matter which must be done as soon as the airdromes are chosen, and work should be commenced thereon immediately.

(n) The question of rail-heads and transports must be considered, since it will be necessary to install at various points railroad sidings; and, in the case of large night bombarding airplanes, it may be found necessary to run special narrow-gauge railroad tracks into the airdromes themselves. The difficulty of transporting spares of large night bombarding airplanes like the Handley-Page must be overcome at once by choosing the routes which permit of transportation of the spares, since on account of the large chord of the wings of these airplanes it is not possible to transport them over every road in France, because they will not pass under all bridges. This means that special routes for transportation must be chosen.

(o) The question of transportation between the various groups becomes difficult, since in some places the ground is marshy and chalky and since under certain conditions the Germans may command some of the roads by shelling if they desire; and it will, therefore, be necessary to choose specific roads for the use of the transport interconnecting bomb-dropping routes, in order to supplement such transportation as takes place by railroad and the limited amount which can take place by air.

(p) The question of the actual choice of position of each individual airdrome is one which must be considered immediately; and it should be remembered that these should not be chosen too close to the German lines, as has actually been the case today with certain of the airdromes in that vicinity. A proper location of our airdromes will facilitate their defense against enemy raids.

(q) Since bomb-dropping over a distance of 150 to 200 miles necessitates a special knowledge on the part of pilots and observers far beyond any instruction now being given in any of the Allied schools, navigation becomes not the only problem, since a very large problem is that of teaching the pilots to know the country over which they are to fly. This means months of training in these particular maps of Germany, and pilots trained simply in the art of map-reading as it is taught today can never hope to accomplish their missions and return to their own lines in safety. French relief maps along existing lines should be made up of German terrain, and their formation together with the natural features of the terrain should be indelibly impressed on the minds of pilots and observers during their scholastic training.

Our own experience in the United States and in Mexico, and Allied experience in Europe, has shown that it is very easy for one or more machines or squadrons to start out to reach a certain point and to return to their base, each believing that he has reached the proper point, when probably all, or nearly all, have reached unconnected points and not the target for which they originally started to fly. Therefore, a knowledge of Germany must be taught to the pilots and observers in their instruction period, and provision must be made at the Front to keep up this instruction.

(r) From both the morale point of view and also that of material damage, concentration of our aerial forces against single targets on the same day is of vital importance since it tends to hamper the defense and also to complete in a thorough manner the work which the bombardment is intended to perform. Therefore, it is suggested that often all available airdromes should concentrate upon a single objective in a single day. For example, suppose 100 squadrons are available and that it is desired to attack Mannheim and the Ludwigshafen Works. Assuming a time-table of three minutes between squadrons, this means a bombardment of about five continuous hours. If immediately afterwards, on the next possible day, Frankfurt were attacked in a similar way, judging from the press reports of what has already occurred in Germany, it is quite possible that Cologne would create such trouble that the German Government might be forced to suggest terms if that town were so attacked. Furthermore, after such a bombardment, the manufacturing works would be wrecked and the morale of the workmen would be shattered. It is also to be remembered that in chemical works of this nature a fire once started will spread and that with such a bombardment going on throughout such a length of time the organization of the fire brigade and fire protection, in the already undermanned German villages, would be broken down and therefore the results would be out of proportion to the immediate effects of the bombs. Germany has shown by her attempts to wreck havoc with the morale of the Allied nations, in such cases as the bombardment of London, that her own human nature lends itself to having havoc wrecked with it in a similar manner, and the press reports taken from German papers indicate that this conclusion is correct.

(s) It cannot be pointed out that the scheme suggested herein is possible now; but it will be possible in the future only by taking the matter in hand immediately and working at extreme pressure from now on till operations are able to commence next year. Therefore, it becomes immediately essential to decide in favor of such an operation for next year and to take the necessary steps to organize and to put into operation such a campaign as that proposed herein. Neither can it be said that an operation such as this is impossible. All of us well remember the huge cry of "Impossible!" that went up when it was proposed to concentrate enormous artillery attacks on the German lines such, for example, as the British have concentrated during the months of August and September against the German Front. Every one of us can now see that what looked impossible in the past has become a reality accomplished with ease in the present. So, with this bomb-dropping campaign, while the difficulties look large at present they will become feasible realities if we only start immediately to prepare.

VII. Future Operations.

(a) After starting the campaign as indicated herein, the difficulties connected with the commencement become negligible; but those connected with transportation and supply of both personnel and material become larger as the campaign increases in size, and it will therefore be necessary for railroad and materiel facilities to increase proportionately with the increase in size

of the campaign, until we work up to a climax where our airplanes are dropping bombs on targets in the same proportion as when the artillery shells a target. Statistics will show very easily that, given a fixed amount of explosives to destroy a target, aerial bomb-dropping will reach and destroy this target with less explosive, fewer shells, and less expenditure of money than is required for the artillery and infantry to destroy a target of similar importance to the final issue of the campaign. For practically three years the artillery has constantly shelled German positions and the infantry has sacrificed an enormous number of human lives, only to gain an insignificant number of miles along the Front. With a similar expenditure in aerial bomb-dropping of money, material, and human beings, the transportation in the rear of the German lines and the supplies of all sorts of material to the German troops could long ago have been cut off.

VIII. Cooperation of the Allies.

(a) The targets chosen in this program to be attacked, and the bases from which it is expected to deliver our attacks, are the same as those contemplated by the British in their proposal to wreck the manufacturing centers of Germany and by the French in such programs as they are proposing. The British are seriously considering such a bomb-dropping campaign, but have not started in earnest on the necessary preparation for such a campaign. The French production program for both airplanes and bombs, as well as for personnel, does not lend itself to an attack on the large scale proposed, during 1918, on the manufacturing centers of Germany. The money appropriated by the American Congress was appropriated with the idea in view of dropping the maximum tonnage of bombs on German manufacturing centers and means of transportation, and the American public as well as American industries and financial purse-string lend themselves to this idea and have so lent themselves since the beginning of the War. We find America today building an aerial program with the sole idea of such a campaign against Germany as that outlined herein, and therefore American backing of this program is certain. British participation in this campaign is also certain. French willingness to participate in such a campaign is certain, although her materiel, especially, and her personnel, to a minor degree, do not lend themselves to such a large scale operation as either the Americans or the British are prepared to undertake. Therefore, since all three nations will be desirous of participating in such a campaign as this and to participate against the same targets and from, roughly, the same bases, it is suggested that there be coordination of the efforts of all the Allied land armies. Therefore, in view of the concentration mentioned herein, as well as other vital considerations, it is suggested as the proper part of America, especially in view of her aerial production, to take the initiative in bringing about such a coordination.

IX. Necessity for immediate action.

(a) Since a bomb-dropping campaign does not mean the mere supplying of airplanes and bombs, and since many other features, as hereinbefore indicated, enter into a project such as that contemplated herein, it is suggested that unless a decision is made to commence this campaign and to commence it immediately, we cannot hope to operate during 1918. Therefore, it is requested that approval of this project be given immediately and that the necessary authority to carry it out be granted in order that it may be started without loss of time and in order that it may be under way in the spring or summer of 1918. If it is not begun at that time, it must go over until 1919. It is not too late yet to commence this campaign; but the time when its commencement is possible with success is drawing to a close, hence the urgency of immediate approval of this scheme.

B. Sequel

After adopting the program for operations it next became necessary to decide upon the staff for Officer in Charge of Strategical Aviation, Z. of A., A.E.F. It was decided that the staff should be comprised of the following officers:

(a) Executive Officer.
(b) Adjutant
(c) Intelligence Officer.
(d) Meteorological Officer.
(e) Armament Officer.
(f) Engineering Officer.
(g) Supply Officer.
(h) Photographic Officer.
(i) Telephone Officer.
(j) Wireless Officer.
(k) Medical Officer.
(l) Transportation Officer.
(m) Officer In Charge of Pursuit and Observation Forces.
(n) Interpreter.

Steps were taken to obtain a few of these officers to start the work of this force.

On December 22, 1917, a conference was held at French G.H.Q., at Compiegne, wherein the following representatives participated,—

British:—Major General Sir Hugh Trenchard, General Officer Commanding the Royal Flying Corps, in the Field.

French:—General Duvall,[5] Commanding the French Air Service, in the Field.

United States:—Lieutenant-Colonel E. S. Gorrell, Officer in Charge of Strategical Aviation, Z of A., A.E.F.

5. Maurice Duvall.

At this meeting General Trenchard told that he had been ordered by his Government to establish a force of bombardment aviation in the vicinity of Nancy for the purpose of bombarding the industrial centers of Germany, that whether or not the Allies intended to join with him in this work did not affect whether or not he continued such work, and that he intended to increase the size of his force and to push this work to its maximum extent in compliance with the orders of his Government on this subject. The French said that, in their opinion, it did not pay to heterogeneously bombard enemy industrial centers and that the Allies must remember bombardment of Allied towns by the enemy was a much easier task than bombardment of enemy towns by the Allies, and therefore not only from the point of view of the fact that the materiel was unavailable for this purpose but also from the point of view of the fact that the use of bombardment aviation as contemplated by the British did not agree with French tactical plans and that the French did not expect to join in this operation. The American representative stated that it was the intention of the United States to also undertake this work along the lines now being commenced by the British but that he could not pledge the United States or the A.E.F. to such a procedure for the reason that decision on that subject lay with G.H.Q., A.E.F.

During the Christmas Holidays, 1917, the Chief of Air Service, accompanied by Lieut-Colonel Gorrell visited Headquarters of the Royal Flying Corps in the Field, for the purpose of discussing this question with General Trenchard, the General Officer Commanding the R.F.C., in the Field. At this meeting General Trenchard proposed that, since he had already begun to operate from the Nancy District, and since the Americans had yet to make their first beginning in this work, that the Americans profit by such experience as he may have gained and such installation as he may have established and place their first few squadrons with his forces in order to train the Americans and to allow them to profit by what experience the British may have already obtained. If the Americans had one squadron it would be General Trenchard's intention to place this squadron in an airdrome with several other British squadrons, the combination of squadrons being commanded by a British officer. When the Americans had several squadrons they would occupy an airdrome by themselves, being commanded by an American officer, to report to the British Commander in that District. When the Americans placed a larger force in the field

than the British had there, General Trenchard proposed to turn over the command in that district, at such time as Americans should thus begin to secure predominance in the combinations, to the Americans and to allow the British to serve under an American Commander in that region. These propositions, because they offered both training and maintenance facilities to the American Air Service, both of which were lacking and both of which promised to be difficult to be obtained, were accepted by the Chief of Air Service. However, it may here be said, that shortly after this conference General Trenchard was recalled to England and General Salmond[6] took his place in the field. Later, approximately the summer of 1918, the British Bombardment Forces in the vicinity of Nancy were separated from the Royal Air Force in the Field and placed under the command of General Trenchard, who would honor the orders of no one except the British Air Ministry. General Trenchard received no orders and would acknowledge no superior in the Field, not even Marshal Foch, who we supposed to command the Allied forces on the Western Front. This turn of affairs necessitated a change in the American attitude towards the problems then confronting them. The Americans had recognized and loyally supported Marshal Foch as the Allied Commander-in-Chief and therefore could not assist the British Independent Air Force in its efforts. It was therefore decided on June 18, 1918, by the Chief of Staff, A.E.F., that while cooperating in every possible way with air forces of our Allies, the Air Bombardment Force must remain an actual integral part of the American Expeditionary Forces. The Chief of Staff on this same date uttered the fundamental principles of the Bombardment Force when he said every one must be impressed with the importance of the principle of the concentration of the effort of each arm, and of all coordination and all effort to a common tactical end. He then said that all must be warned against any idea of independence and all must know from the beginning that every force must be closely coalescent with those of the remainder of the Air Service and with those of the Ground Army. He further stated that in making of arrangements with the British it must be thoroughly understood that, when the aerial forces reached a certain importance, the regions to be bombed would be designated by G.H.Q., A.E.F. and that the selection of the targets would depend solely upon their importance with respect to the operation which the A.E.F. contemplated for its Ground Army.[7]

The Office of the Strategical Aviation, Z. of A., A.E.F. was being utilized for duties other than those belonging purely to this office and it was proposed to also place him as Assistant to the Supply Officer of the Air Service. With this in mind, this officer wrote the following memorandum for the Chief of Air Service, which is quoted herein solely for the purpose of setting forth some of the problems which presented themselves as of January 1, 1918.

American Expeditionary Forces

Paris, January 2, 1918.

Memorandum for
Chief of Air Service.

1. It is of the maximum importance possible at the present time that the officer detailed for charge of bombing should take up the reins if he is to bring an efficient, well-trained team to the front at the speed at which deliveries are to take place. Not only that this officer take up his own duties forthwith, but he must collect his technical staff around him without delay, and fight the thousand and one duties in the all-too-short time at his disposal.

2. The fact that the United States is only now entering into the contest makes it almost impossible to obtain the number of specialist officers required, and the men chosen for these duties must be allocated to the best centers for their own instruction.

6. John Maitland Salmond.
7. See Doc. 38.

The British and French after three and a half years of experience have decided on the personnel, spares and materiel required for their units, and the closest liaison is necessary for the officer commanding American bombing to reap the full advantage of their experience. It is probable that the original American bombing units will work under British command, and it is necessary to study the British organization with a view to blending in with it efficiently. The O.C.'s decision is required, after consultation with the British, as to the most important position from which to operate with a view to the preparation of various sites, and to determine the methods of supply of those sites. He must inspect the bombing units in order to become himself *au fait* with work in the field and to obtain a close understanding of the operations undertaken. He should inspect the English training schools for bombing, choose the commanding officers for the orignal units, and see that they are competent, efficient and well-trained and organize many other details.

3. Accurate bombing on a large scale is a new science and requires the entire time and study of the man who is to shoulder the responsibility for success or failure during the coming year.

4. The following points must be immediately considered and decided upon, and time will be required to do this in accordance with the estimate set forth hereinafter.

	Time
Decision should be made with regard to having the same organization of units as the British have, and the necessary study is required to harmonize our organization and the British since not even the British have yet decided on a part of their organization.	2 weeks
Obtain staff and send them to learn their duties, since strategical aviation is the most unknown part of aeronautics.	4 days to pick staff 3 to 4 months instruction for them.
Obtain office rooms and clerks.	2 days
Establish well-informed intelligence.	at least 4 months.
Lay down detailed program to be iollowed in 1918 and prepare this to exchange with British and French in accordance with agreement Dec. 22.	2 weeks
Work out monthly tonnage for railroads and give them estimate of requirements. Indicate where railheads and railroad installations are necessary.	2 weeks.
Obtain accurate list of deliveries from every source. See if sufficient supplies of every kind have been ordered for strategical aviation. Place requisitions for what has not yet been ordered.	1 week.
Decide on commanders of first units; dispatch them for training.	3 days pick commanders, 2 to 3 months for training.
Obtain necessary specialists from England as a loan for two months during winter inaction. Consult with and learn from them principles taught by their experience.	at least 2 weeks.
Choose aerodromes for squadrons that will be ready by end of June. Choose parks and depots. Get these approved and preparation under way, even if only with a very few workmen.	2 weeks search; 2 weeks survey; 2 to 3 weeks for approval. Time for work depends upon number of men used.
Choose dummy aerodromes.	2 weeks choice; 2 weeks connected with their preparation.
Choose concentration aerodromes.	2 weeks.
Choose hopping-off aerodromes.	2 weeks.
Give to Instruction Department our requirements of pilots and observers showing number and date. Follow progress.	1 day, plus variable time following progress.
Give to Personnel Department and Instruction Department list showing different trades which will be required in organization.	3 days.
Have prepared satisfactory map of Germany, since none exists now.	2 weeks work. 2½ months supervision.
Obtain schedule of bombing training school in England and follow progress made in that school.	1 week.
Visit English and American bombing schools.	3 weeks.
Inspect bombing units in the field now and learn the work myself.	at least 1 month.
Inspect aerodromes allocated for bombing work.	2 weeks.
Obtain schedule of navigation training in England; get mariners into U.S. schools; work with Training Department towards perfection of course.	1 week.

Consultation re organization meterological service as it affects bombing at long range.	3 days.
Obtain information on progress of wireless telegraph for navigation; initiate improvements.	3 days.
Check petrol arrangements.	3 days.
Personnel force keep track all our men working on Strategical Aviation on British Force.	Continuous after March.
Contact with Allies learning from them, keeping up with them, and coordinating our plans with them.	1 month.
Laying out equipment depots, parks, etc.	1 month.

5. The above schedule shows that some 14 months would be necessary in order to be prepared to carry on this work if one person were to attempt to do it himself. With an efficient staff things can be divided into classes and separated, and the work can be started by June, but not before. The person who is to be responsibile for the success or failure must be on hand at all times to handle the staff and make the necessary decisions.

6. This is the class of work which we have promised our Congress, our Country and our Allies that we would do, and it is of utmost importance that we are prepared to carry out wholeheartedly, efficiently and without delay.

Respectfully submitted,
(signed) E.S. Gorrell
Lt-Colonel, A.S.S.C.

An effort was made to set upon an American organization for the Bombardment units of the Strategical Aviation of the A.E.F., similar to the organization adopted by the British because of the fact that the British had had experience in this capacity while the Americans had had no such experience, because the British were already engaged upon this work, and because it was essential that the organizations be similar in order to allow the commanding officer and any Allied officers engaged upon the work to realize the extent of the striking force under his command.

Thus at this date, December, 1917, American plans based their organization upon the "Group" to be the smallest self-contained bombardment tactical unit. The Americans had no expectation of bombing by squadrons but to bombard by groups and perhaps by various combinations of groups whenever the target to be attacked should be worthy of it.

Just after the middle of January, 1918, the Chief of Air Service was ordered by G.H.Q. to detail an Air Service officer for duty in the Operations Section (G—3), on the General Staff. Lieut-Colonel Gorrell was relieved from duty as Officer in Charge of Strategical Aviation, Z of A., A.E.F. and by Par 7, S.O. 21, H.A.E.F., dated January, 21, 1918, was detailed to report to the Chief of Staff, A.E.F., on February 5, 1918, for this duty.

During the first part of February 1918, the office of the Chief of Air Service was moved from G.H.Q. to Tours and Colonel R. O. Van Horn, Air Service, who had been detailed by the Chief of Air Service as Operations Officer in the Air Service (which designation of Air Service was later ordered, by the Chief of Staff, A.E.F., to be discontinued, for the reason that no such office existed within the Air Service) moved to Colombey-les-Belles with his office force. The Chief of Air Service appointed Colonel A. Monell,[8] Air Service, in the Office of Colonel Van Horn and to command the Strategical Aviation, Z. of A., A.E.F. Colonel Monell was assisted by Major Fowler,[9] Air Service, and Wing Commander Spencer Grey,[10] R.N.A.S. The work previously started was carried on by Colonel Monell for a month or so. In the meantime Major Fowler was relieved from duty with this work and sent to command the American Air Forces with the B.E.F. in the Field. Wing Commander Spencer Grey, R.N.A.S., be-

8. Ambrose Monell, who had resigned the presidency of the International Nickel Company to accept a commission in the U.S. Army.

9. Harold Fowler, who had served with the Royal Flying Corps and had transferred to the U.S. Air Service in 1917.

10. While in charge of the Strategical Section, Gorrell had arranged for Grey to serve on his staff. Grey, he said, "was considered at that time as the world's greatest authority on questions dealing with aerial bombardment." (Early History of the Strategical Section, in Gorrell's History, B-6, p 372).

coming discouraged over the failures of the American Production Program and realizing in detail what would be necessary before America could begin a Strategical Bombardment campaign of any size, left the American Air Service and returned to the Air Service of his own Government. Later on Wing Commander Grey was attached to the Air Service of the U.S. Naval Forces, operating in Europe for the purpose of bombarding enemy submarine bases.

Colonel Monell after having selected an airdrome at Latrecey, several bombardment airdromes on the Toul Sector, and an airdrome near St. Blin, and having seen that construction work was begun on each of these, realized that the larger problems that faced the strategical aviation operations of the Air Service were industrial. He also realized that the pursuit operation of strategical aviation would not and could not become a reality for several years, due to the failure of the Allies to deliver pursuit planes to the American Air Service in accordance with their promises made in the Fall of 1917, and due to the fact that no pursuit machines, because of such promises, were being constructed in the United States. Therefore, there remained only one possible future for the Strategical Aviation—that was aerial bombardment. The D.H. airplane was being handled satisfactorily at Romorantin[11] insofar as its assembly was concerned. However the assembly of the Handley-Page airplane presented a more difficult situation and thereafter Colonel Monell concentrated his attention upon the question of the night bombardment program.

The use of the words "Strategical Aviation" had led many persons, in and out of the Air Service, to believe that this operation of the Air Service was something independent from the rest of the Air Service and not dependent at all upon the rest of the Army. In order to eliminate such an idea and to cause a realization of the fact that the Strategical Air Service was employed as an integral part of the Air Service, A.E.F. and therefore of the entire A.E.F. and in order to force a realization of the fact that American Bombardment Aviation should and would be used as a combat arm upon missions synchronizing with and coordinated with the missions of the entire A.E.F., the name Strategical Aviation was changed in the Summer of 1918 to "G.H.Q. Air Service Reserve." This change had the desired effect and brought home the realization of the fact that this bombardment aviation was a combat portion of the Army designed for use upon missions coordinated with the entire use of the A.E.F. in Europe.

Plans were made in G-3, G.H.Q., A.E.F. for the future use of the Bombardment Aviation when it should arrive at the size consistent with its being used as G.H.Q. Air Service Reserve. It was contemplated that any bombardment units in existence prior to the time when this reserve had reached a growth sufficient to justify its creation as a G.H.Q. Air Service Reserve would be used as a part of the Army Air Service of the various American Armies in the Field or in some specific cases units might probably be placed with the British Independent Air Force, later known as the Inter-Allied Air Force, for the purpose of receiving training in long distance bombardment. It being understood by the nations concerned that our bombardment forces must remain an actual integral part of the American Expeditionary Forces.

11. Air Service Production Center No. 2.

Looking at this Section previously known as the Strategical Aviation, Z. of A., A.E.F. and gazing upon it with a hind-sight view of one year, in January, 1918, the time when the plans hereinbefore quoted were originally made, there are two great faults which are easily seen.

(a) Entirely too much optimism was felt for the American Production Program.

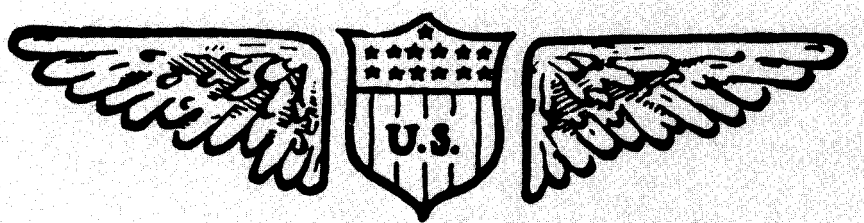
(b) The Air Service failed to secure the approval of the General Staff of its plans for the employment of this aviation and consequently suffered from the fact that its plans for the use of the Strategical Air Service were not synchronized properly, especially from a mental point of view of its employment, with the ideas of the G.H.Q.

These of course are hind-sight view points.

The second point is inexcusable only upon the grounds of inexperience but the first point presents the same facts as affected the entire Air Service, namely, a program far too large to be realized in the length of time allowed for its production. There is no one to be blamed for this program for it had the approval and encouragement of the highest authorities in Europe and it was only cold matter of fact experience which proved to the world the fact that money and men could not make an air program over night and that the time to prepare for war was not after war had been declared but as quoted from the first President of the United States: "In time of peace let us prepare for war."

Assembly of a Handley-Page bomber.


RFC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30. Foulois: Recommendations for Air Service

1 December 1917

Soon after becoming Chief of Air Service, Foulois made a number of recommendations to Pershing's Chief of Staff. His memorandum was devoted mainly to organizational and logistical problems, but one item had to do with aerial operations. The following is an extract from an account written by Foulois in 1919.[1]

. . . . . .

X—26. Under my orders from the War Department, I proceeded to General Headquarters A.E.F. and reported for duty to the Commander in Chief, on November 16, 1917.

I was directed to make an inspection and report upon the Air Service activities as they existed at that time. While upon this inspection trip, I was assigned to duty as Chief of Air Service, A.E.F. (November 27, 1917), relieving Brigadier General Kenly.

X—27. Upon completion of my inspection trip, and pursuant to my assignment as Chief of Air Service, effective November 27, 1917, the following memoranda for the Chief of Staff, A.E.F. were submitted.

Memorandum for The Chief of Staff:

December 1, 1917

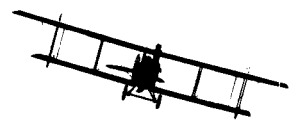
Subject: Recommendations for Air Service.

The following recommendations for the Air Service are submitted for consideration:

. . . . . .

8. That a comprehensive plan of air operations (including bombing) be authorized at once, and that authority for the necessary construction and material be given, in order that fighting and bombing operations in cooperation with the French and British Flying Corps may be carried on at the earliest practicable date. (General plans now being prepared will be submitted as soon as ready.)

B.D. Foulois,
Brigadier General, S.C.



1. In AFSHRC 168.68-5.

Brig. Gen. Benjamin D. Foulois, Chief of Air Service, AEF (November 1917–May 1918).

31. Foulois: Report on Air Service Problems

23 December 1917

In a memorandum to Pershing's Chief of Staff on 23 December 1917, Foulois devoted considerable space to what he had recently learned about bombing. His recommendations included support for Gorrell's bombing plan (Doc. 29) and for cooperation with the British and French in strategical operations.[1]

Memorandum for the Chief of Staff.

Subject. Report on Air Service problems, A.E.F., and recommendations re same.

The undersigned reported for duty at G. H. Q. November 16th, 1917, was assigned to duty as Chief of Air Service per G.O. 66 H.A.E.F., November 27, 1917.

From November 16 to November 25, I visited and conferred with Major General Trenchard, Royal Flying Corps, Commanding the R.F.C., in France; visited and conferred with General Petain, and Colonel Duval, in charge of French aviation on General Petain's Staff.

. . . . . .

From the date of assignment as C.A.S., November 27, up to the present date, I have also had a conference in Paris with Lord Northcliffe, representative of Lord Rothermere, the President of the British Air Board; numerous conferences with our own Air Service Officers in Paris, and have just returned from a four days conference in London with the British Air Ministry and members of the British War Cabinet.

As a result of these conferences and investigations into our own needs as heretofore tentatively outlined by the Air Service, A.E.F., the following general summary of our air problems is submitted, also general air information and data as obtained from official French and British Military and Civil sources.

. . . . . .

11. Each and every high official, military and civilian, with whom I have conferred has frankly stated that under the existing conditions of ship tonnage, the most swift and effective assistance which the United States can give during the Summer and Fall of 1918, is through its air forces.

The war policy of Great Britain for 1918 places (1) Tonnage; (2) Air Service; (3) Army personnel, in the foregoing order of priority. This information I received officially from one of the most prominent members of the British War Cabinet.

12. The foregoing opinion of English and French military and civil officials as regards the comparative effectiveness, during 1918, of troops on the ground as compared with air troops and airplanes in the air is concurred in or was concurred in, two months ago, by the Congress of the United States, a great portion of U.S. Army and by the American public.

The English, French and American military and civil officials heretofore mentioned fully believe that the air campaign of 1918 will be the most severe

1. In Gorrell's History, A-1, pp 131-136.

and critical insofar as its effect on the morale of the English and French civil population is concerned.

The effect, of air raids, on England during the past few months, has absolutely reversed the British war policy which existed four months ago, as regards reprisals on Germany. Today the cry is "Bomb the Huns."

During my visit last week in London I saw two small air raids and saw four civilians killed by a shell within one hundred yards from where I was standing. I also saw hundreds of poor people sleeping on the station platforms of the underground railway stations, because they were too frightened to go to their homes. So far, the air raids on London and the coast of England have been carried out by German squadrons in very small numbers, and on this particular raid only about 40 bombs were dropped. The morale effect, however, on the British people, of this small number of bombs was very great in proportion to the physical damage (10 killed, 70 wounded—4 small fires and several houses wrecked).

Upon investigation, the morning after this raid, I learned that from the time the first warning is sent out until the "all clear" signal was given, practically all work ceases in factories and other industries. This particular raid which I witnessed, kept the anti-aircraft batteries surrounding London, busy for nearly four hours, putting up a barrage about the city.

When one computes the man-hours lost, in a city the size of London, it is readily understood why the British War policy is being directed to taking active offensive measures against the air menace of the Germans.

There were approximately 20 airplanes estimated to have been engaged in this raid, and I could not learn that there had ever been a larger number engaged in any single raid on England.

The British Secret Service, however, have informed us that Germany is exerting every effort to produce a great number of bombing squadrons for offensive use during 1918.

Such being the case, we should most seriously and most promptly consider the probable morale effect on the French and English civil populations, in the event that the Germans attain air supremacy in night bombing in 1918.

From a strictly tactical viewpoint, if Germany secures air supremacy in night bombing in 1918, the first military objective of the German Air Service will be the Allies Airdromes and their squadrons, in order to prevent counter-offensive on the part of the Allies.

At the present time there is no effective method of combating night bombing raids, and the only answer to the problem is to build more night bombing squadrons than the enemy and carry on a greater offensive bombing campaign against him.

13. The Air Service, A.E.F. has collected a great amount of information, maps and data, on the most vital military industrial centers in Germany, where submarine essentials, munitions, chemicals, iron, steel, engines and airplanes are manufactured all of which are within bombing distance of the Verdun-Toul region.

The British and French authorities have fully appreciated the importance of a strategic air offensive against German industrial centers and lines of communications, but they have never during the present war, been able to provide enough personnel and airplanes to take care of the tactical air units with troops, and also provide additional units for strategical offensive operations.

Our entry into the war with large resources of personnel and aircraft materials, if promptly taken advantage of, will allow the Allies and ourselves to take the strategical offensive next Summer, against the German industrial centers, German airdromes and German lines of communications.

14. The British Air Ministry and the British War Cabinet are now preparing a communication to be referred to the Commander-in-Chief, A.E.F. recommending that the British, French and American Air Services take the necessary steps toward inaugurating a combined strategic offensive against German industrial centers without further delay. This communication should reach these headquarters within a few days.

Recommendations in Air Service Policy A.E.F.

15. In view of the foregoing statement of the needs of the Air Service, A.E.F. and the trend of our efforts toward a co-ordinated air policy with our Allies, it is recommended:

First: Provide the necessary air personnel and material for tactical operations with troops.

Second: Take immediate steps in co-operation with the British and French authorities for a combined strategical fighting and bombing campaign in 1918 against German industrial centers, German airdromes, German aero squadrons and German lines of communications.

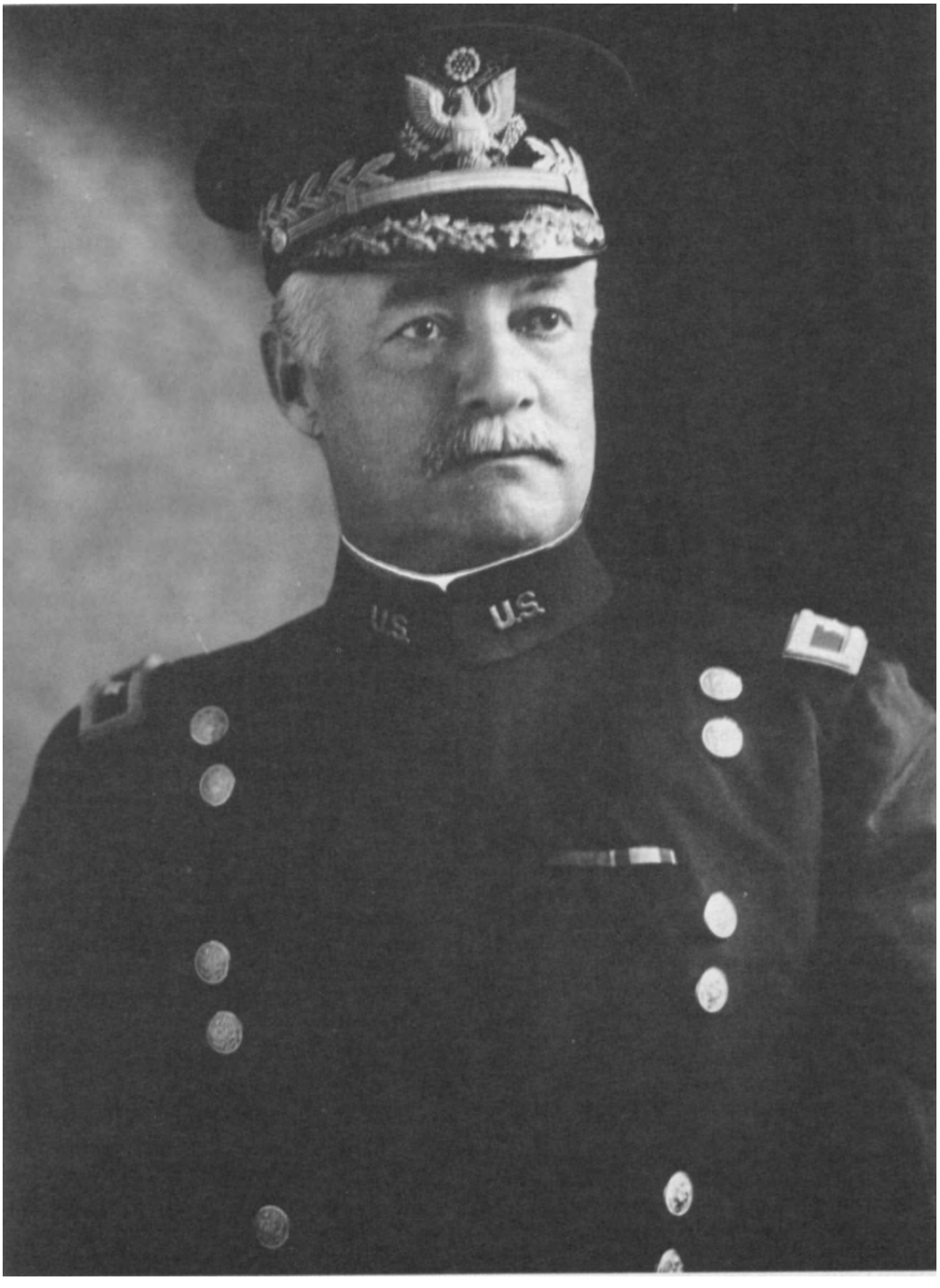
Third: Settle as quickly as possible, the question as to priority of Aviation personnel and material over other personnel and material.

Fourth: Determine, as quickly as possible, the amount of tonnage per month which should be set aside for aviation peronnel and material.

Fifth: Obtain official approval of the air program A.E.F. with the least possible delay, in order that the C.A.S. may take immediate steps to carry it into effect, without further loss of time.

Sixth: Designate three members of the General Staff to work with the Air Service, in drawing up, in detail, a complete and co-ordinated air schedule to include all questions regarding instruction, training, organization, transportation and supply.

B. D. Foulois,
Brig. Gen'l S.C.
C.A.S.



Maj. Gen. Hunter Liggett (taken as Brig. Gen.), commander of I Corps, was one of the few air-minded U.S. infantry generals of World War I.

32. Command of The Air Service, AEF

24 December 1917

As plans were made in December 1917 to organize an army corps in the AEF, orders concerning command of aviation units were revised. When I Corps was formed in January under the command of Maj. Gen. Hunter Liggett in January 1918, Mitchell became Chief of Air Service, I Corps and Corps Air Service Commander.

Headquarters, A.E.F.
France, December 24, 1917.

General Orders,
No. 80

I. 1. The Chief of the Air Service will exercise general supervision over all elements of the Air Service and personnel assigned thereto, and will control directly all Air Service units and other personnel not assigned to tactical commands or to the L. of C.

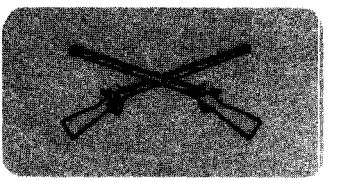
. . . . . .

3. The Air Service units in each army will be under the general supervision of the Army Air Commander, who will control directly all air units and other Air Service personnel on duty with that army and not assigned to Army Corps or other subordinate commands. The Air Service units of each Army Corps will be under the direct control of the Corps Air Commander.

4. Sec II, G.O. 46, c. s., these headquarters, is revoked.

. . . . . .

By command of
General Pershing:
James G. Harbord,
Brigadier General,
Chief of Staff.



Maj. Gen. (then Brig. Gen.) James G. Harbord served as Gen. Pershing's Chief of Staff at Headquarters, AEF. (Sketch by Joseph Cummings Chase).

33. 100-Squadron Schedule

1 January 1918

Following recommendations made by Foulois on 10 December 1917 and again on 23 December (Docs. 30 and 31), a three-man committee was appointed to review Air Service policies, priorities, and schedules. Taking into consideration production, construction, and other problems, the committee concluded that 60 service squadrons ready for combat by the end of June 1918, and 100 by the end of the year, would be the most that could be attained. Following are the report of the committee[1] and a memorandum indicating Pershing's qualified approval.[2]

January 1, 1918.

Memorandum for the C. of S.

Subject: Air Service Program.

1. In accordance with memorandum dated December 21st and your subsequent verbal instructions, the following report is submitted:

2. The committee consulted British Staff Officers. Their opinion appears to be that infantry divisions with corresponding aviation units were most necessary for the immediate future—that no additional aviation should be brought over until an army (including its aviation) was on hand or the situation considered safe. It was, however, admitted that the total number of divisions might be reduced by one by August, 1918, in order to bring over its equivalent tonnage in extra aviation. The principal reasons advanced were probable German superiority on this front, that the British infantry was much worn from fighting and deficient in strength.

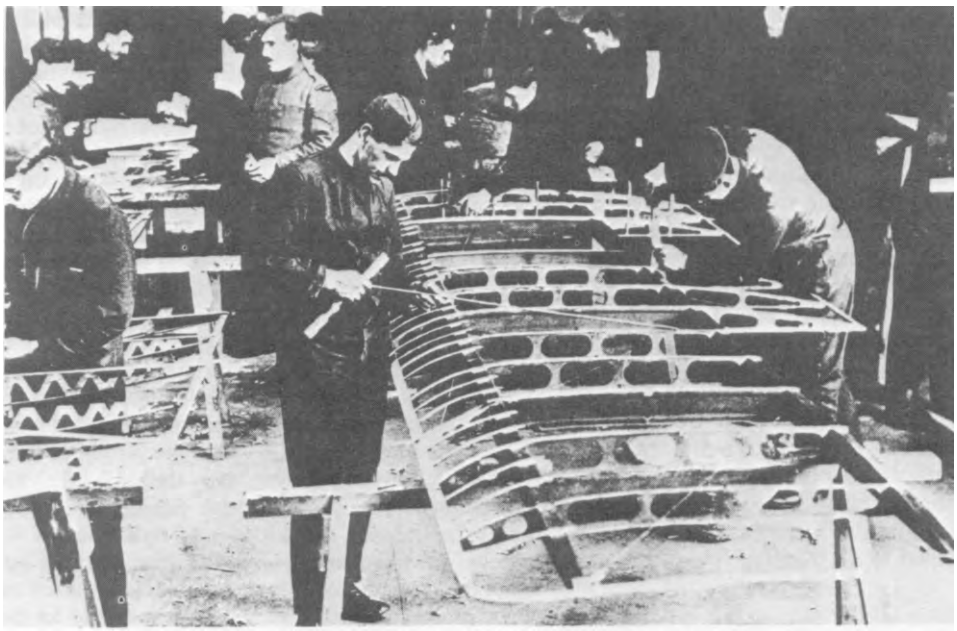
3. The Committee also consulted the French Staff. In a general way their discussion may be summarized as follows: They believe an increase of aviation, especially pursuit and bombardment units, will be the most important reinforcement that the Allies will need, stating as a reason for this, that to obtain control of the air will go far toward rendering a German offensive ineffective.

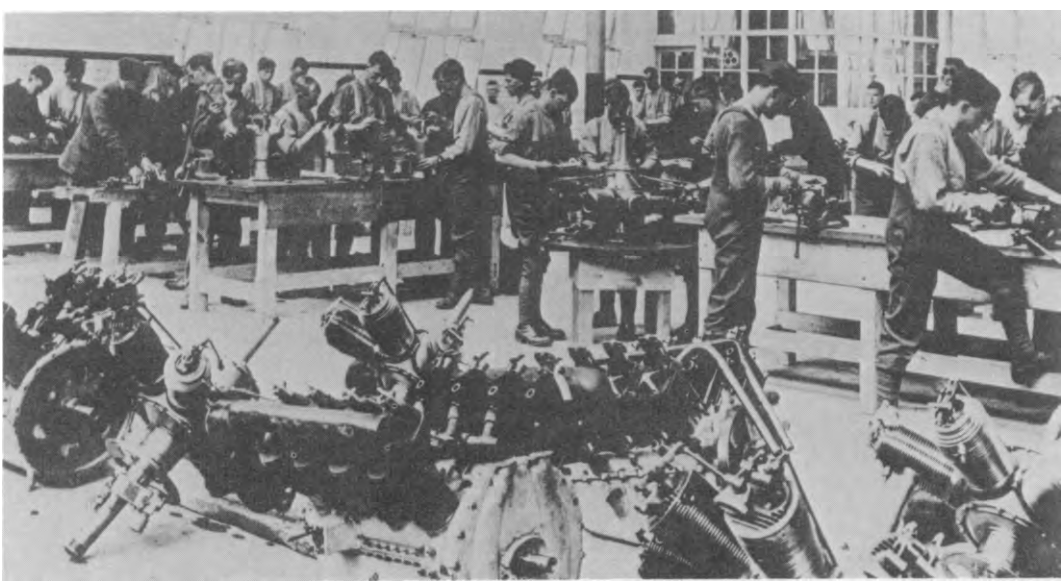
4. The ability of the U.S. to help the Allies this Spring and Summer will not be great either in trained divisions or in aviation units. The number of the latter will be limited also by production of planes, instruction of pilots and other factors.

5. In order to permit the Air Service to be developed within its limiting factors such priority should be given to extra air units as will not unduly delay the formation of a balanced army (including its aviation). With the foregoing in mind it is believed that the weight of the extra aviation should be directed toward, 1st, pursuit, and 2nd, bombardment squadrons.

6. Based on the best estimate obtainable in which allowance has been made for delays in production, preparation of grounds, etc., the Committee believes the following to be about the probable maximum attainment. The program for December 31, 1918, is of course, less accurate and should be considered as subject to later revision, when circumstances warrant it. Program for 1919 to be considered as soon as developments this Spring permit it to be taken up:

1. In Gorrell's History, A-1, pp 136-138.
2. AFSHRC 168.68-5





Type of Unit	To be in service June 30, 1918.	To be in service December 31, 1918.
Service Squadrons	60	100
School Squadrons	40	50
Park Squadrons (incl. supply & repair)	70	100
Construction Squadrons	20	20
Total Squadrons	190	270
Total men	28,500	40,500

The above includes personnel now in England and France. Balance to arrive progressively in England and France by April 1st and October 1st, respectively. The probable ratio of service squadrons to be: Pursuit 6, Observation 2, Bombardment 1. Material to be supplied from U.S. for above service squadrons to arrive progressively by June 30, 1918, and December 31, 1918, respectively.

7. The committee recommends adoption of the above program.

8. A separate report will be submitted regarding the balloon program.

Signed: W. B. Burtt,[3]
Col., Aviation Sec., Sig. Corps
H. A. Drum,
Lt. Col., G. S.
A. B. Barber,
Lt. Col., G. S., A.E.F.

January 5, 1918.

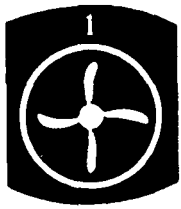
Memorandum for:
Chief of Air Service

Subject:
Air Service Program.

1. The Commander-in-Chief approves the attached report dated January 1, 1918, subject Air Service Program, with the understanding that it represents the maximum the Air Service can attain. He desires no change for the present in the schedule for shipment of aviation troops but desires that you submit before February 10th, a careful estimate of Air Service possibilities for the latter part of this year so that the schedule for the period following the 1st of April may be again considered.

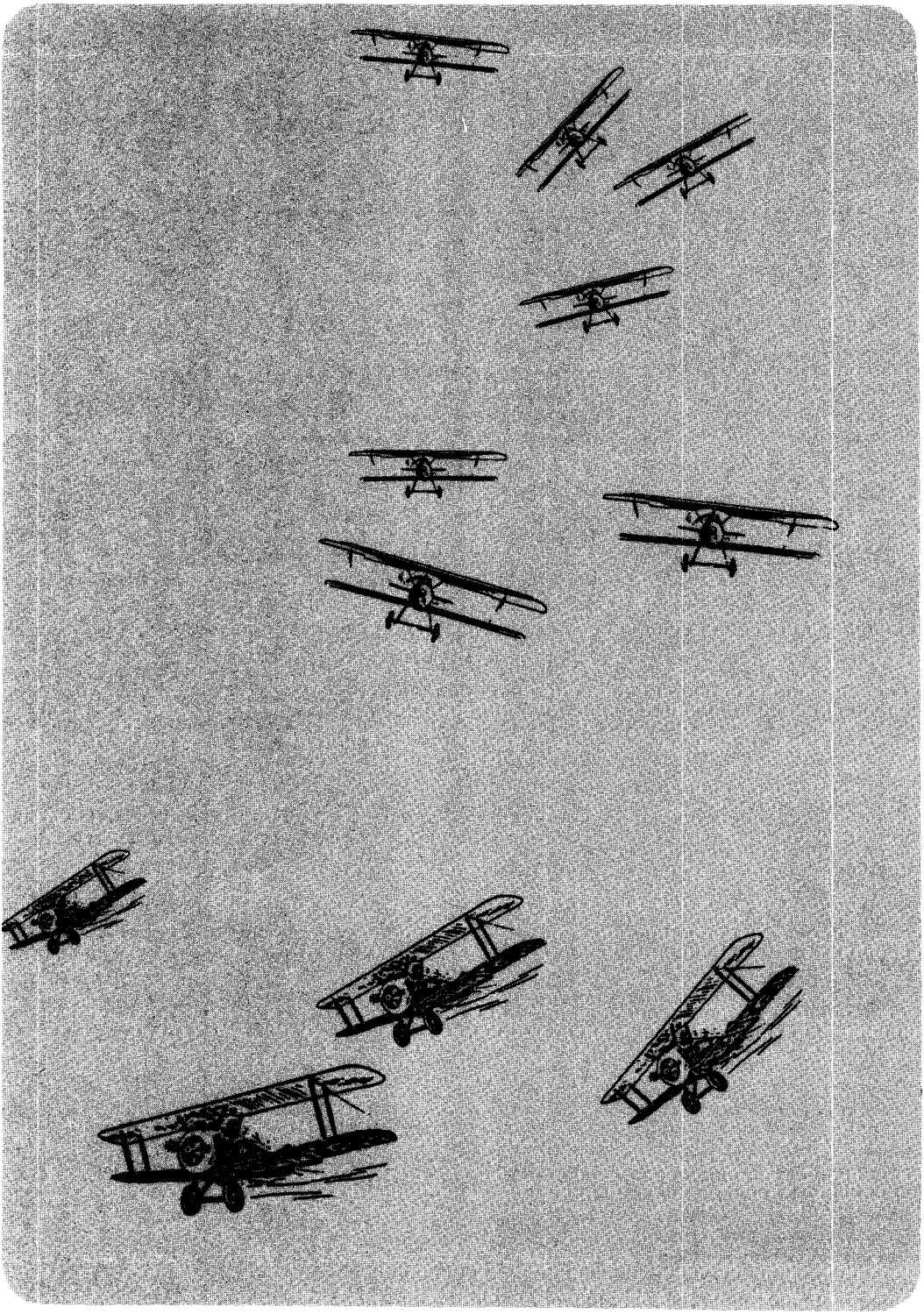
2. There is returned to you, herewith, your report on Air Service program, A.E.F.; it is desired that you take up with the proper sections of the General Staff and supply departments and various detail questions presented in your report so that the Commander-in-Chief's decision may be carried out promptly.

By direction:
W. D. Connor,
Acting Chief of Staff.



The plans devised late in 1917 called for a number of Park Squadrons to assemble and repair aircraft. Top left photo shows wing assembly in progress; bottom left shows the interior of an engine repair shop. Aviation mechanics for these tasks displayed a badge on the left breast of the uniform, above other decorations. It was a large four-bladed propeller within a white embroidered circle (above).

3. Burtt was Assistant Chief of Air Service for Policy; Drum and Barber, who had worked on the GOP, represented the Operations and Administrative Sections, respectively.



34. 120-Squadron Schedule

6 February 1918

In giving tentative approval to the work of the Burtt committee on 5 January 1918, Pershing asked for a review of the schedule for the last half of 1918. As a result of that review, Foulois raised the number of service squadrons to be ready by 31 December 1918.[1]

February 6, 1918.

Memorandum:
For Chief of Staff
(Administration Section)
(Operations Section)

Subject: Estimate Air Service possibilities latter part 1918.

The following program of the Air Service is submitted as being the probable increase in the project already authorized for the latter part of 1918.

2. The project for the latter part of 1918 calls for the following:

Service at the Front	100
Schools	50
Park (Repair Supply etc.)	100
Construction	20
TOTAL	270

3. An agreement entered into with the British Air Ministry accounts for approximately 100 squadrons to be trained in England. An additional agreement calls for the training of 30 bombing squadrons in England, of which about 12 were considered as included in the 100 squadrons mentioned in the approved project.

4. The construction of airdromes and other necessary installations we estimate may use about 100 squadrons of either Service or Construction type, of which, 20 are included in the original project. These squadrons can be exchanged for part of the 100 squadrons in England, obtaining trained men for untrained.

5. The project recommended for approval for the latter part of 1918, would be as follows:

Service at the Front	120
Schools	60
Park (Supply & Repair)	120
Construction	100
TOTAL	400

6. The increase of 130 squadrons is accounted for as follows:

In service for the front	20	(bombing)
Schools	10	
Park (Repair etc.)	20	
Construction	80	(work)
TOTAL	130	

7. Referring now to cable request for squadrons in November, which called for 30 service and 20 park for 7 months, plus those already here or enroute, a total of 393 was contemplated. It should be borne in mind that the agreements with England contemplate a total of about 130 squadrons there for training, so that the actual increase herein, is to provide for those agreements, which furnish a pool, from which we can draw, trained men supplying untrained men from here in exchange for them.

8. The equipment required from the United States will not be increased over that for the original project for 270 squadrons, because the men in England will need no squadron or plane equipment.

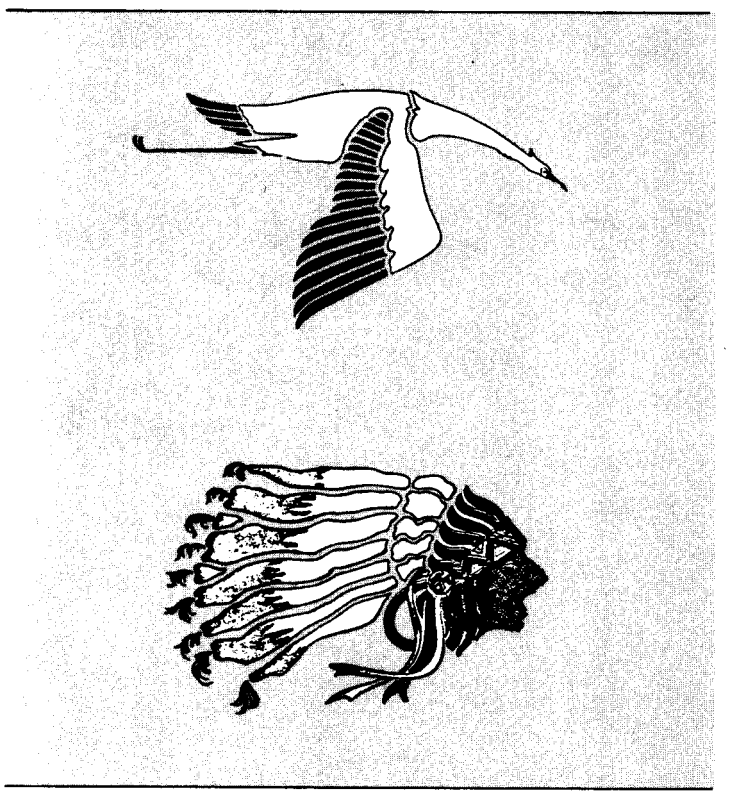
B. D. Foulois
Brigadier General, A. S., S. C.
Chief of Air Service.

1. AFSHRC 168.68-5.

Part III: Combat

February-November 1918

The United States had been at war for more than 10 months before any U.S. aviation unit began active operations in France. The first U.S. aero squadron to enter combat was the 103d, a pursuit unit. Manned by pilots who formerly had fought with the French in the Lafayette Escadrille, the 103d began operations with the French Fourth Army on 18 February 1918. Later that same month the 2d Balloon Company joined the 1st Division in the line in the sector north of Toul. The Toul Sector, where the Germans were relatively inactive on the ground and in the air, was the area to which U.S. aviation units were sent in the spring of 1918 for their initial operations.



"Billy Mitchell."
(art by Linda Mikkelson)

35. Mitchell: General Principles

30 April 1918

In April 1918, after pursuit and observation squadrons had begun operations in the Toul Sector, the Information Section of the Air Service, AEF published Maj. Frank Parker's 10-month-old report on aviation (Doc. 22), to which was added the following preface by Mitchell, Air Commander, Advance.[1]

General Principles Underlying the Use of the Air Service in the Zone of the Advance, A.E.F.

These principles will be held in mind by all personnel in this Service in the execution of their duty.

Wm. Mitchell.
Lt.-Col., A.S., S.C., A.C.A.

PREFACE

1. The issue of war depends primarily on the destruction of an enemy's military forces in the field. To bring this about all elements of a nation's military power are employed to bring about a decision on the field of battle in the shortest time possible.

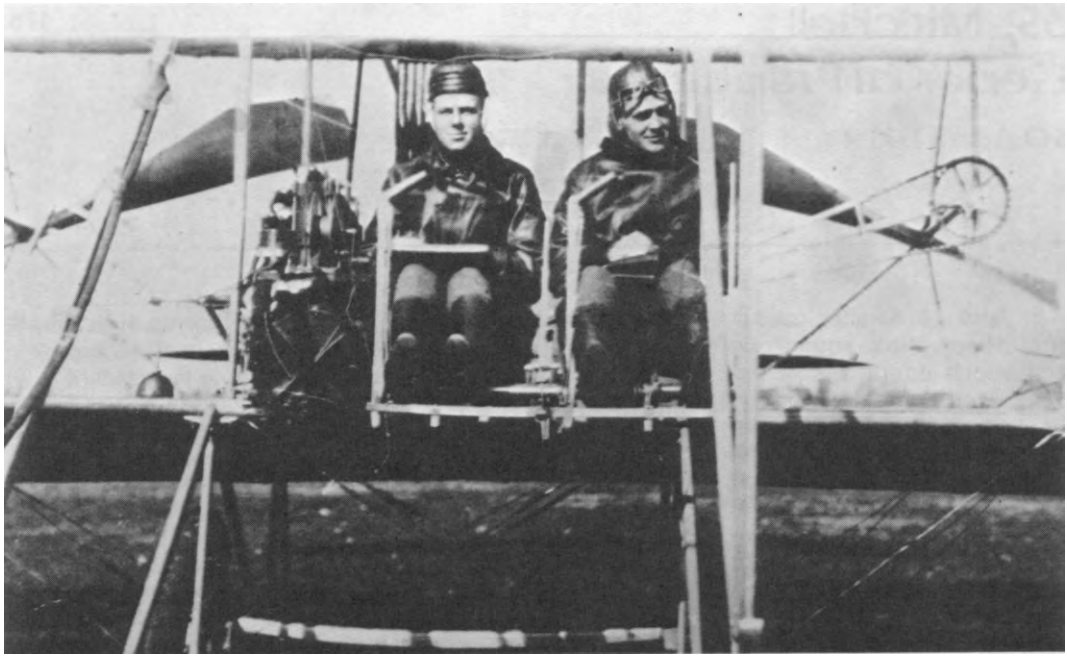
2. An army is composed of various arms and services whose complete interdependence and working together is necessary for efficiency. No one arm alone can bring about complete victory.

3. The efficiency of an army is measured by its ability to carry destruction to the enemy's forces.

4. The efficiency of any arm is dependent on its military training, experience and direction.

5. The Air Service of an army is one of its offensive arms. Alone it cannot bring about a decision. It therefore helps the other arms in their appointed mission. The measure of this help is its efficiency in its mission.

1. *Bulletin of the Information Section, Air Service, A.E.F.*, Vol III, No 132, 30 Apr 18.



Lts. Follet Bradley and Henry H. ("Hap") Arnold are seated in the aircraft equipped with the "wireless" outfit they used for artillery adjustment from airplanes in tests at Ft. Riley, Kansas, 2 November 1912 (above). Lts. Arnold and Joseph O. Mauborgne make adjustments in the radio set during the tests (below).

36. Artillery Adjustment

May 1918

Artillery adjustments by observers in airplanes had become part of the work of the U.S. air service after the first such adjustment was made by Lieutenants H. H. Arnold and Follett Bradley at Ft. Riley, Kansas, late in 1912. When U.S. units went into combat in France in 1918, however, they followed procedures derived from French "Instructions on the Employment of Aerial Observation in Liaison with Artillery." Following are extracts from revised instructions based on the French edition of 29 December 1917 and published by GHQ AEF in May 1918.[1]

Aerial Observation for Artillery.

Chapter 1. When Used

Airplane.

1. Under favorable atmospheric conditions, the airplane affords rapid, accurate and, if necessary, vertical observation, even on distant objectives*. It can determine the sense[2] and also the deviation of shots**.

2. The airplane signals to the ground by means of radio (3), projector, dropped messages, or by signal light. The observer can thus report his presence, designate objectives, report the results of fire, and transmit information in regard to both friendly and hostile troops. This information is received by ground stations.

3. The receiving stations can, by means of white cloth panels, radio***, or projectors, answer the observer's questions and give a certain number of simple indications concerning the conduct of fire.

4. Radio.—Radio has greatly enhanced the importance of aerial observation for artillery. Because of the delicate construction of the radio apparatus and the large number of airplanes which of necessity must operate in a restricted zone, careful organization and strict discipline are essential in order to avoid confusion.

Airplanes sending simultaneously may be distinguished by:

a) Call signals for receiving stations.

b) Differences in the wavelength used.

c) Varying the tone of the emission.

d) The use, in certain cases, of watches with colored dials, by which neighboring airplanes send at alternate specified intervals and thus avoid confusion.

This device interferes with the continuity of observation and should be used only when necessary.

Certain airplanes (for command and for high power guns), use radio sets with sustained or undamped waves*.[3]

Airplanes should remain strictly in their own zones. They should not approach closer than two kilometers to their receiving stations, except for very important messages. Messages sent from immediately above the receiving station interfere seriously with other messages. With proper organization in sending, five airplanes can operate on a kilometer of front.

Technical details concerning the use of radio are prescribed in each army, army corps and division by the Signal Officer.

5. Projectors.—When the number of airplanes is too great to permit all to use radio, the congestion may be relieved by the use of projectors carried by the airplanes. By day, the method is applicable only up to a limited distance from the receiving station.

Projectors on neighboring airplanes can be distinguished by pointing the beam of light carefully, and by the use of call signals.

Notes

1. In Gorrell's History, J-3, beginning p 123.

2. Position of burst (deflection and/or range) with reference to the target.

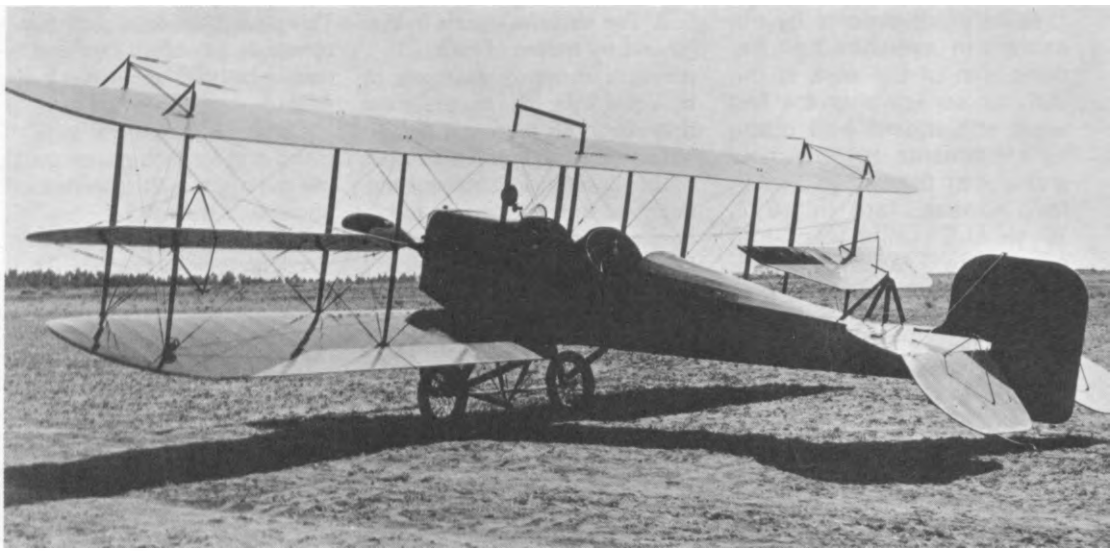
3. Undamped waves, requiring more elaborate equipment, give a more stable signal and are received more easily and clearly than damped waves.

*Under particularly favorable conditions, airplane observation can be used at night.

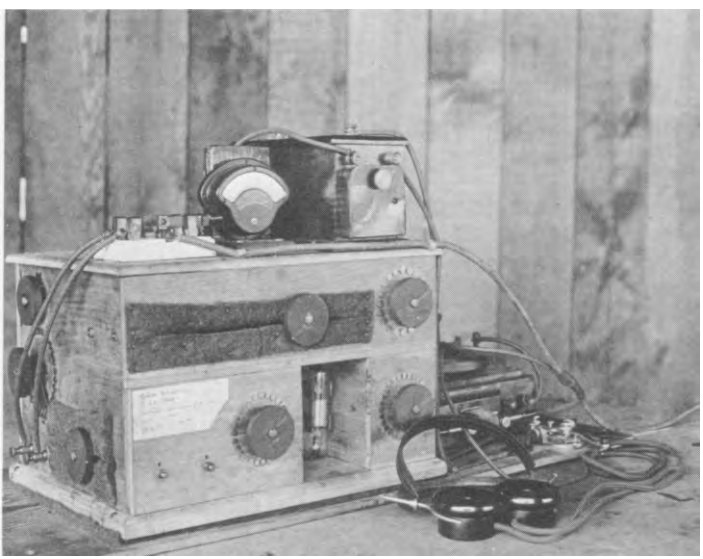
**The deviation of a shot is its distance from the objective.

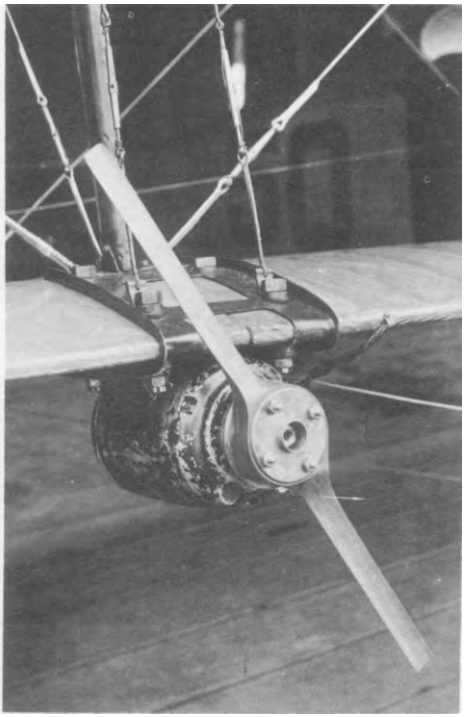
***Some times by radio telephone.

*Ordinarily, airplanes use damped waves.

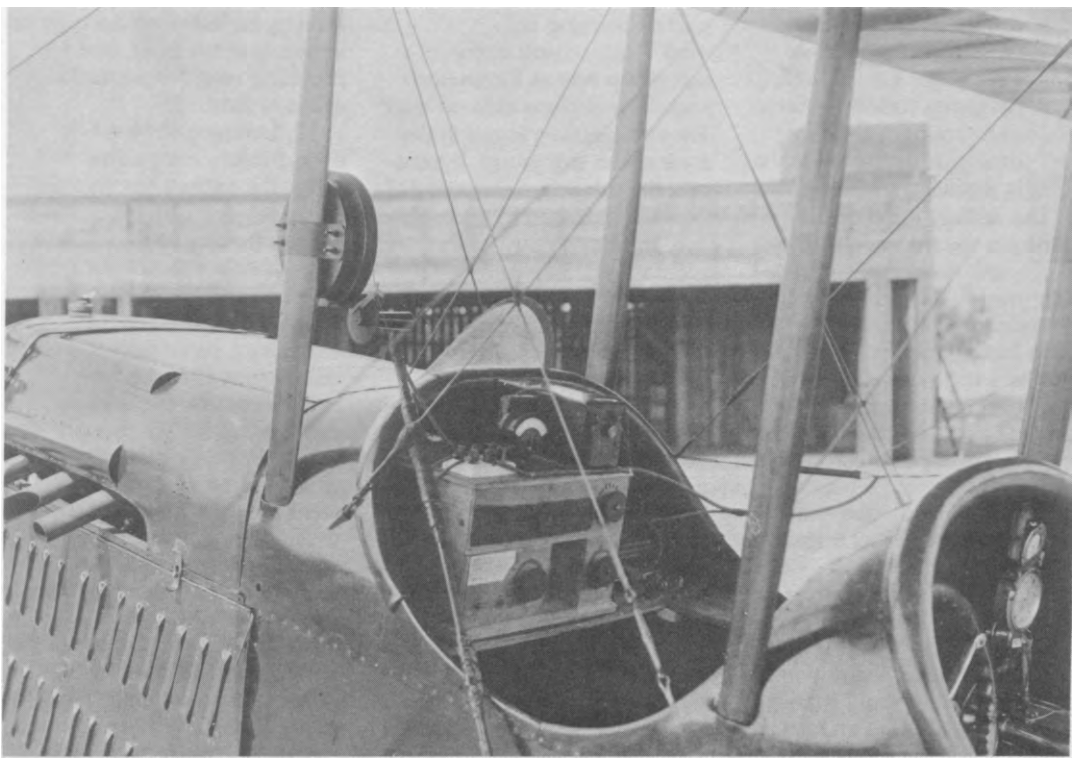


Following the Kansas tests, a major development in transmitting radio-telegraph messages took place at the Signal Corps Air Station, San Diego, in the summer-fall of 1916, when messages were sent and received from ground to planes, planes to ground, and between planes, for the first time in aviation history. The Glenn L. Martin #50 (above) was equipped for the experiments with sending and receiving sets (below).





The radio sets in the airplanes were powered by a small fan-driven generator mounted below the leading edge of the lower wing (above). An aerial of braided wire trailed the aircraft, and a reel attached at the left of the front cockpit was used to reel it into the plane (below).



6. Dropped messages.—This method is useful in transmitting information concerning objectives or firing. The message is placed in a container provided with a streamer. It should be dropped from a height not exceeding 300 meters, and as close to the receiving station as possible.

7. Signal lights.—Generally, these are used only for communication with the infantry. During the artillery preparation, their use with the artillery may be authorized by proper authority. A conventional code must be prearranged, and only a few simple messages can be sent.

8. Receiving stations.—Each regiment, group, or battalion, and sometimes each battery, has a radio receiving station.

The artillery radio officer transmits the message received to the unit concerned. The station must have exclusive and continuous communication with each battery dependent on it. Within a regiment, communication must be arranged so as to provide alternate stations in case of damage to particular stations.

If the airplane is equipped with receiving apparatus, the radio officer handles all messages from the ground station.

9. Telephone communication is covered by Liaison for All Arms.[4]

10. Each receiving station has an identification panel enabling it to be recognized by an airplane.

The personnel of a receiving station consists of the radio and panel operators supervised by the radio officer. All are specialists and must be carefully trained. Suitable replacements should be provided for.

11. The functions of receiving stations depend on the tactical unit to which they pertain. The following general classification may be made:

a) The receiving station of a battalion or battery acts principally as an *adjusting station.* It receives the reports of the airplane observing fire.

b) The receiving station of a sub-group acts as a *command post.* The airplane calls on it for fire on objectives found in the zone of the sub-group. It transmits the sub-group commander's decision in regard to each objective. In certain cases of this kind, such as battalions and batteries having a special mission, and prearranged adjustments, the airplane calls directly on the adjusting station.

The receiving station of a subgroup sometimes replaces an adjusting station which is out of action.

c) The receiving station of a regiment or group acts as an *information station.* It follows the work of the airplanes with the battalions or batteries of the regiment, and also the observation airplane and that accompanying the infantry operating in the zone of the regiment. All useful information is thus collected.

d) In each army corps, supervising receiving stations are established near the command post of the corps artillery. They receive from all corps airplanes, or at least those having general functions (general observation, infantry accompaniment, command). The corresponding commands are thus in a position to exploit promptly all information received.

e) Each landing field has a receiving station for testing the radio equipment of airplanes leaving, for following the work of airplanes at the front, and for providing relief for airplanes about to land.

12. Listening service.—In each division, army corps, and army, the artillery commander, in cooperation with the Air Service and the Signal Corps, decides what portion of the receiving personnel shall be used for listening duty.

At times, particularly during an action or in open warfare, the artillery commander so organizes the listening service that one station at least in each regiment or group will be in a position to receive calls from all airplanes calling the regiment or group, without other previous arrangement. Communication between such stations and the units to which they pertain must be carefully planned. Whatever be the kind of communication used, the radio officer is responsible for its proper operation.

4. See Doc. 40.

Balloon.

13. Balloon observation depends on:

a) The altitude of the balloon.
b) The range.
c) The atmospheric conditions.
d) The terrain.

14. Altitude.—Altitude is an essential condition for good observation. A balloon can ascend to about 1200 meters with two observers, and to 1600 or 1800 meters with one observer.

15. Range.—The balloon should be pushed as far foward as possible while actually observing, but should be withdrawn at once when it ceases to observe and while descending.

It has been found by experience that, on a well established front, the balloon can be maneuvered up to within about 9 or 10 kilometers of the front line. Points of ascension can be within 6 or 7 kilometers of the front line. These distances are determined by the position of the friendly and hostile artillery. They can be reduced when, during preparation for an attack, the hostile artillery is clearly dominated.

16. Atmospheric conditions.—Fog, strong wind, rain, and low clouds ordinarily prevent successful balloon observation.

For the present balloons, the limiting wind velocity is about 18 meters, or 20 meters during an attack.

17. Terrain.—Even when the balloon is at its maximum altitude, there is generally a portion of the terrain hidden from view. The balloon commander prepares a visibility sketch for each point of ascension, and transmits it to the command and the artillery commander.

18. Communication.—Telephone.—The telephone assures constant and reciprocal communication between the balloon and the command and the artillery. It is the normal means. It should be established so as to permit direct communication between the balloon and the battery whose fire is being observed.

Radio.—Balloon companies are provided with radio equipment for use when telephone communication fails.

Visual communication.—In addition the observer has various means of communication for use with the infantry which may, with prearranged signals, be used in connection with observation of artillery fire.

Chapter 2. Functions.

19. The functions of aerial observation for artillery are:

a) Information.
b) General observation.
c) Liaison with the other arms.
d) Observation of fire.

20. Information.—This includes the study of the hostile positions to locate objectives, such as command posts, machine gun emplacements, battery positions, communication trenches, etc.

The best means of obtaining information is by photography for the interpretation of aerial photographs affords information which would not be noted by an observer during a reconnaissance.

21. All aerial observers, during flights or ascensions, cooperate in obtaining information. This information is collected in each air unit by the intelligence officer attached, who communicates it at once to the Intelligence Section and the artillery information officer.

Similarly the intelligence officer attached to an observation unit is given such information from other sources as will assist him in his work.

Objectives are designated by coordinates. An Objective Card is made out for each objective, particularly batteries, giving all available information. . . .

Aerial photographs are the basis for rough sketches in the air unit, provisional interpretation in the army corps, and subsequent incorporation in the battle maps. The *destruction maps* are also made up from them.

During active periods, the rapid distribution of such sketches and interpretations is of prime importance, in order to locate new objectives promptly and permit destruction fire.

22. General observation.—This includes watching for hostile batteries in action and determining the objectives on which they are firing, reporting hostile troops which can be fired upon, and sometimes observing the movements of our own troops.

23. Constant observation is very difficult for airplane squadrons. They have no other means than sight, since all sounds are drowned by the motor. They should be used for such observation only for areas hidden to balloon or terrestrial observation. Such observation is particularly the function of the balloon, in areas which are visible to it.

24. General observation requires:

Of the aerial observer, a prompt call for fire, when deemed appropriate.

Of the command, prompt exploitation of the information obtained.

When practicable, the receiving station informs the aerial observer which battery is to fire.

25. Liaison with other arms.—See Liaison for All Arms.

26. Observation of fire.—This includes fire for adjustment, precision fire for effect, and verification during precision fire for effect, zone fire, and systematic fire.

The observer can determine not only the sense but also the deviation, if each salvo or volley is fired at his signal.

In fire for adjustment or verification and for precision fire for effect, the method fulfills this condition, and airplane observation is very advantageous. It saves ammunition and increases the efficacy of the fire.

For zone and systematic fire, in which the volleys are fired without notifying the observer, airplane observation is uncertain and only fairly effective.

27. An airplane can observe for but three hours at a time. Observation may be interrupted at any time by atmospheric conditions or incidents of combat. The fire should therefore be delivered as rapidly as possible, without sacrificing accuracy of laying.

28. The balloon can observe the sense and sometimes the deviation of shots with respect to numerous objectives. It should be used for the observation of all firing on these objectives, including precision fire, when terrestrial observation is impossible.

For objectives hidden from balloon observation, the balloon can still be used for a rough adjustment to be completed by airplane observation, or for the observation of fire for effect begun with airplane observation.

29. The assignment of the available aerial observation is based on the orders of the command and of the artillery and on the reports rendered by the Air Service.

30. Coordination of balloons and airplanes.—Close coordination of balloons and airplanes and a careful assignment of duties to each are essential for successful aerial observation. For this reason both are placed under the Air Service commander of the army corps or army.

The general assignment of duties is made by the artillery commander as follows:

a) To balloons, the general observation and observation of fire for objectives which they can see, except those for which terrestrial observation can also be used;

b) To balloons, the rough adjustment on objectives wherever possible, to be subsequently completed by airplane observation.

c) To airplanes, the observation of fire only in cases for which balloon or terrestrial observation is impossible.

The Air Service commander makes the detailed assignment of duties to airplanes and balloons, in accordance with the general assignments of the artil-

lery commander and conditions at the time. He makes the necessary arrangements for the successive use of the two methods on the same objective, when this is appropriate.

31. Division of duties among airplanes.—When an airplane can be assigned to each regiment or group of artillery in a restricted zone where the artillery preparation is well advanced, the observer should be given a definite task. He is then charged with general observation and the observation of fire.

In order to avoid errors, it is desirable that the observer who reports an objective should also observe the fire upon it.

In some cases however it is better to assign one airplane to general observation and the verification of fire over a larger zone, and to others, the observation of fire for adjustment and precision fire for effect.

32. The relative importance of the various aerial functions varies with the phases and character of an action. This is covered in orders by the command.

In an *offensive against a fortified position,* the duties of artillery airplanes and balloons are generally as follows:

a) Information and general observation accurately to locate batteries and other objectives.

b) Observation of fire for adjustment on datum points and the principal objectives.

c) Observation of precision fire for effect for the destruction of batteries and other hostile positions.

d) At the same time, reconnaissance and photography, to determine the effect produced.

e) The verification of fire, beginning as early as possible on the day of the attack.

f) During the action, the observation of neutralizing or destruction fire on the hostile artillery, in the form of fire for effect based on previous adjustments and on shifting fire on new objectives. Even, at this time, adjustments on important objectives may be necessary. These are assigned to special airplanes.

33. During movements, each large unit, generally the division, is assigned a route of march and a zone of action. Airplanes reconnoiter this zone and transmit information by projectors, signal lights, dropped messages, or radio, to *information centers.* These are established successively along the route so as to secure continuous reception.

Information centers are in communication with the landing field of the airplanes by visual signals, telephone, radio, carrier pigeons, airplanes, or automobiles. An officer of the Air Service of the army corps or division reconnoiters if possible a suitable landing field near the information center. The necessary sentinels are assigned to it and communications organized.

The division commander generally has his artillery commander with him, and moves successively from one information center to another as the movement continues.

The division artillery commander requests of the squadron commander, through the nearest information center, the airplanes which are needed by him. He states the assignment intended if possible.

The airplanes designated for such duty report at the information center of the division, either from the air or by landing, in order to ascertain the battalion with which they are to work and the objectives. The battalion puts out its identification panel near the receiving station.

34. The division artillery commander establishes a radio receiving station with panels at the information center nearest to him. Each battalion commander installs his radio receiving station as soon as he occupies a position, even if he has good terrestrial observation posts. For this purpose the radio transportation must be pushed forward with the reconnaissance.

35. The designation of objectives and assignment of duties to airplanes is very important. For this reason, an auxiliary landing field near the division information center is desirable, and is the more so when the communications between the latter and the regular landing field of the squadron are not reliable. The division artillery commander sends instructions as to the various assignments to the auxiliary landing field. This is facilitated if he keeps available several artillery aerial observers, who can be given instructions in advance and sent to the landing field to meet the airplane as it lands.

36. But in no case should the lack of an auxiliary landing field or good communications be allowed to interrupt the successful execution of aerial observation.

37. Balloons.—Balloons move with the unit to which they are assigned. The functions remain unchanged. They are charged with general observation and the observation of fire. Communication is by radio, projector or folding cylinder. Telephone communication is established as soon as possible.

A balloon observer is permanently attached to the artillery staff.

When the advance is rapid, the balloon is deflated.

As the attack develops, the organization tends to take the form of that for the attack of an organized position.

. . . . . .

Chapter 4.
Methods of Fire, Field, Heavy, and High Power Artillery.

Airplane

49. Airplane observation of fire has the following advantages.

a) The accurate location of objectives.

b) Determination of deviations.

c) The observation of a salvo or volley as a whole and the determination of the estimated position of the center.

It has the following disadvantages:

a) Unreliable communication between the observer and the battery commander.

b) Short period of observation possible.

c) Airplane moving at high speed, with difficulties due to clouds, wind, sun, obstruction of view by the wings of the airplane, limited radius of action of the radio, and incidents of aerial combat. These render the observation intermittent.

The following points are thus important:

a) A previous complete understanding between the observer and the battalion or battery commander with whom he is to work.

b) Use of *simple methods*, carefully prearranged, in order to avoid *dialogues*.

c) Short, well conducted firing; to save time.

. . . . . .

Night Airplane Observation.

91. Night airplane observation requires the following:

a) Specially clear nights* without mist over the ground.

b) Airplanes of certain models.

c) Very well-defined objectives.

d) A thorough familiarity with the ground on the part of the observer.

e) Strict fire discipline**.

*Airplane observation has been successfully used on moonless nights.

**The flashes of the bursts are extremely fleeting, and the close attention required of the observer is very trying.

92. Night observation should be as nearly vertical as possible, as it is easier to catch the flashes in this manner.

Communication from the ground to the airplane is by radio when the airplane has a receiving apparatus, or by searchlight.

If searchlights are used, two are needed, pointed in the direction of the objective and elevated to about 15°. One fixes the line of fire, and the other is used for signalling.

. . . . . .

94. The sense of shots can be determined at night, but not the deviations.

Night observation is safer for the airplane, which must operate well inside the enemy lines. The methods can be used advantageously for harassing and interdiction fire on distant objectives*, effectively protected in the daytime by the antiaircraft defense, such as depots, railroad stations, camps, or points of obligatory passage. It is not suitable for destruction fire on batteries that are difficult to distinguish at night.

5. A visible target on which fire is adjusted immediately after adjustment on a target that is, or may become, obscured.

*In this case, the observer is not confused by the flashes of the pieces themselves or by bursts in connection with other firing.

Balloon.

95. Methods of fire.—The special signals prescribed in the case of airplane observation are not necessary for balloon observation, because of the continuous and reciprocal communication between the observer and the battery by telephone. Balloon observation imposes no special restriction in regard to the conduct of fire.

The following should be noted however:

a) Only percussion fire can be accurately observed. Time fire should be used only to locate the approximate point of shots which are being lost.

b) In firing by salvos, the interval between shots should be 5 seconds at least, so as to permit observation of the individual shots.

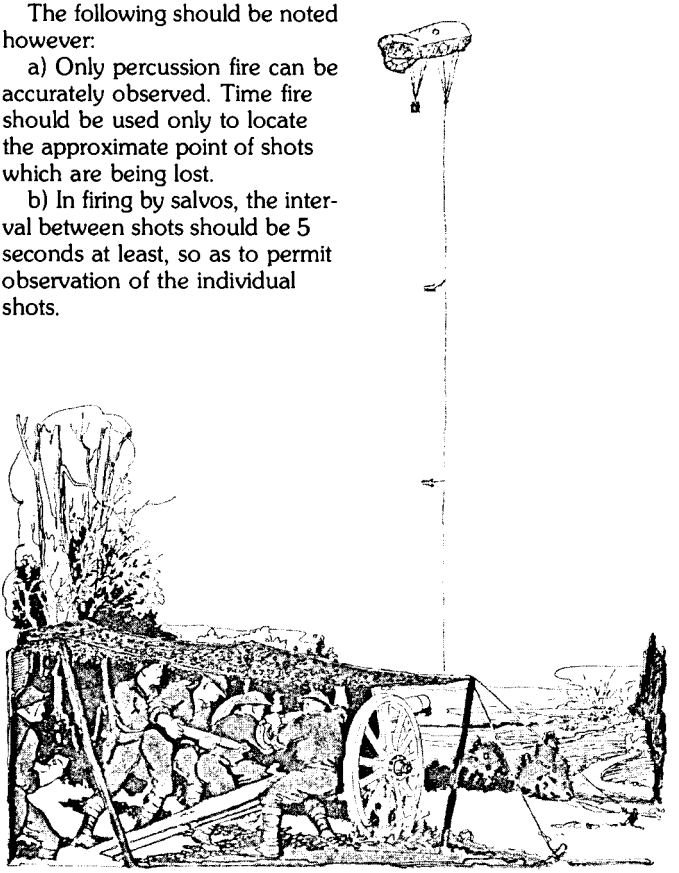
c) To lessen the strain on the observer, he should be warned as to the departure of shots in the following manner:

Battery: "Ready to fire".

Observer: "Ready".

Battery: "On the way".

d) Firing by balloon observation should be followed by firing on a witness point. . . .[5]



Maj. Gen. Mason M. Patrick replaced Foulois as Chief of Air Service, AEF, on 29 May 1918.

37. Command of the Air Service, AEF

29 May 1918

The duties of the chief aviation officers at GHQ and at army, corps, and division levels in the AEF were restated when Brig. Gen. Mason M. Patrick (soon promoted to major general) replaced Foulois as Chief of Air Service, AEF. Foulois then became Chief of Air Service, First Army. Mitchell remained with I Corps.[1]

General Orders
No. 81

General Headquarters A.E.F.
France, May 29, 1918

I. The duties of the Chief of Air Service, A.E.F., provided for in G. O. No. 31, current series, these headquarters, are as follows:

1. The Chief of Air Service is a member of the staff of the Commander in Chief, and acts as adviser on aeronautical matters.

2. He is responsible for the organization, training, materiel and equipment, methods, and all other matters affecting the efficiency of the Air Service. He will make suitable recommendations to the Chief of Staff, based on inspection and study, investigation and experience.

3. He is responsible for the preparation of all details concerning the instruction and training of air units, in accordance with the approved training policies, and he is charged with the supervision of all Army Aeronautical Schools.

4. He will supervise the training of all air units until they join the tactical units to which they are assigned, or until they are sent to the A.S., S.O.S., for final training, instruction and assignment.

5. He will prepare and submit to the Chief of Staff drafts of such manuals and other literature as may be necessary in the training and employment of all air units.

Nothing in the foregoing will be construed as in any way limiting or prescribing the powers and responsibilities of the General Staff, as defined by G.O. No. 31, current series, these headquarters.

6. General Order No. 31, current series, these headquarters, is amended in accordance with the provisions of the preceding paragraph.

II. Brigadier General Mason M. Patrick, N.A., is announced as Chief of Air Service, A.E.F.

III. The duties of the Chief of Air Service of an army are as follows:

1. In each army there will be a Chief of Air Service, who will command the army air units and who will act as adviser to the Army Commander and the Army General Staff on all aeronautical matters.

2. Under authority of the Army Commander, the Chief of the Air Service of an army, is

1. The Air Service and some other elements of First Army were organized before the army itself was formally organized, and Pershing took command, on 10 August 1918. Foulois and Mitchell could not get along together. After trying to have Mitchell sent home, Foulois stepped aside with a recommendation that Mitchell be placed in charge of the First Army Air Service.

charged with the instruction and inspection of all air units of the army. He will keep the Army Commander informed at all times concerning aeronautical matters, and will make such recommendations as he considers necessary concerning aeronautical personnel, materiel and methods.

3. In accordance with the general plan of operations, and in co-operation with G–3 of the army, he prepares the general plan for the employment of all air units in the army. He prepares detailed plans for the air units under his direct orders.

4. He is charged, in accordance with operation orders issued, with the apportionment of aeronautical materiel and equipment placed at the disposal of the army.

5. In addition, he is charged with the instruction and supervision of all Air Service units and personnel in the Advance Section, S.O.S., pending their assignment to tactical units.

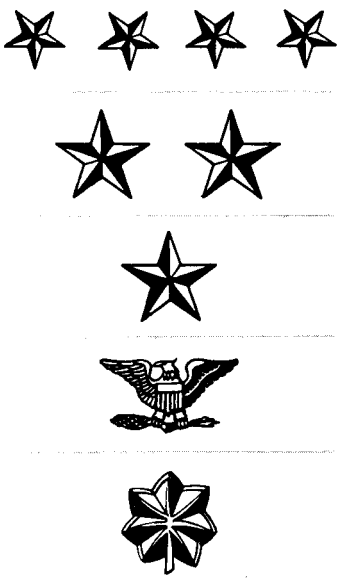
IV. 1. Brigadier General B. D. Foulois, S.C., is announced as Chief of Air Service, 1st Army.

2. The air units now attached to the 1st Corps are detached therefrom and placed under the command of the C.A.S., 1st Army.

V. The duties of the Chief of Air Service of an army corps are as follows:

1. In each army corps there will be a Chief of Air Service, who will command the corps aeronautical units.

2. He is the adviser of the Corps Commander and the Corps General Staff in all that pertains to the Air Service. He will keep the Corps Commander informed in regard to aeronautical matters, and will make such recommendations as he considers necessary concerning aeronautical personnel, materiel and methods. In accordance with the general plan of operations, and in co-operation with G–3 of the corps, he prepares the general plans of action for all the air units of the corps. He insures the co-ordination of the aeronautical plans of divisions and supervises the employment of all air units throughout the corps in accordance with the approved plans. He prepares the detailed plans for the air units under his direct orders.



3. Under the authority of the Corps Commander, the Chief of Air Service is charged with the instruction and inspection of all air units assigned or attached to the corps; the collection, dissemination and utilization of aeronautical information within the corps, and the necessary liaison with the artillery and the Air Service of the Army and of the neighboring corps.

4. He apportions the aeronautical supplies and materiel placed at the disposal of the corps, and prepares timely requisitions for aeronautical materiel.

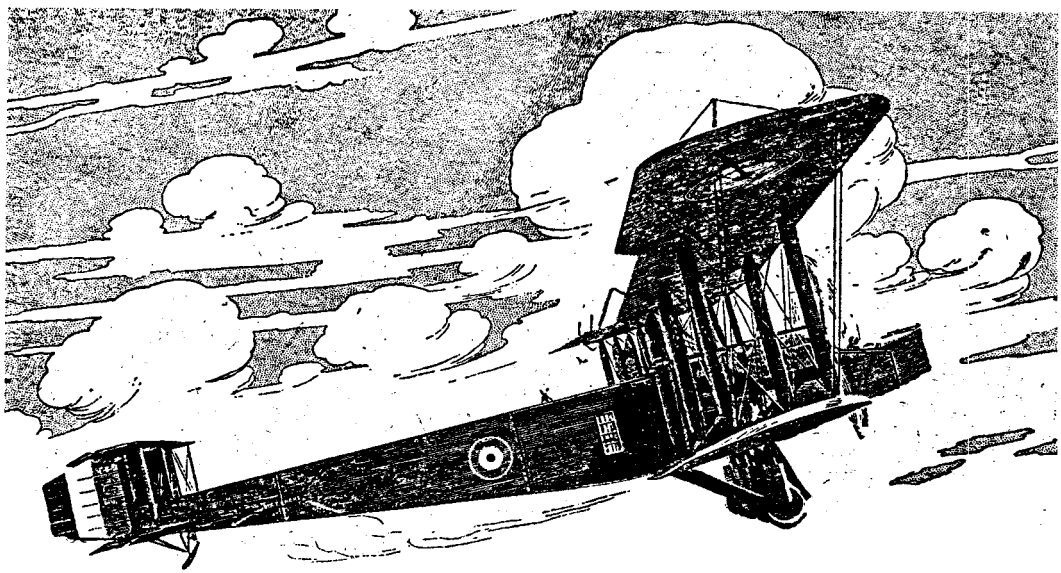
VI. Colonel W. A. Mitchell, S.C., is announced as Chief of Air Service 1st Corps.

VII. When aeronautical units are attached to a separate division, the senior Air Service officer on duty therewith will bear the same relation to the Division Commander and will perform duties similar to those prescribed above for the Chief of the Air Service of an Army Corps.

VIII. The 27th and 147th Aero Squadrons (pursuit) and the 96th Aero Squadron (bombardment) are assigned to the 1st Army A.E.F. These organizations will be reported by their commanding officers to the Chief of Air Service, 1st Army, A.E.F. for duty.

By Command of General Pershing:

James W. McAndrew,
Chief of Staff.




RFC

38. No Independent Air Operations

29 May 1918

Writing about his plan for strategic bombardment (Doc. 29B), Gorrell told of conversations with Trenchard late in 1917 concerning a cooperative Anglo-American bombing program. With Pershing's approval, Foulois had concluded an agreement with British officials on 26 January 1918 for organizing, equipping, and training 30 U.S. squadrons for night bombardment with Handley Page aircraft. Approving the plan and agreement in general, Pershing informed Trenchard on 6 February 1918 that he (Pershing) would instruct Foulois "to take the necessary steps towards insuring the closest possible co-operation with the British Air Service."[1] Gorrell went on to say, however, that on 18 July Pershing's Chief of Staff (Maj. Gen. James W. McAndrew) placed certain restrictions on U.S. bombing operations, and on U.S. Air Service cooperation with the British in such a bombing program. Following is McAndrew's statement, as well as an extract from the document, a memorandum from Patrick, to which McAndrew was responding.[2]

American Expeditionary Forces,
Services of Supply, Office of
Chief of Air Service

May 29, 1918.

MEMORANDUM for Chief of Staff, GHQ, American E.F.

SUBJECT: Approval of preliminaries for night-bombing operations.

1. In order to carry out the agreement arrived at with the British Commander-in-Chief for the joint operation of our bombardment squadrons, and approved by the Commander-in-Chief, A.E.F., February 8, 1918, and in view of the fact that:

(a) Night bombing units operate independently of other units in the Air Service (do not require the protection of Pursuit unit).

(b) The planes used are radically different from those required by day bombing and day pursuit squadrons.

(c) The final training of the personnel is along entirely different lines from that followed in the case of observation, pursuit, and day bombardment personnel, it is recommended that the development and operation of the Night Bombardment Program should be carried forward by such officers as may be designated to specialize in this Section of the Air Service.

2. Approval is requested for the Chief of Air Service to designate officers charged with the following duties:

(a) Study the development of our organization, personnel, and material in conjunction with the British officers charged with night bombardment, in order that our bombing units, when created, may properly cooperate with similar British units.

(b) Establish a center for the organization and instruction of pilots and bombers in night flying and bombing operations with required British instructors, and make special study of British training in night navigation.

1. Ltr, Pershing to Trenchard, 6 Feb 18, in Gorrell's History, B-6, p 33.
2. In Gorrell's History, B-6, pp 39-42.

(c) Arrange for the training of transfer pilots to fly planes from England to the American airdromes in France.

(d) Arrange for the required emergency landing fields between the Channel and the American airdromes.

(e) Arrange with the British for carrying out the present agreement of making a new and more comprehensive agreement, for doing the repair work on night bombing machines at Courban.

(f) Arrange with Ordnance Department to have officers attached to British squadrons to make study of bombs, bomb gears, etc., used on British planes.

(g) Arrange with Intelligence Department for officer or officers to make study of bombing targets with British Intelligence Officers attached to British Brigade Headquarters.

. . . . . .

4. It is necessary that the above points be given close study in order that our bombing operation may be properly correlated with the bombing operation of the British when the American bombing planes are received at the front.

(Sgd) Mason M. Patrick
Brigadier General, N.A.
C.A.S.

1st Ind.

G.H.Q., A.E.F., June 18, 1918.
To C.A.S., Hq S.O.S.

1. Approved subject to such limitations as are imposed by the following paragraphs.

2. While cooperating in every possible way with the Air Forces of our allies, all of our bombing forces must remain an actual integral part of the American Expeditionary Forces.

3. It is of special importance that the higher officers among our bombing personnel be impressed with the importance of the principle of the concentration of the effort to each arm, and of the coordination of all efforts, to a common tactical end. It is therefore directed that these officers be warned against any idea of independence and that they be taught from the beginning that their efforts must be closely coordinated with those of the remainder of the Air Service and with those of the ground army.

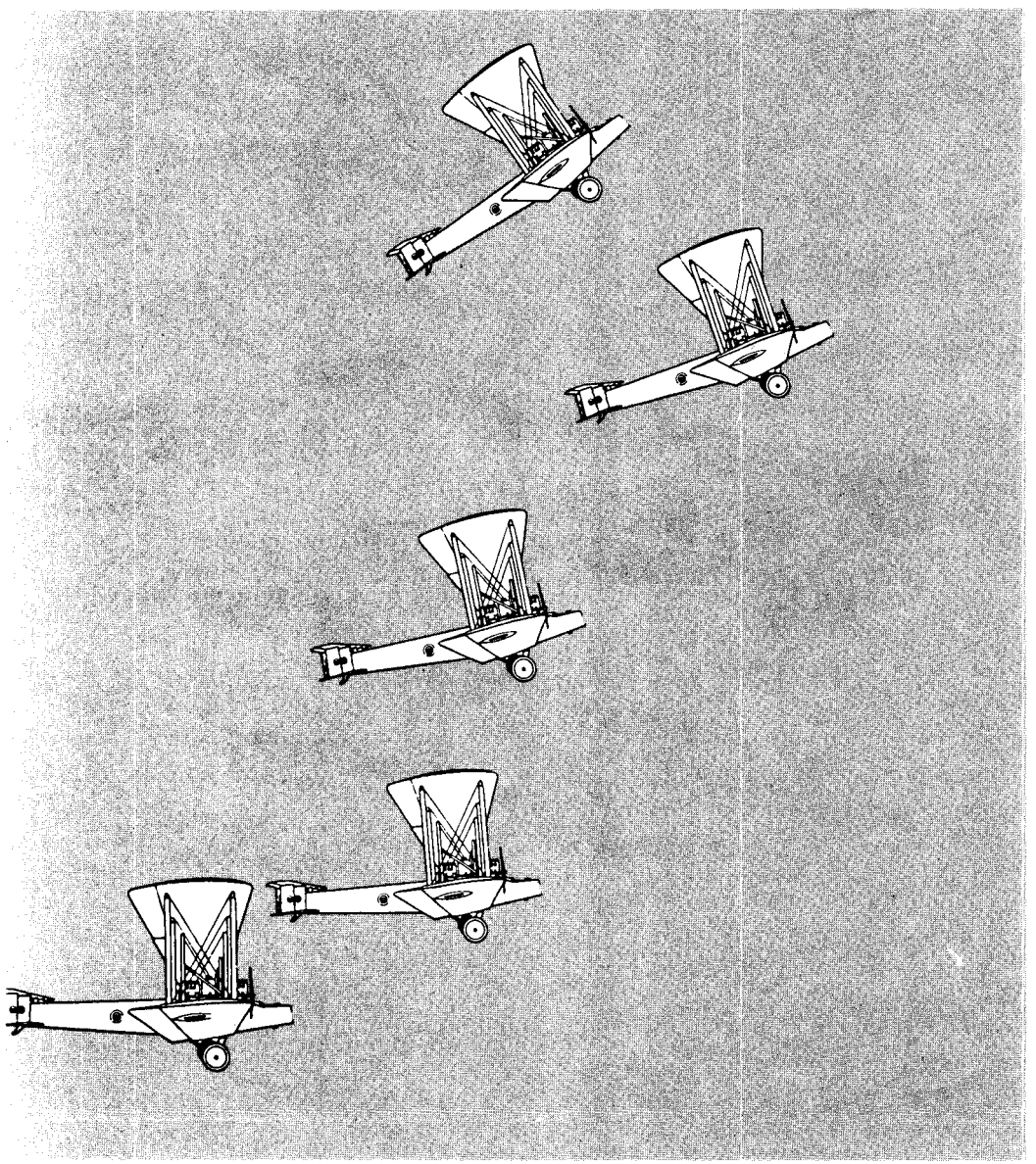
4. In making arrangements with the British it must be thoroughly understood that when our forces reach a certain importance the regions to be bombed will be designated by these headquarters and that the selection of targets will depend solely upon their importance with respect to the operations which we contemplate for our ground forces.

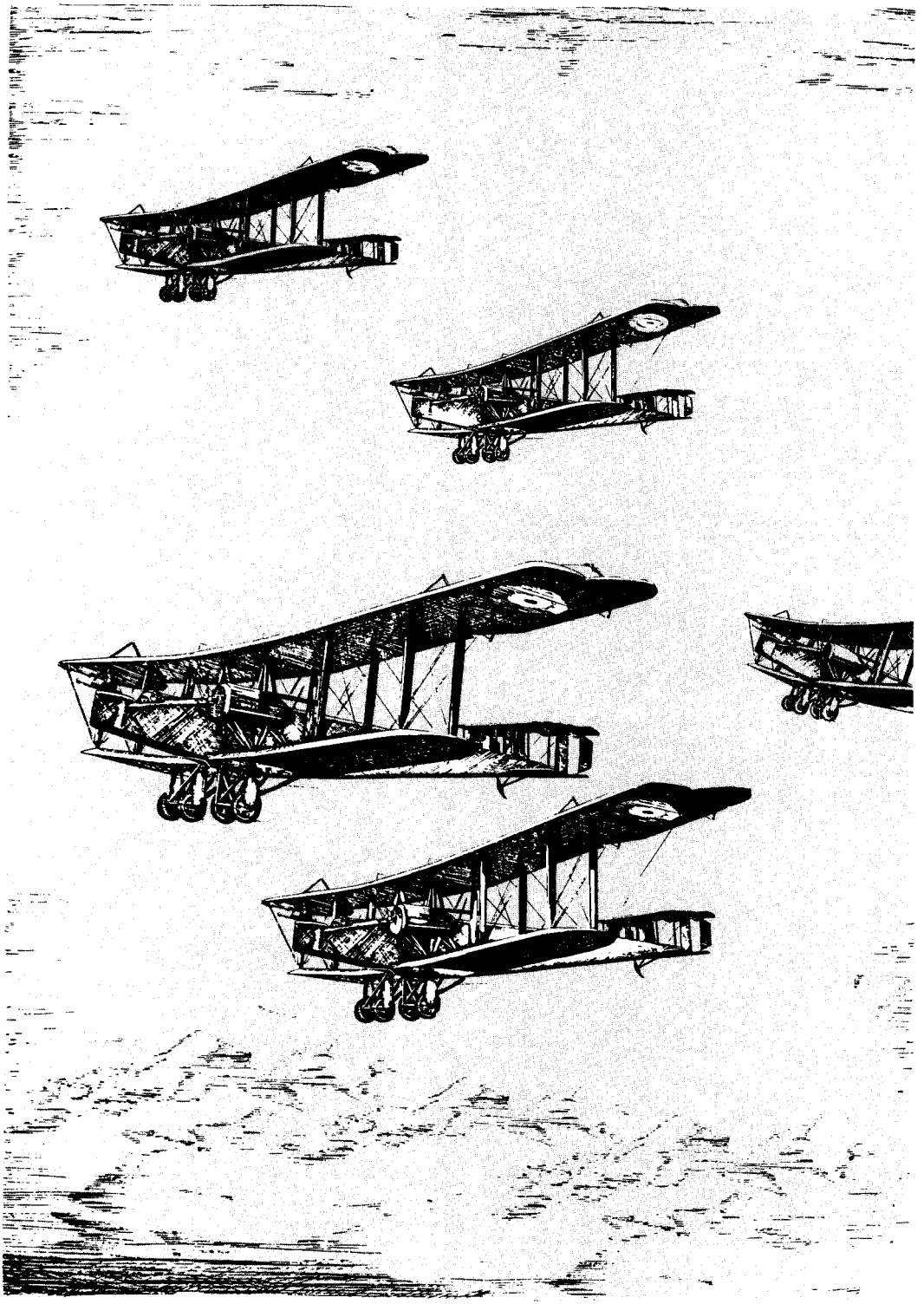
5. In the establishment of training schools the idea of making them purely American must govern.

6. In order to prevent interference with other projects it is necessary that all bombing projects involving matters of construction, supply or repair be taken up with the Asst. Chief of Staff, G.4 at these headquarters.

7. G.2 at these headquarters has already established the liaison requested in subparagraph (g), paragraph 2.

By direction.
(Sgd.) J. W. McAndrew,
Chief of Staff.





39. Restatement of the 260-Squadron Plan

5 June 1918

On 2 May 1918 the War Department informed the AEF by cable that production problems were making it impossible to meet the schedule for preparing squadrons for service at the front.[1] On 20 May Pershing replied that developments to date did not require any change in the GOP and SORP, which he had approved. Those projects, he said, "set forth our needs and desires to include June 1919." He then laid out a schedule that would put all 260 squadrons at the front by that time.[2] This new schedule reflected significant changes made in the 260-squadron plan in the SORP of 18 September 1917 (Doc. 27). The 60 bombardment squadrons of the SORP had been designated for night operations, and the 41 observation squadrons first classed as strategical aviation had become day bombardment units. Because of some confusion that had developed during the exchange of a series of cables concerning schedules, Patrick restated the schedule in the following paper,[3] to which is added a memorandum indicating Pershing's approval.[4]

American Expeditionary Forces
5 June 1918.

From: Chief of Air Service.

To: Commander-in-Chief, American E.F.

Subject: Air Service Building Program In United States

1. Cable 1224–R, dated May 3, 1918, requested our recommendations for the United States Air Plane production program, to include June 1919. Our recommendations were sent to the United States on May 21, 1918, in paragraph 1 of cable 1156–S. The United States requested further information on May 26, 1918, in paragraph 1 of Cable 1397–R, and we gave them this information on May 31, 1918, in our cable 1219–S. The building program given to the United States was based on allowing Squadrons to be efficiently operating on the front according to the following tabulation, and the United States was informed that, to accomplish this, the squadrons should reach the front 1 month prior to the time when they were expected to be operating efficiently.[5]

2. As stated in paragraphs 1 and 1–a of our cable 1156–S, the building program given to the United States conforms exactly to the General Organization Project approved by the Commander-in-Chief on July 11, 1917, as amended and completed by the Service of the Rear Project approved by the Commander-in-Chief on September 18, 1917, for an Army of 20 combat divisions.

3. It is noted that the cable 1224–R states that all we need tell America is the dates when we wish squadrons ready for service on the front and that America will then make the necessary calculations to ascertain what size building program is necessary to permit us to mobilize the squadrons on the dates when we desire. . . .

. . . . . .

6. It is requested that this program be reviewed and that it be returned to this office with such

1. Cable 1224–R, McCain (Maj. Gen. Henry P. McCain, TAG) to Pershing AMEX Forces, May 3d, in Gorrell's History, A–7, pp 89–90.

2. Cable 1156–S. Pershing to AGWAR Washington, May 21st, in Gorrell's History, A–7, pp 85–86.

3. In Gorrell's History, A–7, pp 65–68. The day of the month, missing at the top of the copy of the letter in Gorrell's History is supplied by a paper prepared by Gorrell on 29 July 1918, in Gorrell's History, A–7, p 94.

4. In Gorrell's History, A–7, p 68. It is interesting to note that the indorsement signed by McAndrew was written by Gorrell. For the date of the indorsement, which was missing, see the previous note.

5. In the table which follows, Observation and Bombardment have been abbreviated, and format for Mono- and Biplace Pursuit has been changed to save space.

additions, comments, or modifications as may be desired, and that it then be known as the "AIR SERVICE PROGRAM." It is desired to send this paper to the United States to clarify, if necessary, the cables already sent.

Mason M. Patrick
Brigadier General, N.A.

	April 15, 1918	May 1, 1918	June 1, 1918	June 30, 1918	Sept. 1, 1918	Oct. 1, 1918	Oct. 30, 1918	Nov. 1, 1918	Nov. 30, 1918	Jan. 1, 1919	Mar. 1, 1919	June 1, 1919	Totals
Corps Obs. Sq.	3	1		6					2		3		15
Army Obs. Sq.	1		5				4		4		5	5	24
Monoplace Pursuit Sq.	3		2	3			8		8		8	8	40
Biplace Pursuit Sq.	4		3	9			16		16		16	16	80
Day Bomb Sq.				9			8		8		8	8	41
Night Bomb Sq.				12			12		12		12	12	60

ESG(G–3)

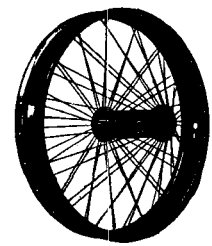
1st Ind.
G.H.Q., American E.F.,
France, June 5, 1918.

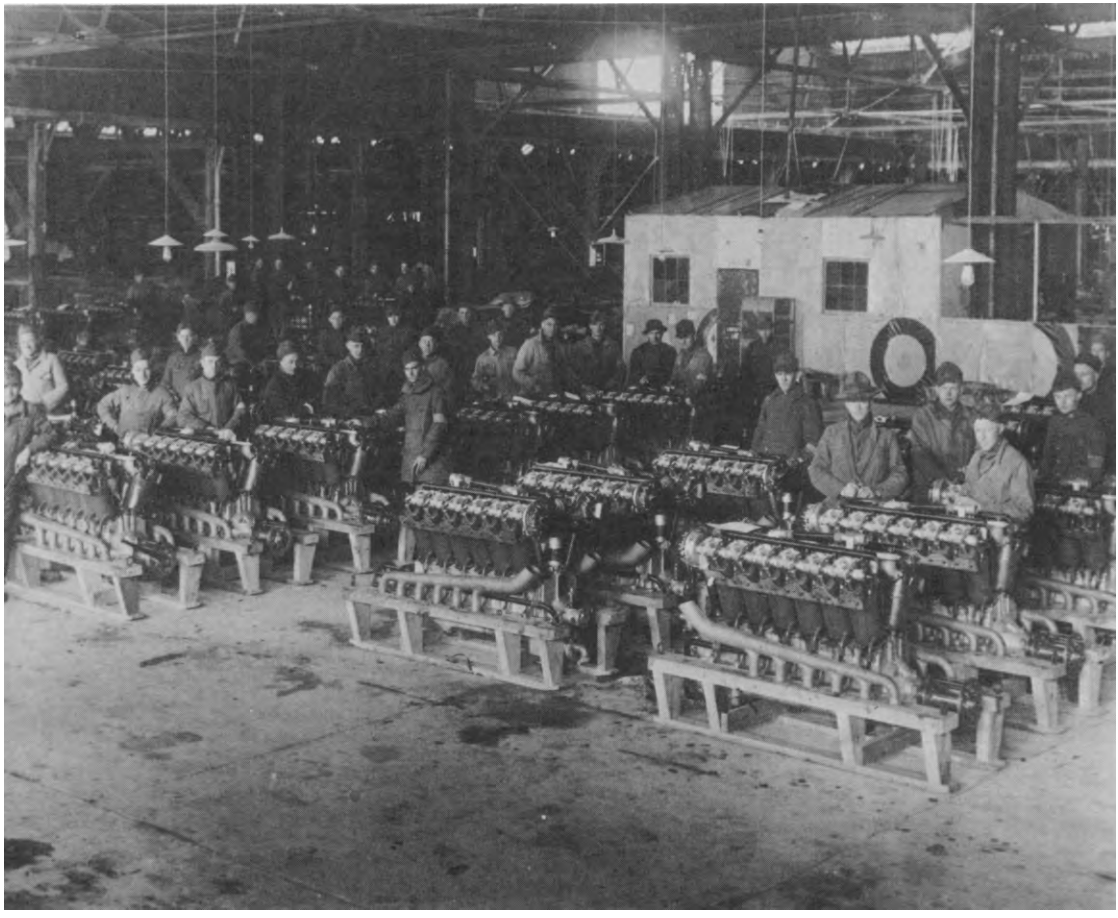
To: Chief of Air Service,
American E.F.

Returned.

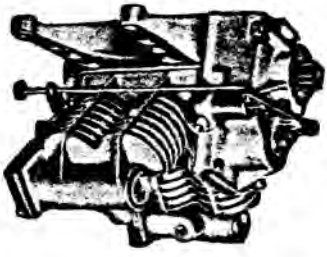
1. The Commander-in-Chief approves this program as a basis for production in the United States. It constitutes a program upon which it is desired the Air Service develop, provided the tonnage is available. It must be understood that the military situation will, from time to time, cause minor variations in the dates when Corps Observation and Army Observation Squadrons are needed, but this fact need not vary the building program as already furnished the United States.

(signed) J. W. McAndrew
Chief of Staff.





With emphasis on developing the aviation program, aircraft factories, such as the Liberty Engine plant (above), worked feverishly to meet production goals.



Infantrymen firing Very pistols to communicate with aviators.

40. Infantry Liaison

15 June 1918

Early in the war, failure of landline and other communications during battle caused the British and French to devise means for using aircraft to keep infantry commanders informed on the movements and locations of their various units. Although balloons were used, most operations of this type were carried out by airplanes. For such infantry liaison, or infantry contact work the Air Service, AEF, adopted procedures issued by the French in a pamphlet, "Instruction on Liaison for Troops of All Arms," dated 12 December 1916. Following are extracts from a revised edition, issued by the French on 28 December 1917 and published in translation by GHQ AEF on 15 June 1918.[1]

1. In Gorrell's History, J-3, beginning p 200.

Liaison For All Arms

I. General Considerations.

1. The object of liaison is as follows:

To keep the commander constantly posted on the situation of the units under his orders, and to furnish him with a basis for his decisions.

To insure, between the various echelons of the command, between adjoining units and between the various arms of the service, the safe and rapid transmission of orders, questions, reports and information, and in a general way to insure all communications necessary to obtain a close co-operation, particularly between the infantry and artillery.

Consequently, to be complete, the liaison must secure the following communications:

(1) From the front to the rear.

(2) From the rear to the front.

(3) Laterally between units co-operating in the same action.

It utilizes:

(a) Means of obtaining information (liaison agents, ground observation, aerial observation, liaison with airplane, liaison with balloon).

(b) Means of transmission:
Telephone and telegraphy.
Radio telegraphy and earth telegraphy (T.S.F. and T.P.S.)
Visual and acoustic signaling.
Various signaling (by arms, by panels, by fireworks).
Courier.
Carrier pigeons, etc.

. . . . . .

Chapter IV. Liaison by Airplanes and Balloons.

I. Airplanes.

A. Work Assigned to Airplanes.

23. In combat, besides the various duties of reconnaissance which may be assigned to them by the commander, the work of aerial observers includes:

Watching the enemy in the zone of the combat.

Liaison of the commander with subordinate echelons.

Accompanying the infantry.

In an army corps, for instance, these duties may be distributed in the following way:

(1) One or several *airplanes of command* follow the general development of the combat, watch the enemy within the assigned zone, give information as to the distribution of his forces, indications of counter-attacks, etc.

(2) *Courier airplanes* are charged with the rapid transmission of orders from the commander and of valuable information about their own situation, that of nearby units and that of the enemy.

(3) *Airplanes for accompanying the infantry* (cavalry uses the same methods as infantry for its liaison with airplanes and balloons), as a rule one per division.

They follow the assaulting troops and reserves, observe signals of the firing line and of the command posts and transmit them to the general commanding the division, and possibly to the artillery radio stations, to the command posts of brigade and regiment.

They transmit to the infantry the orders of the division commander and, generally speaking, inform the commander of everything going on in the vicinity of the first line and behind it.

24. The airplane for accompanying the infantry is provided with distinctive signs (pennants, rows of lights, etc.), and besides makes itself known by a sound signal and a signal cartridge, both determined by the plan of liaison.

Its characteristics and the signals which it uses to communicate with the infantry ought to be familiar to all men of the units for which it works.

To prevent its appearance from giving the enemy a sure indication of an impending attack, and to make all concerned familiar with their own airplanes, it is indispensable that the airplanes accompanying the infantry fly frequently over the lines during the days of artillery preparation. Outside these periods they should fly from time to time in order to practice liaison with the infantry.

The airplane for accompanying the infantry rises above the advanced units to a height which must not exceed 1,200 meters. In certain cases it may be obliged to fly over the lines at very low height, but must not come below 600 meters except in case of necessity.

It must be the constant care of the crew to assist the infantry, noting exactly its position and its needs and conveying rapidly such information to the commander and the artillery.

B. Means of Communication.

(1) *Communication From The Airplane to The Earth.*

25. Airplanes communicate with the earth by means of:

(a) *Weighted messages* (1) for important indications, sketches and photographs intended for the command posts of army corps, divisions, brigades, and in exceptional cases of regiments.

To drop a weighted message the airplane comes down to a low height (about 200 meters) above the command post concerned, calls the attention of the addressee by one or several sound signals (fixed by the plan of liaison), and drops its message so that it falls in open ground. (The plan of liaison should prescribe, as far as possible, on what terrain weighted messages shall be dropped.)

In the course of the infantry's advance, supported by artillery fire of all calibers, it is difficult for an airplane to get through the very dense sheet of projectiles. At the moment it can drop messages on a command post located near the line of batteries only by remaining above that sheet, hence under bad conditions for carrying out its duty.

(b) *Radio telegraphy*, for urgent information (position of friendly troops, requests for artillery fire, lengthening of range, etc.), to the authorities whose receiving station is likely to hear it, i.e., to commanders of army corps, divisions, brigades, infantry regiments, artillery groups and battalions.

Such communications are made by using one of the codes of Appendix VI.[2] Only such indications as are totally useless to the enemy may be transmitted in plain language.

(c) *Visual signaling and signaling by fireworks* (conventional signals of codes in Appendix VI) after having drawn attention by a sound signal (fixed by the plan of liaison) for communications intended for such elements as have no radio stations at their disposal and whose advance position does not permit the dropping of weighted messages.

(1) The message itself is placed in a metal box provided with a white or colored pennant which increases its visibility.

2. This appendix and the others cited have been omitted.

With the fireworks used nowadays the airplane cannot possibly indicate which element it wishes to communicate with. Such signals are consequently intended for all elements constituting the large unit for whose benefit the airplane is working. The use of projectors, on the contrary, enables the airplane to choose its correspondent. It is therefore advisable to try constantly to improve the latter method.

To be visible, visual and fireworks signals must not be used when the airplane is seen by the duties to be carried out, the better.

Signal cartridges must always be fired from a height greater than 300 meters, and as much as possible upwards, to avoid confusion with the signals made by the infantry.

(2) Watch Posts

26. In order that the airplane signals and the messages sent by them may not pass unnoticed, in case the noise of the battle drowns the sound signals, a permanent watch post service must be secured by the radio officers, or by the officers in charge of the liaison near the posts of command of army corps, division, brigade, regiment, artillery group and battalion, as soon as the post of command is established. This service is carried on by observers within the battalions and companies. (The distribution of the personnel should be such as to insure simultaneously "observation" and "watch.")

(3) Communication From The Earth to The Airplane.

27. The airplane receives communications from the firing line and from the command posts.

(a) *Firing line:* The line indicates its location:

1. *By means of position-marking panels.* All men carring panels alternately open and shut their apparatus, taking care to set it facing the airplane with that side whose color stands out better on the surrounding ground. It is better to use many panels simultaneously during a fairly short time than a smaller number of panels during a longer time; thus, the line is automatically traced very quickly and clearly and troubles caused by forgotten panels are avoided.

To reduce the enemy's chances of spotting our line, the airplane observer must endeavor to reduce to a minimum the time required to take note of the new line.

Panels are folded up again as soon as the airplane signals "understood," and in any case after ten minutes.

2. *By means of Bengal flares* of certain color (fixed by the plan of liaison). These signals constitute the surest way of indicating one's position. It is important, however, to conceal them as much as possible from hostile view, by hiding them behind a screen, at the bottom or on the front side of a shell crater, while taking care that they remain visible to friendly observers.

To avoid confusion it is forbidden to display position-marking panels or to light Bengal flares anywhere but on the line. (This interdiction applies as well to patrols sent in front of the lines as to supporting or reinforcing units).

In order to distinguish clearly the signals made by our infantry from those which might be set by the enemy to impede observation it is important to agree that panels or Bengal flares will be placed in groups of 2, 3, etc.

3. For want of marking panels and Bengal flares, the line uses all means available to indicate its location: signal cartridges of the 25 mm pistol or V.B.,[3] signal projectors sending series of alternated dots and dashes, waved handkerchiefs, pocket mirrors, etc.

The marking out of the firing line is carried out:

Either at an hour set beforehand, or on a prearranged line: for instance, the final objective or one of the successive objectives: or by order of the command transmitted by the airplane by means of the signal cartridges, "Where are you?" after having drawn the infantry's attention by a sound signal; or upon the company or platoon

3. Viven Bessiere; a smoke grenade.

commander's initiative, when their unit cannot advance any farther; or when, compelled to fall back, it has succeeded in securing a hold on the ground.

Orders for marking out should not be too frequent. In principle the marking out will be done by panels.

Should the observer not see the panels, or should he see them badly, he will request another marking out, which will then be executed by means of Bengal flares.

In that case the company or platoon commanders will also signal their positions by means of color signal cartridges fired with the 25 mm pistol.

The line sends its request to the airplane by means of the same fireworks and according to the same codes as for communications with the rear (see codes of Appendix VI).

The airplane transmits these requests by radio to the general commanding the division.

(b) *Command posts.* The different command posts indicate their locations by means of the identification panels described in Appendix III.

Such panels are placed, either upon initiative from the command post to draw the airplane's attention, or at a fixed hour, by order of the higher command transmitted to the command post by the airplane under the same conditions as to the firing line. Hence, as soon as the airplane sends out the signal, "Where are you?" all command posts noticing the signal should mark their respective positions. The panels are removed as soon as the airplane has answered, "Understood."

Command posts of generals commanding army corps and divisions can communicate by radio with such airplanes as have a receiving apparatus.

All command posts can communicate with airplanes either by visual signaling or by means of their rectangular panels (described in Appendix III), using the conventional signals of Appendix VI.

As a rule, visual signals are repeated and panel signals left in place until the airplane has answered, "Understood" (preferably by projector signals).

II. Balloons

A. Duties of Balloons.

28. The divisional balloon, whose work it is to insure liaison for the infantry, carries as a distinctive mark one or more pennants attached to the rear or to the cable of the balloon. If a night ascension is deemed necessary in order to receive signals from the infantry, the balloon indicates its presence by means of a luminous signal lit at regular intervals.

Like the airplane for accompanying the infantry, its duties consist in:

Following the progress of assaulting troops and reserves.

Observing the signals from the line of the command posts, and transmitting them to the general commanding the division.

Informing the commander of everything going on in the vicinity of the firing line, and behind it.

Sending out, if necessary, to the advanced elements conventional signals provided for in the plan of liaison.

B. Means of Communication

29. (1) *From the balloon to the command.* The balloon is directly connected by telephone with the divisional command post (balloon circuits) and with the army system.

It is besides provided with a radio apparatus enabling it to transmit its observations in case telephone communications should not work.

(2) *From the balloon to the firing line and to the advance command posts.* The balloon can communicate with the advance elements.

(a) In daytime by means of a cylinder which folds and unfolds at will, thus making signals corresponding to dots and dashes. These transmissions are limited to the two signals, "Understood" or "Repeat," preceded by the call of that particular post which the balloon addresses.

(b) At night by means of luminous signals, enabling it to send more complete messages, which, however, are always likely to be read by the enemy.

(3) *From the firing line and the advance command posts to the balloon.* In daytime, the firing line and the advance command posts indicate their positions to the balloon and communicate with it by means of the same methods as for communicating with the infantry airplane. However, the following should be noted:

(a) The balloon does not send out to the firing line the order to mark out the line which it occupies. Consequently it only observes the prearranged marking, or that ordered by the airplane.

(b) The balloon does not see the panels clearly.

(c) It can see the identification panels and the rectangular panels of the command posts only when they are inclined at a sufficient angle.

(d) Being far away from the lines it can hardly ever receive in daytime the signals made by the advanced elements with the 24 cm. projectors.

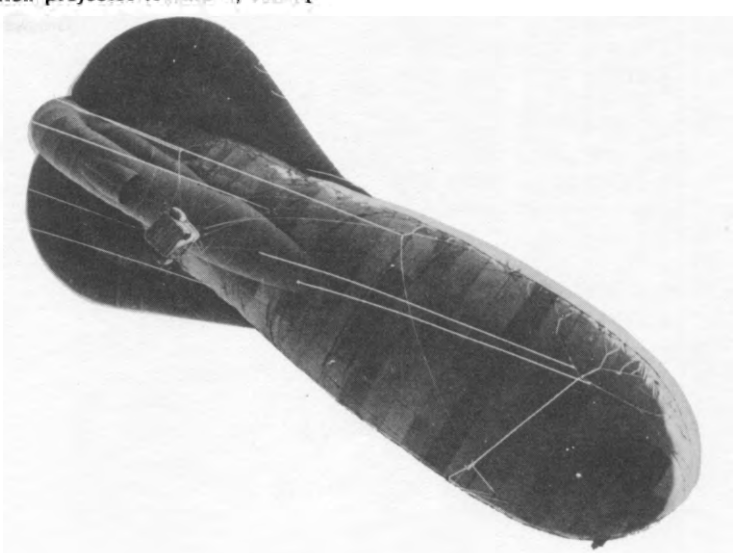
At night the balloon indicates its presence and position by lighting a luminous signal at regular intervals.

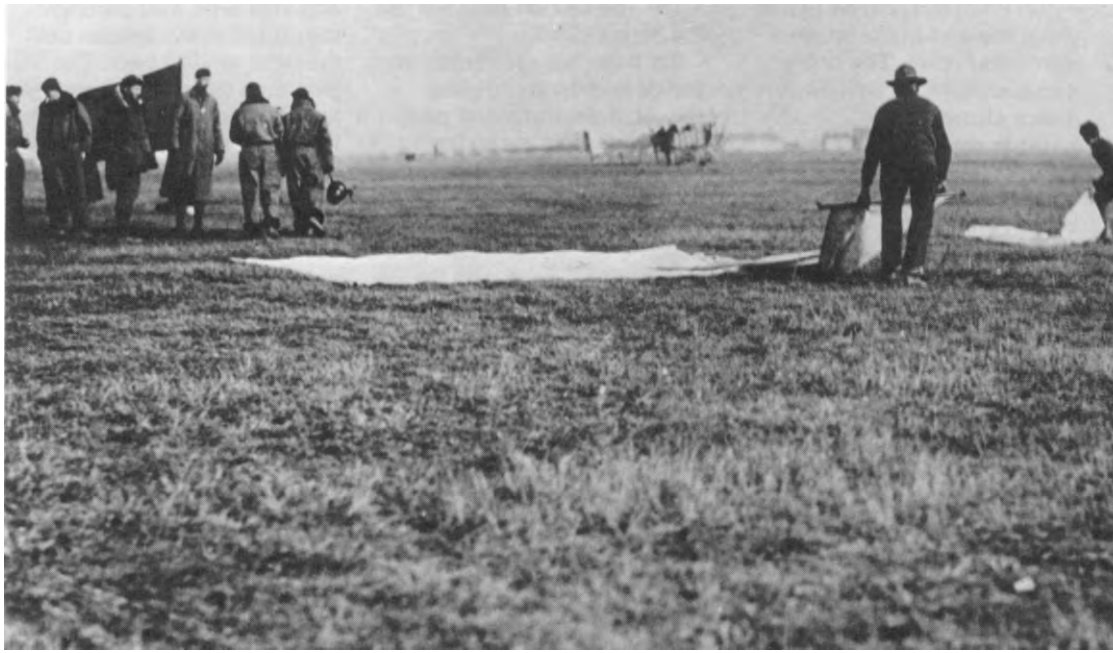
To this end, at an hour settled in the plan of liaison, the balloon sends out its call several times in succession and keeps its light up for five minutes.

The signalers of the different command posts take note of the direction of the balloon, orient their projector toward it, call up and then send their particular station call to the balloon until the latter sends it back. The balloon then takes them from right to left successively and receives their message, which it immediately transmits to the post of command by telephone or radio.

After these liaisons have been established the balloon observer watches the battlefield to catch any call which the different posts of command might send to him, and every 15 minutes he indicates his presence by two-minute calls.

As soon as he notices a call from a command post he starts communications with that post according to service regulations prescribed in Appendix V. Signals must be transmitted at low speed.





Ground panels laid out to signal aviators in flight.

41. Infantry Liaison in I Corps

June 1918

The following instructions[1] for infantry liaison apparently were written shortly before I Corps began operations early in July 1918 and before the AEF version of the French instructions of 28 December 1917 (see Doc. 40) had been received. Much attention is given to a variety of ways for aerial observers to communicate with infantry troops and headquarters. With radiotelegraphy for air-ground communications still in its infancy, and with radiotelephony even less developed, there really was no satisfactory means of communication, as these instructions indicate.

Notes on Liaison Between Aircraft and Infantry During Attack

Prepared under direction of Col. W. Mitchell, C.A.S. First Army Corps.

I. **Functions of the Infantry Airplane.** During periods of attack one infantry airplane is, in general, allotted to each Division. The functions of this plane are:—

1. To follow the advance of the attacking troops and reserves.

2. To observe signals from the front or most advanced line and the various P.C. and to transmit them to the Division Commander and, when required, to receiving stations of the P.Cs. of the artillery, Division, Brigade, or Regiment.

3. To transmit to the infantry the orders of the Division Commander, and, in general, to keep the headquarters informed of everything that is going on in the neighborhood of the advanced line and behind it.

The Infantry Airplane, therefore, has a double mission to assure; first, to keep the staff informed of what is taking place, secondly, to act as liaison agent between the troops in the first line and Division Headquarters, or, when required, with the P.Cs. or artillery and infantry brigades or regiments. This forms a task of the highest importance and one which is extremely complex and very delicate. It can be said without exaggeration that liaison with the infantry is the most difficult mission that can be entrusted to an aerial observer. For this reason, it is indispensible, both for the infantrymen and for the aviator, that exercises should be held frequently and as closely as possible approaching the realities of active warfare. The work of liaison with infantry is extremely difficult and arduous, both for the infantry and for the aviators, that the more practice exercises held to familiarize both with the duties to be carried out, the better.

II. **Mission of the Infantry Airplane—general principles.** It is difficult to fix definite limits to the activity of Infantry Airplanes, Artillery Surveillance Airplanes, and Command Airplanes. It should not be forbidden to the observer in the Infantry Airplanes, to spot enemy batteries in action and to signal them to the artillery, or to notify the Command of points particularly swept by the fire of the enemy; nor should it be forbidden to the artillery observer to observe and report matters of interest in our front lines or trenches, but the former is solely responsible for locating the advance of our attacking infantry, whereas the latter is solely responsible for observing, adjusting and directing the fire of our artillery. The observer of the Infantry Airplane has about all he can do to see what is occurring in the neighborhood and behind the foremost lines of the infantry. Without entirely ignoring what is going on on the enemy's side, he should, in principle, only interest himself with *our own* infantry. If he fails to confine himself to this, he runs a considerable risk of failing to satisfactorily carry out his mission and obtain the best possible results. It is essential that the observer should thoroughly realize this—that what takes place beyond our foremost lines is not his concern; this latter is the mission of the Command Airplane.

1. In Gorrell's History, J-12.

III. **Mission of the Infantry Airplane**—execution. The Infantry airplane flies above our lines, slightly behind our most advanced troops at an altitude generally low, but varying with atmospheric conditions, the nature of the ground, and what the observer is looking for. This altitude, however, should never be more than 1,200 meters and only exceptionally less than 600 meters. Owing to the vulnerability of a low flying observation airplane, it should not descend below 600 meters except in cases of absolute necessity. It is, furthermore, advisable that the plane should not keep constantly to the same altitude, as by frequently changing its altitude, it is less likely to be hit by shots fired from the ground. During the course of operation, the surveillance of the battlefield should, in principle, begin before dawn and the infantry airplane should leave its field while it is still dark so as to arrive above the lines at the first moments of daylight. This is nearly always the most interesting time of day for observation. The results of reconnaissance by infantry airplanes during a light rain are often particularly valuable for the reason that at such a time the enemy takes few precautions to conceal himself, generally thinking that he is in complete security from aerial observation.

At the beginning of offensive operations, the Infantry Airplane should not arrive over the lines until a little after "H" hour, so as not to call the attention of the enemy prematurely to the point and moment of attack. When no attack is planned it is sometimes of value for an airplane to fly over the lines at dawn dropping various luminous signals in order to deceive and worry the enemy.

Fire from the ground by the infantry constitutes the principal source of danger for the low flying observation plane. The best method of contending with this and protecting himself as far as possible, is for the observer to fire with his machine gun as frequently as he can against the enemy trenches and positions. Furthermore, by machine gunning certain suspicious points, the observer often succeeds in making the enemy disclose himself by movements.

IV. **Means of communication between the airplane and the ground.**

1. *By radio.* The observer signals by radio all his observations, in general addressing himself to the Division report center. He must pay special attention to the rapidity and clearness with which he sends his messages, and he should not hesitate to repeat his message several times until the receiving station gives the signal "understood." It is advisable that the artillery receiving stations should also take any messages sent to the Division report center. Infantry airplane observer should not send by radio any information of which they are not certain. Observations of this nature should be noted on the written message to be dropped at the report center, mentioning, of course, the fact that the information is of doubtful accuracy. All radio messages should be preceded by the call letters indicating to whom the message is addressed. Coordinates, etc., must always be given in code. It is most strictly forbidden for any messages to be sent in clear.

Note: Before leaving the neighborhood of his airdrome, the infantry airplane observer will test the working of his radio with the receiving station of the group (squadron) and will not start off over the line until the latter has notified him by a prearranged signal (a Special form of panel, for example) that his radio is working properly. For this reason, the Infantry Airplane must take off from his field early enough to make this test and, if necessary, to remedy any fault in his radio and still arrive over the lines at the hour fixed.

2. *By visual signals and signal lights.* The observer carries two sorts of luminous signals:

1. The projector.
2. Signal lights of various kinds.

Up to the present time the former method has been by no means perfected, and, although

it has many advantages over the light signals, the infantry is not yet sufficiently expert in reading indications sent them from an airplane by projector to allow this method to be successfully employed.

Liaison by signal lights presents several disadvantages. In the first place, such signals do not indicate the unit with whom the airplane desires to communicate (for example, they do not show that the observer wishes to call the attention of one certain battalion, rather than any other battalion that happens to be in the neighborhood). The considerable variety of signal lights which have to be employed necessitate the carrying of a large number of cartridges, with the result sometimes of overloading the airplane. The pistol, unless fixed, is long and inconvenient. It may occur, by a false movement on the part of the observer, by a violent movement on the part of the plane or by bad functioning of the pistol, that the signal light is shot-inside, or on to the fuselage or wings of the machine. To guard against the last difficulty, it is desirable that the pistol should be fastened to the edge of the cockpit. An aluminum pistol is preferable, because of the weight, to one in bronze.

Signal lights should not be fired from an Infantry Airplane at an altitude of less than 300 meters, in order to avoid confusion with similar signals fired from the ground. The pistol should be held vertically.

Before leaving his field the observer should test the working of his signal pistol. A second pistol should always be carried in case for any reason the first one fails to work, and, furthermore, in order to permit of two different signals lights being fired rapidly one after the other. The latter is of value when, as often happens, the observer is required to send successively "I am the infantry airplane of "X" Division", and "Where are you?"

3. *By sound signals.* This is another method which has not yet been completely perfected, although tests with certain instruments have given good results. Infantry airplane reconnaissance over the positions held by the first lines of our attacking troops being usually made at a predetermined hour, and the Infantry airplane flying at a lower altitude than any other plane and bearing distinctive marks and letting off identifying light signals, there is little chance that it will fail to be recognized by the many infantrymen who will be looking at it. It does not, therefore, appear necessary for a sound signal to be employed in this case. On the other hand, sound signals are practically indispensable in the case of airplanes wishing to inform the P.C. that they intend to drop a weighted message, because, particularly if the P.C. is under shell fire, the vigilance of the look-outs cannot always be relied upon. If the plane is not equipped with a Klaxon horn, or some other type of sound producing instrument, a peculiarly timed burst of machine gun fire, several times repeated, if necessary, will usually have the same effect.

4. *By weighted message.* Weighted messages are especially valuable for the purpose of confirming and completing the information already dispatched by radio or by various light signals. Weighted messages are dropped at the P.Cs. of Army Corps and Divisions, and but exceptionally to P.C. of infantry regiments. Weighted messages should never be dropped to advanced units, for orders or information addressed to the P.C. of a battalion, for example, run a considerable risk of falling into the enemy hands. It is necessary for observers to practice dropping weighted messages from a height of at least 200 meters, until they are able to drop them with the greatest precision.

Written messages, and maps showing the location of Bengal fires, P.Cs. &c., should be made in triplicate (one copy to be dropped at Division P.C. or Report Center, one copy at Army Corps Report Center, if required and one copy retained for the Squadron Commander). Before leaving the airdrome the three copies of the map, with new carbon sheets between, should be carefully affixed to an aluminum back and kept in place by gummed corners and by surgeons tape around the edges. The same is done with the message forms. The observer indicates in pencil on the map the location of our front line and P.Cs., as shown him by panels, Bengal fires &c. and any other observations of interest, noting the hour. When he has completed his mission he pulls off the tape and takes off one sheet of the map, rolls it up, and puts it in the Div. P.C. The second sheet is similarly taken off and placed in the message carrier for the Army Corps P.C., and the third is left attached to the board by means of a clip. The same is done with any messages that the observer may have written out.

V. **Means of communication between the ground and the airplane.** The Infantry Airplane observer receives signals both from the most advanced line and from the Staff (generally the Staff of the Infantry Division).

1. *Communication with the most advanced line.* Units of the most advanced line (excluding both patrols sent further out and units in support or reserve further back) signal their location by—

a) Individual panels (one for two men).

b) Bengal fires.

c) Projectors.

d) Signal lights.

e) Various make-shift methods, such as mirrors, pocket torch lights, handkerchiefs, overcoat linings, etc.

At the demand of the Infantry Airplane, or at an hour prearranged by the Staff, or at the initiative of a Company Commander or the Commander of any other unit, when this unit can no longer advance, or when after having been obliged to retire he has succeeded in holding his ground—the infantrymen lay out their individual panels. If the Infantry Airplane observer fails to see the panels, or has difficulty in distinguishing them, he repeats his signal of identification "I am the Infantry Airplane of "X" Division", and the question "Where are you", and thereupon the signals of the infantry must be made by Bengal fires.

(a) *Panels*

In case of individual panels, because of their small dimensions, it is indispensable that they be placed together in groups of at least three or four, in order that the observer may see them clearly. Furthermore, it is necessary that they should be waved or moved about at the right moment in order to attract the observer's attention—the right moment being when the airplane has passed slightly beyond a point directly above the signalers. The observer will do his utmost to reduce to a strict minimum the time necessary for him to note the positions shown by the signals, in order not to keep the attention of the infantry for too long a time and to avoid, as far as possible, that the enemy should be able to locate our line. On the other hand, infantrymen should wave and move about their panels for a time sufficient for the Infantry Airplane observer to properly locate them. It is extremely difficult for anyone on the ground to determine the exact moment at which an airplane passes vertically over him, and it is certainly better for the panels to be shown a little too long than not long enough. However, if at the end of ten minutes the Infantry Airplane has not given the signal "understood", the panels should be rolled up.

It is necessary to insist on the very important point that the panels when laid out must be

"living," that is to say, continually moved about or agitated, and not merely unrolled and left lying. If this is not done it is likely to give rise to errors of the greatest importance, for immobile panels are very apt to give erroneous, or at least uncertain indications to the observer, being easily confused with other things and not informing the observer whether or not they are the locations of the most advanced line.

Individual panels should be placed in such a way as not to be visible to the enemy, i.e., inclined on the parados of a trench, hidden in shell holes, or behind a slight rise of ground, etc. It is strictly forbidden to anyone not in the most advanced line to signal his presence by means of individual panels. This does not, of course, apply to battalion P.Cs. whose identification panels should be laid out as soon as the Infantry Airplane sends his signal "Where are you?" The laying out of the battalion identification panels is often very useful to the airplane observer, especially when he has no clear idea of the approximate location of the most advanced line. Similarly, and for the same reasons, it is desirable that regimental P.Cs. should lay out their identification panels when the Infantry Airplane sends his signal "Where are you?" (This is formally ordered in the French instructions of the 28th December, 1917. . . .)

Care must be taken to prevent the panels from becoming dirty. It is recommended that they should be carried in cloth cases or sacks to protect them from mud and dust.

(b). Bengal fires.

The panels have the serious inconvenience of being invisible, or nearly so, against light background, such as clay soil broken up by shell fire, or when they become soiled and are no longer a brilliant white—which is nearly always the case.

Bengal fires, on the contrary, are always visible against no matter what background, and constitute certainly the most satisfactory method of signaling from the ground. It is, however, important that they should be concealed from the view of the enemy, while, at the same time, being clearly visible to the observer in the airplane. For this reason they should be placed behind a screen, or at the bottom or on the forward slope of a shell hole, etc. The same way as in the case of the panels, the Bengal fires should be placed out in groups of three or four so as to be more visible to the airplane observer.

(c) *Projectors.*

Projectors can hardly be considered as a means of signaling the location of the advanced lines, but they can be very usefully employed to attract the attention of the airplane observer. They possess the advantage of being able to be employed without attracting the attention of the enemy and, furthermore, of being the more visible the worse is the visibility. Well handled they should render excellent service, but it is essential that the signalers with the infantry be very skillful in following the airplane. The present number of projectors authorized for a battalion (14) is considered to be scarcely sufficient and should be added to. Furthermore, in order to simplify the handling of a projector to as great an extent as possible, it is desirable that the signalers carry spare batteries and lamps.

(d) *Signal lights and smokes.*

Signal lights sent up from the ground give only a very vague indication of the point from which they were sent (not within 50 or 100 meters) and, therefore, are of little value to any one desiring to signal "I am here." As for smoke signals, these are practically useless during battle as it is almost impossible to distinguish them among the shell-bursts.

(e) *Make-shift methods.*

Handkerchiefs waved in the air, overcoats turned inside out, so that the lining is exposed, and waved, pocket electric torches, mirrors, etc., directed towards the airplane, etc., etc., are very ineffective and give very poor

results, but they should not be forgotten in any special circumstance when other regular methods of signaling are, for any reason, not available.

(f) At present, with the apparatus available for receiving radio messages by an airplane, the results are so uncertain that it is hardly worth considering this method for signaling from the ground to the airplane in connection with liaison with infantry. For an observer to be encumbered with the radio receiving helmet and constantly obliged to look at his lamps and mess about with the handles, would seriously interfere with the efficient performance of his mission, which requires concentrated observation of what is going on below him.

2. *Communication with Staffs and Headquarters.*

The various P.Cs. indicate their locations to the airplane observer by means of the different identification panels described in Annex 4 of the instructions of 28th December 1917. These panels are laid out at the discretion of the P.C. in order to attract the attention of the airplane, or at a certain hour, arranged beforehand, or by order of the higher command, transmitted to the P.C. by the airplane in the same manner as to the most advanced line. The panels should be taken in as soon as the airplane has given the signal "understood".

It is, of course, possible for the P.Cs. of the Corps Commander or Division Commanders to communicate by radio with any airplanes which have receiving apparatus on board, but it must be remembered that this procedure practically results in making the observer both blind and deaf to everything else during a comparatively long time when it might be more profitable for him to be employed in observing what is going on beneath him. All P.Cs. may communicate with the infantry airplanes, either by means of optical signals or with the rectangular panels of the P.Cs. as described in Annex 4, and employing the conventional signs used in Annex 8 of the instructions of December 28, 1917. In general, optical signals should be repeated and panels left in position until the airplane has given the signal "understood". To avoid enabling the enemy to locate the P.C. it is preferable, if possible that the observer should give the signal "understood" by projector.

VI. **Preparations for liaison with infantry.**

The missions of Infantry Airplanes and Command Airplanes can only be carried out effectively when the observers are thoroughly trained and have a complete knowledge of the plan of the operations, or, as the case may be, of the defence. In case of a necessary retirement of our troops, the observer should know our own successive positions quite as well as the enemy's lines. It is, furthermore, indispensable that the observers should personally visit the Commanders of the various infantry units, down to, and including, Company Commanders at least, with whom they will have to work; that these visits should be held in the trenches; that the observers should look over the ground of operation from the first line observation posts, and that they should work out on the spot with the various Commanders the details of the missions which they will be called upon to fulfill. Delicate liaison of this nature can only be efficiently accomplished when each party thoroughly understands the other, and the only way that this can be arrived at is for each one to thoroughly know the other. No opportunity should be lost of improving the relations between the observers and the infantry officers, both when the latter are in the trenches and especially—because then they are less occupied with other duties—when they are on rest. The habit of close cooperation in working together must be encouraged to the greatest possible extent.

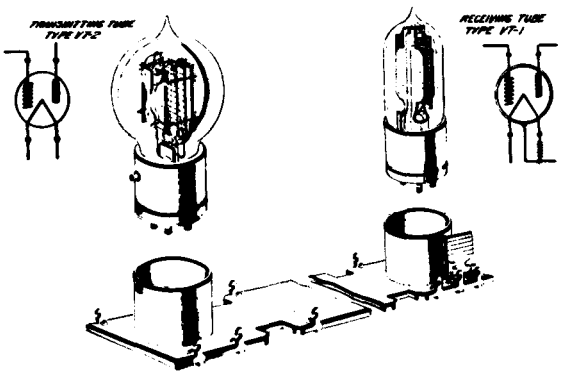
VII. **Practice Exercises.**

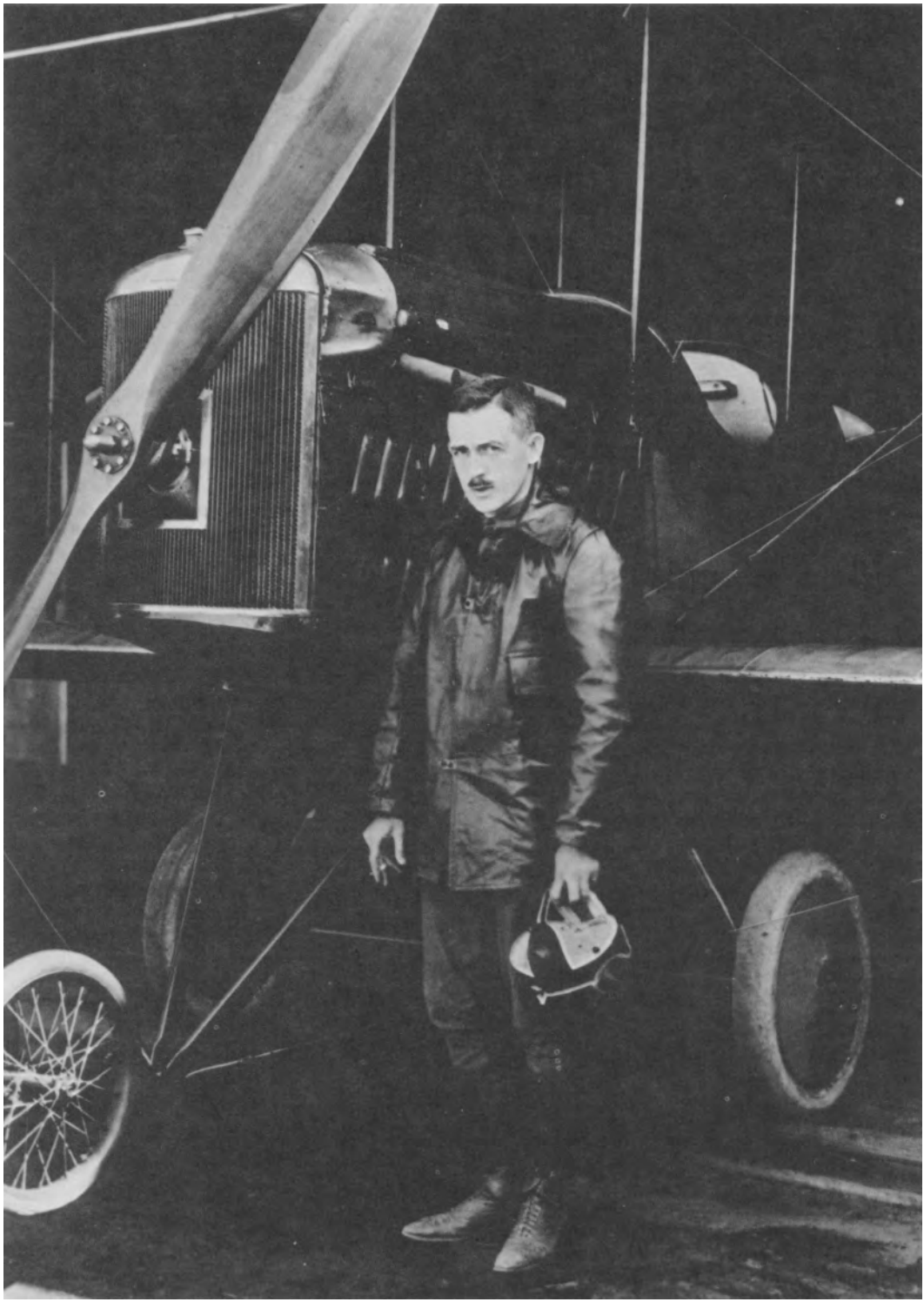
The more practice exercises of aerial liaison with infantry that can be carried out, the better. It is impossible to over do it. In the course of these exercises every one must endeavor to simulate, as far as possible, the conditions that will be met with during the actual attacks. The airplane should fly rapidly above the positions and, from time to time, fly off as if he were driven by hostile aerial attack, or forced away by clouds or other climatic conditions. The observer should strive to observe from the highest altitude possible. The infantrymen must handle their signaling apparatus exactly as they would do under the conditions of an attack and as if they were continually harassed by enemy fire, etc. The men handling the projectors must strive to follow exactly the course of the airplane until the latter has given the signal "understood", or has repeated his call signal. (With regard to the training of the projector signalers, in addition to that carried out in exercises in cooperation with our aircraft. The signalers should, on all occasions, endeavor to follow with the projector any airplane that may pass over them, without, of course, lighting the lamp of the projector.)

If possible, during the course of the practice exercises, several airplanes should fly over the troops at the same time, only one of which acts as the Infantry Airplane and gives signals. This serves the double purpose of training several observers at the same time and of accustoming the infantrymen to pick out their own plane from among a number of others. During the exercise the observer should precede all his radio calls by the call *e* (. . - . .), or *ex* (. - . . -). Coordinates sent by radio should be given in code, but in an obsolete code and not the one actively in use. The code signals actually in use for list No. 2 of the signals between an airplane and the infantry instructions of 28th December, 1917, should not be used for practice exercises.

In order that observers in the event of an advance should not find themselves handicapped by the lack of large scale maps (Plans Directeurs) it is advisable that in exercises of liaison with the infantry they should practice both with the Plans Directeur and with the maps of 1/80,000.

VIII. The maximum return from liaison with the infantry will only be obtained when every infantryman is thoroughly convinced of the value of the aid that can be given him by the observer in the airplane. It is indispensable to create in the infantry the spirit of the knowledge of the absolute necessity of infantry liaison and its undeniable utility.





Maj. Davenport Johnson.

42. The Role of Pursuit

June 1918

The following notes,[1] which carry no indication as to date or author, evidently were written late in June 1918, at the time the 2d Pursuit Group was being organized under the command of Maj. Davenport Johnson. The group, which began operations immediately in the Toul Sector, was part of the short-lived 1st Brigade Air Service, commanded by Col. William Mitchell.

Notes on The Tactical Employment of Pursuit Aviation

Prepared under the direction of Col. W. Mitchell. C.A.S. 1st Corps.

The role of Pursuit Aviation is two-fold:

1. *Offensive*

To seek out and attack all enemy elements in the air, forcing the combat back over enemy territory, breaking up the enemy's aerial formation activity, inflicting the greatest possible casualties on his air service, and preventing his observation aviation from functioning;

To co-operate with our Day Bombardment Aviation in the attack of enemy elements on the ground, and especially enemy air elements that are forced by the bombardment of their airdromes to take to the air.

2. *Defensive*

To protect our observation aviation from interference by enemy aircraft, and to prevent incursions by enemy aircraft over our area.

Offensive.

Ascendency in the air on any given sector of the front is obtained by the attack, destruction or dispersing of the enemy air elements operating on that sector, and so completely dominating them that they are unable to carry out their missions. To accomplish this it is necessary for large forces of pursuit aviation to be concentrated under one command, so that the protection of our observation aviation may first of all be assured, and that strong, purely offensive patrols—formidable in numbers, battle formation and tactical grouping—may be thrown out to clear the air of hostile elements, inflicting great losses on the enemy's air service, breaking up his aerial defense against our aircraft and forcing his whole aviation to keep back of the zone in which it is of primary value.

At all periods during the preparation and conduct of offensive operations by our troops, it is essential to prevent the functioning of the enemy's observation aviation as it is to prevent enemy aircraft from interfering with the functioning of our own observation aviation. This is also very important when the enemy has assumed the offensive and is correspondingly difficult to accomplish as the enemy will have made a concentration of his air forces for the attack. The attack and destruction, or dispersing, of the enemy observation elements, as well as other enemy air elements back of his own lines, is the duty of the second Group of the Pursuit Wing and is most effectively carried out by offensive patrols of five to seven airplanes each, one of which may be a fast bi-place machine to cover the rear of the patrol. These offensive patrols penetrate far over the enemy's territory at an altitude of 5000 to 6000 meters, seeking combat, sweeping the air of hostile aircraft; their primary duty being to attack at once any enemy aircraft that they may sight. The patrols of our Day Bombardment should work in close co-operation with them, striking the enemy's aerial defensive organizations simultaneously with strong attacks by the Pursuit patrols, taking advantage of the breaking up of the enemy's formations and the dispersing of his offensive elements by the strong formations of the Day Bombardment aviation which are then attacked in detail by the pursuit machines of the Offensive Pursuit Patrols.

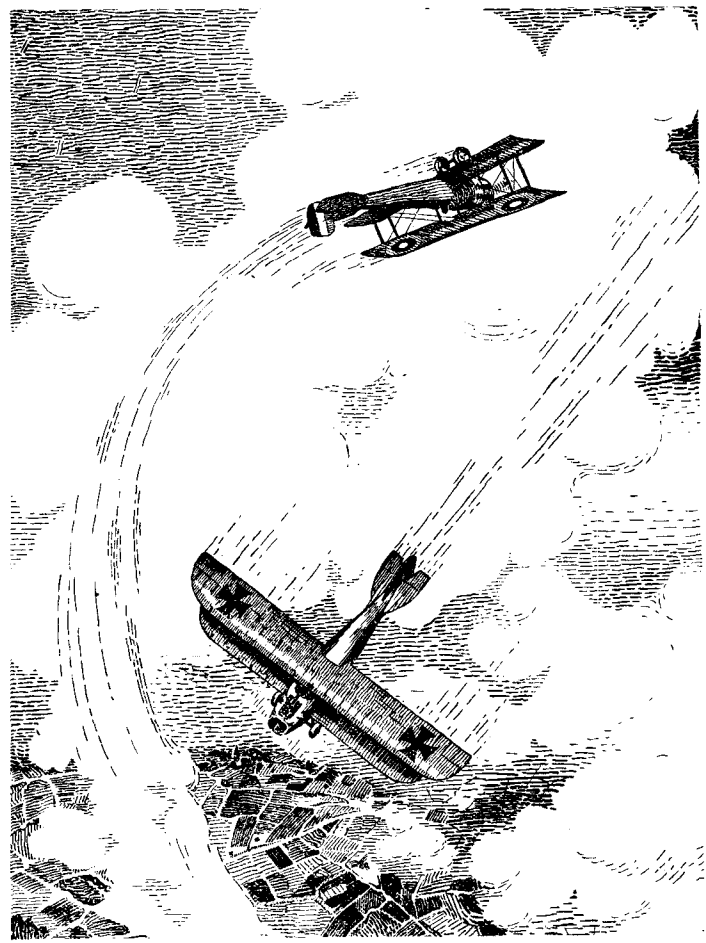
1. In Gorrell's History, C-4, pp 500–503.

Offensive patrols acting in co-operation with Day Bombardment Patrols should penetrate as far over enemy territory as the objective of the latter, in order to take advantage of opportunities for attacking the enemy air elements that may attempt to oppose them, and any enemy aircraft forced by the bombardment of their airdromes to take to the air. This does not mean that the pursuit planes should stay with them constantly, but should work in cooperation with them.

Day Bombardment patrols are frequently followed back to their lines by enemy aircraft afraid to attack the formation but waiting a chance to pick off stragglers, and our Pursuit patrols should be in readiness to take advantage of the demoralization caused by the bombing, especially the bombing of camps, hutments, parks, transport, columns of troops on the march, etc., and find special opportunities for attack with M. G. fire on the enemy personnel scattered and driven into the open by the bombs.

Such attacks at low altitude should be carried out by special patrols or special machines and not by the regular offensive patrols, which ordinarily should not attempt to descend to very low altitudes.

The Second Pursuit Group is furthermore responsible for carrying out attacks on enemy observation balloons. These also are done by machines specially detailed for the purpose and not by the regular patrols. It should be borne in mind, however, that isolated attacks for destruction of observation balloons are attended with considerable danger, as the German balloon winches can bring down their balloons very rapidly and an attacking aeroplane is therefore forced to descend very low and come under heavy machine gun fire. The results obtained are rarely in proportion to the risk run, and such isolated attacks should, therefore, be undertaken only under especially favorable



weather conditions (clouds) or when it is considered essential for some particularly annoying enemy balloon to be destroyed or forced to move further back. This does not apply to demonstrations against enemy balloons by airplanes with the object not of destroying the balloon but merely forcing it to descend temporarily and interrupting the work it is carrying out. Such demonstrations are of advantage in that they interfere with the observation or adjustment of artillery fire that the balloon observer is engaged upon, while they are not especially dangerous as the airplane does not have to descend very low. Attacks for destruction carried out on a large scale against all balloons along a considerable length of the front give valuable results, especially when carried out at the beginning of, or during, any minor operation, but these must be organized with great caution and precision.

The duties of the Surveillance Squadrons are to keep the enemy's back area under constant observation, for general activity and important movements, but especially for the activities of his air service. These machines will be bi-place or tri-place, and will carry out their missions singly or, in special cases, in pairs. They will be equipped with cameras, and with radio—by means of which they can signal the location of enemy aircraft, patrols, activity on airdromes, etc.

The most efficient and economical organization of Pursuit Aviation, it is considered, is for it to be combined with Day Bombardment and Surveillance Groups in a Combat Brigade composed of:

The Brigade Commander and Staff;
2 Groups of six Pursuit Squadrons each, each with a Park and Meteorological Section;
1 Group of six Day Bombardment Squadrons; and
1 Group of two Surveillance Squadrons, with a Park, Photo Section, and Meteorological Section each.

The functions of the three types require the closest co-operation and inter-dependence. It is therefore essential that they should be grouped under one tactical command.

It is important that close liaison be constantly maintained between the Pursuit Groups and Observation Groups, and that all information of interest be interchanged between them. Observation Group Commanders should keep Pursuit Group Commanders constantly informed as to the number of observation planes they have in operation over the lines, the areas in which they are working, their altitude and the character of their missions—photographic or visual reconnaissance, artillery adjustment, liaison with infantry, etc. The Corps Air Service Commander should furthermore keep the Pursuit Group Commanders in possession of all information likely to be of value to them, both about the enemy and about any proposed operations within the Corps.

Close liaison must be maintained between Pursuit Group Commanders and Commanders of Anti-aircraft Artillery. Anti-aircraft artillery serves as the sentinel of aviation, and the system employed by it to signal to our pursuit patrols the presence and the course of hostile aircraft, must be worked out with the greatest care and precision with the Pursuit Group Commanders.

Pursuit Group Commanders should furthermore carry out frequent liaison with troops in line and at rest, with a view to developing the mutual understanding of each other's functions and capabilities and perfecting the co-operation between them and the Air Service. In a war of movement all pursuit elements must be ready to move their airdromes, parks and all equipment at a moment's notice. At such times the liaison systems are necessarily interrupted and the closest touch by motor vehicle, radio or signaling must be kept with the necessary division, Corps and Army posts of command, and with contiguous air units.

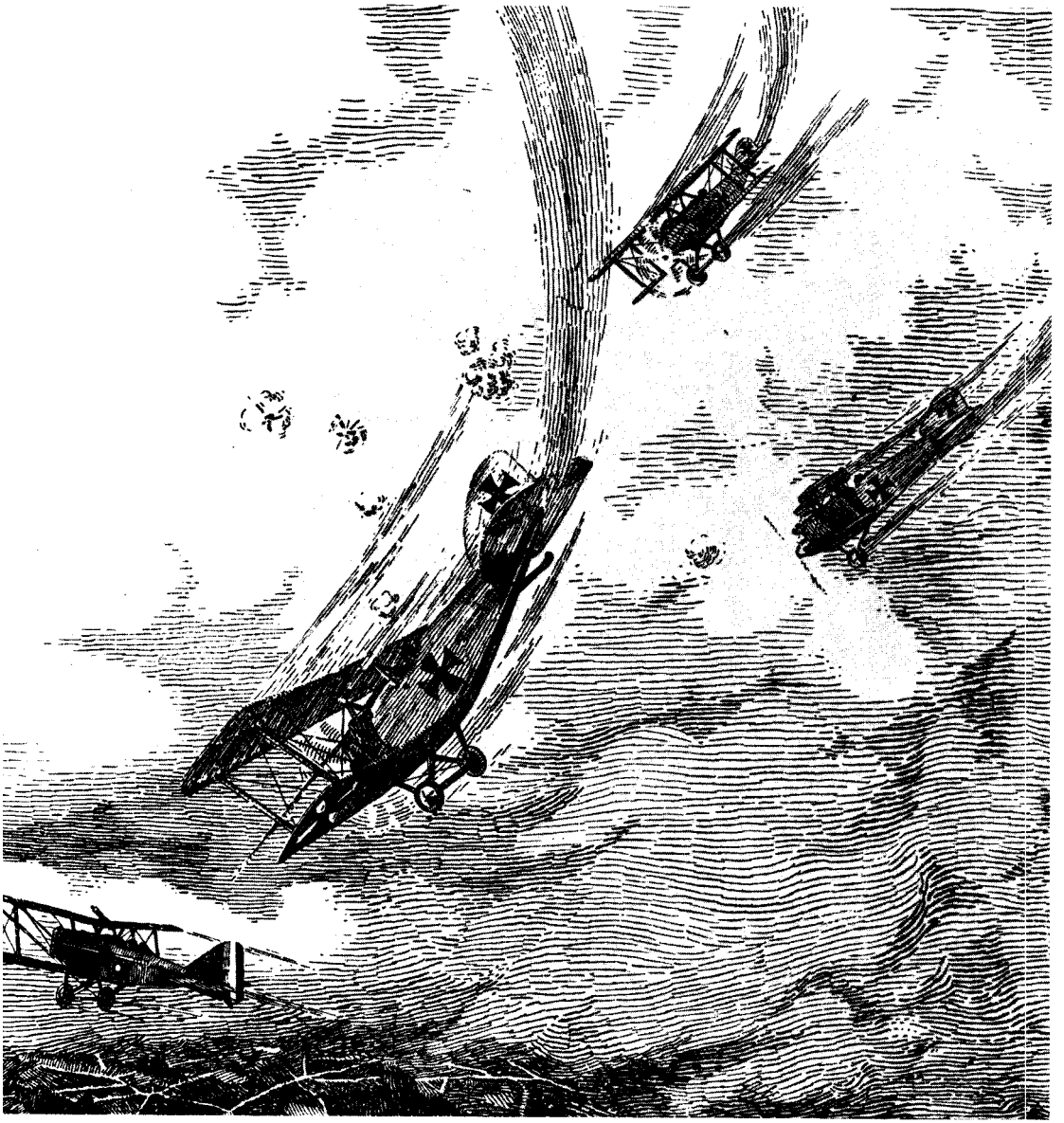
Defensive.

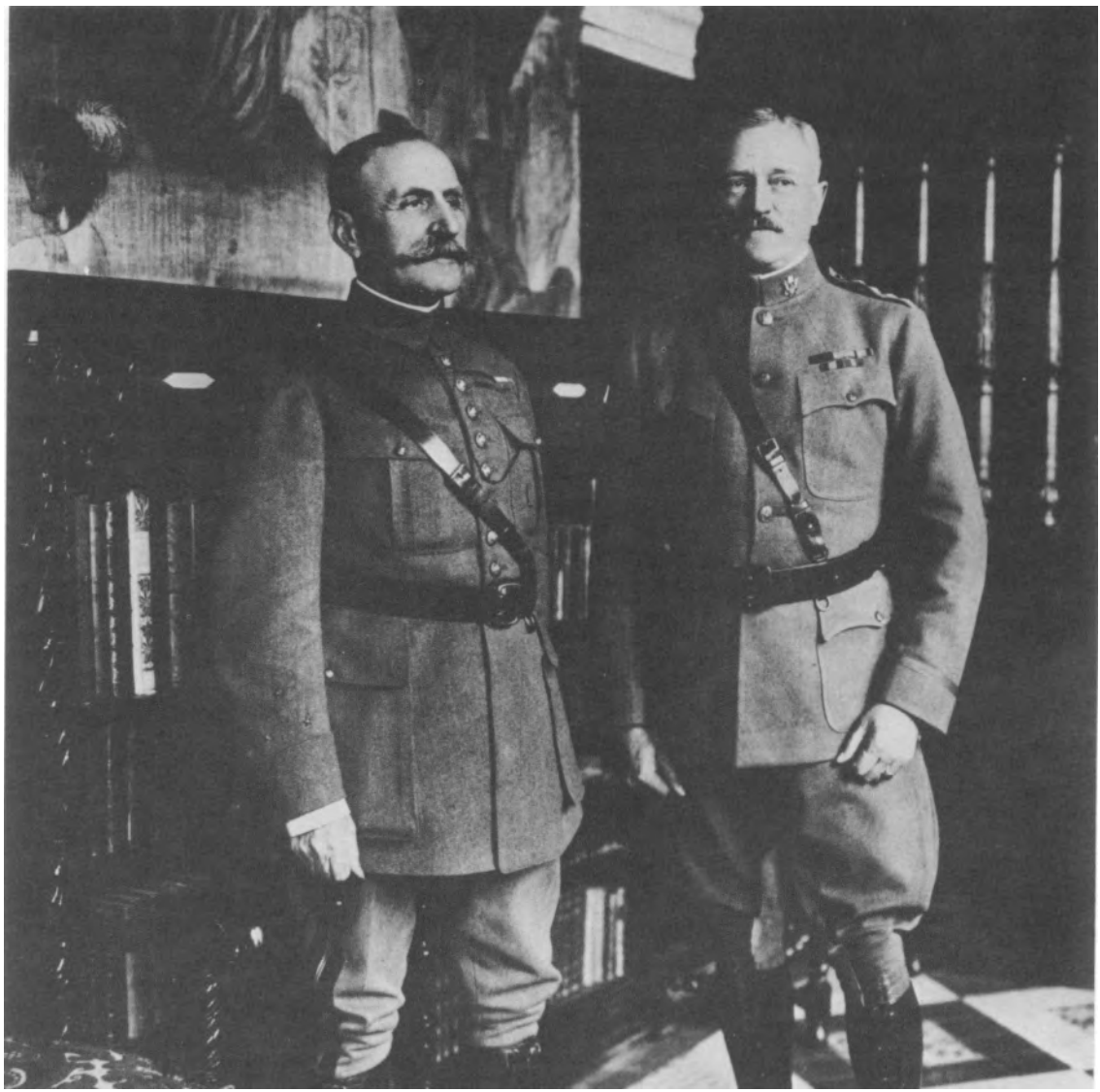
The basis of an Air Service is its Observation Aviation, but the very existence of this Observation aviation depends upon a strong and well trained Pursuit Aviation, able to defend it from enemy attack, and powerful enough to assure at least a local superiority in the air in any sector selected for offensive operations. In order that our Observation aviation, carrying out photographic and visual reconnaissances, artillery adjustment, liaison with infantry, etc., may render its maximum service, it is essential that observation squadrons be enabled to accomplish their missions without interference from the enemy's aviation. This is true at all times, but especially so during periods of offensive operations.

To protect individual reconnaissance and artillery missions by individual pursuit patrols keeping continually close to the observation planes is a wasteful and inefficient method of protection, but it is sometimes necessary, especially in the case of long distance reconnaissance missions. The protection of the observation aviation is best assured by a system of defensive patrols of five airplanes each, forming a protective (lower tier) barrage. These patrols fly back and forth beyond and slightly above the line of the observation airplanes, between them and the enemy, approximately over the enemy trench line at an altitude of about 3500 meters. These defensive patrols attack any enemy aircraft that approach, but they should not attempt to penetrate far over enemy territory to seek enemy aircraft, as in so doing the successful accomplishment of their principal mission is jeopardized, the observation airplanes behind being left unprotected while the defensive patrol is away.

The duty of maintaining the Protective (lower tier) Barrage is allotted to one Group of the Pursuit Wing.

This Group is also responsible for the defense of our area against incursions by enemy long distance photographic reconnaissance planes. As such enemy planes usually cross our lines at a height of 5000 to 6000 meters and maintain this altitude throughout the course of their mission, it is rarely successful for our pursuit to start from the ground after them after they have been sighted. A method of defense against these photographic planes is for high patrols of three to five airplanes each to patrol back of our line at an altitude of 5500 to 6000 meters throughout the hours of daylight suitable for photography. The sectors covered by such patrols must be carefully selected with reference to the likely points at which enemy long distance reconnaissance planes are apt to cross our lines and the courses which they are believed to follow. The patrols must be on their beats at their altitudes as soon as or just before the light becomes sufficient for photography.





Generals Ferdinand Foch and John J. Pershing.

43. 358 Squadrons

July 1918

Two days before approving the schedule submitted by Patrick on 5 June 1918, Pershing had informed the Army Chief of Staff and the Secretary of War that the military situation was "very grave." A German offensive on the Aisne had driven back the French and seemed to be threatening Paris. The Supreme War Council was depressed. Everyone wanted more help from America. On 19 June Pershing recommended a buildup of the AEF to 3,000,000 men (66 divisions) before May 1919. After a meeting with General Foch on 23 June, Pershing endorsed a plan that would put 46 divisions in Europe by October 1918, 64 in January 1919, 80 in April 1919, and 100 in July 1919. On 23 July the War Department informed Pershing that a program for 80 divisions in France by 30 June 1919 had been recommended to the President.[1]

The job of translating the latter plan into an Air Service program fell to Gorrell, Aviation Officer, G-3, General Headquarters, AEF. Although Gorrell's plan called for only 9 additional bombardment squadrons, he was able to add 14 to the day bomber force by reducing the night bomber program by 5 squadrons. He also provided for an additional 62 squadrons of observation and 27 of pursuit, making a total of 358 squadrons for the Air Service AEF by June 1919. Following is a brief extract from the long and detailed study which Gorrell produced and which was forwarded to Patrick on 29 July 1918.[2]

ESG-G.3

EXHIBIT "A".

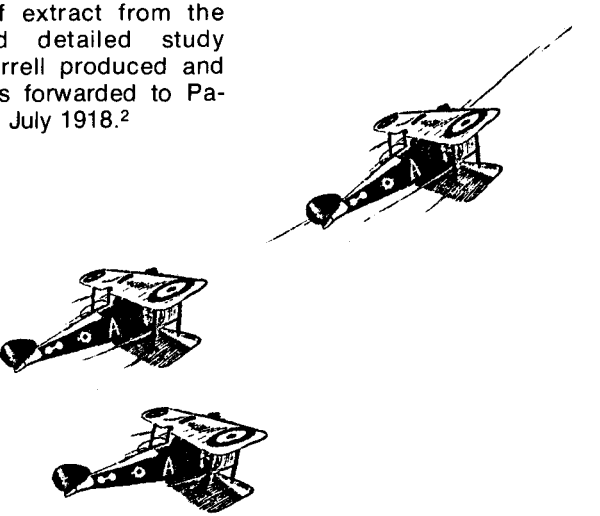
July 29, 1918.

1. **"Problem"**

A. Promises:—

(a) In July, 1918, the United States will have 30 Divisions in the American Expeditionary Forces in Europe.

(b) By July 1, 1919, the



1. See Cable P-1235-S, 3 June 1918, Cable P-1342-S, 19 June 1918, Cable P-1369-S, 25 June 1918, and SWC: 316: Cablegram, 23 July 1918, and related documents in Historical Division, Department of the Army, *United States Army in the World War, 1917-1919*, Vol 2 (Washington 1948), pp 449-450, 476-479, 482-483, 544, and *passim*.

2. In Gorrell's History, A-7, pp 94-101.

United States will have 80 Divisions in the American Expeditionary Forces in Europe. . . .

. . . . . .

B. Required to ascertain:—

(a) Th ? size and rate of formation of tne Air Service program necessary for a balanced Army of the size indicated in paragraph 1–A. (Answer to this question is found in paragraph [and table] 5).

. . . . . .

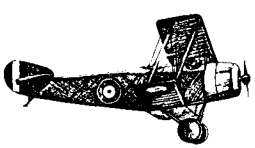
. . . . . .

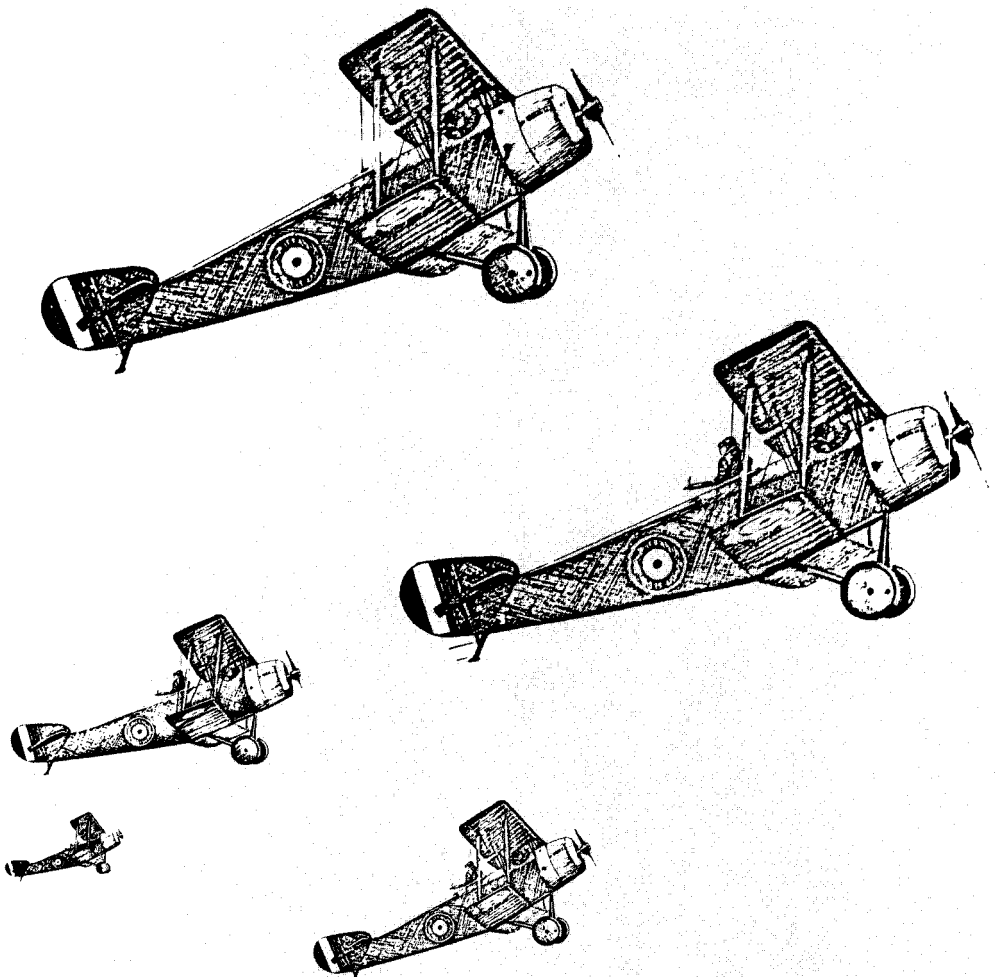
8. The above program in Table V, even with the help of our Allies, can not be met in full but should serve as a goal which the Air Service should strive to reach.

Table V.

Size and Rate of Formation Desired for the Air Service

Date	Corps Observation Sqd.	Army Observation Sqd.	Pursuit Sqd.	Day Bombardment Sqd.	Night Bombardment Sqd.	Balloon Companies
1918 July	22	12	22	8	4	52
Aug.			11	4	4	1
Sept.	3	5	11	4	4	9
Oct.	4	7	12	4	4	8
Nov.	3	5	12	4	4	7
Dec.	2	6	12	4	5	6
1919 Jan.	2	2	9	3	5	6
Feb.	2	3	9	4	5	8
Mar.	3	2	12	5	5	9
Apr.	3	3	12	5	5	10
May	3	4	12	5	5	9
June	2	3	12	5	5	8
TOTAL	49	52	147	55	55	133
GRAND TOTAL					358	133





Brig. Gen. Malin Craig.

44. Liaison—A Costly Business

4 August 1918

American pilots assigned to infantry liaison found the work both dangerous and frustrating. They complained that the infantry ignored their signals, did not put out markers, and otherwise failed to cooperate. The airman's attitude is reflected in the following memorandum concerning this aspect of the employment of airpower.[1] The memorandum apparently was prepared by Maj. Lewis H. Brereton, who had succeeded Mitchell as Chief of Air Service, I Corps, or by a member of his staff, for signature by Brig. Gen. Malin Craig, Chief of Staff to Maj. Gen. Hunter Liggett, Corps Commander.

Headquarters, 1st Army Corps,
American E.F.,
August 4, 1918

Suggest Memorandum for Division Commanders:

Liaison Instructions.

1. The Chief of Air Service will be notified at the earliest possible moment of the arrival of new units in the Corps, and the date of their active operations. The Chief of Air Service will immediately have air service assigned to the unit concerned, and will notify such unit and the Corps Commander regarding dispositions made, and will cause liaison to be established and maintained immediately therewith. The attention of the unit arriving should be directed particularly to Confidential Pamphlet., No. 2, "Liaison for all Arms," dated H.A.E.F., June, 1918, [2] and Confidential Pamphlet No. 88, revised, "Aerial Observation for Artillery," dated H.A.E.F., May 1918.[3] With reference to the contents of these pamphlets, which contain the basis for all liaison and co-ordination between air service and the Corps Troops, the following should be impressed strongly upon the newly-arrived units:

(a) *Artillery:* Adjustment of fire and artillery surveillance should not be requested from aero squadrons when same can be as efficiently performed by terrestrial observation or balloons.

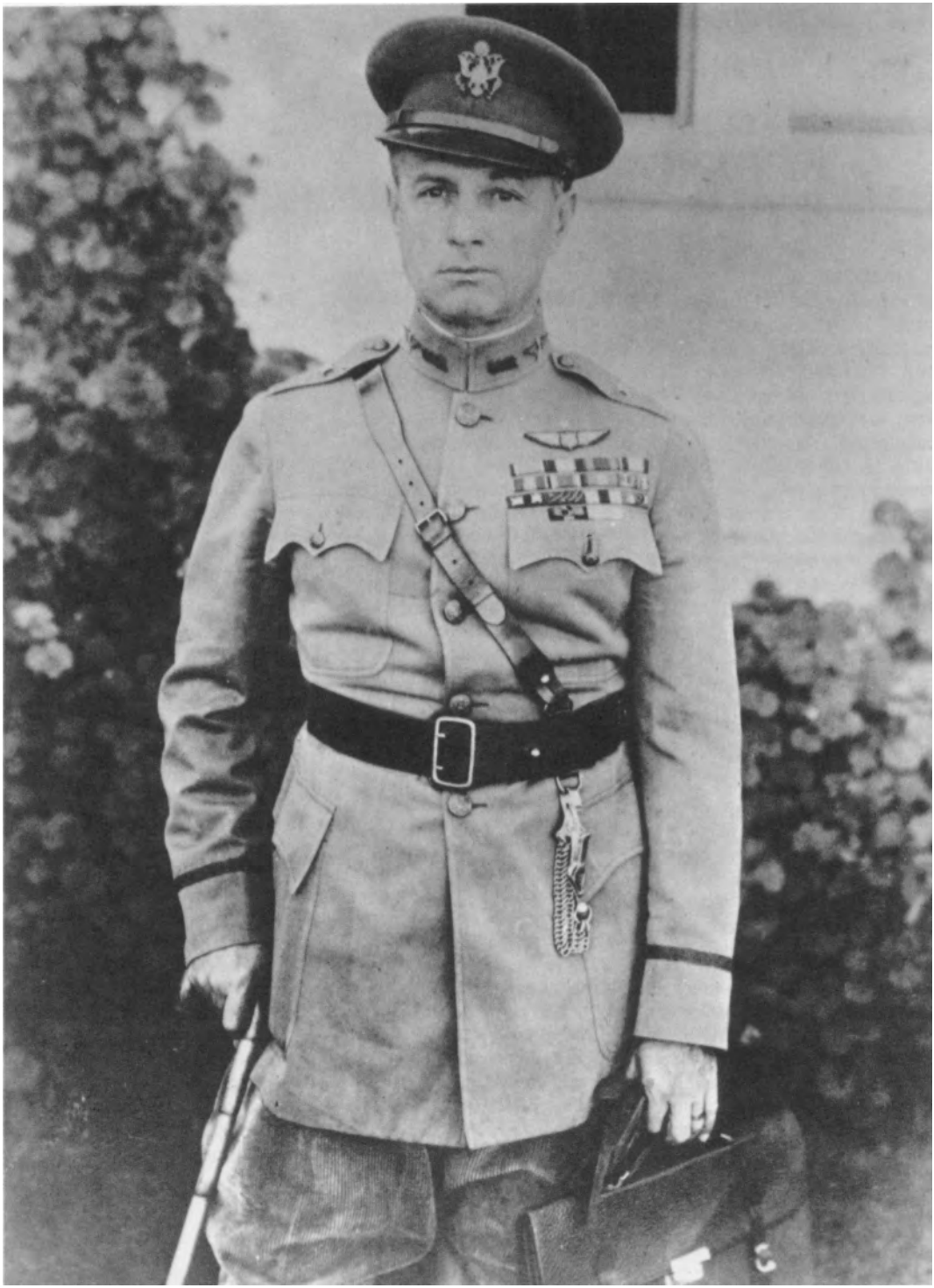
(b) *Infantry:* An infantry contact plane (i.e., jalennement)[4] should not be demanded from an aero squadron if desired information regarding the position of the advance units can possibly be obtained through any other source. In this connection, it is desired to point out that observation balloons can effect efficient liaison between the infantry P.C. and the advance units under ordinary circumstances.

II. When an infantry contact plane is called for, it must be realized thoroughly by the troops concerned that the infantry plane cannot remain at a low altitude over the lines for more than a very few minutes without the certainty of being shot down. It is, therefore, of the utmost importance, that watchers be designated to observe all signals from the infantry plane, and that the personnel have on hand at all times the required material to indicate the positions of the troops to the airplane, and that the signals be made immediately upon demand of the plane.

III. The cost to the Government of training a pilot and observer, coupled with the cost of an observation plane, is approximately $80,000.00. Infantry contact work is the most hazardous of all air service operations. The present state of organization of the Air Service renders replacement of planes, pilots and observers increasingly difficult. It should be realized that the expense to the Government ensuing from the loss of an observation plane properly equipped and manned, can be decreased materially by a thorough understanding on the part of the unit concerned of the necessity of having the proper material ready for instant use in indicating the location of the lines, and the utilization of such material promptly, when called upon by the observer.

Malin Craig
Chief of Staff

1. In Gorrell's History, C-12, p 35.
2. See Doc. 40.
3. See Doc. 36.
4. A marking out.



Brig. Gen. "Billy" Mitchell.

45. Command of the Air Service, First Army

6 August 1918

When the First Army was formally organized in August 1918 with Pershing as Commanding General, Mitchell was staff advisor on aeronautical matters (Chief of Air Service, First Army) and commander of the First Army's aviation units (Army Air Service Commander) (see Doc. 37). The authority to assign missions to Air Service units and the channels used in making such assignments were outlined in the following memorandum.

Headquarters, 1st Army, A. E. F.

MEMORANDUM
Number 8

August 6th, 1918.

The following system and routine of assigning missions to the Air Service in the 1st Army is published for the information and guidance of all concerned:

MISSIONS	BY WHOM OFFERED	TO WHOM TRANSMITTED
A. *Army Observation Group:*		
1. Reconnaissance		
a. Visual	Army G–2	Group Commander through Branch Intelligence
Day		Officer
Night		
b. Photographic		
2. Command Reconnaissance	Army G–3	Army Chief of Air Service
3. Artillery Adjustment	Army Artillery Commander	Group Commander
B. *Pursuit Group:*		
1. Patrolling		
a. Offensive	Army G–3	Army Chief of Air Service
b. Defensive		
2. Protection	Air Service Commander	
C. *Bombing Group:*		
1. Tactical Bombardment	Army G–3	Army Chief of Air Service
D. *Balloon Group:*		
1. General Surveillance	Army G–3	Army Chief of Air Service
2. Artillery adjustment	Army Artillery Commander	Group Commander
E. *Corps Observation Group:*		
1. Reconnaissance		
a. Visual	Corps G–2	Group Commander through Branch Intelligence
Day		Officer
Night.		
b. Photographic		
2. Commander Reconnaissance	Corps G–3	Corps Chief of Air Service
3. Artillery Adjustment	Corps Artillery Commander	Corps Chief of Air Service
4. Liaison	Division Commander	
a. Infantry		
b. Artillery	Division Artillery Commander	Group Commander
F. *Balloon Group:*		
1. General Surveillance	Corps G–3	Corps Chief of Air Service
2. Artillery Adjustment	Corps Artillery Commander	Group Commander

Lower unit commanders should come into direct communication in arranging for the missions outlined above.

The collection, collation and dissemination of information of the enemy obtained by the Air Service is a duty of G–2 and is fully covered by the Intelligence Regulations.

By command of General Pershing

Maj. Gen. (Col. in August 1918) Fox Conner.

46. 202 Squadrons

16 August 1918

Believing that Gorrell's schedule for 358 squadrons could not be met (Doc. 43), Patrick prepared a different schedule,[1] printed below, for 202 squadrons by June 1919. The reduction from 358 was made by cutting pursuit and bombardment. Patrick's plan was approved, as indicated by the indorsement[2] appearing below, this being the last change in the squadron program before the Armistice.

General Headquarters
American Expeditionary
Forces Air Service.

France, 16 August, 1918.

Memorandum For: CHIEF OF STAFF G–3

Subject: Air Service Program to 30 June 1919.

1. A careful study has been made of the papers entitled "Air Service Materiel" A.E.F. Estimate of July 29, 1918, and Exhibit "A" appended thereto.

2. It was soon evident that it would be absolutely impossible to get together sufficient materiel or sufficient trained personnel to enable the Air Service to accomplish the program as laid down in Table 5 of Exhibit "A" which called for 358 Squadrons on the front by the end of June 1919, and for the same date, 133 Balloon Companies.

3. Further consideration was given to a possible program and at the last meeting of the Inter-allied Aviation Committee all of the Allies were asked to submit to the Committee by Monday, the 19th, August 1918, programs showing what units they expected to place at the front by end of June 1919.

4. Below is given a table in which are shown the number of Air Units we now have at the front and the number which it is

Notes

1. In Gorrell's History, A–7, p 104.

2. In Gorrell's History, p 103. The initials indicate that the indorsement was prepared or initiated by Col. Fox Conner, Assistant Chief of Staff, G–3. Having reviewed the various programs, the anonymous author of a "History of the Various Air Service Programs for the Air Service, A.E.F." (in Gorrell's History, A–7), said, "The above programs serve to illustrate two points: (a) the fact that G.H.Q., A.E.F., was at all times willing for the Air Service to expand to its maximum possible extent, and that G.H.Q. desired the largest and most efficient Air Service that could be placed on the American front; and (b) the fact that G.H.Q., A.E.F., having determined upon a policy for the Air Service did not vary in this policy but continued to allow the Air Service to expand as rapidly as possible."

	Pursuit	Obs. Corps	Obs Army	Day Bomb	Night Bomb	Totals
Present	12	10	1	1	0	24
August	4	3	3	2		12
September	4	3	1	1		9
October	4	2	1	1		8
November	4	2	2	1	1	10
December	4	3	4	0	1	12
January	4	3	5	2	2	16
February	4	4	5	1	4	18
March	5	4	5	2	4	20
April	5	4	8	1	5	23
May	5	5	8	2	5	25
June	5	6	9	0	5	25
TOTALS	60	49	52	14	27	202

hoped may be placed at the front during each month between now and July 1, 1919. It is recommended that this be approved as the American E.F. Air Service Program for the next 11 months, including August 1918.

5. In addition to the above there are now two Pursuit Squadrons with the English which are to be released to us about the 1st. of Oct. if we so desire.

6. Also in addition to the above it is planned to place at the front by 1st. July 1919 a total of 133 Balloon Companies.

(Sgd) Mason M. Patrick
Major General, N.A.
C.A.S., A.E.F.

1st. Ind. FC (G–3)

Chief of Staff, GHQ, AEF
France Aug. 17, 1918.

To Chief of Air Service

1. Returned. The foregoing program is approved. This program will replace all previous projects. It is desired that the Chief of Air Service prepare a cablegram informing the War Department of the new program.

(sgd) J. W. McAndrew
Major General

Maj. Gen. James W. McAndrew. (sketch by Joseph Cummings Chase)

Lt. Col. Bert M. Atkinson.

47. Plans for the Initial Phase of the Meuse-Argonne Offensive

September 1918

With the successful completion of operations at St. Mihiel in mid-September 1918, the First Army, commanded by Pershing, issued battle instructions, in the form of a proposed field order, for an offensive in the area from the Meuse River to the Argonne Forest. The first objective was penetration of the Hindenburg Line for about 16 kilometers, and second being a further penetration for another 16 kilometers.

On 16 September, the Assistant Chief of Staff G–3, First Army issued instructions, written by Lt. Col. Frank P. Lahm, for employment of the Air Service in the attack. The following day, Mitchell, Chief of Air Service, First Army, submitted the Air Service plan, which became an annex to the field order that the First Army issued on 20 September. At midnight on 22 September, Pershing assumed command of allied forces that were to take part in the offensive. On 23 September, Mitchell issued a supplementary plan for the First Army Air Service, and on 25 September, Lt. Col. Bert M. Atkinson issued a plan for the 1st Pursuit Wing, which he commanded. H-hour for the attack was 0500 on 26 September.

The First Army moved three corps into the line on the front of the main assault; I Corps was on the left, V in the middle, and III on the right. To the left of I Corps was the French Fourth Army, which was to work in coordination with the First Army. To the right of III Corps was the French XVII Corps, French II Colonial Corps, and U.S. IV Corps. For the initial operations Mitchell had under his command 54 squadrons (28 American, 23 French, and 3 Italian), with a total of 963 airplanes. In addition, his air service included 22 balloons (14 American and 8 French). The British Independent Air Force was to cooperate. Mitchell wanted the French 1st Air Division, with some 525 bombardment, pursuit, and observation aircraft, under his command, as it had been during the Battle of St. Mihiel, but the most he could get was a promise of assistance in an emergency.

Following are: A. First Army instructions for the employment of the Air Service;[1] B. Extracts from the First Army field order[2] and aviation annex;[3] C. Supplementary plan of First Army Air Service;[4] and D. Plan of 1st Pursuit Wing.[5]

A. Instructions of First Army

G–3
Headquarters First Army,
A.E.F.

September 16, 1918.

Memorandum, For: Chief of Air Service.

Subject: Employment of Aviation in Proposed Attack.

The employment of aviation in the proposed attack will be divided into four phases:

I. Preparation.
II. During the Artillery Preparation.
III. During the Attack.
IV. Exploitation.

1. **Preparation:** Absolute secrecy must be maintained prior to the opening of the artillery preparation, consequently there will be no increase in aerial activity at this time. Sufficient patrols will be maintained to prevent the enemy's reconnaissance planes penetrating our lines; bombardment aviation will continue its normal activity (targets will be furnished from this office); reconnaissance aviation will secure the maximum information of the enemy without arousing his suspicions.

1. Historical Division, Department of the Army, *U.S. Army in the World War, 1917–1919*, Vol 9 (Washington, 1948), pp 82–88.
2. AFSHRC 248, 211–61K.
3. In Gorrell's History, N–2, pp 350–355.
4. *Ibid.*, pp 356–359.
5. *Ibid.*, C–7, pp 391–392.

2. **During The Artillery Preparation:** Pursuit aviation will attack concentrations of enemy troops, convoys, enemy aviation and balloons. Day Bombardment aviation will attack enemy concentrations, convoys, stations, command posts and dumps, in a zone between approximately 10 and 30 kilometers back of the lines. Night bombardment aviation will attack railroad centers, enemy airdromes, troop concentrations and dumps. Reconnaissance aviation will carry out its usual missions, army squadrons paying particular attention to locating the arrival of reserves.

3. **During The Attack:** The same employment as during the artillery preparation.

4. **Exploitation:** As dictated by the progress of the attack and situation at the time.

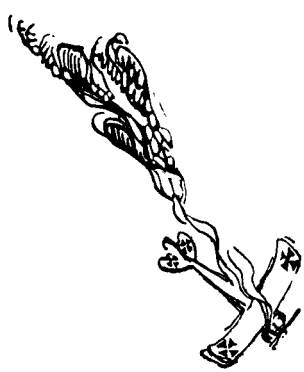
5. Four command airplanes will be held at the disposal of G–3 beginning at daylight on the day of the artillery preparation, these planes to be located as near as practicable to Army Headquarters.

6. Missions will be ordered and results reported as directed in Memo. No. 8, these headquarters, dated August 8, 1918.

7. Bombing objectives will be indicated by G–3 and detailed information concerning these objectives by G–2, 1st Army.

R. McCleave
Colonel, General Staff,
A. C. of S., G–3.

FPL—P



Headquarters, Air Service, 1st Army, American Expeditionary Forces

France, September 17th, 1918.

Annex No. 4,
(Field Orders No. 20).

Subject: Plan of Employment of Air Service Units, 1st American Army.

I. Plan of Employment. This will consist of four stages as follows:

A. Preparation until day of attack.

B. During the Artillery preparation.

C. During the Attack.

D. Exploitation.

A. *Preparation Until Day of Attack.*

1. Surprise, being a factor in the success of operations, the utmost secrecy will be observed in movements and concentration of Air Service Units.

2. Hostile reconnaissance aviation will be prevented from entering our lines and the work of hostile balloons hindered. This will be insured by placing an absolute barrage over the front, from and including the Meuse on the east, to and including La Hazaree on the west.

3. All information necessary in the preparation of attack, especially for the Artillery preparation, will be gathered. Particular care will be taken that the suspicions of the enemy are not aroused. These missions will be accomplished by:

(a) Army Reconnaissance

Col. Robert McCleave.

Aviation—Photographic and visual missions.

(b) Army Corps and Army Artillery Aviation—Photographic and visual missions, ordered by the Army Corps and Army Artillery Commanders.

(c) Night Reconnaissance Aviation—Visual reconnaissance carried out at night to obtain information of the movements and concentrations of enemy forces.

4. Bombardment Aviation, both day and night, will continue to be employed in a normal manner.

The above missions will be carried out so as to change as little as possible the usual aspect of the sector.

B. *During The Artillery Preparation.*

1. *Pursuit.*

(a) The First Pursuit Wing (4 groups) will insure an absolute barrage of the front and protect our observation aviation at every altitude from the Meuse inclusive on the east and LA HAZAREE inclusive on the west; prevent enemy aviation from attacking through the WOEVRE and will attack concentrations of enemy troops, convoys, enemy aviation and balloons.

(b) Pursuit Aviation, French Aerial Division, will be so disposed as to protect our right flank and front in case of an attack.

2. *Day Bombardment Aviation.*

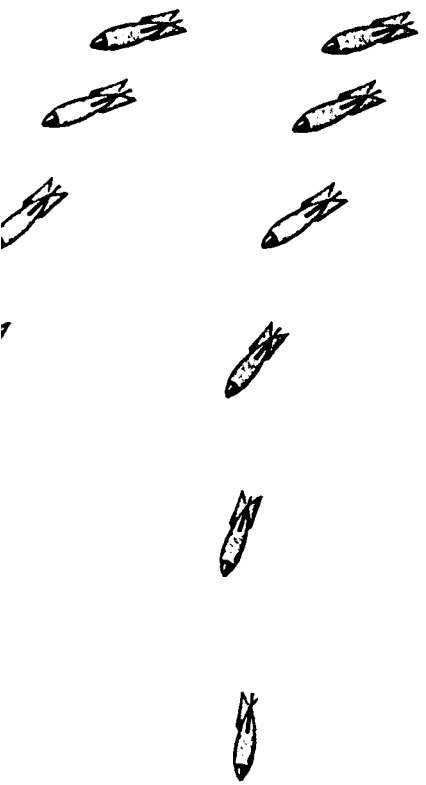
Will attack concentrations of enemy troops, convoys and aviation, railroad stations, command posts and dumps.

3. *Night Bombardment Aviation.*

Will attack railroad stations and trains, troop concentrations, ammunition dumps, and enemy airdromes.

4. *Reconnaissance Aviation.*

(a) Army Reconnaissance—will carry out long distance missions, both photographic and visual.



(b) Army Corps and Army Artillery—Will carry out the missions, both photographic and visual, prescribed by the Army Corps and Army Artillery Commanders, including:

The observation and results of artillery fire.

Liaison with Infantry.

Information of the enemy of benefit to the Higher Command.

(c) Night Reconnaissance—Will carry out visual reconnaissance as prescribed.

C. *During The Attack.*

The same general employment as prescribed in B. The offensive will be taken and maintained at all points and under all conditions.

D. *Exploitation.*

The offensive will be maintained, based on the progress of the attack and the situation at the time, with the particular object in view of destroying the enemy's air service, attacking his troops on the ground and protecting our own air and ground troops.

II. Four Command Airplanes will be held at the disposal of G–3, commencing at daylight on the day of the beginning of the Artillery preparation. These planes will be located on the Souilly airdrome.

III. Appendixes.

Appendix No. 1, shows the distribution of the air forces.

Appendix No. 2, shows the plan of reconnaissance aviation.

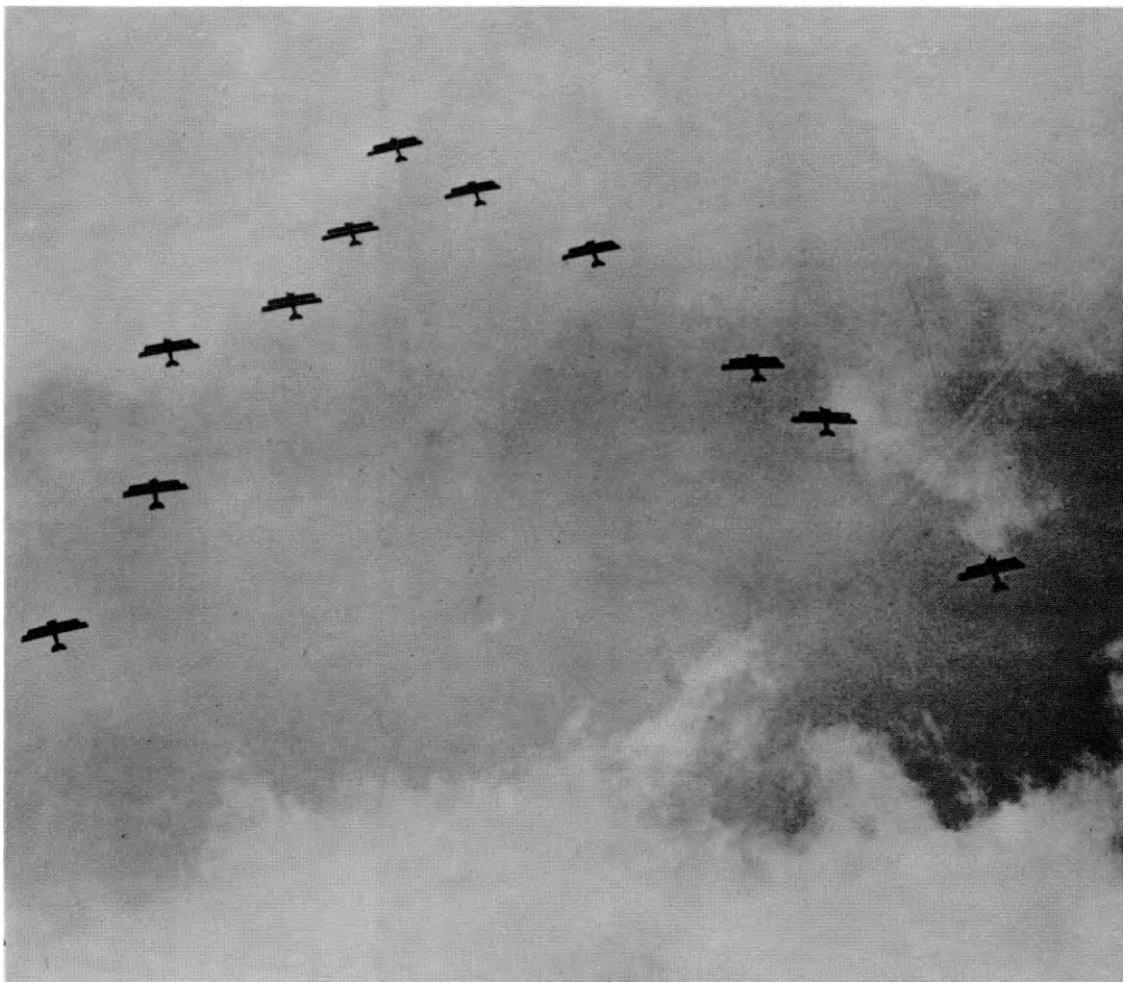
Appendix No. 3, shows the plan of Bombardment Aviation.[6]

The plans for the utilization of Aeronautical Units with the Army Artillery and with the Army Corps conform to the general scheme and are prepared in detail by those units.

By Command of General Pershing
H. A. Drum
Chief of Staff.

Official:
William Mitchell
Colonel, A. S., U. S. A.
Chief of Air Service, First Army.

6. The annex has no appendix on pursuit.



Col. Joseph C. Morrow.

Maj. William K. Thaw and Lt. Col. Ralph Royce.

Lt. Col. Lewis H. Brereton.

Appendix I

[The appendix is an organizational chart labeled "Air Service of the American 1st Army." Since it is not suitable for reproduction, it has been used as the basis for the following listing of units:]

First Army Air Service (Col. William Mitchell)
- 1st Pursuit Wing (Maj. Bert M. Atkinson)
  - 2d Pursuit Group (Maj. Davenport Johnson)
    - 4 squadrons (13, 22, 49, 139)
  - 3d Pursuit Group (Maj. William K. Thaw)
    - 4 squadrons (28, 93, 103, 213)
  - 1st Day Bombardment Group (Maj. James L. Dunsworth)
    - 4 squadrons (11, 20, 96, 166)
- 1st Pursuit Group (Maj. Harold E. Hartney)
  - 4 squadrons (27, 94, 95, 147)

Army Observation Group (Maj. John N. Reynolds)
- 3 squadrons (9, 24, 91)

Army Artillery Observation Group (Capt. Bloch) (Fr.)[7]
- 6 squadrons
- 4 balloon companies

Night Bombardment Wing (Commandant Villome)
- 2 groups (1 French; 1 Italian)
  - 5 squadrons (2 French; 3 Italian)

Corps Observation Wing (Maj. Lewis H. Brereton)
- 1st Corps Air Service (Maj. Melvin A. Hall)
  - 1st Corps Observation Group
    - 4 squadrons: 3 U.S. (1, 12, 50); 1 French
  - Balloon Wing Co. A
    - 3 companies (1, 2, 5)
- 3d Corps Air Service (Col. Joseph C. Morrow)
  - 3d Corps Observation Group
    - 5 squadrons: 2 U.S. (88, 90); 3 French
  - Balloon Wing Co. D
    - 4 companies (3, 4, 9, 42)
- 4th Corps Air Service (Maj. Harry B. Anderson)
  - 4th Corps Observation Group
    - 3 squadrons: 2 U.S. (8, 135); 1 French
  - Balloon Wing Co. C
    - 3 companies (10, 16, 69)
- 5th Corps Air Service (Lt. Col. Arthur R. Christie)
  - 5th Corps Observation Group
    - 4 squadrons: 2 U.S. (99, 104); 2 French
  - Balloon Wing Co. B
    - 4 companies (6, 7, 8, 12)
- II Colonial Corps Observation Group (Fr.)
  - 3 squadrons
  - 2 balloon companies
- XVII Corps Observation Group (Fr.)
  - 2 squadrons
  - 2 balloon companies
- From Second Army Observation Group (Fr.)[8]
  - 3 squadrons: Pursuit, night reconnaissance, and day observation

1st Air Division (Fr.)[9]
- Day bombardment brigade
  - 2 bombardment wings
    - 7 bombardment groups
      - 15 bombardment squadrons
      - 2 protection squadrons
- Pursuit brigade
  - 2 wings
    - 6 groups
      - 24 squadrons

7. This group and the other French and Italian units listed here, except for the 1st Air Division, were attached to the U.S. First Army and under Mitchell's command for operations. The French organizational hierarchy was escadrille (flight)—groupe—escadre (squadron), which was comparable to the U.S. squadron—group—wing organization.

8. These units are not on the chart, but they are on the station list for the First Army Air Service for 26 September 1918.

9. Although the division appeared on the chart, it was not under Mitchell's command. See the editor's introductory note to this document.

Appendix II

September 17th, 1918.

Observation Plan—Under Battle Instructions No. 2.[10]

1. The Enemy can, in addition to reacting on the front attack, do the following:

a. On the right bank of the Meuse he can engage reserves which he always has in the area Damvillers-Mangiennes in order to attack either on the Haute de Meuse or by debouching from the Forest of Spincourt.

b. On the left bank of the Meuse attempt an attack as a diversion or take away reserves from this part of the front and transport them to the right bank.

c. Bring up reserves on both sides of the river from other parts of the front.

2. In consideration of the above the following observations will be carried out:

a. On the right bank there must be constant observation of the area north of the Forest of Spincourt.

b. In addition, reconnaissance carried out over Montmedy—Longuyon—Spincourt—Audun-le-Roman would give notice of any arrival and unloading of reserves which might be brought from other parts of the front.

c. On the left bank of the Meuse there must be constant observation of the area Dun—Romagne-sous-Montfaucon—Charpentry—Vilosnes in order to watch the possible movement of troops or concentration.

d. In addition reconnaissance must be pushed along the Mouzon—Dun and Mouzon—St. Juvin railroads in order to determine if any unloading has taken place.

e. Observation of the crossings over the Meuse are indispensable.

3. To carry out the foregoing plan the following instructions will govern:

a. Observation Squadrons of the respective Corps will be responsible before operations for a depth of eight kilometers. Boundaries are indicated on map attached hereto.[11] During operations Corps units will not go beyond a depth of five kilometers unless they are provided with pursuit planes for protection.

b. Enemy front lines will be photographed by Corps Machines at every opportunity. Prints of such photos will be sent to Army Dropping Ground by airplane delivery.

c. Army Observation units will observe the area bounded on attached map by single green line, carrying out the missions indicated in paragraph #2 above.

d. The necessary steps will be taken to secure the cooperation of the observation service of the 4th and 8th French Armies.

Approved: *Willey Howell,*
Lt. Col, G.S.
A.C. of S., G–2

Wm. Mitchell,
Colonel, Air Service,
Chief of Air Service.

Appendix III

September 18th, 1918.

PLAN OF BOMBARDMENT AVIATION

Four phases are to be considered.

1. *Preparation.* Covering the period from this date until the time of artillery preparation.
2. *During the Artillery Preparation.*
3. *During the Attack.*
4. *Exploitation.*

1. *Preparation.*

Object: To hinder the arrival of enemy troops and supplies in the sector to be attacked. Destruction of enemy aviation on its airdrome and parks.

A loaded bomber awaiting takeoff.

10. The proposed field order. This plan, submitted as Appendix II to Annex 4, became Annex. 9 to Field Order 20.

11. Not in Gorrell's History, N–2.

As absolute secrecy must be observed, there will be no heavy concentration of bombing, consequently with the limited means available, the various targets indicated herewith will be bombed in turn.

2. During The Artillery Preparation.

Object: To harass the enemy by attacking his troop concentrations, convoys, stations, command posts and dumps; to hinder his movement of troops and to destroy his aviation on the ground.

Such of the following targets will be selected as are found to be the most important as shown by reconnaissance made at the time.

Preparation

OBJECTIVES	TO BE BOMBED BY	BY ORDER OF	REPORTS ON RESULTS, ETC. TO BE ADDRESSED TO
Railroad Centers:			
Longuyon			C.G., 1st Army C.S., 1st Army
Stenay			G–2
Montmedy	American	C.A.S.	G–3
Carignan	Day Bomb-	1st Army	C. of A.
Mouzon	ing		by
Vouziers	Group of		C. A. S. 1st Army
Lumes	3 Squadrons.		
Airdromes & Parks			
			C.G., 1st Army
Malmy	2 French	C.A.S.,	C.S., 1st Army
Mouzon	Night Bombing	1st Army	G–2,
	Groups at		G–3,
	Epiez &		C. of A.
	Chermisy		by C.A.S. 1st Army

During Artillery Preparation

Objectives	To Be Bombed By	By Order Of	Reports On Results, Etc., To Be Addressed To
Troop Concentrations, and convoys wherever found in a zone approximately 10 to 30 kilometers back of the lines.	American Day Bombing Group of 3 Squadrons	C.A.S. 1st Army	C.G., 1st Army G–2 G–3 by C.A.S., 1st Army
Dumps, Railheads, Camps & Command Posts.			
1. Brieulles S Meuse			
2. Romagne S Montfaucon			
3. Termes Grand Pre			
4. Saint Juvin			
5. Briqueney			
6. Harricourt			
7. Dun-Doulcon			
8. Saulmey			
Railroad Centers			
Stenay	2 French		
Vouziers	Night Bombing Group	C.A.S. 1st Army	
Airdromes and Park			
Mouzon			
Malmy			

3. *During The Attack*

Object: (a) To prevent the arrival of reserves.
(b) To break up counter attacks.
(c) To harass the enemy in the withdrawal of his troops & material.
(d) To destroy his aviation on the ground. Targets will be the same as those during the Artillery Preparation, selecting the ones found to be the most important as shown by visual and photographic reconnaissance made at the time. Orders for missions will be transmitted by G–3, through the C.A.S., and reports on results made as in the preceding phases.

4. *Exploitation.*

As dictated by the progress of the attack and the situation at the time.

F. P. Lahm,
Colonel, Air Service

Official:
William Mitchell.
Colonel, A.S. U.S.A.
Chief of Air Service, First Army.

B. Field Order

First Army, A.E.F.
Ligny-en-Barrois,
September 20, 1918—3 p.m.

Field Orders
No. 20

. . . . . .

3. [Mission assignments, corps and services.]

. . . . . .

(K) Air Service:

(1) For plan of employment, see Annex No. 4.

(2) It will attack and defeat the hostile Air Service while screening our army front from hostile observation and attack.

(3) The army dropping ground for messages from aeroplanes will be at the Souilly aerodrome. Four command planes will be held ready to execute any mission given at the army landing field at Souilly.

(4) The Chief of Army Air Service will designate certain army balloon companies to accompany the advance. Corps commanders will designate and regulate roads for these movements.

. . . . . .

By command of General Pershing
H. A. Drum,
Colonel,
Chief of Staff.

Lt. Col. (later Col.) Frank P. Lahm.

C. Supplementary Plan

Headquarters, Air Service, First Army American Expeditionary Forces
France, September 23, 1918

Supplementary Plan of Employment of Air Service Units, 1st Army

1. This plan covers four phases:

(1) Preparation until day of attack.

(2) During Artillery preparation.

(3) During attack, as far as first combined army objective.

(4) Exploitation of Attack as far as second combined Army objective.

2. (1) *Preparation Until Day of Attack.*

(a) Acting vigorously over the enemy's lines between LA CHAUSSEE and the MOSELLE RIVER, on the right flank of this position and North and East of NANCY, so as to hold the enemy's attention in that direction and lead him to believe that we are to attack METZ.

(b) Stopping all hostile reconnaissance from crossing our lines and preventing observation from hostile balloons throughout the area mentioned above. In addition a Pursuit barrage to be placed between the MEUSE and the AISNE to prevent enemy reconnaissance.

(c) Gathering all information necessary for the preparation of the Attack throughout the area as far as, and including the final objectives.

(d) All missions along the new front of operations will be carried out in such a way as not to alter the usual aspect of the Sector.

3. *Special Missions For Each Branch of Aviation Under (1).*

(a) *Night Bombardment.*

Independent Royal Air Force, Night Bombardment Wing.

VILLOME, French Night Bombardment Wing.

French Squadrons of French Group of Armies of the Center.

The objectives have been pointed out in the original plan of employment covering the period of attack and are chosen so as to shut off the zone of the last operations from the present zone of attack.

(b) *Pursuit and Day Bombardment—French Air Division.*

Missions as per "a" paragraph 2, over the front between LA CHAUSSEE and CHATEAU-SALINS by means of:

1. Short distance offensive patrols across the lines, carried out by combined Bombardment and Pursuit forces.

2. Patrols covering our lines and attacking balloons. These missions should be carried out whenever any reliefs of troops are being made.

(c) *Pursuit and Day Bombardment of 1st US Army*

1st Pursuit Wing (Atkinson).—Barrage over front and attack of balloons between CHATILLON SOUS LES COTES—PONT SUR SEILLE. Offensive Pursuit and Day Bombardment patrols as directed in or to the East of this area.

1st Pursuit Group (Hartney)—Barrage patrols over the front between CHATILLON SOUS LES COTES—AISNE RIVER at MELZICOURT so as to stop hostile reconnaissance and patrols.

(d) *Army Reconnaissance Aviation.*

1. *1st Army Observation Group.* Photographic and visual reconnaissance of area included between a line from VERDUN to LONGUYON inclusive, West to the RIVER AISNE, inclusive.

2. *2nd French Army Observation Group.* Photographic and visual reconnaissance of area between a line drawn from VERDUN to LONGUYON inclusive, East to the RIVER MOSELLE inclusive.

Night Reconnaissance.

1st Army Observation Group
VILLOME, Night Bombardment Group
2nd French Army Observation Group.

Visual reconnaissance to watch any movements of concentration or withdrawal of the enemy throughout the areas assigned to each aviation unit.

NOTICE: These missions have been allotted by G–2, 1st Army, in the plan of reconnaissance.

(e) *Army Artillery and Army Corps Aviation.* Visual and photographic reconnaissance—Spotting Artillery objectives and adjustments.

4. *(2) and (3) During Artillery Preparation and During Attack of First Combined Objective.*

(a) Destruction of the hostile air service at all altitudes, attack of his ground troops, and protecting our own air and ground forces.

(b) The benefit of surprise and the quick progression of the attack will give us an advantage, our Aviation therefore will be able to act very boldly. This will enable our Pursuit Aviation to fight ground troops with machine guns and bombs.

Special Missions of Each Class of Aviation.

(a) *Night Bombardment.*

(During the night before D day, and during the night following D day).

Independent R.A.F.—Will attack the railway stations of METZ, SABLONS, THIONVILLE, AUDUN LE ROMAN, and the most important aviation grounds in that region. (Same general mission for Day Bombardment on D day).

Villome night Bombardment Wing—Will attack the railway stations of CONFLANS, LONGUYON, MONTMEDY, and all large gatherings of troops noticed.

(b) *Aerial Division.* Its mission will be to cover the front, up to a depth of 10 kilometers in the enemy lines, destroy enemy aircraft and balloons.

It will develop its greatest offensive power with bombs and machine guns against all enemy reserves, reinforcements and convoys, whether they are marching to the attack or retreating so as to throw them into confusion, cause a block in the road traffic and block cross roads throughout the enemy back area.

The central line of action will be on the plateau along the general axis Montfaucon—Nantillois—Romagne—Bayonville—Buzancy.

(c) *Pursuit and Day Bombardment Aviation of First Army.*

1st Pursuit Wing (Atkinson)—Barrage at medium and high altitude up to 5 kilometers on our whole front.

Enemy ground troops will be attacked by Pursuit Units with machine guns and bombs whenever ordered.

1st Day Bombardment Group, (Dunsworth)—Will attack enemy concentrations along the valley of the MEUSE—ROMAGNE—ST. JUVIN— and GRANDPRE.

1st Pursuit Group (Hartney)—Will specialize against enemy low flying airplanes, protect our infantry liaison and observation planes and attack hostile balloons on the front *Chatillon Sous Les Cotes—Melzicourt.*

(d) *Army Reconnaissance Work.*

The 1st Army Observation Group (Reynolds)—Will cover the sector to the West of a line drawn from Verdun to Longuyon inclusive with both day and night reconnaissance.

The 2nd French Army Observation Group (De Vergnette)—Will cover the sector east of a line drawn from *Verdun* to *Longuyon*, inclusive, with both day and night Army Reconnaissance.

The missions specified in the plan of reconnaissance will be carried out.

Four command airplanes will be located at *Souilly* ready to take off at any moment to verify or obtain precise details concerning any important piece of information that may be required by the Army Commander.

(e) *Army Artillery Aviation and Army Corps Aviation.* Their employment will be governed by the plans of employment of the Army Artillery or of the Army Corps.

These airplanes will have to protect themselves to some extent from hostile machines which have broken through our Pursuit Aviation.

Army Artillery and Army Corps airplanes should avail themselves of every favorable opportunity to attack enemy troops on the ground, when it does not interfere with their general mission.

5. *(4) Exploitation of Attack on Second Combined Army Objective (Second Operation)*

1. *General Aims.* Theoretically the same as during the preceding period. The missions will be specified according to the situation after the first attack.

2. *Special Missions of Each Branch of Aviation.*

(a) *Pursuit and Bombardment Aviation of The First Army.* Same missions as during preceding period.

(b) *French Aerial Division.* Same missions. Two principal axis along which its action will be ordered according to the situation.

Buzancy—Stonne
Bridges Over the
Meuse.

(c) Night Bombardment.

Independent Force R.A.F.—

Commandant Villome, French Air Force. (Courtesy *Attache de l'Air*, French Embassy)

Same list of objectives. *VILLOME Night Bombardment Wing.*—Different objectives throughout the battlefield, railheads and bridges over the MEUSE as far as and including LUMES.

(d) Army Reconnaissance. Reconnaissance of lines where the enemy is organizing fresh centers of resistance, supply and direction of movement of reinforcement or withdrawal. (Details of these missions should be specified by G–2).

(e) Army Corps and Army Artillery Aviation. Same missions. Greater importance will be given to the Infantry Liaison work:—the airplanes should bring in direct information to the Infantry (to the Divisions, regiments and even battalions on the first line)—a greater share, too, should be given to the attack on land, (rear-guards, nests of resistance, reinforcements or reserves).

6. *Provision For A Movement Forward.*

Army Artillery and Army Corps Aviation.

Advanced airdromes for the Army Corps and Army Artillery Aviation will be selected near the post of Command of the larger units, which will be equipped for use at the earliest practicable moment in order to facilitate the liaisons. If the attack progresses normally, the advanced airdromes will become the permanent ground of the sector.

When the movement forward is sufficiently important, new advanced ground will again be selected and prepared in a similar manner.

The Equipment Section will make arrangements accordingly.

Pursuit and Bombardment Aviation.

These units will move nearer to the front as soon as terrains are freed by the Army Corps and Army Artillery.

In Special cases, these units may utilize advanced airdromes, auxiliary airdromes or the airdromes of the Army Corps and Army Artillery.

William Mitchell,
Colonel, A.S., U. S. A.
Chief of Air Service

D. Pursuit Wing Plan

Headquarters, First Pursuit Wing,
Air Service, American E. F.
September 25th, 1918.

PLAN OF EMPLOYMENT OF PURSUIT, AND DAY BOMBARDMENT UNITS FIRST PURSUIT WING

1. The operations will cover 4 phases:

I. Preparation until day of attack.
II. During artillery preparation.
III. During attack, as far as first combined army objective.
IV. Exploitation of attack as far as second combined army objective.

While the areas and objectives will be altered from time to time the plan of employment of pursuit aviation in the last three stages of the attack will follow the same general principles.

2. (A) *Preparation until day of attack:* In order that secrecy may be obtained no airplanes from this wing will operate west of Chatillon-sous-les-Cotes until after H hour.

(B) The normal activity of the sector between Chatillon and Port-sur-Seille will be maintained and the Groups will operate over the sector of the last operations.

3. *Pursuit Aviation after H hour:*

(A) Pursuit aviation at the disposal of the First Pursuit Wing comprises the 2nd and 3rd Pursuit Groups. The sector of the 1st Pursuit Wing is from Port-sur-Seille on the east to La Harazee on the west. The sector of attack is from the Meuse River on the east to La Harazee on the west.

(B) In order to maintain a proper superiority over the enemy air service it will be necessary for our air service, not only to maintain protective patrols within the enemy's lines for the defense of our Army Corps Air Service and to attack enemy reconnaissance planes, but it will also be necessary from time to time to take the offensive with a display of dominating force sending out powerful expeditions so as to cover intermediate and high altitudes and to sweep the air clear of enemy aviation up to a depth, 10 or 12 kilometers inside his lines.

(C) One Group will protect the front, daily, from dawn to 12 h 30 and the other from 12 h 30 'till dark. In the protection of the front, patrols of one Flight will operate over the sector, Chatillon-sous-les-Cotes, Port-sur-Seille; Patrols of 2 Flights will be maintained throughout the period assigned over the sector Chatillon-sous-les-Cotes—La Harazee.

In view of the fact that it is believed that most of the enemy aviation is concentrated in the region of Metz, especial attention will be paid to the sector between the Meuse and Chatillon.

(D) *Special Missions of Pursuit Aviation:*

By requiring one Group to do its barrage work in the morning its squadrons will be available for an offensive operation in the afternoon, and vice-versa. The Group assigned to patrol in the afternoon will be on the alert in the morning to carry out an offensive mission, in which the entire Group may be called upon to participate at medium and high altitudes, penetrating about 12 kilometers beyond our advancing lines to clean the air of enemy aviation. A similar expedition may be sent out in the afternoon from the Group that has done the patrolling in the morning. The hours at which these offensive missions are carried out will be constantly various and an effort will be made to order offensive missions at hours when intelligence received from the Anti-Aircraft Artillery indicated maximum enemy activity. The strength and frequency of attacks on ground objectives will depend upon the strength of enemy aerial activity encountered.

In special circumstances pursuit reconnaissances will be ordered. While it is not anticipated that such missions will be ordered, Group Commanders will see that their pilots are familiar with infantry ground panels.

Close protection for Corps Observation photographic missions, when it is required, will be provided by the squadron assigned to barrage patrol. The Corps Observation Wing will be informed of the hours at which the different Groups will be responsible for the barrage patrol the night before. When Observation Squadrons cannot provide their own protection they will notify the Corps Observation Wing Commander who is authorized to adjust this protection directly with the Group that is responsible, at the hour in question, for the barrage patrol. The Group Operations Officer will inform the patrol leader of the squadron going out on barrage patrol that its mission has been altered from that of barrage patrol to one of close protection and the patrol leader in question will get into immediate telephonic liaison with the pilot who is responsible for the photographic mission.

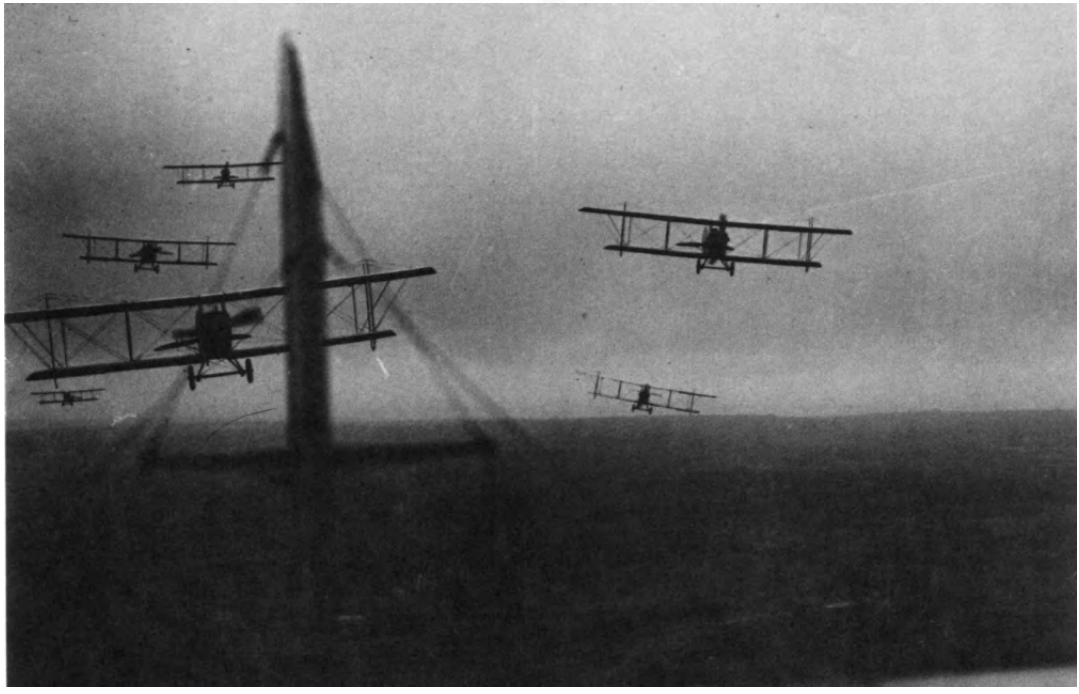
4. *Day Bombardment Aviation* In the First Pursuit Wing comprises the First Day Bombardment Group. In principle this Group will be used to attack from high altitudes, large objectives such as towns and railroad stations from which traffic is radiating.

In the first stages of attack it will operate against enemy concentrations along the valley of the Meuse, Romagno, St. Juvin, Grandpre.

Special Missions of Bombardment: In emergencies when intelligence is received that specially favorable targets are presenting themselves within 6 or 8 kilometers of our front lines this Group will be ordered to attack such targets at low altitude in order to cause confusion and material damage to enemy elements arriving as reinforcements or retreating.

By order of Lieutenant Colonel Atkinson

Philip J. Roosevelt,
Captain, Air Service, U. S. A.
Operations Officer.



Col. Milling, Gen. Mitchell, and Maj. Paul Armengaud, liaison of the French Air Service and adviser to Billy Mitchell's Air Headquarters.