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AIRCRAFT PRODUCTION

HEARINGS

BEFORE THE

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SUBCOMMITTEE OF THE COMMITTEE ON MILITARY AFFAIRS UNITED STATES SENATE

SIXTY-FIFTH CONGRESS

SECOND SESSION

VOL. II

WASHINGTON
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FRIDAY, JULY 12, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met pursuant to adjournment at 10.30 o'clock a. m., in the committee room, Capitol, Senator Charles S. Thomas (chairman) presiding.

STATEMENT OF MAJ. CUSHMAN A. RICE—Continued.

The CHAIRMAN. Maj. Rice, since you were here last, have you prepared any tables or any data with regard to the proportions and the relative merits of planes and of motors at the front?

Maj. RICE. Yes, sir; Senator Reed asked me to make up an approximate table of some sort that, without being absolutely technical, would show more or less the number of planes that have been operated and used successfully and satisfactorily by the British during the four years of war, and that are being so operated and used at the present time, the idea being to give the committee a chance to judge which machines are the most satisfactory and have given the best results. Naturally, the British, with their experience during these four years, would adopt the machines that have given them the best results, and that balances their service to give the best results.

Now, I have based this computation that I made on approximately 70 squadrons, or a matter of about 1,400 planes. This in no way represents the British strength. It is quite true that you might change the figures considerably by going through the whole British service, but it gives an approximate idea of which machines they are most generally using.

The Sopwith Camels lead with quite a proportion. Then there are the R. E.'s. That is an experimental machine which is a very fast flying machine, somewhat on the same principle as the Camel. Then there is the S. E. 5, which is also a fast-fighting single-seater scout machine.

Then come the D. H. 4's and then there is the F. E. 2. The F. E. 2 is a pusher type. It is an odd-looking machine. It has a metal frame. It is used a great deal for night bombing. It is not as fast as the others, but it is successful for that purpose. Then there is the D. H. 9, which is used considerably. There is the Bristol fighter. The Bristol fighter, in my opinion, is one of the most satisfactory and finest fighting machines they have over there. That is a two-seater fighter as against the single. Again, the British have used

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and met with considerable success in the operation of the Handley-Page for bombing purposes; they use also the A. W. B. There is the Sopwith Dolphin, a very fast new machine with a high ceiling. They have installed a few of those. A few squadrons have those, but the proportion of Camels, R. E.'s, and S. E. 5's is much higher than the other machines. Of course, they are fast single-seater fighters. The D. H. 4's predominate in photographic and reconnoissance work.

I may say, Senator, that this table is not absolutely correct to a machine, or anything of that sort, but it just gives a general idea of what machines the British Government found could be successfully used and operated, and they are used and operated at the present time on the fighting front.

The CHAIRMAN. What can you tell the committee, if anything, about the training machine called the Avroe?

Maj. RICE. It is a very good machine. The British use it successfully for training purposes.

The CHAIRMAN. Do they use it exclusively for training purposes?

Maj. RICE. I doubt if they use any one training machine exclusively, though they may. They use the Avroe with good success. They are good machines.

The CHAIRMAN. What engine does the Avroe use?

Maj. RICE. They use three types of motor—the Rolls Royce 75 horsepower, a Gnome 80 horsepower, and a 100 horsepower Monosupape for the two seaters and the 80 Gnome for the single seaters.

STATEMENT OF THOMAS A. HILL.

Mr. HILL. My attention was first attracted by the cross-license agreement of the Manufacturers' Aircraft Association on or about July a year ago, at which time I published some criticism of the iniquitous effect of such an agreement for the reason that I knew the patents affected by the agreement were not the dominating patents in the aircraft art.

This was followed by a conference at Judge Crisp's office in New York. After conference with Mr. Coffin in Washington, and conferences with Secretary Daniels in Washington and Admiral Taylor and others. But I found it impossible to accomplish anything.

Later on, toward the end of the year, I was asked by Mr. Gutzon Borglum to assist him in some investigations which he said President Wilson had requested him to make, in the matter of the aircraft situation. I told him of my objections to the cross-license agreement and of the fact that I had brought the matter to the atention of the Aeronautical Society of America, which had taken some action, and I came to Washington a number of times to confer with Mr. Borglum in the hope of having the matter brought to the attention of the President.

Again after Mr. Snowden Marshall had been appointed by the President I went over the matter. I received a letter from Mr. Marshall stating that he had been requested to get my views at the instance of Mr. Stebbins, and again I came to Washington and went over the ground with Mr. Marshall and told him that if he would provide me with the necessary records I would gladly give him a full,

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complete, accurate, impartial, technical report, such as the Government should have before paying any money in the guise of royalties.

Following this I conferred with Col. Harris, who, I understand, was the legal adviser to the Aircraft Board; Mr. Montgomery, who, I understand was the legal adviser of the Signal Corps; Mr. Potter, and others, and I again conferred with them and discussed with them the substance of the report which I drew for Mr. Marshal's consideration and for presentation with his report to the President. I found no one who could take actual exception to the recommendations in my report, and while the report embraced only one method of dealing with the situation, it is clear to my mind that there is no excuse, nor has there been, for the procedure worked out under the cross-license agreement.

For instance, I have not been able to get any record of any competent investigation leading to any conclusions as to the probable necessity or value of any of the so-called inventions covered by the agreement. In other words, no one seems to have actually ascertained, as a matter of fact, that the so-called improvements covered by the cross-license agreement were actually of any need or merit to the manufacturer or aircraft, nor which of them were of need or merit. I am not aware that any competent report has been rendered to determine whether or not such alleged improvements, if necessary, and if actually used in the manufacture of aircraft, were protected by valid patents claims, or to what extent, nor am I aware of any competent investigation resulting in a determination of the probable value of any such validity claimed necessary and actually incorporated improvements.

Now, my experience of upward of 20 years as a patent lawyer enables me to say, without fear of contradiction, that such an examination is absolutely essential in order that the Government might determine what it should pay, if anything, for the use of these alleged patented improvements, and to illustrate the shortcomings and iniquity of this cross-license agreement in one particular let me point out the instance of the Janin patent. Here is a case where some years ago an interference was declared between Curtis and one Albert S. Janin, of Staten Island, as to who was entitled to the broad patent covering the use of a central boat beneath an aeroplane superstructure, having side floats for lateral balance. It is perhaps the most underlying and basic patent in the water-flying art. My connection with the case begins with a time after the testimony had been taken in the interference proceedings, and the first tribunal of the Patent Office decided in favor of Curtis. This case was bitterly contested through the highest court of appeals and finally resulted in favor of this poor carpenter, Janin, of Staten Island. Curtis was held not to be the first inventor and lost his rights. Recently the Curtis Co. entered into a contract with Janin, and paid him $1,000 for an option to purchase these rights for $70,000, or to take a license for $15,000. The Curtis Co. does not own any of these rights to-day, and yet this is a concrete illustration of a controlling and dominating patent, recognized by the Curtis Co. and yet not embodied in the cross-license agreement; that is to say, if the Government pays these royalties under the cross-license agreement it will yet have to account with the dominating patentee.

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The same may be said of other patents, such as the Forber and Mayer patents, and others which can readily be located in the prior art, so that your committee will see that the agreement does not contemplate the controlling patents, as the Government has been led to believe, and even though the Government were to pay royalties under this agreement it would yet perhaps have to settle very heavily in royalties under patents not covered by the agreement.

This only deals with the purely technical and legal aspect of the matter to a limited extent. The far-reaching effect in a popular sense with regard to this cross-license agreement is, as very ably pointed out by Hon. Charles S. Thomas, in the Senate Chamber, that it discourages inventors by enabling a few powerful interests to force the aerodynamic inventors of the country to yield under pressure of control by this combination.

My recommendation to this committee is that the attorneys and others who have had anything to do with the creation of this cross-license agreement be called upon to produce before this committee every record and transaction in any manner connected therewith, in order that this committee may ascertain what investigation, if any, has been made as to the probable merit, necessity, value, legality, and other qualities of the patents involved. I will then gladly, at the request of the committee, go over these matters and be glad to give the committee the benefit of my personal judgment as to the merit of any such investigations or reports; and if these investigations or reports—assuming that something of that kind has been done—do not appear to be of the character required under the circumstances, I gladly offer my services to this committee, providing any necessary disbursements are paid, to make these investigations and to render a competent report thereon, without any compensation whatsoever, purely in the interest of the Government and in justice to all concerned.

This would probably take considerable time; but it does not seem possible that the committee can competently terminate its investigation without this is done, unless the committee simply report that such action has not been taken and condemn the agreement because of such failure.

As to the action of the Federal Trade Commission and the Patent Office in the suppression of patent applications, about a month ago I called the attention of Senator Thomas to one or two instances which, to my mind, illustrated laxity and incompetence in dealing with the suppression of patent applications supposedly of value to the enemy in this war. One, in particular, to which I referred was the case of John Samotej, Serial No. 234596, a patent application filed for improvement in the manufacture of thread gauges. This is a case where a couple of Polish young men, brothers, hit upon the idea of manufacturing gauges automatically for contractors supplying ordnance shells to the Government. These gauges are used for examining the threads in the shell, and are necessary in order that the threads be accurate to a considerable degree. The invention, therefore, is one that is of great importance in the manufacture of war material. I am advised that these gauges usually cost considerably upward of $100, but that these inventors were actually able to produce them more perfectly and automatically in less time

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at something less than $7 apiece. The invention, therefore, was undoubtedly of unusual merit. That invention relates to a simple machine which in principle was not unlike previous machines in the prior patented art, but it differed in its operation and in the method of producing the gauges automatically in a unique particular, which made it possible to produce such gauges with extreme accuracy. I understand, to within one ten-thousandth of an inch.

At the time the matter was brought to my attention as a patent lawyer there was some quarrel between the brothers, one of whom invented the machine and the method, and I was brought into the case through the civil lawyers in New York. Recognizing the apparent value of the invention and its importance to the country and to our allies at war, I unhesitatingly recommended that an application for a patent be filed by the true and first inventor or inventors in accordance with the law provided for such procedure, and that a request be made that the application be kept secret in order that information might not leak out and reach Germany, who would profit greatly, not only in the economy in producing such tools but in the speed with which such tools might be produced. At the urgent request of the civil counsel in the case, I made a special trip to Washington to file the application personally and requested one of the assistant commissioners of patents to mark the case for suppression, which means that the application would be prosecuted to allowance and then withheld from publication, the inventor having the same rights under the allowed application as if his patent had been actually issued, but this procedure would avoid any publicity of the invention. There was no other way in which Germany could learn of the secret, as the tools were not being sold or used in any general way, and it could not be ascertained by looking at the gauges how the machine operated. I am advised that one or two machines were made in Toronto for the use of the Canadian Government, and that many of the gauges have been used by the British Government, and very large quantities by contractors to the American Government, but all of these operations had been guarded with great secrecy.

After the application had been filed and the request for suppression made as aforesaid, I received a notice from the Patent Office stating that it would not be suppressed, as it was not regarded as of sufficient importance.

I replied to this by an explanation substantially as above set forth and actually gave the names of contractors to the American Government who were using large quantities of these gauges, but with no further result. Following this the patent application itself was rejected by the Patent Office, but in this particular there is no special grievance, for the reason that in filing the application the claims were so worded, and properly so, to bring out anything in the prior art which might affect a patent issued on the invention. Accordingly the rejection of the claims was proper. I thereupon made another trip to Washington and took the matter up with the examiner in charge of the patent application, having previously mailed to the Patent Office an amendment to the application containing new claims which could be allowed in the case.

In my conference with the examiner, who very courteously examined into the merits of the points I raised, the value of the invention

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I think was appreciated. At any rate, he gave me his verbal assurance that he believed the claims were allowable, and even suggested that I add some further claims covering the method as well as the machine, subject to the possible requirement that a further application be filed. I have no complaint as to this action by the examiner.

I thereupon saw Mr. Smith, of the Patent Office, to whom the matters relating to the suppression of patent applications are referred, and told him of the grave mistake that was being made in refusing to suppress this application, and discussed with him other cases wherein I had filed a complaint.

Mr. Smith referred me to Maj. Decker. After having listened to my story and, apparently, having been impressed that the Patent Office was in error—after repeating my story to Maj. Decker he also seemed to be impressed with the error of the office, and told me that the matter would be again taken up before the board next Tuesday, which fact I reported back to Mr. Smith, and there the matter now stands. This case serves to illustrate an instance where suppression was clearly proper, important to the Government, but yet refused and stands refused at the present time.

Another illustration, showing an opposite state of affairs. This involves the patent application of Carl Weaver, serial No. 169648, for concrete structures and method of constructing same. This inventor was not my client, but is an assignor to the Torcrete Shipbuilding Corporation, which is a subsidiary corporation of one of my clients. The assignees some time ago received notice from the Patent Office that this invention would be suppressed, and any publication by the inventor, assignee, attorneys, etc., would be punished by $10,000 fine or 10 years' imprisonment. Naturally the receipt of this notice by the corporation, who were then engaged in shipbuilding indirectly for the Government, aroused much embarrassment, and the president of the company called me up promptly to know what it meant. I immediately came to Washington and took the matter up with the Washington associates of the attorney of record in the case and explained that I had advised my clients to discontinue operations, and that it was wrong on the part of the office to interfere in this way with the work of such great importance to the Government, as a particular tank ship which was then being built by the assignee was to be used for the transportation of oil from Tampico, Mexico, to New Orleans, La., for Government use.

Subsequently a permit was obtained which recited that the order of the Commissioner of Patents was dismissed to the extent of granting permission to make such disclosure as might be necessary, and that all due precautions be taken to otherwise safeguard the invention from publication. The permit, however, did not specifically state that the assignees might proceed with the construction of vessels where permits were obtained from the Emergency Fleet Corporation, and the parties affected, as a precautionary measure, and to avoid possible conflict with Government interests, therefore deemed it necessary that I should again take the matter up with the Patent Office for a broader permit, which I have done to-day.

The only object in citing the preceding case was to show that this is an instance where suppression was applied unnecessarily, so much so, in fact, as to interfere with important Government operations,

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AIRCRAFT PRODUCTION.

MONDAY, JULY 15, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The committee met pursuant to adjournment, at 10.30 a. m., in the committee room, Capitol, Senator Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, and New.

STATEMENT OF MR. JOHN A. JORDAN.

The CHAIRMAN. Mr. Jordan, what is your place of residence?

Mr. JORDAN. Sacramento, Cal.

The CHAIRMAN. What is your business?

Mr. JORDAN. Constructing engineer. Lately I have been engaged in the construction of aeroplanes for the Government.

The CHAIRMAN. How long have you followed the profession of construction engineer, and where?

Mr. JORDAN. Oh, in San Francisco mostly, in Buffalo and Chicago, for about 25 years.

The CHAIRMAN. In connection with what company, if any, have you been engaged in aircraft production?

Mr. JORDAN. The Andermat Aeroplane Co. That is a built-up name of different parties concerned. It is located at Sunnyvale, Cal. That was in 1915, I think.

The CHAIRMAN. You were then engaged in aircraft construction prior to our entrance into the war?

Mr. JORDAN. Yes, sir.

The CHAIRMAN. And after that, what company?

Mr. JORDAN. After that I was with the Liberty Iron Works at Sacramento as a 30 per cent stockholder and as general manager.

The CHAIRMAN. Did you, at any time, have any conferences with the aviation authorities in Washington since our entry into the war with regard to aircraft production?

Mr. JORDAN. Yes, sir. I came on to Washington to solicit a contract. After we got our plant in shape.

The CHAIRMAN (interposing). When and where?

Mr. JORDAN. I came after we got our plant organized. On our first arrival I introduced myself to the Aircraft Production Board. They were in session in the War Department Building at that time. That was about July 27, 1917. We sent our cards in, the president of the company and myself, and shortly afterwards Mr. Deeds and Mr. Waldron came out.

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The CHAIRMAN. Who was the president of the company?

Mr. JORDAN. Mr. Henderson was the president of my company. Mr. Deeds and Mr. Waldron were on the Aircraft Board at that time and assumed to speak for the board. They told us flatly that we could not get a contract; that all arrangements had been made as to where they were going to place contracts; that the companies had been selected. That was about the end of July a year ago—1917.

The CHAIRMAN. Did they give you the names of the companies?

Mr. JORDAN. No, sir.

The CHAIRMAN. Did you ask for them?

Mr. JORDAN. No, sir. I proceeded to argue that we people on the Pacific coast had plenty of mechanics and plenty of materials wherewith we could build airplanes, with some exceptions, principally the steel and wire; that they were using a large number of the school machines at San Diego and that another school was about to be established, and it seemed foolish to send clear across the continent a finished machine when the spruce and heavier materials, the bulky materials, were already on the coast. I said that all they had to do was to ship steel, wire, etc., in order for us to construct the aeroplanes over there. We were making motors that were satisfactory out there at that time—the Hall-Scott motor made in Berkeley, Cal. I argued along those lines, but they persisted in saying that they had made final arrangements with other manufacturers. Henderson then got disgusted and went home, but I hung on. I said that there was a crying need for aeroplane factories to produce aeroplanes and also to drill mechanics in aeroplane construction on the Pacific coast. They were shipping at that time from three to four aeroplanes in one car, and those aeroplanes were shipped at tremendous expense from Buffalo, N. Y. After a long session and considerable dickering back and forth—in fact it was about at the end three months—I got a contract.

I had several sessions with Deeds and Waldron before that, but always with the same result. I hung on for the reason that I was convinced that if we were going to have aircraft schools on the Pacific coast, we could bring over in a single carload materials for 100 planes, instead of three completed aeroplanes in a car, and that would be much better business. It costs $400 to $700 each to get the individual airplanes from Buffalo. That was a waste of money. They were paying to the Wright-Martin concern out there $1,000 more on the theory that construction was more expensive than in the East.

The CHAIRMAN. Just explain that, please.

Mr. JORDAN. Well, for instance, the price in Buffalo was $4,750. They paid the Wright-Martin concern $1,000 additional.

The CHAIRMAN. Where were they located?

Mr. JORDAN. In Los Angeles. So I pointed out to these people of the Aircraft Board that there was no necessity for that; that our workmen on the Pacific coast are quite as efficient and that we do not pay them any more money. The spruce that they paid a very large freight rate on to get it to Buffalo is grown on the Pacific coast. I told them that what they would have to ship us was linen and the steel. Of course, we all know that the freight on the knocked-down stuff or raw material is much cheaper than on the assembled product. I argued along those lines and finally, after much persuasion, Chairman Coffin

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took our proposal up with Gen. Squier. Gen. Squier agreed with me, and he said that it was manifest that I was correct. He said, "We ought to have trained mechanics on the coast. We have one school, and we should establish others. There is no reason why you should not have out there trained mechanics to build airplanes and to repair them." Finally I got a contract for 300 airplanes.

The CHAIRMAN. At what price?

Mr. JORDAN. $4,750 each.

The CHAIRMAN. What type?

Mr. JORDAN. The J N 4D school machine.

The CHAIRMAN. With what engine?

Mr. JORDAN. The Curtiss engine.

Senator REED. Is that the same kind of machine that the Wright-Martin people have been making for $5,700?

Mr. JORDAN. Substantially the same kind of machine. There is no difference in the manufacturing cost. There were some refinements and some differences in details.

The CHAIRMAN. Do you know how many machines were covered by the Wright-Martin contract?

Mr. JORDAN. I do not know.

Senator REED. What were they making?

Mr. JORDAN. The J N 4A.

Senator REED. And what were you making?

Mr. JORDAN. The J N 4D. It is practically the same machine. Ours was a later machine. There was no material difference. The aerolon in the lower wing of the J N 4A was not in the J N 4D. The Wright-Martin machine had an aerolon in the lower wing. That was a matter that would not cost $10 in addition and yet they gave $1,000 more for that machine. I objected to that.

Senator REED. Why?

Mr. JORDAN. Because I did not want the Pacific coast to get a black eye.

Senator REED. No; I do not mean that. You said you objected to something. Do I understand you to mean that you objected to this part of the plane?

Mr. JORDAN. Oh, no; but as an engineering problem it is absolutely useless in that type of machine. That is, the aerolon in the upper wing is all sufficient.

The CHAIRMAN. Did your objection go to the price?

Mr. JORDAN. I did it on the theory that people thought we could not do the work on the Pacific coast as well or as cheaply as they could on the Atlantic side. I have some very interesting correspondence along those lines.

The CHAIRMAN. Have you that correspondence here?

Mr. JORDAN. Some of it.

The CHAIRMAN. With whom did you have that correspondence?

Mr. JORDAN. With Senator Phelan. They set up the argument that we could not do it as cheaply on the Pacific coast.

The CHAIRMAN. When you say "they" whom did you mean?

Mr. JORDAN. Deeds and Waldron. They were the Air Craft Board, so far as letting these contracts were concerned. There is no question about that. They went through the formality of passing it

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through the board, but their recommendations were absolutely final except in my particular case. I learned that much. After I got this contract both Waldron and Deeds told me, and so did Montgomery, who is another one of the particular outfit, that I would not be able to carry out the contract. I said, "I will carry it out if you will help me to get the stuff." I had begun to realize that we had a tough proposition ahead of us. I said, "If you won't block me, and will assist me to get the steel and tubing, I can carry out the contract." This tubing is made in the East. We have no tubing, wire, or cable manufactured out there. They said, "You can not depend upon us; we have all we can do ourselves." I said, "All right."

The CHAIRMAN. State what, if any, difficulties you encountered as to the receipt of needed material from the East after you began work on your contract?

Mr. JORDAN. Now, Senator, if you will permit me for the sake of continuity to go ahead with my story, I believe that I can get along better.

The CHAIRMAN. Yes; go ahead.

Mr. JORDAN. Finally I got the contract signed up. I said to Montgomery, who was preparing the contract, "Where are my plans and specifications?" He sent me to a man by the name of Shepler. Shepler said, "You can not get them here; you will have to go to Buffalo." I said, "That is a little bit out of the ordinary; I have just signed a contract, and ordinarily you would have the plans and specifications for me and a copy should be attached to the contract." I ran into Lieutenant Farwell. He was Deeds' confidential man. Farwell said—this was before I got the contract—"You will have to join the association, the aircraft association." I said, "What is that?" "That is composed of all the aircraft builders who are doing Government work."

The CHAIRMAN. That had reference to what we call the cross-license agreement?

Mr. JORDAN. Yes. He proceeded to explain about that arrangement; that I was to pay into this concern about $240, as I now remember it, on every aeroplane we constructed.

The CHAIRMAN. Were you required to join it and pay an initiation fee?

Mr. JORDAN. I do not think there was any initiation fee. I said, "That is not business. The Government has to pay for that. I will add it to my price." I said, "You know very well that these patents do not amount to a row of pins; that the Langley patents cover practically everything except the curvature of the wing, Montgomery's patent covered these, and between these two all things necessary in the plane." He said, "I do not know anything about that, but I know what you have got to do." I said, "All right, we will see about that." So, a day or two later I got the contract, and I had to go to Buffalo to get the plans.

The CHAIRMAN. To whom did you apply?

Mr. JORDAN. To the Curtiss Co. I went up there and they told me that I would not only have to pay $240, but 1 per cent additional to them, for the use of the plans and specifications. So I said that I

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would not do anything of the kind. I came back to Washington and finally succeeded in getting them without making any payments whatever.

Senator REED. Tell us about that.

Mr. JORDAN. I have documents which I will send you. I had them put their demands in writing.

The CHAIRMAN. Who said that?

Mr. JORDAN. Well, those things are down at the New Willard Hotel.

Senator NEW. You spoke of Mr. Shepler.

Mr. JORDAN. Yes, sir.

Senator NEW. Did I understand that name all right?

Mr. JORDAN. Yes, sir.

Senator NEW. Was that the Shepler who was afterwards brought into the service?

Mr. JORDAN. Yes, sir. He was then in the service.

The CHAIRMAN. He was in the service, but he had not been commissioned. Deeds and Waldron at that time were not in the Army service?

Mr. JORDAN. They just came in.

The CHAIRMAN. The first letter that you have produced here is dated September 26, 1917, signed by Mr. S. D. Waldron, Colonel, Signal Corps, and reads, as follows:

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, September 26, 1917.

Mr. W. A. MORGAN,
Curtiss Aeroplane & Motor Corporation,
Buffalo, N. Y.

DEAR SIR: This will introduce Mr. John A. Jordan, of Sacramento, to whom the Aircraft Production Board has recommended that an order be given covering 300 J N 4D airplanes. Please give Mr. Jordan one complete set of blue prints for the J N 4D plane, together with bills of material, material specifications, and any other special information that he may need to enable him to get quickly into production.

Mr. Jordan has filed a bid with the Chief Signal Officer on these 300 planes at the price of $4,750, each exclusive of engine, but with engine mounted and the plane complete, ready to fly. He has filed with his bid an agreement to forfeit 5 per cent of the price of any plane not delivered according to the following schedule of deliveries: October, 30; November, 150; December, 120.

We realize that it may be difficult for you to take care of our requirements for complete planes, as well as ship engines to California on this contract. Please make a record of the schedule on which this contract is placed, advising us as to your ability to meet it on the basis of one engine per plane, so that where you will be unable to meet it we may make arrangements for the acceptance and shipment of planes minus engines.

Very truly, yours,

S. D. WALDRON,
Colonel, Signal Corps.

Mr. JORDAN. You will observe the close relations indicated by the letter. Waldron gave Curtiss Co. all the information as to price, etc., of my contract, which was supposed to be confidential.

The CHAIRMAN. You presented that letter, did you?

Mr. JORDAN. Yes, sir; to Mr. Morgan, of the Curtiss Co., at Buffalo.

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The CHAIRMAN. On the 29th of September you received a letter addressed to the Liberty Iron Works, Cal., attention of Mr. John A. Jordan, which reads as follows:

[Curtiss Aeroplane & Motor Corporation—aeroplanes, hydroaeroplanes, flying boats, aeronautical motors.]

BUFFALO, N. Y., *September 29, 1917.*

LIBERTY IRON WORKS,
California.

Attention of Mr. John A. Jordan.

GENTLEMEN: Referring to conversation to-day in regard to blue prints, bills of material, etc., as advised you, the cross-licensing agreement requires a royalty to be paid of $200 on each machine you build and sell, which on the 300 you have under contract will amount to $60,000.

This goes to the Aircraft Association, but until you are a member of that association the Curtiss Co., or whomever you obtain your blue prints from, is responsible to the association for that royalty.

In addition to the $200 section D, article 8, in reference to payments to the company, reads as follows:

"Each subscriber agrees to pay such amount, or amounts, as may be payable with reference to the use of specifications, drawings, and data as provided in paragraph 6 hereof, including the royalty payments therein provided for, but the 1 per cent payment on account of the use of such specifications, drawings, data covering any one model shall cease when the total by all users shall aggregate $50,000."

This means on your contract there would be about $14,000 that you would be obliged to pay for the blue prints and specifications, although you understand these payments are not necessarily made in advance, as our Mr. Guy explained to you to-day. A deposit should be made of about 10 per cent of the total in advance.

Yours, very truly,

W. A. MORGAN,
Vice President and General Manager.

The CHAIRMAN. On the same day you received another letter accompanying what was said to be a complete set of J N 4D's drawing blue prints, bill of materials, material specifications, finish specifications, alphabetical and numerical parts list. You were notified that you would be supplied with all new and changed prints on this model as soon as released from production. There is also an unsigned receipt accompanying the letter acknowledging the receipt of the above prints, etc. It does not seem to be signed.

Mr. JORDAN. No. I refused to sign it for the reason that I did not get the prints.

Senator REED. Why didn't you sign it?

Mr. JORDAN. I put in three days investigating and checking those blue prints. It is necessary in engineering to check the blue prints to see that these details fit in the general assembly. Now, they would not fit. I had a large number of duplicates furnished me. They made a mistake in giving those things to me. There were almost 600 of them. I said to this man Mueller, Curtiss Co.'s engineering manager, "Why don't you put this in 25 or 30 prints and let us get away?" I said that that would be ample, and then we could make the rest ourselves in Sacramento. He said, "This is our system." I said, "You have not got them all here. According to your lists there are many missing, and you have a lot of academic prints showing details that are a sequence in assembled parts." I referred to prints of standard screws, brads, nails, etc. "I particularly want the print of the nose plate and the general assembly print." He said, "We

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have not released the nose plate." The nose plate is substantially the foundation for the engine. It is of high-grade steel one-sixteenth of an inch thick. That has to be a very efficient piece of steel, a fine piece of material, and well constructed. That nose plate is absolutely essential. You can not build a machine without it. That print was not furnished until two months later. They claimed that it was "not released." I had voluminous correspondence over getting that nose-plate print.

(The letter referred to is here printed in full, as follows:)

[The Curtiss Aeroplane Co., aeroplanes, hydroaeroplanes, flying boats, aeronautical motors.]

BUFFALO, N. Y., *September 29, 1917.*

LIBERTY IRON WORKS,
Sacramento, Cal.:

Attention, Mr. Jordan.

We are handing you herewith a complete set of J N 4D's drawing blue prints, bill of material, material specifications, finish specifications, alphabetical and numerical parts list.

You will be supplied with all new and changed prints on this model as soon as released for our own production.

CURTISS AEROPLANE & MOTOR CORPORATION,
G. H. MUELLER, *Engineering Manager.*

CURTISS AEROPLANE CO.:

Mr. G. H. MUELLER: I hereby acknowledge receipt of the above prints.

NOTE.—Parts 15124 and 14900 are not included in this set, as these parts are not yet released, but will be forwarded within a week. We are also inclosing 11602 model J N 4A plan drawings as a reference print

Senator REED. Where is that correspondence?

Mr. JORDAN. That is in Sacramento.

The CHAIRMAN. It is a part of this story?

Mr. JORDAN. Yes; the thread of the story is carried through in that correspondence, of making demands and calling attention to deficiencies, to the bad drawings, and the impossibility of constructing airplanes from the drawings which they gave us. It was absolutely impossible. We had to reform the whole business.

The CHAIRMAN. Before you leave your first visit to Buffalo, please tell the committee whether you executed the cross-license agreement.

Mr. JORDAN. No, sir; I did not. They wanted $75,000. I said, "I do not purpose to pay it unless you show me." They said, "Everybody else is doing it." I said, "Well, I won't do it unless there is some reason for it." Then I went back to Washington and thrashed it out with Messrs. Coffin and Montgomery. I went to Montgomery and explained to him the whole situation. He said, "I do not know. It appears that there is a cross-license agreement in existence here." I said, "I never subscribed to it; I have a perfectly good contract signed by the proper authorities, giving me $4,750 each to build 300 aeroplanes. I do not purpose to give $75,000 to Mr. Curtiss, or Wright, or anybody else, unless there is some reason for it." He said, "Of course, you signed the contract; we will see that you get the plans and specifications." He was very much put out about it.

Senator REED. Put out about what?

Mr. JORDAN. At the position I had taken.

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Senator REED. Who was this?

Mr. JORDAN. Montgomery. Of course, that is my own idea. He was apparently much put out.

The CHAIRMAN. Was anything said about the Government paying this royalty in the event you signed the contract?

Mr. JORDAN. Nothing was said.

The CHAIRMAN. As to whether it would be added to your contract price?

Mr. JORDAN. Nothing was said.

The CHAIRMAN. Was anything said by the Curtiss Co.?

Mr. JORDAN. No, sir.

The CHAIRMAN. What was your understanding?

Mr. JORDAN. I understood that I was not required to pay any royalties to anyone, or any commissions. Afterwards I had reasons, after discussing these matters, to believe that it was going to be a hard proposition to fulfill my contract. I made up my mind it was going to be hard sledding for me.

The CHAIRMAN. Did you discuss the cross-license agreement with Shepler?

Mr. JORDAN. No, sir; only with Farwell.

The CHAIRMAN. Montgomery, you mean?

Mr. JORDAN. That was after I came back I talked with Montgomery.

The CHAIRMAN. I am talking about that.

Mr. JORDAN. Yes. I discussed it briefly with him. I told him I would not pay it, but he did not say very much. He sent his brother, another Montgomery, who was a lawyer for the board, with me to Buffalo to get the plans and specifications.

The CHAIRMAN. That was the second visit?

Mr. JORDAN. Yes, sir.

The CHAIRMAN. When was that.

Mr. JORDAN. That was about a week later.

The CHAIRMAN. About the first week in October?

Mr. JORDAN. Yes. We got to Buffalo, but Montgomery did not take me with him to visit the Curtiss Co. He came back to the hotel and said, "You can get the plans and specifications any time you go after them." I went down there to get the plans and specifications. They gave me another set, not the set that I had already checked, so that I had to go over the whole thing again.

The CHAIRMAN. What reason was given for doing that?

Mr. JORDAN. No reason at all. I had the other ones all bundled up and tied with a string around them, and I had asked them to keep them for me in that shape until I was ready for them. They promised to do so, but when I got back it seems they could not find my bundle. When I got to Sacramento I found they were in bad shape.

The CHAIRMAN. Did you go from Buffalo to Sacramento?

Mr. JORDAN. Yes. The time was short in which to do the work. Then I took it up with the different manufacturers of parts. They assured me they would be only too glad to have our business. Robey, of Cleveland, wanted all our business. He claimed to be a manufacturer in Cleveland. He was strongly indorsed by the department by a young man named Cook in the department. Cook was production engineer for the Pacific coast for the Aircraft Board. Cook was anxious that I should deal with Robey. He said Robey could furnish

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all the parts. That dragged along for weeks, and finally I found out he could not furnish anything on time.

The Erie Specialty Co., of Erie, Pa., agreed to furnish bolts. Then I got a wire saying that they could not furnish them. Still another wire saying they could do so. They then shipped us bolts that did not conform to specifications.

Senator REED. Do you know any of its connections?

Mr. JORDAN. No; I do not.

The CHAIRMAN. Who recommended that company?

Mr. JORDAN. This man Cook brought a whole list of manufacturers who could produce those parts. It was a very serious question because of the steel situation and also because of the dies.

Then the Buffalo Pressed Steel Co. came in. That, as I understand it, is an auxiliary of the Curtiss plant. They are closely connected, anyhow. They managed to get possession of all of the 3½ per cent nickel steel used in the axles of the airplanes.

The CHAIRMAN. What concern is that?

Mr. JORDAN. The Buffalo Pressed Steel Co. First they refused to furnish any, but finally they said they would furnish a limited number for $14.50 each. That was fully three times the value of them under fair conditions.

The CHAIRMAN. Did you secure any?

Mr. JORDAN. Yes, sir. We got five at a time, or altogether about 30 or 40, at that extravagant price.

Then there was the Lewis Spring & Axle Co. I think they are in or near Chicago. I may not have that right. They agreed to furnish the controls all complete, and were enthusiastic at first. A couple of weeks later they fell down absolutely and could not do anything. They finally did furnish some of them, which were very inferior in quality.

The CHAIRMAN. Now, from what source did you obtain your spruce and other materials for the wooden parts of the planes?

Mr. JORDAN. The spruce we got through the Government Wood Production Board, at Portland, Oreg.

The CHAIRMAN. Did you have any difficulties or delays?

Mr. JORDAN. There was no material delay in getting the spruce, but when it did come in it was bad. It was wet and green. It was poorly selected. There was great wastage.

The CHAIRMAN. Is the document that I now show you [exhibiting document] the proposed contract with the Curtiss Co. for the payment of $200 for each airplane manufactured and a royalty of 1 per cent?

Mr. JORDAN. Yes; that is the original contract.

The CHAIRMAN. Which you did not execute?

Mr. JORDAN. No, sir.

(The contract referred to is here printed in full, as follows:)

This agreement, made this —— day of ———, 1917, by and between the Curtiss Aeroplane Co., a corporation of the State of New York, having its principal office at Buffalo, N. Y., party of the first part, and the ———, a corporation of the State of ———, having its principal office in the ——— of ———, party of the second part;

In consideration of the promises and agreements hereinafter contained the party of the first part hereby promises and agrees to deliver to the party of the second part a set of drawings, designs, specifications, and bills of material covering aeroplane model known as JN military tractor, as designed and built by the party of the first part.

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The party of the second part, in consideration thereof, promises and agrees to pay to the party of the first part 1 per cent of the selling price of all aeroplanes or parts thereof manufactured by the party of the second part according to said drawings and designs, and also to pay to the party of the first part the sum of $200 for each and every aeroplane so manufactured, all such payments to be made to the party of the first part not later than the tenth day of each month for all aeroplanes or parts thereof manufacured during the preceding month.

The party of the second part has this day paid to the party of the first part the sum of ——— in payment of the 1 per cent charge on the first $——— of aeroplanes or parts thereof which shall be manufactured by the party of the second part, it being expressly understood and agreed that said payment of $——— shall remain the property of the party of the first part even though the party of the second part shall not manufacture and sell aeroplanes or parts thereof equaling the sum of $———.

The party of the second part has also this day paid to the party of the first part the sum of $———, covering the payment of $200 each for the first ——— aeroplanes to be manufactured by the party of the second part under such drawings and designs as hereinbefore agreed.

The party of the second part further agrees that it will not permit or allow such drawings, designs, and specifications to be read, copied, photographed, or otherwise used, by any person other than the employees of the party of the second part, and that the party of the second part will return the same to the party of the first part in the event of the dissolution or termination of the business of the party of the second part for any reason whatsoever, it being understood that such drawings, designs, and specifications are merely leased to the party of the second part during such time as it shall desire to make aeroplanes according to such drawings, designs, and specifications.

In witness whereof, the parties hereto have caused this agreement to be signed by their respective duly authorized officers and their respective corporate seals to be hereunto affixed the day and year first above written.

CURTISS AEROPLANE CO.,

By ——— ———
Secretary and Treasurer.

By ——— ———

By ——— ———

The CHAIRMAN. When you refused to execute that contract, what, if anything, did Mr. Morgan, or the representative of the company, say?

Mr. JORDAN. They said they would not give the plans and specifications until I did execute it.

The CHAIRMAN. And that is why you came back?

Mr. JORDAN. Yes.

The CHAIRMAN. Who said that?

Mr. JORDAN. Mr. Guy. His signature is on that letter.

Senator REED. You have spoken of the difficulties you had in getting these materials?

Mr. JORDAN. Yes.

Senator REED. Can you tell us whether or not other airplane builders who had signed these contracts to pay these royalties, or whatever they may be called, were getting their supplies without difficulty from the same people?

Mr. JORDAN. The Curtiss Co. themselves furnished the Fowler Airplane Co. the same supplies.

Senator REED. Did you try to get them from Curtiss?

Mr. JORDAN. I tried. They absolutely refused to give me a screw or a bolt or anything else.

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Senator REED. You mean the Curtiss Co.?

Mr. JORDAN. Yes, sir.

Senator REED. Who made that refusal?

Mr. JORDAN. Mr. Gay——

Senator NEW. Had Fowler & Co. signed the cross-license agreement?

Mr. JORDAN. I believe Fowler said they did. Fowler did pay Curtiss the 1 per cent demanded. He told me so.

Senator REED. Have you any correspondence with these various people showing that they were furnishing supplies to other contractors who had signed the cross-license agreement at the time that you were being refused supplies?

Mr. JORDAN. To my own knowledge I only know that they were furnishing them to Curtiss and through Curtiss to the Fowler Co. Fowler was getting them there through Curtiss.

Senator REED. What was he getting?

Mr. JORDAN. Certain clips and small parts.

Senator REED. Can you name them?

Mr. JORDAN. The Universal clip. He had a quantity there. I asked him where he got them, and he said from Curtiss. That is the clip, the largest single item used in the machine; that is, a greater number of those clips is used than of any other. Then there were the landing gear clips which were furnished by Curtiss to the Fowler Co. I speak more of the Fowler Co. because they are neighbors.

Senator REED. Did the Fowler Co. get contracts before or after you got yours?

Mr. JORDAN. Yes; before, a matter of a couple of months.

Senator REED. From whom did the Curtiss Co. get these materials, which they afterwards furnished to the Fowler Co.?

Mr. JORDAN. I do not know that.

Senator REED. And when you asked the Curtiss Co. to furnish these supplies, what reason did they give for their refusal?

Mr. JORDAN. They just absolutely refused. I have more correspondence. It is in the files in Sacramento.

Take this matter of the bent part, in the blue print. It is a most difficult matter for a draftsman to show the exact bending in the blue print. It can scarcely be done. Under certain conditions it can not be done. It is like a perspective down hill in a photograph. It is practically impossible. For that reason I wanted samples of these things so as to get the angle of bend.

Senator REED. You just wanted samples?

Mr. JORDAN. At first I wanted them in quantity. Then I asked for samples. Morgan said that he would give them to me, but Gay refused to do it, without giving any reason.

Senator REED. Gay is connected with the Curtiss plant?

Mr. JORDAN. He was the secretary.

Senator REED. He was the man you would naturally go to to get these things?

Mr. JORDAN. Yes, sir.

Senator REED. And they refused to give you a sample?

Mr. JORDAN. Yes, sir.

Senator REED. This occurred after you refused to sign the cross-license agreement and had come back to Washington, and at Washington had gotten a contract, notwithstanding you refused to sign the cross-license agreement?

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Mr. JORDAN. No, sir. I had the contract before I refused to sign the cross-license agreement.

Senator REED. Now, as to these parts that he refused to let you have; can you give us an idea of their size? Can you state whether they were such things as could not be given to you without doing serious harm or injury; were they large or small things?

Mr. JORDAN. They were small parts.

Senator REED. Of what size?

Mr. JORDAN. Three inches each way, we will say.

Senator REED. These little steel clips?

Mr. JORDAN. These little steel clips; yes, sir.

Senator REED. In the making of a single machine you would require a great many of them?

Mr. JORDAN. Some 28 of this one particular clip.

Senator REED. This particular clip?

Mr. JORDAN. Yes, sir.

Senator REED. You tried to get more than one clip?

Mr. JORDAN. Yes; I wanted to get a quantity of them in order to get a start.

Senator REED. What is the name of that clip?

Mr. JORDAN. That is the Universal clip.

Senator REED. It took about 28 for one machine, you say?

Mr. JORDAN. Yes, sir.

Senator REED. How much is that clip worth?

Mr. JORDAN. About 30 cents.

Senator REED. And yet is was a very essential thing for you to have in order to get the proper angles and curvature?

Mr. JORDAN. Yes, sir.

Senator REED. Angles or curvature, which?

Mr. JORDAN. Angles and curvature, both.

Senator REED. And you could not get one?

Mr. JORDAN. No, sir.

Senator REED. Did that seriously handicap you?

Mr. JORDAN. We had to make a number of them and then figure it out.

Senator REED. Did you try to get other small parts of similar kind?

Mr. JORDAN. Yes, sir. We tried to get all the metal parts, the wing washers, in which the struts fit.

Senator REED. They were also little things?

Mr. JORDAN. Yes, sir. They weigh probably 2 ounces. They were drop forgings, necessitating dies. The making of a die takes a long time, but when it is once made you can make a million as well as you can make one, if you do not break the die. You can hammer them out. There is no reason, other than spite, why Curtiss could not pound them out for everybody.

Senator REED. Do you know whether or not he was furnishing them to others?

Mr. JORDAN. I do not know of my own knowledge.

Senator REED. These were little, simple things that, having once made the machinery to produce them, you could turn out like nails?

Mr. JORDAN. Exactly. Once the dies are made you can pound them out in indefinite numbers.

Senator REED. You have a lot of correspondence about that?

Mr. JORDAN. Yes, sir.

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Senator REED. How long will it take to get it by wire?

Mr. JORDAN. Six days, I suppose. We will have to have an official summons.

(Informal discussion occurred which the reporter was directed not to record.)

The CHAIRMAN. If we were to call upon your corporation, the Liberty Iron Works, of Sacramento, for all correspondence up to March 1, 1918, bearing upon the procurement of metal parts, would that be sufficiently definite so that the concern could give us the letters that will really bear upon the question?

Mr. JORDAN. Yes; I think so.

Senator REED. How much delay did you actually suffer, as near as you can state, by virtue of the refusal of the Curtiss people to furnish these parts which they had in their possession?

Mr. JORDAN. In connection with the poorly made drawings, we suffered at least 90 days' delay there. What I kept telling Curtiss and Gay was that we could not make this stuff from their prints. I said, "Why don't you give us this stuff?" They were not making it from their own prints at this time.

Senator REED. They would not give it to you?

Mr. JORDAN. No, sir.

Senator REED. Can you go ahead and give the technical names of those parts that they refused to give?

Mr. JORDAN. The correspondence would show. Technically, it was clips, fuselage, landing-gear clips, and wing clips. That covers it.

The CHAIRMAN. How about the nose plate?

Mr. JORDAN. Yes; and the nose plate.

Senator REED. Did you ever get a nose plate from the Curtiss people?

Mr. JORDAN. No, sir. Along in December we got the blue print.

Senator REED. How much late was that on your contract?

Mr. JORDAN. I should have had it the 1st of October. There was no reason—and I say this advisedly—there was no reason why that drawing should not have been furnished when I was in Buffalo.

Senator REED. Why do you say that?

Mr. JORDAN. They were making it at that time, and it came out two or three months later without any material change.

The CHAIRMAN. What reason did they give?

Mr. JORDAN. That it had not been released, which does not mean anything at all.

Senator REED. When the Curtiss people refused to give these little pieces of material which you say were so essential, and refused to give you either the drawings or a sample of the nose plate, did you then appeal to any of the authorities here in Washington for assistance?

Mr. JORDAN. Yes, sir.

Senator REED. To whom did you appeal?

Mr. JORDAN. To Farwell, Montgomery, Shepler, and everybody that I thought had any influence to get them.

Senator REED. Did you appeal in writing?

Mr. JORDAN. In writing.

Senator REED. Have you that correspondence?

Mr. JORDAN. That is in the correspondence.

Senator REED. Will that be covered by this subpœna which we have been talking about?

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Mr. JORDAN. Yes; if you get all the correspondence up to March 1, 1918.

The CHAIRMAN. What have you to say about the ultimate performance of your contract?

Mr. JORDAN. Well, we did not deliver, of course, anywhere near on time, but finally we did get to making them. My principal row with my own partners was that we were using material that I did not consider fit to go into the machines, and the inspector passed on them.

The CHAIRMAN. What materials were those?

Mr. JORDAN. Those same nose plates that we manufactured. I threw out several of them.

The CHAIRMAN. Where did you get them?

Mr. JORDAN. Made them. They did not suit me, so I threw them out. They were afterwards brought in and used and put in airplanes against my objection.

The CHAIRMAN. Your own airplanes?

Mr. JORDAN. Yes, sir.

The CHAIRMAN. How could they be used without your consent?

Mr. JORDAN. I had resigned as manager during the battle. They hired as superintendent a former chief inspector of the plant, which I would not have done.

Senator REED. A Government inspector?

Mr. JORDAN. The Government inspector. When he came in he immediately swayed those inspector boys so that they passed everything and went out to the scrap pile and brought in everything. It was dead wrong.

The CHAIRMAN. Did you report that fact to the authorities here?

Mr. JORDAN. I have been reporting it ever since.

The CHAIRMAN. Have you correspondence with relation to that?

Mr. JORDAN. I reported it to the officers of the company first. I went out and saw Maj. Emmons at the flying field. He said that the inspection was rotten.

The CHAIRMAN. Where is he?

Mr. JORDAN. The Sacramento field. I found they were using bad material. I called attention to some of the things I was fearful of, such as welded nose plates.

Senator REED. Mr. Chairman, I think it would be a good idea to let Mr. Jordan get in mind the points which he wishes to bring before the committee, and in which he knows we are interested, and then let him appear before the committee later on, perhaps to-morrow afternoon.

(After informal discussion a recess was taken until 2.30 o'clock p. m. of the same day.)

AFTER RECESS.

At 2.30 o'clock p. m. the committee reassembled pursuant to the taking of recess.

STATEMENT OF EDOUARD DE BILLY, ACTING FRENCH HIGH COMMISSIONER, AND COL. TULASNE AND LIEUT. HENRI MARQUISAN OF THE FRENCH HIGH COMMISSION.

Senator NEW. Mr. de Billy, I have understood that you gentlemen have the same interest that all of us have in arriving at some sort of

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program for the development of aircraft in this country so as to result in the greatest good to all of the allies. If there have been mistakes in our program in the past, we want to be able to point out those mistakes. We want to benefit and profit by our own mistakes, if we have made them, and in case you gentlemen know where mistakes have been made, we invite you to point them out to this committee, in order that we may base our recommendations upon them. You have had no preliminary conversations with any of the members of this committee that I know of, and I therefore scarcely know upon just what line to base an inquiry, but as we go along things will develop, no doubt.

The CHAIRMAN. I assume that you gentlemen represent aviation over here in this country.

Mr. DE BILLY. These gentlemen, Col. Tulasne and Lieut. Marquisan, do.

Senator NEW. Please state you name and your position in this country, Mr. de Billy.

Mr. DE BILLY. My name is Edouard de Billy, and I am a deputy high commissioner for France, and in the absence of Mr. Andre Tardieu, who is the high commissioner, and who is now in France, I am acting for him, so I am acting high commissioner, and Col. Tulasne is at the head of the French aviation section here, and Lieut. Marquisan is one of the officers under the orders of Col. Tulasne. As you know, these French officers, as well as the British officers, are here to give information and cooperate in the different aviation camps and schools, so as to be the direct link between the Aviation Section of the American Army and what is going on on the front, so as to give the most recent information from the other side.

Senator NEW. Have either of you had occasion to pay any particular attention to the American aircraft program?

Mr. DE BILLY. Yes. The commission are in very direct touch, and so are these officers with the Aircraft Production Board, as well as these officers with the aviation officers. Personally I am in direct contact with Mr. Ryan and Mr. Potter, and I do a great deal of work in connection with what is done in France, as well as in England, and we are asking, as you know, for a great many Liberty motors for the other side, so that the development of this proposition is very interesting for us and for all the armies.

Senator NEW. It is for all of us. We have a common interest, and that suggests to me the thought that if the representatives of any one of the allies have any suggestions to offer that will speed up things we want those suggestions made, in order that we may profit by them. I suggest, Mr. de Billy, that you proceed in your own way to tell this committee what you think should be done, particularly in reference to aircraft, both as to motors and as to planes.

Mr. DE BILLY. Mr. Senator, I will say a few words from a general point of view. As I am not a professional man, I will ask you to question these officers regarding details. I will first speak in regard to motors. I have not much to say that you do not already know, and the praise that I would give of the Liberty motor has been given by all the French officers, and that which is better than words is this, that the aviation section of the French Army is now asking from the American Aircraft Production Board a great many of those Liberty motors, so there is quite a good deal of competition between the

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British and French as to the number of motors that can be delivered to the other side for all the different armies. As regards France, they have quite a number of demands, first, for the motors that will be used by the manufacturers of French airplanes, and, second, quite a number for the airplanes which are to be manufactured for the American armies.

The CHAIRMAN. May I interrupt for a moment? Do you French except to use the Liberty motor in the fighting plane as well as the bombing plane?

Mr. DE BILLY. Yes.

Senator NEW. That is, I presume, in certain types of fighting machines?

Mr. DE BILLY. Yes; in certain types. We are more advanced in France as regards the construction of airplanes than you are here, and so there have been quite a number of airplanes that the French manufacturers have been able to get of the American manufacturers previously. They can be fitted with motors, so there are two demands for motors and for airplanes for the American armies, and the enormous demand shows more than any words could what appreciation we hold the Liberty motor in.

Senator NEW. Mr. de Billy, you spoke of the French furnishing airplanes to the Americans in France.

Mr. DE BILLY. Yes.

Senator NEW. Can you tell us something of the number of airplanes that have been built in France and delivered to the American forces there?

Mr. DE BILLY. I have not the figures in my memory.

Col. TULASNE. About 1,000 French training planes and about 20 squadrons of 18 planes each of combat or war planes.

Senator NEW. What kind of motors were in those planes—the combat planes?

Col. TULASNE. In the combat planes there were Renault engines, Hispano-Suiza motors, and Canton-Une motors. Those are the three best motors now over there.

Senator NEW. The three best that the French have?

Col. TULASNE. Yes.

Senator NEW. Is it in part to relieve France of the necessity of furnishing those motors that you are asking for so many Liberty motors?

Mr. DE BILLY. Yes; because the program for the construction of airplanes is enormous.

The CHAIRMAN. Are the French also asking us to manufacture any Hispano-Suizas for them?

Mr. DE BILLY. No; we manufacture Hispano-Suizas.

The CHAIRMAN. I thought possibly you might need a little assistance there also.

Col. TULASNE. No; not that I know of; no. But I believe that France will ask you to give her some Bugatti motors. The Bugatti motor is now built in the United States.

Senator NEW. That is an Italian motor, is it not?

Mr. DE BILLY. The name is Italian, but the motor is French.

Senator NEW. The Liberty motors that you expect from the United States are to be used in the machines which the French will use themselves as well as in the machines that you expect to turn over to the United States?

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Mr. DE BILLY. Yes. We are asking now for twice as many for our use as for the use of the airplanes that we have to get from you.

Senator NEW. You have tested the Liberty motor yourselves?

Mr. DE BILLY. We have tested the Liberty motor ourselves, and we have not only tested it as a machine, but we have fitted it into some of our planes and, for instance, in the Breguet plane it has given very remarkable achievement.

Col. TULASNE. The Breguet will be the main type of plane in which the Liberty motor will be used in France, because it is especially adapted for it and we made some tests and they gave very good results.

Mr. DE BILLY. It is a very rapidly climbing plane.

Lieut. MARQUISAN. It gave exactly the same result as the 400-horsepower Renault.

Senator NEW. Is the Liberty motor adapted to all the planes that the French make?

Mr. DE BILLY. No. If there is anything to criticize in the past, and you can always find criticisms somewhere, and I do not want to be considered as making a severe criticism, because, considering everything, the American Aircraft Board has done something splendid.

The CHAIRMAN. Do not hesitate to criticize things. That is what we want.

Mr. DE BILLY. If there was a mistake in the beginning, it was to believe that one motor could be adapted to every type of plane and that one type of plane was suitable for all purposes, but what your Aircraft Board is doing now and is doing with great success and with great wisdom is at the same time that they push the manufacture of the Liberty motor to the utmost possibilities, they are at the same ime developing the manufacture of other types of motors.

The CHAIRMAN. They are now.

Mr. DE BILLY. Yes. They are certainly manufacturing the Hispano-Suiza, which is developing in great numbers, and I have no doubt that air planes will be designed to which the Liberty motor will be fitted for all purposes, but in order to save time it is perfectly wise to develop the manufacture of other motors immediately fitted to planes that actually exist.

Senator NEW. Then, the Liberty motor is highly regarded by the French?

Mr. DE BILLY. Highly regarded.

Senator NEW. Within certain limits; that is, for planes of certain types; the Bugatti, for instance.

Col. TULASNE. I believe all sorts of planes except some monoseater fighting planes, because it is not adapted to that plane. For other planes, such as bombing planes, Corps d'Armies, it can be used.

Mr. DE BILLY. As regards the motor, it is a 420-horsepower motor. It is now one of the best known motors which has been produced. It is the finest achievement which has been accomplished by the American Aircraft Board, and we are all very strongly impressed by it.

Senator NEW. The United States is also making motors of certain other types. For instance, we are making some Hispano-Suiza. Do you regard that as a good motor?

Mr. DE BILLY. Yes, sir; it is a very good 300-horsepower motor.

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Senator NEW. The 300 horsepower, the 180 horsepower, and the 150 horsepower. The Le Rhone we are also making. Is that regarded by the French as a good motor?

Lieut. Marquisan. We use that motor for training planes, monoseater planes.

Senator NEW. The Curtiss O. X.; do you know anything of that?

Lieut. MARQUISAN. Yes; I flew with it a great deal in San Antonio and in San Diego, and I think it is the only motor that I know of that could resist the high temperature of the southern schools in summer. It is an excellent motor for primary training planes.

Senator NEW. The temperatures, then, have their effect on airplane motors?

Lieut. MARQUISAN. A great deal.

Senator NEW. How would the temperatures affect the Liberty motor, in your judgment, Lieutenant?

Lieut. MARQUISAN. I think it will not affect it in France, because the temperature is not as high as it is here in some places, like Houston or Lake Charles.

Senator NEW. It would be affected by high temperature?

Lieut. MARQUISAN. Like the Hispano-Suiza and like most motors.

Senator NEW. What about the altitudes? In some motors the loss of power——

Lieut. MARQUISAN. In all motors.

Senator NEW. Yes; but in some more than in others, if I am correctly informed. The Liberty motors stand that test too?

Lieut. MARQUISAN. It seems to from the tests that have been made in France for the Liberty. It flew to 5,000 meters in a very short time and shows that they are not more affected than our best motors.

The CHAIRMAN. You speak very highly of the Liberty motor?

Mr. DE BILLY. Yes.

The CHAIRMAN. Do you base your statement on tests made in France?

Mr. DE BILLY. Yes, sir; certainly, and fitted in our Breguet planes it gave excellent results.

The CHAIRMAN. In the tests made in France did you make any changes in the parts or auxiliaries of the motor? For instance, did you use any other carburetor than the one we sent over with the engines?

Lieut. MARQUISAN. I think we just removed the carburetor from between the cylinders and put it outside.

The CHAIRMAN. Did that produce better results?

Lieut. MARQUISAN. Yes, it did. It gives better cooling, and about 30 horsepower more.

The CHAIRMAN. Thirty horsepower more?

Col. TULASNE. In fitting it to the motor it is much better that the carburetor be outside.

The CHAIRMAN. You think it would be a good permanent improvement to build them with the carburetor outside of the V?

Col. TULASNE. I believe it would be very good to have a series of tests with the carburetor inside and another series with the carburetor outside to make the comparison before taking any chances. I believe that we have not the troubles in France with the Liberty motor. In regard to all these troubles, you have some very good

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reports by Maj. Muhlenberg to Maj. Kenly, who has it now in hand, about the tests of this machine.

The CHAIRMAN. Maj. Muhlenberg testified substantially as Lieut. Tabuteau.

Mr. DE BILLY. Is not that rather a criticism of the plane than a criticism of the motor?

Col. TULASNE. Yes.

Lieut. MARQUISAN. Yes.

The CHAIRMAN. The criticism they made was both as regards the combination of the Liberty motor with the De Haviland, the De Haviland having been originally designed for the Rolls Royce engine and, of course, it has been changed and they have had to make some changes to adapt it to the Liberty motor and we asked them particularly as to the plane, as to the motor, and as to the combination, so I think that is one of the troubles. Let me ask what type of plane the Liberty motor was tested in in France.

Mr. DE BILLY. In the Breguet plane.

The CHAIRMAN. Is that a two-seated plane?

Mr. DE BILLY. Two-seated.

The CHAIRMAN. Heavier or lighter than the De Haviland?

Mr. DE BILLY. Heavier and exactly the same type of machine.

The CHAIRMAN. The French use it for the same purpose that the English use the De Haviland?

Mr. DE BILLY. Yes.

The CHAIRMAN. Lieut. Marquisan, were you consulted in regard to the location of any of our aviation fields?

Lieut. MARQUISAN. No.

The CHAIRMAN. Were you, Col. Tulasne?

Col. TULASNE. For some fields, some of my officers were, and they gave their advice?

Senator NEW. I think that is all in reference to motors, unless there is something that some one of you gentlemen want to offer; and if not, we will turn to the planes.

Mr. DE BILLY. The only thing I would say is that we quite agree with the Aircraft Board in what is contemplated now, which is that by next spring there must be 500-horsepower engines in use, so this work on the airplanes is transforming so much, and the German aviators are doing so much to equal us that in order to get ahead of them we will have to fly next year motors of 500 horsepower, whereas now 400 is the highest. I think this is the program and it is the program of all nations.

Col. TULASNE. We are not in France working about these 500-horsepower motors. There are two of these motors—the Bugatti, which is built here in this country now at Elizabeth, N. J., at the Duzenberry factory, and another is the Canton-Une, which is not here in this country, and the French mission strongly recommends this motor now.

Senator NEW. Let me ask you if you have had any opportunity to test the De Haviland Four plane with the Liberty motor?

Col. TULASNE. Lieut. Tabuteau is with Maj. Muhlenberg at the Wilbur Wright field and he is testing this plane with the American commission.

Senator NEW. We took his testimony, as was just stated a few moments ago, at Dayton. He reported to us the result of his observa-

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tions up to that time. Do you know whether any additional facts have been learned since Lieut. Tabuteau testified before this commission that change your opinion on the adaptability of the Liberty motor for use in the De Haviland plane?

Col. TULASNE. Nothing new.

Mr. DE BILLY. I think that we all agree that when the actual changes are made the De Haviland will be a good observation plane. Is that not your opinion?

Col. TULASNE. A good observation plane, but not a good fighting and bombing plane.

Senator NEW. That is one point that I very much wish to develop; that you think it will be all right for observation purposes, but that it will not answer the purpose of a bombing plane.

Col. TULASNE. Not very good for bombing. You can use it for bombing, but with a very slight loading of bombs, but not for a fighting machine.

Senator NEW. In other words, it is not a good type of combat plane?

Lieut. MARQUISAN. It is not intended for a combat plane. A good machine must be fitted for one purpose only.

Senator NEW. Perhaps I should not have employed the word "combat" there, but I used it in the sense that any machine which is used for bombing may be classed under the head of a combat plane, but the De Haviland is not a high-class bombing plane for the reason that it does not carry a sufficient load. Is that the idea?

Lieut. MARQUISAN. Yes.

Senator NEW. We are making in this country some Capronis. How do you estimate them?

Col. TULASNE. The Caproni with the Liberty motor is a high-class bombing machine.

Lieut. MARQUISAN. I saw it flying in Mineola a week ago last Sunday. We have three Liberties now, and I never saw a bombing machine with such a climb and speed, and I think it carries with five hours of fuel, it is estimated that it carried about 1,000 kilograms of bombs. This is only an estimate made by the Italian commission.

Senator NEW. The Caproni plane as manufactured abroad has carried the Isotta motor?

Lieut. MARQUISAN. They had two kinds of motor, the Isotta-Fraschini and the Fiat.

Senator NEW. It gives equally good results with three Liberty motors?

Lieut. MARQUISAN. It is much better. They have not yet made the test on long flights, but it seems to be all right.

Senator NEW. As to the Handley Paige, what opportunities have you had for observation of the Handley Paige plane?

Lieut. MARQUISAN. I carried on Saturday, the 6th of July, and that was the first flight that I saw.

Senator NEW. Were you in the plane?

Lieut. MARQUISAN. No.

Senator NEW. That is the only one you have seen?

Lieut. MARQUISAN. I have seen it on the front in France, but not with the Liberty motor.

Senator NEW. You were satisfied with the performance, were you?

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Lieut. MARQUISAN. I think it is far from being as nice as the Caproni.

Senator NEW. Far from being as good as the Caproni?

Col. TULASNE. We believe it would be necessary to make comparative tests of both machines. We want some official tests in order to have a certain opinion about it.

Senator NEW. Is it not true that we should make all the planes we possibly can?

Mr. DE BILLY. Certainly, by all means.

Col. TULASNE. Certainly.

Lieut. MARQUISAN. Oh, no. It is better to have 1 plane of the very best type than 10 of an obsolete type.

Col. TULASNE. That is very difficult to tell, because it is a question of number. If the type is too obsolete it is of no use, but if it is just a little different it is good to have a great many of these planes. I can not give an answer to this question, because I want to have the speed, etc.

Senator REED. Let me put it in another way, which I think will cover the Senator's thought. I think the Senator wants to know whether we should confine ourselves absolutely to a certain type of bombing plane or whether we should have, perhaps, several approved up-to-date types of bombing planes. Stated in a little longer form, should we confine ourselves to the Handley-Page machine or the Caproni machine; or, in view of the fact that both of them are good machines and both of them are approved and both of them are in production, should we endeavor to utilize both of them? I am using that to illustrate and not to compare just those two particular planes, but to illustrate the whole situation, whether we should say here is one type of plane and we will have only that and one for fighting, and we will have only that, and whether if there are two, three, or four good planes, each of them really being fine machines we should not make all of them.

Col. TULASNE. That is a question of possibilities of production; but if we have to choose two planes under certain conditions it is much better to take the best of the planes; but sometimes we have difficulties of production which oblige us to have both. But if you can have just one it is better to have the best machine.

Senator REED. Is this not true, Colonel, that the Italians are making a very superior bombing machine, which is called the Caproni, and the English are making a superior bombing machine, which is called the Handley Page; is it not better for each of those nations making the planes that they are to continue to make it than to try to change it?

Col. TULASNE. Perhaps; yes.

Senator REED. If in this country we have some factories that are fitted to produce the Handley-Page and some of them to produce the Caproni, would it not be better for us to go on and make the two types of planes?

Col. TULASNE. Yes; I think so.

Senator REED. Is it true also that either of those two planes, which I think pretty nearly conform to each other in general purposes; that is, for long flights and bombing; is it not true that each of those planes may have some superiority in some respects and for certain uses over others.

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Col. TULASNE. No; I do not think so. I believe that the two machines—in my opinion, one of them is better than the other, because she carries a much greater load of bombs. If I was a private individual I would buy the best of these machines, but as a Government official I believe it is best to utilize all the capacity of production.

Senator REED. You are acquainted with the Spad machine?

Col. TULASNE. Yes, sir.

Senator REED. Is that a good machine?

Col. TULASNE. That is now the best machine, a monoseater fighting machine.

Senator REED. Do you think it is the best single-seated fighting machine?

Col. TULASNE. Yes; it is.

Senator REED. Next to that as a fighting machine, what do you regard as the best?

Lieut. MARQUISAN. The S. E. 5 is very much the same and has about the same speed.

Senator REED. What is your judgment as to the Bristol fighter as made in England, and as equipped with the English engine?

Col. TULASNE. What type of Bristol?

Senator REED. The two-seated Bristol fighter.

Col. TULASNE. I believe it is a type of last year, is it not?

Senator REED. I think they are still used.

Col. TULASNE. Yes; it was built in 1917. It is that type of machine.

Senator REED. In your judgment is that a good machine?

Col. TULASNE. I believe that is a machine like the D. H. 9.

Senator REED. What do the Italians use for their light photographic machines and the machine which can also fight on the defensive?

Col. TULASNE. The SVA.

Senator REED. Is that the type of machine that fell with Gino?

Col. TULASNE. Yes. They have a single seater and a double seater. Gino fell with a single seater.

Senator REED. You two officers have been here in this country for some time studying the airplane situation, have you not—giving it particular attention?

Col. TULASNE. Yes.

Senator REED. What suggestion have you to make in reference to improvements in our airplane program so as to get results, either as applied to our machines or as applied to the whole situation?

Col. TULASNE. I believe that now your construction program of engines is very good, because you have the Liberty motor, which is a good motor, and you have other motors under construction. You have the Hispano-Suiza, which is 500 horsepower, so you have now a complete program of construction for the engines. I just suggest that to build in this country one of our best type motors, which is the Canton-Une, 500 horsepower.

Senator REED. To be used in what kind of machines?

Col. TULASNE. This Canton-Une will be used in a two-seater fighting machine.

Senator REED. What kind of results have been attained from that?

Col. TULASNE. We have not now the results of the machines. We

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have just the result of the engine, because the machine and the plane is now built, but has not finished its tests.

Senator REED. Your opinion is that the Caproni machine is a better machine than the Handley-Page?

Lieut. MARQUISAN. It is just because we have seen the two machines fly, and the Caproni seems much faster and flies much better than the other, but it is necessary to make complete tests with a rigorous method before making any statement about it.

Senator REED. This new engine which you are developing, has it ever been fitted into machines and used yet?

Lieut. MARQUISAN. Yes.

Senator REED. Has it been thoroughly tried out?

Col. TULASNE. The machine is not in service. It is just being tested now. It is a two-seater fighting plane.

Senator REED. Do you not think it would be better for the French who have developed this machine to carry it beyond the experimental stage before we begin to try to make it over here?

Col. TULASNE. No; because it takes much more time to launch the production of a motor than for a plane, and it is possible to build in this country a plane a little different from the one built in France for a fighting plane for this motor. It is always possible to have a plane when you have the motor.

Mr. DE BILLY. The reason why this suggestion is made is because of what we said a while ago when the Senator questioned us about the future. It is the belief in all countries that the next year's motor will be a 500-horsepower motor, and the reason why we suggest that this motor should be tried here is that we consider that, as a motor, it is quite ready for construction.

Senator REED. We now have contracts for something in excess of 23,000 Liberty motors. Do you think we should add to the volume of those contracts and go ahead producing them as rapidly as possible?

Mr. DE BILLY. It is my very strong opinion that we should. Yes; you can never make too many of them. The Liberty motor is so much appreciated that it is asked for and demanded by the French aviation authorities and the Italian aviation authorities, as well as by the American aviation authorities. It is demanded, also, for the tanks. There is a very strong demand for the tanks.

Senator REED. They would not make the same motor for the tanks as for the air?

Col. TULASNE. I think so.

Senator REED. Would they not make it heavier?

Col. TULASNE. I do not know, exactly.

Mr. DE BILLY. There is a very strong demand, and the difficulty of your Aircraft Board now is to meet all those demands which must be for either the air or the tanks.

The CHAIRMAN. Gentlemen, I want to thank you, on behalf of the committee, for giving us some very valuable information.

(Whereupon, at 4 o'clock p. m., the subcommittee adjourned until 10.30 o'clock a. m. July 16, 1918.)

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AIRCRAFT PRODUCTION.

TUESDAY, JULY 16, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met pursuant to adjournment at 10.30 o'clock a. m., in the committee room, Capitol, Senator Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, Frelinghuysen, and New.

STATEMENT OF COL. H. H. ARNOLD.

The CHAIRMAN. Col. Arnold, please give your full name.

Col. ARNOLD. H. H. Arnold.

The CHAIRMAN. What position do you occupy in the Aviation Service?

Col. ARNOLD. Assistant director of military aeronautics.

The CHAIRMAN. Who is the head of the Bureau of Military Aeronautics?

Col. ARNOLD. Gen. Kenly is director of the Department of Military Aeronautics.

The CHAIRMAN. How long have you been connected with the Aviation Service?

Col. ARNOLD. I started in April, 1911.

The CHAIRMAN. As a member of the Signal Corps?

Col. ARNOLD. As a member of the Signal Corps; yes, sir. My service was continuous from April, 1911, to September, 1913. I rejoined in May, 1916, and have been in it ever since.

The CHAIRMAN. Were you in that service when Langley field was equipped and the structures were placed upon it?

Col. ARNOLD. I do not quite understand your question.

The CHAIRMAN. Were you in the Signal Service at the time the present buildings and facilities for testing were placed on Langley field?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. About when was that?

Col. ARNOLD. They started in the construction of Langley field, as I remember it now, just about one year ago—a year ago in June.

The CHAIRMAN. When were those structures completed?

Col. ARNOLD. They are not all completed yet.

The CHAIRMAN. When was the field ready for testing?

Col. ARNOLD. We were flying down there on the field in the fall. I do not remember the exact date.

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Senator REED. The fall of what year?

Col. ARNOLD. The fall of last year.

The CHAIRMAN. You say you were flying. Do you mean that cadets were being trained there?

Col. ARNOLD. They were testing and making minor experiments there last fall.

The CHAIRMAN. Was that field originally designed for the purpose of testing out and experimenting with planes?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Why was that work removed to McCook field?

Col. ARNOLD. I used to be a sit-in member of the Aircraft Board. In other words, I had the privilege of attending their meetings, and everything that I give you about Langley field is from hearsay. I heard a discussion at the Aircraft Board meeting which indicated that the reason they gave up the use of Langley field was that the transportation problem connected with Langley field was very difficult. They had one railroad line going in there and it was hard to get the machines in, get them tested, and then get them out. Another thing was that McCook field was right in the center of the manufacturing district.

The CHAIRMAN. Who comprised that board?

Col. ARNOLD. That board was comprised of Mr. Coffin, who was chairman; Gen. Squier, Col. Deeds, Col. Montgomery, Admiral Taylor, Capt. Irwin, Commander Atkins, and it had various civilians on it, the last members being Mr. Howe and Mr. Thayer.

The CHAIRMAN. Mr. B. B. Thayer?

Col. ARNOLD. I do not remember his initials.

The CHAIRMAN. When these discussions to which you have referred were going on had a field been secured at Dayton, or had the field now known as McCook field been secured?

Col. ARNOLD. The first discussion, of course, was relative to the advisability of putting this experimental work at Dayton, but as I remember it now the field at Dayton was started before the change was made.

Senator REED. I do not understand that last statement. Of course the Dayton field would have to be started before the change was made.

Col. ARNOLD. I mean this: They were actually performing experiments at Dayton before they said, "We will quit using Langley field."

Senator REED. If it was unfit for use, why didn't somebody discover that before?

Col. ARNOLD. It was all right in time of peace, when there was no big hurry.

Senator REED. But they improved it in time of war.

Col. ARNOLD. This statement was made: "It is all right in time of peace but not in time of war; we have not got time to do these things." Everything was based on this question of time and the matter of transportation.

Senator REED. There was also the question of time from other manufacturing places?

Col. ARNOLD. Yes, sir.

Senator REED. Was Langley field constructed for any one manufacturing place?

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Col. ARNOLD. No, sir. It was selected by a board of officers, with a view to locating a permanent engineering laboratory there, without regard to any one manufacturer.

Senator REED. When was that located?

Col. ARNOLD. Before we got into the war. I am unable to give you the exact date.

Senator REED. How far is it from Washington?

Col. ARNOLD. About 220 miles, I should say.

The CHAIRMAN. How far is it from Newport News or Old Point Comfort?

Col. ARNOLD. From Hampton it is 5 miles; from Old Point Comfort it is about 8 miles, I should say.

Senator REED. Has it been entirely abandoned now?

Col. ARNOLD. We have an observation school, and now a small amount of experimental work is going on.

Senator REED. But it is not used for engineering and testing purposes since the transfer was made?

Col. ARNOLD. No, sir; not in a broad sense. They do conduct a few oil tests there.

Senator REED. You were talking about McCook field being located with reference to the manufacturers in and around Dayton.

The CHAIRMAN. He said they said so.

Senator REED. Yes; I know.

Col. ARNOLD. That seemed to be the general impression.

Senator REED. Were the machines tested out at Dayton, simply the ones made in Dayton or those made all over the country?

Col. ARNOLD. All machines are tested, so far as I can see, except the Capronis and the Handley Page. Those are the only two that have not been sent to Dayton for tests.

Senator REED. So that when you say they ought to be sent to Dayton with reference to the manufacturers it means that machines manufactured in New Jersey, Detroit, Buffalo, and numerous other points where planes are being made, have to be sent to Dayton and then sent back to the eastern coast if they are to be used in Europe?

Col. ARNOLD. Well, that is not altogether the case. You see, as to the original machine, each type is sent to Dayton for test. They test the machine at that place and make such improvements as they think necessary, and then they give instructions to go ahead with production.

Senator REED. Do I understand that these gentlemen claimed that there was such a dearth of transportation at a point 5 miles from Newport News that sample machines of each type could not be sent in there promptly for test?

Col. ARNOLD. That was the inference to be drawn.

Senator REED. What do you know about it?

Col. ARNOLD. Personally I think they could be tested down there.

Senator REED. Langley field is within 5 miles of Newport News?

Col. ARNOLD. About 7 miles.

Senator REED. Is it on a railroad?

Col. ARNOLD. We have a railroad running in there; yes, sir.

Senator REED. Running into Langley field?

Col. ARNOLD. We put a railroad in there ourselves.

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Senator REED. You built, or the Government built, a railroad that long?

Col. ARNOLD. It is just a spur.

Senator REED. Is it a railroad of 7 miles in length or is it connected up with another railroad?

Col. ARNOLD. It is connected up with railroads that are near. We fly back and forth to Langley field all the time. It takes about two hours from Washington.

Senator REED. But you can not very well fly from here to the Dayton field?

Col. ARNOLD. We have tried to make that trip, but we have not been successful so far.

The CHAIRMAN. Were any changes made or did any suspensions occur in the work of the construction of Langley Field after this transfer?

Col. ARNOLD. They transferred all the machinery that was supposed to go from Langley Field to Dayton.

The CHAIRMAN. It was first sent to Langley Field?

Col. ARNOLD. Some of it was first sent to Langley Field, and the shipping orders were changed on other machinery so that it was shipped to Dayton.

The CHAIRMAN. What are the buildings at Langley Field used for; what have they been used for since that change was made?

Col. ARNOLD. The permanent buildings are now being completed. The temporary buildings down there, of course, were put up to cover the needs as they existed. For instance, they are doing a small amount of experimental work with oil tests and instrument tests and bomb dropping. They keep a number of machines down there all the time, but the thing has not been pushed, because it has not been necessary.

The CHAIRMAN. Because of the transfer of activities to McCook Field it has not been necessary?

Col. ARNOLD. Yes, sir.

Senator REED. How many acres in Langley Field—the flying field?

Col. ARNOLD. I should say, offhand, about 1,650 acres.

Senator REED. How much is swamp, if any?

Col. ARNOLD. I have been down there a number of times, and I have not seen any swamp.

Senator REED. Was anything said at this meeting when they were going to move to the McCook Field that they had available some swamp land that might be particularly desirable for alighting purposes, and that gave it an advantage over Langley Field?

Col. ARNOLD. No, sir; I did not hear that.

Senator REED. Have you seen McCook Field?

Col. ARNOLD. Yes, sir.

Senator REED. What is the acreage?

Col. ARNOLD. 200 acres.

Senator REED. The Wilbur Wright Field is now being transformed into a real experiment station, is it not?

Col. ARNOLD. No, sir.

Senator REED. Are they not doing experimental work at the Wilbur Wright Field?

Col. ARNOLD. In order for you to understand about the Wilbur Wright field I will have to go into the organization a little bit. At

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the present time, with the dual organization, Gen. Kenly has to dictate as to the type of machines that are going to be used on the other side. Mr. Ryan produced the machines. After Mr. Ryan produces the machine Gen. Kenly tests the machine to see whether it gives the performance that must be had if it is to prove a suitable machine at the front. Gen. Kenly has to have some place where he can put the machine through its military tests, and the tests are being made at the Wilbur Wright field.

Senator REED. It is being used as an experimental station?

Col. ARNOLD. No, sir; not as an experimental station, but as a test station.

Senator REED. Perhaps I did not use the right word. What I mean is this: The Wilbur Wright field is now being used for the purpose of testing new machines along with other things?

Col. ARNOLD. Yes, sir.

Senator REED. If you had a field with 1,400 or 1,500 acres in it at which to test these machines, it could also be employed, could it not, for the purpose of training cadets? That could all be done at one field?

Col. ARNOLD. I would not say that it should be used for the training of cadets. It is a mistake, I think, to do that.

Senator REED. You have got those fields now close together?

Col. ARNOLD. We are actually training cadets and testing machines, but we do not believe in it; we think it is wrong.

Senator REED. McCook field is too small for safe testing, is it not?

Col. ARNOLD. Absolutely.

Senator REED. So that when you get down to the cold facts—and I do not mean to intimate that you have not been telling facts, but I mean that when you come to talk about it with brutal frankness—the truth is that McCook field is too small a field to be regarded as just the proper kind of a place at which to make these experiments with the new machines, is it not?

Col. ARNOLD. That would be my personal point of view.

Senator WEEKS. It is apparently because of that that you had to go a few miles farther over to the Wilbur Wright field, where there is more room, in order to test the machines?

Col. ARNOLD. There is more than that. The real reason that we took the machine away from there is that we can have it absolutely out from under the influence of the production people. We found that the tests by the production people always gave 10 miles an hour faster, or the machine climbed 100 feet per minute faster.

Senator REED. What do you mean by saying that they went faster and climbed more?

Col. ARNOLD. I mean that the records show that.

Senator REED. What is the fact about the McCook field being surrounded by trees?

Col. ARNOLD. I flew at McCook field. It is not an ideal place for flying. There is no doubt about that. It is surrounded by buildings, trees, and houses, and there is the river on one side, and then there are telephone wires. It is not an ideal field.

The CHAIRMAN. Isn't it too small, even if those objects are not present?

Col. ARNOLD. Personally I do not see why they selected such a small field.

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Senator REED. Particularly it is too small for a machine that is being experimented with?

Col. ARNOLD. I would not fly an experimental machine there.

Senator REED. The Langley field has about 1,400 acres and the Wilbur Wright field has about 2,000?

Col. ARNOLD. Yes, sir.

Senator REED. And a large part of the Wilbur Wright field is swamp?

Col. ARNOLD. Some part of it.

Senator REED. There is about half that is wet or boggy or rough?

Col. ARNOLD. A good bit of it.

Senator REED. It is all liable to be overflowed?

Col. ARNOLD. The opinions differ as to that. Some people say that it is, while others say that it is not. Col. Edgar says that he has a subsoil drain which will carry off that rainfall. I know for a fact that it was under water last spring. I was out there.

Senator REED. Has he got it fixed so that it will take care of the water when the river is overflowing its banks 6 or 8 feet?

Col. ARNOLD. I do not know about that.

Senator FRELINGHUYSEN. Have you seen the result of the 36-inch rainfall?

Col. ARNOLD. When I was out there it rained for three or four days running. That was last spring. There was water all over the field.

Senator FRELINGHUYSEN. Including the floors of the hangars?

Col. ARNOLD. No, sir.

Senator REED. When was it that Col. Edgar got this drainage put in there?

Col. ARNOLD. I do not know.

Senator REED. Was it within four or five weeks?

Col. ARNOLD. We were there shortly after your committee was there—two or three days afterwards. It was not in then. I asked him about it since. As I remember it now, he said he had just put it in.

Senator REED. He has not had time to do it unless he had some thousand men at work, because it takes a good while to do that.

Col. ARNOLD. I am not sure that is going to correct it.

Senator REED. Langley Field is a dry field, is it not?

Col. ARNOLD. It was under water last winter.

Senator REED. From what cause?

Col. ARNOLD. I do not know, sir; but I remember hearing that it was under water.

Senator REED. Do you know how it is, generally speaking?

Col. ARNOLD. I have been down there four or five times and it has always been dry.

Senator REED. Do you know the reason why this field should be overflowed? Is there any reason why it can not be located upon high ground?

Col. ARNOLD. When they hunt for an aviation field they usually hunt for a flat area—a large flat area—and a very large flat area is usually low ground. I have not seen many of them on the tops of hills.

Senator REED. Within 3 miles of the Wilbur Wright field is a large, flat, elevated piece of ground without a particle of swamp on it, and the drainage runs in two or three directions from it.

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Senator FRELINGHUYSEN. Are you familiar with the cost of the Wilbur Wright field?

Col. ARNOLD. I have seen the figures, but I do not remember them now. I should say, offhand, that it was over $2,000,000.

(Col. Arnold afterwards obtained and supplied the following figure as the actual cost of Wilbur Wright field to the date of June 30, 1918: $2,804,632.)

Senator FRELINGHUYSEN. What was the cost of grading the Wilbur Wright field? Do you recollect that?

Col. ARNOLD. I can not remember those figures; no, sir. I have seen so many figures that I get them mixed up, but Col. Edgar, who is in charge of the Supply Division, can give you the exact figures to a dollar for all the operations there.

(Col. Arnold afterwards obtained and supplied the following figure as the cost of grading at Wilbur Wright field: $700,000.)

Senator FRELINGHUYSEN. By reason of the location of the field on this low ground the cost of preparing the field for flying was excessive, was it not?

Col. ARNOLD. It was probably more than that for any other field that we had, except Mineola.

Senator FRELINGHUYSEN. Do you know whether the advice of any of the officers of the French Aviation Service was asked in regard to the location of the field?

Col. ARNOLD. I am unable to say how the Wilbur Wright field was located. I know how pretty nearly all the other fields were located, but I am unable to say about that one.

Senator FRELINGHUYSEN. Is it not a fact that certain French officers who were here at the beginning of the war advised the Government officials that the field was not suitable for flying?

Col. ARNOLD. I can not answer that question.

Senator NEW. There are a few questions that I would like to ask.

Senator REED. Just a moment, if you please. Colonel, will you please supply us with those figures, the comparative figures for each of the flying fields in the country? We would like somewhat in detail the cost of the buildings, the ground, and the grading, including the improvements to the land. If you have had to build lines of transportation, also include that.

(The matter referred to was subsequently submitted by Col. Arnold and is here printed in full, as follows:)

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Field.	Location.	Acreage.	Cost of buildings and facilities.	Yearly rental.	Grading and clearing.	Crop damage.	Railroad lines.	Construction started.	Field opened.
Barron	Everman, Tex	633	$1,013,200.00	$4,431.00	$23,100.00	.....	$12,000.00	Aug. 29, 1917	Nov. 15, 1917
Brooks	San Antonio	874.7	796,772.00	8,076.00	107,352.00	$300.00	15,385.00	Dec. 12, 1917	Mar. 15, 1918
Call	Wichita Falls	640	951,500.00	1,280.00	12,000.00	.....	.....	Sept. 5, 1917	Dec. 1, 1917
Carlstrom	Arcadia, Fla	640	694,000.00	320.00	78,000.00	.....	.....	Dec. 14, 1917	Mar. 25, 1918
Carruthers	Benbrook	640	843,000.00	4,480.00	28,000.00	.....	22,000.00	Sept. 17, 1917	Nov. 20, 1917
Chanute	Rantoul	640	923,512.00	12,800.00	123,820.00	41,620.00	8,387.00	May 28, 1917	July 2, 1917
Dorr	Arcadia, Fla	640	735,000.00	320.00	76,000.00	.....	106,000.00	Jan. 7, 1918	May 23, 1918
Eberts	Lonoke	960	1,173,000.00	1.00	150,000.00	.....	100,000.00	Dec. 10, 1917	Mar. 23, 1918
Ellington	Houston	1,280	1,400,000.00	3,840.00	35,000.00	.....	8,988.00	Sept. 14, 1917	Dec. 1, 1917
Gerstner	Lake Charles	1,304.2	2,122,436.00	1,304.20	37,542.00	.....	.....	Sept. 16, 1917	Nov. 20, 1917
Hazelhurst	Mineola	1,065.88	4,241,000.00	19,500.00	345,000.00	.....	14,000.00	July 20, 1917	[1] June 7, 1918
Kelly No. 2	San Antonio	1,721.54	3,557,200.00	24,102.00	47,580.00	8,444.05	40,000.00	July 22, 1917	[1] Aug. 11, 1917
Langley	Hampton	1,650	750,000.00	.....	[2] 489,201.51	.....	.....	Aug. 1, 1917	May 20, 1918
Love	Dallas	650	920,000.00	4,550.00	50,000.00	3,780.00	.....	Sept. 4, 1917	Dec. 10, 1917
March	Riverside	960	591,872.00	1.00	86,144.00	.....	.....	Mar. 15, 1918	June 15, 1918
Mather	Sacramento	1,107	509,000.00	1.00	81,000.00	.....	.....	Mar. 28, 1918	June 24, 1918
Park	Millington	907.61	1,007,261.00	9,076.10	894,994.00	28,887.45	7,549.00	Aug. 28, 1917	Dec. 3, 1917
Payne	West Point, Miss	800	650,000.00	6,400.00	150,000.00	.....	.....	Mar. 1, 1918	May 16, 1918
Post	Fort Sill, Government land	.....	1,734,993.00	.....	141,984.00	.....	31,558.00	Aug. 4, 1917	Sept. 2, 1917
Rich	Waco	690	735,000.00	6,900.00	164,812.00	.....	.....	Sept. 5, 1917	Dec. 1, 1917
Rockwell	San Diego	.....	635,969.00	.....	10,798.00	.....	25,799.00	Feb. 4, 1918	[1] May 1, 1918
Scott	Belleville	640	1,321,880.00	7,410.52	256,000.00	33,881.00	10,640.00	June 25, 1917	Sept. 5, 1917
Selfridge	Mount Clemens	640	1,560,456.00	13,500.00	369,482.00	.....	110,209.00	May 28, 1917	July 8, 1917
Souther	Americus	800	560,810.00	8,000.00	[2] 244,029.00	.....	12,000.00	Feb. 19, 1918	May 3, 1918
Tallaferro	Fort Worth	688.8	1,061,600.00	4,132.80	25,100.00	.....	6,500.00	Aug. 27, 1917	Oct. 10, 1917
Taylor	Montgomery	800	839,435.00	3,200.00	150,900.00	4,676.00	.....	Dec. 18, 1917	Mar. 15, 1918
Wilbur-Wright	Fairfield	2,245.2	1,929,632.00	20,000.00	700,000.00	73,000.00	175,000.00	May 29, 1917	July 8, 1917

[1] Flying operations conducted at these fields prior to present construction and this date of opening.
[2] Includes also cost of roads, sewers, etc.

Senator NEW. Col. Arnold, I understood you to say that you had been in the aviation department of the Army since 1911.

Col. ARNOLD. Yes, sir.

Senator NEW. Since then what positions have you occupied?

Col. ARNOLD. In 1911 I learned to fly at Dayton, Ohio. I came to Washington and, in addition to my flying, I was made supply officer at the school which was then at College Park. I was supply officer from the year 1911 to 1912. In the fall of 1912 I was put in the office of the Chief Signal Officer, as assistant to the officer in charge of aeronautics. I held that office until the year 1913, when I went back to join my regiment. In May, 1916, I rejoined at San Diego as a flying officer and as supply officer. I held that position until February, 1917, when I went to Panama and commanded the Seventh Aero Squadron. I remained in Panama until the war broke out. I came to Washington after the war broke out and was in charge of the information section of the aeronautical service. I was then made assistant to the executive officer, and then later was made executive officer of the Aero Service. I was then relieved from duty as executive officer and put on the control board of the Aero Service, and then, during the recent organization, I was made assistant to the Director of Military Aeronautics.

Senator NEW. You have not been in Europe since we entered this war?

Col. ARNOLD. No, sir; I have not.

Senator NEW. Have you at any time had anything to do with the designing of aeroplanes?

Col. ARNOLD. No, sir; I have not.

Senator NEW. You are a practical flyer?

Col. ARNOLD. Yes, sir.

Senator NEW. But you are not an engineer?

Col. ARNOLD. No, sir; I am not.

Senator NEW. As a practical flyer, have you made any recommendations to the department concerning the types of aeroplanes that should be adopted for use by this country?

Col. ARNOLD. I am a member of the Joint Army and Navy Technical Board, which recommends all the machines before they are put into production. That was before this recent split. Since this split, the Joint Army and Navy Technical Board has practically ceased to exist.

Senator REED. What do you mean by "split"?

Col. ARNOLD. Since the reorganization, when they separated production from operation.

Senator NEW. Have we completed any aeroplanes in this country for service at the front?

Col. ARNOLD. We have one type that we are sending over for service on the front that was a copy of a British design, changed to take care of the Liberty engine.

Senator REED. What is that?

Col. ARNOLD. The D. H. 4.

Senator NEW. Your answer to that question is qualified. That seems to be a qualified answer, Colonel. I wish you would explain just what you meant by that.

Col. ARNOLD. Your question is subject to two interpretations: One is, Have we designed and built any planes for service on the front? The other one is, Have we merely constructed planes, regardless of who designed them?

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Senator NEW. Well, separate the question.

Col. ARNOLD. We have not designed and constructed any planes for service on the front. We have copied an English design and built the planes and sent them over.

Senator NEW. And that design is the De Haviland 4?

Col. ARNOLD. Yes, sir.

Senator REED. Modified to fit the Liberty engine?

Col. ARNOLD. Yes; modified for the Liberty engine.

Senator NEW. Have we adopted any other type and attempted its construction?

Col. ARNOLD. We attempted to revise the Bristol for construction in this country, to be sent over for service.

Senator NEW. What was the Bristol?

Col. ARNOLD. It was an English two-seater plane of comparatively good performance used on the front as an observation and fighting machine.

Senator NEW. Designed for use with what kind of a motor?

Col. ARNOLD. Two types of engines. One is the 190-horsepower Rolls and the other is the 200-horsepower Hispano Suiza.

Senator NEW. Can you give us the comparative or approximate weight of those engines?

Col. ARNOLD. The Rolls 190-horsepower engine weighs 710 pounds; the Hispano weighs 515 pounds.

Senator NEW. What is the weight of the Liberty motor?

Col. ARNOLD. The Liberty engine weighs 800 pounds.

Senator NEW. Eight hundred and twenty-four, is it not?

Col. ARNOLD. It varies from 800 to 810, depending upon the particular engine.

Senator NEW. We have sent abroad some of the De Haviland 4's, have we not?

Col. ARNOLD. Yes, sir.

Senator NEW. Have you any knowledge as to how many of them have been put into service on the front?

Col. ARNOLD. We have not received any report relative to that, sir.

Senator NEW. You have not?

Col. ARNOLD. No, sir.

Senator REED. How many did we send and when were they sent? Can you give us that information?

Col. ARNOLD. I told my secretary to put that data in here, but he neglected to do it, apparently. There had been approximately 400 shipped up to last week.

(Col. Arnold later secured and supplied the information that the number of De Haviland–4 planes which had been forwarded for shipment overseas to the date of July 12 was 425.)

Senator NEW. You said, I believe, Colonel, that you had no means of knowing just how many of these American-built De Haviland–4's had been received on the front in France?

Col. ARNOLD. No, sir; we have not.

Senator NEW. The War Department has no report on that subject?

Col. ARNOLD. We get a monthly report from the other side showing the number of planes that they have on the front of every type. It has only been a very short time since they started shipping these De Haviland machines overseas. The planes that they shipped over were not ready to be immediately put on the front. There were certain minor changes that had to be made to make them serviceable.

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Meanwhile we did get reports showing the number of planes they had on the front and giving the names of the different types of planes. The last report I saw gave the names of the planes in use. It showed the Nieuport, the Spad, the AR–2, the Sopwith, the Sampson, and the Voisin, none of which are American-made planes.

Senator NEW. Will you let us know—or state for the record—just how many of those planes there were? Give us the figures that are contained in that report you have just read and the date.

Col. ARNOLD. The date of the report that I just read was April 30, but I have a later one than that.

Senator NEW. Let us have the later one.

Col. ARNOLD. I did not know exactly the questions you were going to ask or I could have brought the information along with me. I have not got that with me.

Senator NEW. May I ask you, then, to supply those figures when this transcript is sent you for correction?

Col. ARNOLD. Yes, sir; I will put them in. I will put in the number of each one of these types where I have given the name.

Senator NEW. State in each case whether or not it is an American or foreign built machine.

Col. ARNOLD. Yes, sir.

(The matter referred to was subsequently submitted and is here printed in full, as follows:)

Actual deliveries of aeroplanes from contracts placed with France, with types.

Type.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	Total.
Service, artillery:								
A. R. 1	.....	.....	.....	.....	1	.....	.....	1
A. R. 2 (Ren. 190)	.....	.....	16	4	.....	12	19	51
Salmson (Salm. 270)	.....	.....	.....	.....	15	12	46	73
Sopwith A2 (Rh. 120)	.....	.....	10	17	39	21	113	200
Sopwith B2	.....	.....	.....	.....	.....	14	31	45
Fighters:								
One-seater—								
Morane Saulnier Rouleur (Gnome-Anzani Rhone 50)	14	36	9	5	44	.....	.....	108
Nieuport XXVIII (Gnome 160)	.....	.....	.....	37	21	102	20	180
Spad VII (H. S. 150)	1	1	.....	.....	.....	18	28	48
Spad XIII (H. S. 220)	2	.....	.....	.....	.....	.....	24	26
Two-seater—								
Spad XI A2 (H. S. 200)	.....	.....	2	8	.....	12	.....	22
Bombers:								
Day—								
Breguet 14A2	.....	.....	.....	.....	.....	.....	14	14
Breguet 14E2	.....	.....	.....	.....	.....	.....	7	7
Breguet 14B2 (Fiat 300)	2	13	8	14	.....	.....	.....	37
Sopwith B2 (Cl. 130)	.....	.....	.....	18	15	.....	.....	33
Night, short range—								
Voisin (Peugeot 220)	.....	.....	.....	.....	8	.....	.....	8
Training.								
Caudron G3 (Rh. 80)	1	.....	.....	.....	18	14	24	57
Farman (Ren. 130) F40	.....	.....	6	2	.....	.....	.....	8
Farman 50 B2 (Ren. 130)	.....	.....	.....	2	.....	.....	.....	2
Nieuport X (Rh. 80), same as 83	43	.....	2	.....	.....	68	.....	113
Nieuport XIII (Rh. 80), same as LXXXI	15	.....	16	36	9	.....	.....	76
Nieuport LXXX (Rh. 80)	.....	.....	.....	.....	.....	20	30	50
Nieuport LXXXI (Rh. 80)	.....	.....	.....	.....	.....	15	17	32
Nieuport XIII, S. C. (Rh. 80), same as LXXX	16	.....	6	16	36	.....	.....	74
Nieuport XVII (Rh. 120)	74	1	.....	.....	.....	.....	.....	75
Nieuport XXI (Rh. 80)	118	23	15	12	9	.....	.....	177
Nieuport XXI (Rh. 120)	.....	1	3	.....	.....	.....	.....	4
Nieuport XXIII (Rh. 80)	.....	.....	1	.....	.....	.....	.....	1
Nieuport XXIII (Rh. 120)	.....	.....	16	13	.....	.....	.....	29
Nieuport XXIV (Rh. 120)	.....	41	32	10	1	.....	.....	84
Nieuport XXIVbis (Rh. 120)	2	9	43	33	1	2	.....	90
Nieuport XXVII (Rh. 80)	.....	20	48	.....	.....	.....	.....	68
Nieuport XXVII (Rh. 120)	111	65	1	1	.....	.....	.....	178
Nieuport LXXXIII (Rh. 80)	.....	.....	35	.....	4	.....	47	86
Total	399	210	269	228	221	310	420	2,057

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Actual deliveries of aeroplanes from contracts placed with Great Britain: Sopwith Camel (Clerget 130), 13.
Actual deliveries of aeroplanes from contracts placed with Italy, S. I. A. (D. C.), 44.
Grand total, 2,114.

Senator NEW. Then I would like you to give us the reports as to the number of machines that had been delivered and put in use by Gen. Pershing's forces on the 1st of June, and also on the 1st of July, if you please.

Col. ARNOLD. The number of American-built planes?

Senator NEW. The number of American-built combat planes that had been put in use on the front on the 1st of June and the 1st of July, or if it is impossible to supply the figures as of those dates, approximate those dates just as nearly as you can, using the reports nearest to those dates.

Col. ARNOLD. I would have to cable for the dates. I can get the June 1 report, but I would have to cable for the last date.

Senator NEW. Then I suggest that you do that.

(Col. Arnold afterwards supplied the information that no planes of American manufacture had been delivered at the front on June 1, but that by July 1 about 200 had been delivered. While exact information on this subject was not at hand, latest advices were that little or no use had been made of these planes at the front up to July 1.)

Senator NEW. In answering a previous question, which you did somewhat in detail, you said that when those planes (referring to the De Haviland) were received over there they were not in condition for immediate use.

Col. ARNOLD. Yes; I said that.

Senator NEW. What do you mean by that?

Col. ARNOLD. In the first place the machine has no altitude control device. I do not know exactly what changes the American people, or our forces, are making in the machines, but the English are putting on a different carbureter.

The CHAIRMAN. We were told yesterday by Col. Tulasne that they get excellent results by moving the carbureter from its position as we put it in the engine.

Col. ARNOLD. Yes. Col. Tulasne told me about that several weeks ago. I immediately asked our production people why we did not do the same thing, and I was told that they were considering it. I understood Col. Tulasne to say that he got 20 more horsepower by making that change.

The CHAIRMAN. Thirty more.

Col. ARNOLD. Then they have improved it since I spoke to him.

Senator NEW. Is the matter of altitude control an important one?

Col. ARNOLD. It is important in this way, that due to the fact that we have not got altitude control the engine burns 36 gallons of gasoline an hour. By putting altitude control in, you get it down to 23 gallons an hour, and you get a radius of action that is greater. At the present time the radius of action is only two hours, which is very small for any machine that is used on the front.

Senator NEW. Now, what other deficiencies were there that have come to your notice?

Col. ARNOLD. The cloth is one thing; that gets loose after about 20 hours of flying. It has to be entirely resurfaced.

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Senator NEW. Does the loosening of the cloth impair the efficiency of the machine?

Col. ARNOLD. If it is not changed, the cloth will come off in the air, as it did with the Bristol, and there will be a fatal accident.

Senator NEW. In other words, it renders the machine highly dangerous?

Col. ARNOLD. Yes, sir.

Senator NEW. What is the cause of that loosening?

Col. ARNOLD. I am not, as I have said before, a technical man, but I inquired into these things. The first thing I asked of Col. Semple, the British technical expert, was why the cloth was not applied properly and not doped properly. He said that as a matter of fact there is nothing wrong about the cloth, but it must be put on properly.

Senator FRELINGHUYSEN. In other words, it is due to poor workmanship?

Col. ARNOLD. I would not say that, because the workmen do what they are told. It is improper designing.

Senator NEW. And improper inspection?

Col. ARNOLD. Yes.

Senator FRELINGHUYSEN. Has this happened to the De Haviland 4's?

Col. ARNOLD. Yes, sir. We have at Mineola eight De Haviland 4's. We took them out to find out what was the matter. Out of the eight we flew five, and they all have loose cloth. They were all made at Dayton, at the Dayton-Wright plant.

Senator NEW. All those machines, then, are dangerous?

Col. ARNOLD. They are not so dangerous that we will not fly them now, but as the cloth gets looser they become so dangerous that they will not fly them. In other words, after 20 hours' flying they have to change the cloth.

Senator FRELINGHUYSEN. They had the same trouble with the Bristol fighter?

Col. ARNOLD. Yes, sir.

Senator NEW. Would you say that you regard the De Haviland plane as it is produced to-day as an efficient and satisfactory machine?

Col. ARNOLD. No, sir; it is not a satisfactory machine.

Senator REED. That is, the De Haviland 4 and the Bristol fighter?

Col. ARNOLD. As they are being produced.

The CHAIRMAN. Before we leave the question of the De Haviland plane I want to ask if these defects and deficiencies to which you have referred developed in the tests of the machine after it was sent over?

Col. ARNOLD. We developed them in our own tests.

The CHAIRMAN. Did you find anything wrong with the compass?

Col. ARNOLD. The compass was worthless.

The CHAIRMAN. Why?

Col. ARNOLD. Our production people improved on it to such an extent that they made it worthless.

The CHAIRMAN. Please explain what that improvement consisted of.

Col. ARNOLD. The English, in their mountings, have agate in order to reduce the friction of the rotating member.

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Senator NEW. It is a nonconductor, in other words.

Col. ARNOLD. We improved it by putting steel on the agate. Now it is worthless.

Senator REED. It is worthless, you say?

Col. ARNOLD. That is the report on it that we get, that it is worthless.

The CHAIRMAN. When was that improvement made?

Col. ARNOLD. I do not know.

The CHAIRMAN. About when was that made?

Col. ARNOLD. Well, I can not answer that question, because the first I knew about our improvement of the compass was that it was put on a machine and immediately the testing squadron reported that it was worthless.

The CHAIRMAN. What department or division has charge of the supply of compasses?

Col. ARNOLD. The equipment division.

The CHAIRMAN. Can you give the name of the official or individual having direct charge of such equipment as compasses?

Col. ARNOLD. I can not answer that question, because I am not acquainted with the intimate details of that organization. Col. Deeds was in charge of the equipment division, and later, Montgomery.

The CHAIRMAN. Do you know in what volume the improved compass has been manufactured?

Col. ARNOLD. I had those figures all prepared to bring along, but through some mistake my secretary did not put them in my bag.

The CHAIRMAN. Can you furnish them later?

Col. ARNOLD. Yes, sir.

(Col. Arnold later supplied the information that a total of 1,154 of these compasses were on order, of which 442 had been delivered.)

The CHAIRMAN. You were about to refer to a report concerning the compass test when I interrupted you with a question. I wish you would turn to that report and say what it is.

Col. ARNOLD. Here is a report that we submitted. The compass is useless.

The CHAIRMAN. What is the date?

Col. ARNOLD. May 12, 1918. It says that the compass is useless due to rotation; that they will be reswung or replaced; that it is thought best not to hold up the shipments, but allow them to install better compasses.

The CHAIRMAN. That is a report to Gen. Pershing?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. What other defects were developed at the tests, either in France or at Mineola, or elswhere, in the De Haviland fighting machine?

Col. ARNOLD. There are no other defects that I can think of, except small defects that can be easily corrected.

The CHAIRMAN. Why were not those defects which you spoke of developed at the McCook Field?

Col. ARNOLD. I can not answer that question. I saw the first machine that was flown there. I saw it fly myself, in December, 1917. There was no military test given the machine until we got the machine ourselves. That was in April, 1918. I believe it was April 15.

Senator REED. Who was in charge of McCook Field at that time?

Col. ARNOLD. Col. Clark and Col. Vincent.

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Senator REED. Which one of them would have charge of the testing of this machine?

Col. ARNOLD. This machine was not at McCook Field. This machine was at the Dayton-Wright Field, commonly called the South Field.

Senator REED. Who had charge there for the Government—anybody?

Col. ARNOLD. I do not know the intimate details connected with that organization, sir. I can not answer that question.

The CHAIRMAN. You can not answer?

Col. ARNOLD. No.

Senator NEW. I want to try to make one point clear. Whatever test was made there at the Dayton-Wright Field was not made by the Government nor under the supervision of Government officials?

Col. ARNOLD. In a general way; yes. I remember seeing this machine fly in December. A civilian went up and flew it, and when he got through they said, "What a wonderful machine." Col. Jones, who wanted to fly that machine, was not permitted to fly it.

The CHAIRMAN. What was the reason given for that?

Col. ARNOLD. Because he had not flown that particular type of machine.

Senator NEW. Is that B. Q. Jones?

Col. ARNOLD. Yes; and he probably knows more about flying machines than any other man they ever had.

The CHAIRMAN. When you get these machines for practical tests of your own at Wilbur Wright Field and such other places as you make them, do you aim to make the tests with what is called a military load?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Are they flown at McCook Field with a military load?

Col. ARNOLD. I do not think so.

The CHAIRMAN. Is the test without a military load a satisfactory one?

Col. ARNOLD. I do not think they are satisfactory, because they always get a higher performance than we do.

Senator REED. That is, they report a higher performance?

Col. ARNOLD. Yes.

The CHAIRMAN. How early, Col. Arnold, did your branch of the service attempt to secure the facts regarding the De Haviland and the merits of the planes from the production department?

Col. ARNOLD. As soon as we saw this machine we began to ask questions. We asked, "How fast will it go?"

The CHAIRMAN. That was in December.

Col. ARNOLD. In December; yes

The CHAIRMAN. Whom did you ask?

Col. ARNOLD. We asked the production people. They said they were going to have tests. We were always told that they were going to have them.

The CHAIRMAN. Who was in charge?

Col. ARNOLD. Col. Deeds and Col. Montgomery. They were always going to have tests. Finally, I was at Dayton, again, in February, and the test had not been pulled off then. I was getting sort of dis-

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couraged because these machines were coming out in quantity, and we did not know what they would do. I came back to Washington and asked point-blank that the machine be put through a test, and asked if they would not test it, to give us a machine so that we could test it ourselves.

Senator REED. When was that?

Col. ARNOLD. March.

The CHAIRMAN. How long a time elapsed between your first effort to secure the facts regarding the De Haviland and the time when you were able to obtain them?

Col. ARNOLD. I can not remember when we first started asking for tests of the machine, whether it was in the latter part of December or the first part of January, but it was some time in those months. We did not have the machine turned over until the 15th of April.

The CHAIRMAN. When did you make the first test?

Col. ARNOLD. April 15.

The CHAIRMAN. So that you had spent about two months' time?

Col. ARNOLD. Yes. It was more than that. It was January, February, March and April.

The CHAIRMAN. Did you get any statements or records as to the results of the tests made at the Dayton-Wright field before the 8th of May?

Col. ARNOLD. Only that somebody said the machine made 130 miles an hour.

The CHAIRMAN. I mean an official report.

Col. ARNOLD. No, sir.

The CHAIRMAN. Did you get one about the 8th of May?

Col. ARNOLD. It seems to me they turned over a machine to us to test, and McCook Field also started in to test.

The CHAIRMAN. In other words, simultaneously with giving you a machine to test one was turned over to McCook Field to test?

Col. ARNOLD. Yes; that is approximately right.

The CHAIRMAN. Did you get records of the tests from the McCook Field?

Col. ARNOLD. We sent Col. Bane there. There had been several deaths. Maj. Damm and Maj. Brindley were both killed. We saw that we had to do something.

Senator REED. Killed in these machines?

Col. ARNOLD. In the De Haviland; yes. We sent Col. Bane to conduct the tests himself.

Senator REED. At McCook Field or the Wilbur Wright Field?

Col. ARNOLD. At the Wilbur Wright Field. Col. Vincent at that time was starting to test his machine. Col. Bane had his machine at the Wilbur Wright Field. They always differed as to speed by about 10 miles. The McCook Field test was always about 10 miles faster than the Wilbur Wright Field test.

The CHAIRMAN. We have a record of a test made on the Wilbur Wright Field.

Col. ARNOLD. Yes.

The CHAIRMAN. Now, about what was the date of that?

Col. ARNOLD. About May 9.

Senator NEW. Col. Arnold, have you had any reports from Gen. Pershing as to the efficiency of the De Haviland four machines delivered to him?

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Col. ARNOLD. A cablegram came back about it, sir.

Senator NEW. What was the nature of that cablegram?

Col. ARNOLD. It had about three or four pages of criticism of structural defects of the machines. Most of them were minor ones that we knew about. We knew most of them before the machines were sent over.

Senator NEW. I would like to have that cablegram in the record.

(Informal discussion followed.)

Senator NEW. I move, Mr. Chairman, that the chairman be requested to again request from the War Department a copy of the cablegram from Gen. Pershing, the date of which I do not definitely know, but in which there was enumerated a number of defects in the De Haviland 4 plane, and with it such other cables from the same source as have a direct bearing on this question.

Senator FRELINGHUYSEN. My position is this, that before this report is written the information concerning the airplanes that we have sent to Europe, which information has been cabled by Gen. Pershing, must be revealed to this committee, and if the War Department refuses to allow us to look at these cablegrams I feel that our report should so state. It should state that this information has been concealed from us, so that the country may know that the War Department has prevented us from being fully informed upon this subject. That is my position in this matter.

(Informal discussion followed.)

Senator REED (addressing the witness). Do you know when that cablegram came?

Col. ARNOLD. No.

Senator REED. Can you give the date approximately?

Col. ARNOLD. I should say the latter part of June.

Senator REED. I move to amend the motion of Senator New, and ask that it be made to read this way:

That the Secretary of War be requested to furnish the committee a copy of the cablegram sent by Gen. Pershing in the latter part of June or the early part of July, in which he pointed out the conditions and the performances of the De Haviland 4 machine.

Senator NEW. I will accept that.

The CHAIRMAN. Gentlemen, you have heard the motion.

Senator FRELINGHUYSEN. I move to amend that, and ask that the committee be allowed to see all of the cables relating to what Gen. Pershing has said relative to aviation.

[Informal discussion occurred.]

Senator FRELINGHUYSEN. I would like to ask whether these aviation cables are kept in separate files. Are they in bulk or are they pasted in a book?

Col. ARNOLD. We get approximately 30 cables a day relating to aviation and we send out approximately the same number.

[Informal discussion occurred.]

Senator FRELINGHUYSEN. I will withdraw my motion. I feel very deeply that this committee should make a searching investigation.

The CHAIRMAN. You have heard the motion of Senator Reed.

[The motion was agreed to.]

Senator NEW. Is it not true that the general tenor of the cable received from Gen. Pershing on or about the 28th of June—you know

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the cablegram to which I refer—was that the De Haviland machine as delivered to him was not satisfactory?

Col. ARNOLD. Before I answer that question I will say that if you take the mere fact that he sent the cablegrams in which he criticized the construction of the machine as being an indication that it was not satisfactory, I answer your question yes; it was not satisfactory.

The CHAIRMAN. Let me ask you if you feel any reluctance about answering these questions because of your position as a military officer under the command of a higher official? In other words, is there anything in your official position which makes you feel reluctant about answering?

Col. ARNOLD. It makes me hesitate.

Senator NEW. I wish to say that I do not want to embarrass you. I do not want to ask you a question which it embarrasses you to answer.

Col. ARNOLD. I personally would prefer that you wait until you can see whether you get the cable. If you get the cable, that will answer your question.

Senator NEW. We have shipped no planes abroad other than De Haviland's, have we?

Col. ARNOLD. No, sir.

Senator NEW. It has been reported unofficially to this committee that the first De Haviland machine which was sent abroad, late in February, went abroad without any tests having been made of it. Do you know whether or not that is true?

Col. ARNOLD. I can not say for a fact whether it is true, but the probabilities are that it is true. That machine, I think, never reached France.

The CHAIRMAN. Never reached France?

Col. ARNOLD. No, sir; I think it was sunk by submarines.

The CHAIRMAN. That was the first machine forwarded?

Col. ARNOLD. I think so. As I remember it now, we got a telegram——

Senator NEW. Haven't shipments of De Haviland machines been held up since the Pershing cablegram was received?

Col. ARNOLD. No, sir.

Senator NEW. They are still being sent?

Col. ARNOLD. Yes, sir.

Senator NEW. Are they being more rigidly tested in this country than they were before that cablegram was received?

Col. ARNOLD. After aviation was separated from the Signal Corps, Gen. Kenly took it upon himself to prescribe that all machines should be given a flying test before they were shipped overseas.

Senator NEW. Tested by whom?

Col. ARNOLD. By Army aviators. This was not carried out, however. We could not get the pilots, in the first place. We could not get the factories to do it, so then we turned it over to one of our men and made him responsible for seeing that all received a flying test before they were packed for overseas shipment.

Senator NEW. Who is that officer?

Col. ARNOLD. Col. Bane.

Senator NEW. Now, I want to take up another subject.

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The CHAIRMAN. Is this other subject one relative to De Haviland planes?

Senator NEW. Not at all.

Senator FRELINGHUYSEN. You spoke of the defects in the De Haviland 4 being the loosening of the cloth owing to imperfect construction?

Col. ARNOLD. Yes.

Senator FRELINGHUYSEN. And imperfect workmanship?

Col. ARNOLD. Yes, sir.

Senator FRELINGHUYSEN. Have you had any similar experience with any of the training planes?

Col. ARNOLD. No, sir.

Senator FRELINGHUYSEN. The training planes manufactured by Curtiss did not develop this defect, did they?

Col. ARNOLD. No, sir.

Senator FRELINGHUYSEN. Did the training planes manufactured by the Fisher Body Corporation?

Col. ARNOLD. No, sir.

Senator FRELINGHUYSEN. By the Dayton Wright Co.?

Col. ARNOLD. No, sir.

Senator FRELINGHUYSEN. By the Standard Airplane Co.?

Col. ARNOLD. No, sir.

Senator FRELINGHUYSEN. Do you believe that if those factories were under Government control these defects would occur?

Col. ARNOLD. Yes, sir.

Senator FRELINGHUYSEN. Why?

Col. ARNOLD. It is not the fault of workmanship; it is the fault of design. If you do not tell them the proper way to put on the cloth, naturally they put it on wrong.

Senator FRELINGHUYSEN. Who was responsible for the imperfections in design?

Col. ARNOLD. I can not answer that question, sir. As I testified before, I talked to Col. Semple, who is the latest arrival on this side. He has the latest information from the other side. He tells me that instead of putting the cloth on perpendicularly to the leading edge they put it on diagonally to the leading edge. They dope it in an entirely different way and they fasten it to the ribs in an entirely different way.

Senator FRELINGHUYSEN. Has that defect been remedied in any particular?

Col. ARNOLD. So far as I know, no, sir. The production people state that the original De Haviland 4 machine that they received from England had the cloth put on in exactly the same way that they are putting it on now. In any event, it is not satisfactory.

Senator FRELINGHUYSEN. Then there is a conflict of opinion between the Department of Military Aeronautics and the Aircraft Production Division on this question?

Col. ARNOLD. I do not think there is any conflict of opinion. I think that they agree as to that.

Senator FRELINGHUYSEN. Why were these defects not remedied?

Col. ARNOLD. I can not answer that question, sir.

Senator FRELINGHUYSEN. Is the De Haviland 4, as designed in this country, a proper design for the Liberty engine, in your opinion?

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Col. ARNOLD. I think it makes a very good machine, providing they do not put what we call too many Christmas-tree ornaments on it. As a design for a day bomber, it is an excellent machine, but unfortunately it is the only machine that is being produced, so that we have to use it for a day bomber, an observation machine, and a two-seater fighter. It is not suitable for a two-seater fighter, because it is not handy in the air. As a day bomber it is not entirely satisfactory, due to the short radius of action and the low ceiling; and the same objection applies with regard to its use as an observation machine. But it is a fairly good machine with certain structural modifications.

Senator FRELINGHUYSEN. Then, we have had a mistaken policy in not constructing engines of other types suitable for fast flying machines, relying entirely on the Liberty engine; is that true?

Col. ARNOLD. I think that is true; yes, sir.

The CHAIRMAN. Did you, as one of the members of the Signal Corps, acting for the Signal Corps, make any effort to get from the Production Board any records as to the speed of the Bristol machine at any time?

Col. ARNOLD. We saw the first Bristol flight, some time between the latter part of February and the first week of March. I think it was about March 5. Beginning that day we tried to get the performance of that machine. We wanted to know what we could expect from it.

The CHAIRMAN. With what success?

Col. ARNOLD. We never did have a complete military test of that machine.

The CHAIRMAN. From whom did you try to get this record?

Col. ARNOLD. From the Equipment Division.

The CHAIRMAN. Who was at the head of it at that time?

Col. ARNOLD. I think Col. Montgomery was for a while, and then Mr. Potter.

The CHAIRMAN. You were going to turn to the record, I believe.

Col. ARNOLD. Yes. My records show here that the first actual flying test we had of the Bristol was about May 9, on which date we got a speed test for the Bristol.

The CHAIRMAN. Was that date the first time that you were able to get this test?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. When you did get it Mr. Potter was in charge of production?

Col. ARNOLD. Yes, sir; Mr. Potter was in charge of production. That was with the Liberty engine in it.

The CHAIRMAN. Were those records furnished to the Army and Navy joint board?

Col. ARNOLD. They were never completed.

The CHAIRMAN. To the extent that they were completed, were they furnished to the Army and Navy joint board?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Now, upon what basis were those records made? You say that they were not complete.

Col. ARNOLD. The tests were not complete. In other words, these were just tests made by the production people. They took a speed test. The climbing test was never completed and the endurance test

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was never completed. The real reason was that the cloth failed on the Bristol and it was demolished.

The CHAIRMAN. Who made the records originally?

Col. ARNOLD. Col. Bayne was at Dayton, but Col. Hall was conducting the tests.

The CHAIRMAN. Did you get records made by Mueller, the engineer of the Curtiss plant?

Col. ARNOLD. He gave us a different kind of record. The joint board wanted to pass on the suitability of the Bristol machine with the Liberty engine in it. They requested the production division to furnish a stress analysis and estimated performances. After waiting for several weeks we got a report, submitted by the chief engineer of the Curtiss Co., Mr. Mueller, without any notation of the production engineers, as to whether they approved or disapproved or anything else. We sent it back to the production people, asking what their engineers thought about it.

The CHAIRMAN. Did you get any reply?

Col. ARNOLD. No, sir; we have not got any reply.

The CHAIRMAN. You have no reply? Were those records which Mueller furnished you from actual flying tests or were they his estimates?

Col. ARNOLD. Estimates, sir.

The CHAIRMAN. Were they submitted, or were any of the records submitted, to Col. Vincent?

Col. ARNOLD. I think that Col. Vincent got them from Mueller and furnished them to us.

The CHAIRMAN. They went through Vincent to you?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Is he what is called an aeronautical engineer?

Col. ARNOLD. No, sir; he is not; he is a mechanical engineer.

The CHAIRMAN. He is in charge of the McCook field?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. And has been since Clark left?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. A very recent and additional test was made of the Bristol, was there not?

Col. ARNOLD. We had the Bristol, with a 300 Hispano turned over to us out at McCook Field. Realizing that it was not altogether satisfactory with the Liberty engine in it, we wanted to see if we could use it with the 300-horsepower Hispano. We had some tests made of it. The McCook Field people made the first test and then we made a test.

The CHAIRMAN. When did they make their test?

Col. ARNOLD. About May 22. Then it was turned over to us for test about July 1.

The CHAIRMAN. Have you tested it?

Col. ARNOLD. Yes, sir. We tested it at the Wilbur Wright Field.

The CHAIRMAN. What was the result of the test with the Hispano Suize?

Col. ARNOLD (reading):

Weight empty	pounds	1,842
Military load	do	1,068
Gross	do	2,910
Crew	do	360
Armament	do	364

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Fuel and oil	pounds	344
Climb in 11 minutes	feet	10,000
Climb in 21 minutes	do	15,000
Speed at ground	M/H	114.7
Speed at 6,000 feet	do	112.5
Speed at 10,000 feet	do	103.9
Ceiling (theoretical)	feet	21,000

The CHAIRMAN. What was the test at McCook Field?

Col. ARNOLD (reading):

Weight, empty	pounds	1,667
Military load	do	534
Gross	do	2,201
Crew	do	365
Armament	do	169
Fuel and oil	do	338
Climb in 10.41 minutes	feet	10,000
Climb in 19.41 minutes	do	15,000
Speed at ground		
Speed at 6,000 feet	miles per hour	126.5
Speed at 10,000 feet	do	122
Ceiling (theoretical)	feet	24,000

The CHAIRMAN. You tested it with a military load?

Col. ARNOLD. Yes, sir. They also claim they tested it with a military load.

The CHAIRMAN. With the usual difference that seemed to develop?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. What was the result of the test with regard to the Hispano-Suiza 300-horsepower engine?

Col. ARNOLD. We are not satisfied.

Senator FRELINGHUYSEN. What are you going to do about it?

Col. ARNOLD. That is not up to us. We tell them what we want.

The CHAIRMAN. In other words, you determine upon what must be produced by the Production Board to satisfy the needs of the Bureau of Aeronautics?

Col. ARNOLD. Yes; for the people on the front.

The CHAIRMAN. And then the production of the things which you have ordered or tested and which you want is up to the production side of the activities?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Does that result in misunderstanding or friction?

Col. ARNOLD. Well, we are not getting anywhere. There is no friction.

The CHAIRMAN. I used the wrong word.

Col. ARNOLD. They are perfectly willing to do everything that Gen. Kenly asks for.

The CHAIRMAN. But you say you are not getting machines.

Col. ARNOLD. Yes, sir.

The CHAIRMAN. To what do you attribute that, notwithstanding the harmony of understanding. To what do you attribute the fact that you are not getting satisfactory results?

Col. ARNOLD. My answer is the simple statement that you do not have a bricklayer make you a suit of clothes.

The CHAIRMAN. In other words, some of them are not fit for the work?

Col. ARNOLD. That is my personal opinion.

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The CHAIRMAN. Some of those who have upon their shoulders the burden of production are not fitted for the task?

Col. ARNOLD. A ball-bearing expert can not cure a radiator problem; a salesman can not put guns on an airplane in the proper places; an automobile engineer can not design aeroplanes.

The CHAIRMAN. Do you mean an airplane or an engine?

Col. ARNOLD. He can not design airplanes. That is the condition that exists.

The CHAIRMAN. Are automobile engineers in the production division of aviation engaged in the attempted production of aeroplanes?

Col. ARNOLD. Col. Vincent is in charge of all production.

The CHAIRMAN. Does he attempt to design airplanes?

Col. ARNOLD. He passes on them.

The CHAIRMAN. The engine builder not only passes on engines but also on planes?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Is McCook Field the testing or experimental station for all engines and airplanes used or to be used in the Aviation Service of the United States?

Col. ARNOLD. As I understand it, all machines, before they are put into production, are sent to McCook Field to have the drawings checked up and to be given certain production tests and passed upon by the engineers at that place.

The CHAIRMAN. Does that statement apply as well to planes as to engines?

Col. ARNOLD. Yes, sir; it does.

The CHAIRMAN. Is the decision of the authorities in charge of McCook Field, either as to adoption or rejection, final?

Col. ARNOLD. No, sir; because after they start in production they have to produce a machine which is satisfactory to Gen. Kenly.

The CHAIRMAN. Is the initial step of production dependent upon the final say of those in authority at McCook Field?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. So that you can not start production until they have determined that you shall?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Then, matters are still subject to this condition, that what is produced shall be satisfactory to the Bureau of Aeronautics?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Do you consider that condition beneficial or otherwise to the aviation program?

Col. ARNOLD. I do not think it is. I think it is detrimental to the progress of the aviation program.

The CHAIRMAN. Who was responsible for that condition of affairs?

Col. ARNOLD. I can not answer that question.

The CHAIRMAN. Who inaugurated the system?

Col. ARNOLD. It was started when the equipment division was run by Col. Deeds and Col. Montgomery.

The CHAIRMAN. Do you know whether or not the objectionable conditions there have been called to the attention of the present administrator of production?

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Col. ARNOLD. I do not know.

The CHAIRMAN. Do you know of any instances in which the Bureau of Aeronautics have requested changes in or additions of any sort to the machines or motors; if so, please state what they are and whether these requests have been complied with.

Col. ARNOLD. Some time in the early part of June a request was submitted to the director of aircraft production that two steel braces be placed on the stabilizers of the DH-4 in order to strengthen the stabilizers.

A couple of weeks later we noticed that the machines that were coming in or that were coming out of production did not have braces upon them; and upon a further request for information from the Bureau of Aircraft Production the Director of Military Aeronautics was notified that the braces for the machines which were not fitted with them had been shipped separately to Europe, so that they could be put on after the machines arrived on the other side. So far as I know, those braces have not yet been placed on any machine that has been produced.

The CHAIRMAN. Do you consider that method a compliance with the requirements of the Bureau of Aeronautics?

Col. ARNOLD. No, sir; we do not.

The CHAIRMAN. Why?

Col. ARNOLD. Because we believe that all those braces should be fitted on the machine in the factory.

The CHAIRMAN. And tested out?

Col. ARNOLD. And the machine should be flown with them on.

The CHAIRMAN. What reply have you made to the information you have received from the production board regarding the manner in which they have attempted to comply with your request?

Col. ARNOLD. We have asked them again to see that the braces are placed on the machines.

The CHAIRMAN. How long ago was that?

Col. ARNOLD. Some time in the middle of June.

The CHAIRMAN. Do you know whether or not it is being done?

Col. ARNOLD. I have seen later De Havilands, but the last time I investigated it was not being done.

The CHAIRMAN. That was how long ago?

Col. ARNOLD. Some time toward the latter part of June or the first part of July.

Senator FRELINGHUYSEN. Are there any experienced men in this country to-day who could improve this situation in the production of aircraft?

Col. ARNOLD. The situation would be improved if you had one man at the head of all aviation.

The CHAIRMAN. You mean at the head of what?

Col. ARNOLD. Of all aviation.

The CHAIRMAN. Including the military and production side?

Col. ARNOLD. Yes; so that when the man in charge of operation told or asked the production department to do a certain thing to improve performance the man sitting at the top would say, "Do it," and if he did not do it he would be kicked out. As it stands now the man in charge tells his subordinates to do this thing; then subordinate No. 1 tells subordinate No. 2, and subordinate No. 2 tells sub-

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ordinate No. 3, and so on; and by the time you get to the factory the whole thing is lost, because the man who produces the machine does not have to fly in it. It is immaterial to him whether the changes are made. He does not have to fly the machine.

Senator FRELINGHUYSEN. There is a conflict of authority?

Col. ARNOLD. No. There is a lack of authority. There is no authority.

Senator FRELINGHUYSEN. There is no coordination, in other words?

Col. ARNOLD. No, sir.

Senator NEW. Col. Arnold, I note in the newspaper reports of yesterday, the day before, and also of this morning that six planes in an American bombing expedition that had set out were compelled to come down inside of the German lines, and were therefore captured. Have you any knowledge of the type of plane that was used in that raid?

Col. ARNOLD. No, sir; I have not. We have not gotten the report from the other side yet.

Senator NEW. No report has as yet been received?

Col. ARNOLD. No, sir.

Senator NEW. I asked that question for the reason that the capture of the entire outfit would appear to indicate that the machines were compelled to land through some common defect.

Col. ARNOLD. They were forced to land, through a lack of gas.

Senator NEW. Well, that might in itself be a defect. It might show that the machines consumed a great amount of gasoline; that the consumption of gasoline was so great that they could not, with safety, be sent upon a bombing expedition to a point at all remote. What I am trying to get at, and what I would like to know, is, if some common defect in the type of machine is responsible for the loss of a whole expedition. If so, I think that it is time the type should be changed.

Col. ARNOLD. The reports would indicate that a squadron of about 18 machines went over to do this bombing, and when they got through and started back toward their own lines they ran into a very strong head wind. Six of the machines, due to the small amount of gasoline they carried, were not able to get back and had to land; the other 12 machines got back.

The CHAIRMAN. Did they do any damage?

Col. ARNOLD. We never know what damage they do.

The CHAIRMAN. My question was perhaps clumsily worded. Were they captured before they reached their objective?

Col. ARNOLD. No, sir; they were on the way back. Our over-seas forces, our early forces, are equipped practically with whatever they can get. For instance, the A R 2 has not been used on the front lately to a great extent, but we have used it only because it is the only one we can get.

Senator FRELINGHUYSEN. What kind of machine is that?

Col. ARNOLD. It is a French machine.

Senator NEW. Is it obsolete?

Col. ARNOLD. It is not obsolete, but it is last year's machine.

Senator NEW. It has become a second-class machine?

Col. ARNOLD. Yes; it has become a second-class machine. We are absolutely using everything that we can get our hands on that will fly.

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Senator NEW. Changing the subject completely and entering another field, from a private source I have a report that at Kelly field there are a great many planes that have been received there in boxes and that have not been unpacked for the reason that they are not satisfactory. Do you know anything about that?

Col. ARNOLD. The total number of airplanes at Kelly field, of all kinds, is 170. Out of that number they have 85 in actual flying commission; they have 65 out of commission.

The CHAIRMAN. Just about 50 per cent.

Col. ARNOLD. Sixty-five out of commission due to a lack of parts undergoing repairs and things of that kind. In answer to your question I should say—I think I know what you refer to, but I am not sure—when we first started out training a year ago, we were told by the production people that we had to meet a program of about 20,000 airplanes for this coming June. That was a big problem.

The CHAIRMAN. It has since been discovered to have been a big problem?

Col. ARNOLD. Yes. From our own side we were interested in this production. We had confidence in their ability to do it, but we discovered afterwards that they did not know what they were talking about. We had to train for that bunch a large number of aviators, so we accepted anything that would fly successfully, for training purposes. Therefore, we had this Standard airplane built, knowing when we bought it that it was only a makeshift until we could get sufficient Curtiss J N 4's to supply all the schools. We only ordered 1,600 Standards. We ordered something like 3,000 Curtisses. The Standard was a better manufacturing proposition and they could get quicker deliveries until the Curtiss people got going, and then they could get more J N 4's. So we got, I believe, 1,600 Standards delivered, as I remember now, some time in February. Then we started in with the Curtiss J N's. They began to come through, and as it is a better machine, we immediately began replacing the Standards with the Curtiss until along in June, due to the particular engine in the Standard machine catching fire so readily in hot weather. Gen. Kenly took it upon himself to absolutely throw out all the Standard machines until such time as they can be redesigned so that they can be successfully used in the training schools. So that at the present time we must have about 1,000 Standard airplanes stored at various places in Texas waiting until we can get technical men to work on the problem and to fix that machine and put in a Curtiss engine to make it satisfactory.

The CHAIRMAN. What engine were you using?

Col. ARNOLD. The Hall-Scott engine.

The CHAIRMAN. It is due to the fact that the Hall-Scott engine is not a proper engine for training?

Col. ARNOLD. It is.

Senator NEW. These are machines that have been used, but have since been replaced by what is regarded as a more satisfactory machine?

Col. ARNOLD. Yes, sir.

Senator NEW. And will remain out of commission until such time as they are redesigned?

Col. ARNOLD. Yes, sir.

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Senator FRELINGHUYSEN. I would like to know why the Standard training machine is not suitable for training purposes. Is it the engine or the plane?

Col. ARNOLD. It is both. The engine in hot weather is liable to catch on fire at any time. All our burnings in the air, with the exception of one, have been caused by the Hall-Scott engine.

Senator FRELINGHUYSEN. And you have discarded it?

Col. ARNOLD. As soon as the hot weather came there were accidents. We had two in one week, showing that the weather had a great deal of influence on it. So Gen. Kenly said that we would not use any more of them.

Senator NEW. I suppose in those accidents the aviators were killed?

Col. ARNOLD. They did not have any chance at all. The machine just burned in the air before the aviator hit the ground.

Senator FRELINGHUYSEN. The man who designed that engine is now an officer in the Aviation Service in charge of inspection of airplanes at Buffalo and Dayton—Col. Hall; isn't that true?

Col. ARNOLD. I am not sure that he, individually, designed the engine. There are three or four Hall brothers. I do not know which one designed the engine. Of course, it is all a copy of the German Mercedes.

Senator FRELINGHUYSEN. Is the Hall-Scott engine now being manufactured?

Col. ARNOLD. As far as I know it is not.

Senator FRELINGHUYSEN. Was Col. Hall interested in the company that manufactured this Hall-Scott engine?

Col. ARNOLD. I imagine that he must be, because the Hall-Scott Co. is made up of the Hall brothers.

Senator NEW. I also have a report here of another incident about which I would like to inquire. I am told by an officer that 300 flyers were recently sent from the Waco Field to Hoboken and kept there a while. They were not ready for over-seas service because of a lack of sufficient training. The statement was made in the newspapers at the time that they were there for over-seas service. It was said that some time later 25 of them were sent across and the other 275 were sent back to Waco. Do you know anything about that?

Col. ARNOLD. That is correct, but the reasons are not correct.

Senator NEW. The reasons are not correct?

Col. ARNOLD. No, sir.

Senator NEW. What are the reasons?

Col. ARNOLD. Gen. Pershing said he wanted 300 R. M. A.'s, and they were sent to Hoboken. Then he changed his request and said he only wanted 25, so we sent the 25 overseas and the rest were sent back to Texas.

Senator FRELINGHUYSEN. What are R. M. A.'s?

Col. ARNOLD. Reserve military aviators. We can not tell the public everything like that.

Senator NEW. That is the report that has come to me, and I wanted to know about it.

Col. ARNOLD. Yes. Our actions are usually misunderstood.

(Thereupon, at 1 o'clock p. m., the committee took a recess until 2 o'clock p. m.)

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AFTER RECESS.

STATEMENT OF COL. H. H. ARNOLD—Resumed.

The CHAIRMAN. Col. Arnold, your department furnished me with a record of the accidents upon our aviation fields up to the date thereof, assigning the causes and giving results to aviators. Has the Bureau of Aeronautics made any investigation as to these causes, and if so please state what and the extent to which your investigations have gone.

Col. ARNOLD. Our department has made very careful study of accidents, with a view of determining whether they were caused by the type of machine, the condition of the student, the degree of training of the student, the method of instruction, or any other one or more causes which might be determined. The idea was to eliminate as far as possible any causes which might add to the number of accidents which seemed almost unavoidable. The first thought that occurred was that probably the mental condition of the student had something to do with it, so trainers were obtained and put on duty at each school to watch the physical and mental condition of each student and report whether or not he should be allowed to fly on any particular day. Then, it was believed that it might possibly be the fault of the instruction, so special inspectors' schools were established so as to have a uniform method of instruction at all our schools. A study was made of curves, comparing the number of accidents on the different types of machines with the number of airplanes in use, the number of cadets flying, and the number of hours in the air for each type of machine. Another study was made showing the hours of the day at which accidents occurred. While a great deal of information has been obtained from these studies, the accidents occur practically in the same proportion as they did before the remedies were sought. At the present time we average in all training one fatality for about every 2,900 hours flown. While it is not possible to obtain the exact English and French figures on the subject, unofficial figures furnished show that the English have one fatality in their flying schools for every 1,000 hours flown.

The CHAIRMAN. That does not include fatalities on the front?

Col. ARNOLD. No, sir. The French in their training schools have fatalities for every fifteen hundred hours flown.

Senator NEW. In those cases the hours flown refer to training hours only.

Col. ARNOLD. They refer to training hours only; yes, sir.

Senator NEW. Not to hours flown in any other kind of flight?

Col. ARNOLD. These figures as given are comparisons of hours flown by the students performing the same operations at the schools in France, England, and the United States.

Senator NEW. So that the comparison is made exact?

Col. ARNOLD. Yes, sir. Steps are being taken now to obtain official confirmation of those figures. It is rather hard to get them.

Senator NEW. In other words, the accidents to the French are twice as many as ours?

Col. ARNOLD. Yes, sir.

Senator NEW. And the English three times as many?

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Col. ARNOLD. Yes. It is rather difficult to obtain these figures, for naturally the French and the English both do not desire to publish the number of casualties during training. We have, however, as a basis of comparison, the result of fatalities of the Royal Flying Corps during their winter training at Fort Worth, which may be taken as a basis on which to figure the other fatalities in the English service. This information consists of actual figures taken from the records of the training schools in Texas and show that during the winter the Royal Flying Corps, while training our cadets, averaged 1 fatality for every 757 hours flown.

The CHAIRMAN. Have you any other data which is used as a basis for your calculation of a casualty for ever 1,000 hours of flying on the part of the British?

Col. ARNOLD. The statement that the British averaged 1 fatality for every 1,000 hours during training is based upon semiofficial information received by actual observers who served with the English during training. The French information was received in the same way.

The CHAIRMAN. Have you made any comparison as to the casualties occurring in the use of different types of training machines?

Col. ARNOLD. Yes, sir. We have made a study to determine whether or not, for instance, there were more accidents in the Curtiss during training than there were in the Standard, taking into consideration the number of machines used, the number of cadets flying, and the number of hours in the air. The results are slightly in favor of the Standard. However, due to the fact that we have had several cases of cadets burning to death in the air in the Standard type of machine and many very serious crashes in the Standard which did not result fatally, due to the sturdiness of construction of the Standard machine, it was believed by the director of military aeronautics that of the two machines the Curtiss was the most satisfactory.

The CHAIRMAN. Can you state the proportion of collisions to other classes of accidents?

Col. ARNOLD. Our records show a total of 152 fatalities between July 1, 1917, and July 1, 1918. Of this number 86 were caused by so-called stalls. By stalling is meant that the airplane loses its flying speed through one cause or another, usually caused, however, by the pilot making a mistake in the air. In all cases in a stall when the airplane loses its flying speed it either drops into a straight nose dive or turns into a tail spin. In case the airplane is up over 1,000 feet the pilot usually gets out of the spin or the dive before he hits the ground. In the case of experienced pilots, they can get out of these nose dives or tail spins at 500 feet, but under that height it nearly always results in a complete crash of the machine and the death of the pilot or capture. Collisions caused 30 deaths. Side slips caused 10 deaths. The other accidents were divided among many causes, no one of which predominated over the others.

The CHAIRMAN. What is the occasion of this relatively large number of collisions?

Col. ARNOLD. The records show that there were more collisions at Park field, Millington, than at any other place. I went to Park field a short time ago just to look over the field and find out, if I could, why they were having so many collisions. It appeared that

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the commanding officer had taken every reasonable precaution against collisions. He had prescribed rules of the air which, if followed by the pilots, would have eliminated collisions. Even that did not stop collisions, however, and he went so far as to keep all machines on the ground except two. He started them out at opposite ends of the field and told them both to go around in the same direction and to fly at different altitudes, and these two men, being the only two in the air, he thought could not possibly collide, and yet they did so and both of them were killed. If the pilots will not look around to see where they are going and to see if there are other machines in the way they will collide, just the same way that automobiles collide on the street. You can not make a man think. You can give him instructions, but you can not make him carry them out.

The CHAIRMAN. You think that a principal factor is the thoughtlessness or inattention of the pupil?

Col. ARNOLD. I am positive that it is, because the old pilots never get into collisions. I know of no case on record in our country where an old pilot has been in a collision.

The CHAIRMAN. Are the students in all the fields given explicit instructions regarding the method of procedure in the air and warning as to the dangers of collision?

Col. ARNOLD. Yes, sir; they are given special rules of the air and made to memorize them and understand them thoroughly before they are allowed to go into the air.

The CHAIRMAN. What have you ascertained with regard to the existence of inherent defects in machines causing accidents, either as to a poor quality of material or poor workmanship upon the same?

Col. ARNOLD. Our records show only three accidents caused by machines collapsing in the air. One of these accidents happened at Fort Sill and killed two out of three men. In this case it was believed by everyone who saw it that the machine must have been hit by an artillery shell, for the machine was observing artillery practice at the time and no other cause could be given which would account for this accident. In the other case, the probabilities are that there was a weak spot in the machine which caused it to collapse in the air. The proportion, however, of collapses in the air is very small considering the fact that we are now flying approximately 3,000 hours per day and have approximately 2,400 machines flying every day.

The CHAIRMAN. Is the tendency toward increase or decrease in the number of accidents?

Col. ARNOLD. The number has markedly decreased, as shown by our records last winter at Fort Worth. They had one fatality for every 757 hours. We took over the school in April and since that time have averaged one fatality for every 2,600 hours.

Senator NEW. Since you took it over from the English?

Col. ARNOLD. Yes, sir.

The CHAIRMAN. Colonel, what is your method of inspection of training machines at your training camps? How efficient is it, in other words?

Col. ARNOLD. A new machine arrives on the field and is set up, inspected, and flown by the engineer officer whenever possible. In case the engineer officer does not fly he has an old pilot fly the machine for him to see that it is set up properly and properly adjusted.

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After the initial flight and the final adjustments the machine is turned over to a working crew. The crew chief inspects the machine before and after each flight.

The CHAIRMAN. He is an officer, is he not?

Col. ARNOLD. No; he is a noncommissioned officer. The pilot is required to inspect the machine before each flight so that there are two inspections made of every machine before any flight.

The CHAIRMAN. How complete are your facilities for repair?

Col. ARNOLD. Every field is equipped so that if necessary it can entirely rebuild any machine.

The CHAIRMAN. What is the quality of your workmen?

Col. ARNOLD. Our workmen have improved materially in the last few months. Naturally, when we expanded so rapidly to start with we had poor workmen, but special emphasis had been put on their training so that now they are all doing exceptional work.

The CHAIRMAN. Is the material tested thoroughly which is used for repairing machines?

Col. ARNOLD. It is inspected very thoroughly before it is ever put into the machines.

The CHAIRMAN. The facilities for repairing and the quality of the material are both constantly improving?

Col. ARNOLD. Yes, sir; they are.

Senator NEW. I understand that Maj. Jones and Col. Bane have been sent away under orders. When will they be back? When do you expect that they will return?

Col. ARNOLD. They should be back by to-morrow night. The object of their trip was to make a final inspection of the Bristol to determine just what shall be done with it. The Production Division has not determined just what to do with the machine. They have tried the Liberty engine and the Hispano-Suiza engine in the machine, neither of which has made an entirely successful machine from the operating point of view, so that it looks very much as if the Bristol will not be put into production at all.

Senator NEW. Then, if not, it means that there has been a very great loss of time and a very considerable loss of money by the experimentation upon the Bristol machine up to this time, does it not?

Col. ARNOLD. Yes, sir. Col. Clark designed the Bristol to take the Liberty engine. His figures called for a total weight, including our military load, of about 2,900 pounds, I believe. When the machine was constructed and turned out ready to fly it weighed 3,600 pounds, 700 pounds more than it was designed to carry. No other model has been made in the Bristol since.

Senator FRELINGHUYSEN. Was that increased weight due to radiation?

Col. ARNOLD. The increased weight was due to changes made in the Curtiss factory by various people without consulting Col. Clark.

The CHAIRMAN. About what time was Col. Clark's design of the Bristol turned over to the manufacturers?

Col. ARNOLD. I do not know exactly, but about the 1st of November. Col. Clark turned over to the Curtiss Co. about 860 drawings of the Bristol.

In regard to this diagram, showing that the majority of fatalities occur about 3 o'clock in the afternoon, I wish to state that as soon

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as we got that curve fixed up and found out that the majority of casualties occurred about 3 o'clock in the afternoon, Gen. Kenly said, "We will cut out flying at 3 o'clock," and so he has stopped all flying between the hours of 11 a. m. and 3 p. m.

The CHAIRMAN. Colonel, we are very much obliged to you for this information.

WAR DEPARTMENT,
DIRECTOR OF MILITARY AERONAUTICS,
Washington, July 20, 1918.

MY DEAR SENATOR THOMAS: In reply to your letter of July 15, there is attached herewith copy of the cablegrams which led to the cancellation of the Spad contract with the Curtiss Co.

Very sincerely,

H. H. ARNOLD,
Colonel, Signal Corps,
Assistant Director of Military Aeronautics.

HON. CHARLES S. THOMAS,
United States Senate, Washington, D. C.

[Outgoing.]

Our 359, paragraph 7, dated November 3, 1917:

"For Bolling: We have contract with Wright-Martin Company for five hundred 150-H. P. Hispanos and thirty-five hundred 220-H. P. geared Hispanos. We have practically decided to increase the order for 150 H. P. engines to one thousand to be used for our advanced training program and order three thousand 300-H. P. Hispanos, drawings of which are here. Mr. Chapuis is here also. We can get production on 300 H. P. practically as soon as on the 220 geared. The tool work has not progressed so far as to make change impossible. We understand from Mr. Chapuis that the 300 H. P. has passed the fifty-hour test. Please cable your recommendation at once."

[Incoming.]

State Department cable 2775, paragraph 3, dated November 20, 1917:

"Your three fifty-nine, paragarph seven. Your programme, Hispano engines, build no two-twenty Hispano for use here which can not be delivered here by June first next year, except such as you desire for United States needs. Probable that two-twenty Hispano will be followed by five hundred. Reference, three hundred Hispano. This engine will require change in airplane. No fully satisfactory airplane yet designed this country, therefore think quantity deliveries here could not be made before June first, after which time more than three hundred horsepower will be necessary."

[Outgoing.]

Our 461, paragraph 1, dated November 30, 1917:

"For Bolling: Reference your 2775, State 273, paragraph 3: Curtiss Company have completed drawings and ordered material for Spad for 220-H. P. geared Hispano. We have canceled that order. Tulasne suggests possibility of helping the French program by building Spad planes here to be equipped with 220-H. P. geared Hispano engines built in France. We could get production in February without materially affecting output of two-place fighters. We are not urging this because of the fact that we have ordered material which can be utilized in other machines, but if it would help your program, here is a quick source for these machines."

[Incoming.]

Dated December 14, 1917.

* * * * * * *

With reference to paragraph 1, your cablegram 461, do not recommend unionized production Spad airplanes for France. No such request received from French here. Believe they can produce all these airplanes they need. Think our whole efforts should be applied airplanes and engines already on our program. United States should leave production single-place fighter to Europe.

PERSHING.

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STATEMENT OF LIEUT. COL. V. E. CLARK.

Senator NEW. Please state your name and rank.

Col. CLARK. Lieut. Col. V. E. Clark, of the Air Service.

Senator NEW. What is your relation to the Aviation Service?

Col. CLARK. At the present time, sir, I am on duty with the Technical Section in the office of the Director of Military Aeronautics.

Senator NEW. How long have you been in the service?

Col. CLARK. Fifteen years.

The CHAIRMAN. Whom do you mean by the Director of Military Aeronautics?

Col. CLARK. Gen. Kenly.

Senator NEW. Through what avenue did you go into the military service?

Col. CLARK. I am a graduate of the Naval Academy, sir, of the year 1907. Two and one-half years after graduation I transferred as a second lieutenant in the Coast Artillery, and in 1913 I was appointed in the Aviation Section.

Senator NEW. You are a military aviator?

Col. CLARK. Yes, sir.

Senator NEW. Not a junior aviator?

Col. CLARK. A military aviator.

Senator NEW. How long have you been flying?

Col. CLARK. Five years, sir.

Senator NEW. Have you had any particular education, training, or experience to fit you as an engineer for airplane designs; and if so, what?

Col. CLARK. Before I had an opportunity to start to learn to fly I studied the theory of airplane design and the principles of flight as much as I could out of such textbooks as there were at that time. When I started to learn to fly I attempted to analyze the flights I made and the flights that my associates made. In September, 1914, I was sent as the only Army officer attending a post graduate course in aeronautical engineering, both theory and practice, of airplane design, at the Massachusetts Institute of Technology, and immediately after that I was put in charge of the experimental and repair department of the Aviation Section, which was at San Diego; and since June, 1915, I have been the chief aeronautical engineer in the Army.

Senator NEW. Have you been on duty in Europe since we entered the war?

Col. CLARK. Yes, sir. I went to Europe——

Senator NEW. In what capacity and what were your services over there, please?

Col. CLARK. I was selected as the airplane engineer on a commission composed of three officers from the Army, two from the Navy, and two civilians. Col. Bolling, then Maj. Bolling, was the chief of the commission. We went to England, France, and Italy, and our duty was to attempt to negotiate with the foreign Governments regarding the production of certain airplanes in the United States and the production of certain airplanes in Europe for the use of our troops. In addition to that I was assigned the duty of getting all available data concerning the development of airplane design and

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construction and reporting it back to this country from Italy, France, and England.

Senator NEW. Did you make any report recommending any types of airplanes for production by the United States?

Col. CLARK. Yes, sir; I was instructed to do so. After I had been to all three countries and been through all factories I submitted a report by cable, which I confirmed later immediately upon my arrival back in the United States in September of last year.

Senator NEW. Were your recommendations carried out?

Col. CLARK. No, sir.

The CHAIRMAN. Have you a copy of that recommendation?

Col. CLARK. No, sir; that was in a number of memoranda which I turned over to Col. Deeds. I think Col. Waldon should have copies. I have not been able to find my retained copies. They should be on record in the War Department.

The CHAIRMAN. That was during the time that Col. Squier was in charge of the military branch?

Col. CLARK. Yes, sir.

Senator NEW. They were official recommendations, and as such should be on file at the War Department, I presume?

Col. CLARK. Yes, sir; they were turned over to Col. Deeds, who was my immediate chief.

Senator NEW. I suggest that copies of those recommendations be requested by the committee for its use, Mr. Chairman. You say your recommendations were not carried out. Do you know why not or have you any opinions as to why they were not?

Col. CLARK. I believe, sir, that it was something like this: I made my recommendations, and in the main they were accepted, and action was started in the way of placing tentative orders for the development of the various machines at the various factories. It so happened, through no intention on my part, that of the six types that I recommended three were British, two French, and one Italian. That happened without any intention to divide it among the nations on my part, but merely from judging what I took to be the relative merits of the airplanes.

The CHAIRMAN. That was a mere coincidence?

Col. CLARK. A mere coincidence; yes, sir.

Senator NEW. To get a variety of planes?

Col. CLARK. There were six military types distinct as regards military functions, and it so happened that three were British, two French, and one Italian. Probably a week or two after action had been started on my recommendation the French commission in this country, for instance, heard that action had been started and called on Col. Deeds and Gen. Squier. This is largely theory, because I have gotten it in roundabout ways; I was not present at any of the conferences, but I heard about it. The French commission would call on Gen. Squier and Col. Deeds and they would say, "We understand you have ordered three British types. We do not want to start any trouble, but we believe that the Breguet and the Spad and the Le Tord are superior to the corresponding machines that the British have, likewise the Italian commission, and so on." It is my opinion that the pressure that they brought to bear was suffi-

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cient to bring about more or less of a vacillation on the part of the authorities.

The CHAIRMAN. In other words, they complained that you were discriminating against the French and Italian in favor of the British machines?

Col. CLARK. I think they were quite sincere in their belief that the French were superior machines.

Senator NEW. Will you state what the six types of machines were which you recommended and the purposes for which each type was designed; that is, which were scout planes and which were pursuit planes and which bombing planes, et cetera?

Col. CLARK. For day bombing I recommended the D. H. 9, to take the Liberty 12-cylinder, direct-drive engine—redesigned accordingly. For observation work—that is, control of artillery fire and photography over tactical area, etc.—the so-called Corps or Army observation machine, I recommended the Bristol Fighter redesigned to take the Liberty engine. For a single-seater pursuit I recommended the Martinsyde to take the Liberty eight-cylinder engine. As a single-seater combat I recommended two types, both the Spad, one with 150-horsepower Gnome engine and the other with 180-horsepower Hispano-Suiza engine, and for night bombing I recommended the Caproni triplane.

The CHAIRMAN. Were those recommendations of yours made with the approval of Col. Bolling?

Col. CLARK. Yes, sir. In fact, they were made in a cablegram sent as a result of conferences that we held daily and nightly over in France. I was assigned the duty by Col. Bolling to decide on these various types, and he sent through my recommendations.

Senator NEW. Have we built any airplanes in this country for service at the front?

Col. CLARK. Yes, sir.

Senator NEW. What type or types?

Col. CLARK. The D. H. 4 is the only one I know of.

Senator NEW. Is that type successful, do you think?

Col. CLARK. No, sir; except in a very limited sense.

Senator NEW. Why? Just give us your ideas now of the reason why it is not.

Col. CLARK. The attributes in which it fails or the reasons for failing?

Senator NEW. Both the attributes in which it fails—and I would like to have your opinion as an expert and as a flyer of the D. H. 4, and if it has defects that disqualify it in any degree I would like to know just what they are. Tell us freely what you think of it.

Col. CLARK. In the first place, I think that for the military functions which it should perform in France the performances are not as good as they should be. It is barely good enough to cope with the situation as it stands to-day, and will certainly not be good enough in a few months to stand up and take its part evenly with the German machines. By performances I mean the ceiling and the high speed at high altitudes and the rate of climb. Then, the D. H. 4 is a machine that this year hardly fits in any place. It is not a bomber. It has not the proper compartments in the fuselage to carry the bombs and release them. It is not a fighter. Vision for the pilot

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is very poor, and the means of communication between the pilot and observer are very poor. Those two things are absolutely essential in a fighter. It is not a good observation machine for the same reason that it is not a good fighter.

The CHAIRMAN. You say it is not suited for observation. That is because the seats are too far apart?

Col. CLARK. That is one contributing factor; yes, sir. That covers the performance and the military attributes of the machine. In the matter of details, we have not a satisfactory radiator for it. In the first place, we found it very difficult to cool the Liberty engine in the De Haviland 4. The radiators we have built have been of rather poor workmanship. The machines which we have shipped abroad have been very unsatisfactory to them over there, aside from other reasons, on account of the poor inspection. The workmanship was poor. The ailerons and tail surfaces were fitted on very loosely. The exerciser cord that serves as a shock absorber for the landing gear was wound poorly.

Senator NEW. You say they have been unsatisfactory in the service over there. How do you know that?

Col. CLARK. I have seen two reports, one a cablegram from Col. Dodd, who was assigned the duty by Gen. Foulois of investigating the merits and demerits of the De Haviland 4 as we have sent it over, and another report I have seen from Capt. Hucks, of the British Royal Flying Corps, who was assigned the duty of testing the first De Haviland 4 with the Liberty engine which was flown in England. Both these reports indicate that the machine is very unsatisfactory as it is now built. You asked me to what I attribute the fact that the machines are more or less unsatisfactory?

Senator NEW. Yes.

Col. CLARK. I believe that in the case of the De Haviland 4 there are two primary contributing factors. One is that the engineers who were placed in charge of the redesign and development of the machine neither had any knowledge of the fundamentals of airplane design, either by education or experience, nor did they have any knowledge of what the military flyer actually doing service at the front needs—what his actual requirements of the machine are. I think that no man ought to be assigned to the developing of a service airplane unless he has had some dealings with fighters at the front. I mean that he ought to get that atmosphere. If they do not get the fighter's attitude, they will, for instance, be making fittings throughout the machine which are very easy to build, from the production standpoint, but which will be just a little bit heavier or offer more head resistance to the air. By the time you get through you will have practically ruined what was a good machine by loading it down and adding this resistance. For instance, in the case of the De Haviland 4. That was designed by Capt. De Haviland, who is a very highly educated aeronautical engineer, and he has had years of education and experience, and who—over there in England——

Senator NEW. He is an English officer?

Col. CLARK. He has been appointed an English officer. Before that he was first in the royal craft factory as an engineer and later with the Aircraft Co., which is the company which makes

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the De Haviland machines. Over in England now he is in a position to be constantly in touch with the flyers at the front. He interviews every man that comes back who is thoughtful about analyzing the conditions at the front. He uses that information in the development of his machines. The De Haviland 4 and all the De Haviland machines are a consequence of that man's labor along that direction. Not only that, but the De Haviland 4, as it was turned over to us, was a highly developed machine. The first De Haviland 4 built was very poor, like all other machines—the first experimental ones of new types. They found glaring faults, corrected those faults and built a sufficient number, until the machine had reached a high point of development through eliminating these faults. This machine—the acme of refinement—came over here and was turned over to men who have not the slightest education in aeronautical engineering and have not in the slightest degree the flyers' viewpoint.

Senator NEW. The De Haviland machine was sent over here for use as a model?

Col. CLARK. Yes, sir.

Senator NEW. To whom was it delivered?

Col. CLARK. To the Dayton-Wright Co. As an indication of the attitude of the people who have taken that machine and changed it from what it was, I cite the case of an officer who not only admits but boasts that he has made 3,600 changes in that machine after a man like De Haviland has developed it to the point where it was when it arrived over here.

Senator NEW. Who is that officer?

Col. CLARK. Maj. Hall. I believe he is a lieutenant colonel now.

Senator NEW. Of the Hall-Scott motor?

Col. CLARK. Yes, sir. The same man.

Senator NEW. Maj. Hall is the designer of motors, but has he had any experience as a designer of aircraft?

Col. CLARK. Absolutely none. Not only that, but he has never been in touch with flyers; certainly never with flyers who have been actually flying at the front.

Senator NEW. He has been permitted to make those changes in the De Haviland 4 machine?

Col. CLARK. Yes, sir. That is, I am not saying that he made them. He boasts that he has made them; that he has made 3,600 changes.

Senator NEW. Tell us, Colonel, what is the essential difference between the De Haviland 4 and the De Haviland 9.

Col. CLARK. The De Haviland 9 was redesigned by Capt. De Haviland, taking the De Haviland 4 as a working basis. It was designed to act as a day bomber. He did it by moving back the rear seat, called the gun-fighter's seat, about a foot and a half and then moving back the pilot's seat until it was directly in front of the rear seat and very close to it, giving direct communication between the two. Then he left a long space between the front man and the engine, long enough to permit not only the necessary fuel for the work but also to put in a bomb compartment. The wings are practically the same. The tail is practically the same. He has increased the wing surface slightly to take care of the additional load, but the layout of the machine is much the same as the De Haviland 4.

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Senator NEW. Your recommendation of the De Haviland was for the 9 model?

Col. CLARK. Yes, sir; not the 4.

Senator NEW. Colonel, classified according to military function, what types of aircraft should we build?

Col. CLARK. First, observation; second, single-seater pursuit; third, two-seater fighters; fourth, day bombers; fifth, night bombers, and, sixth, what might be called ground-harassment machines. I have never heard a standard name for it, but over there it is called the machine for groundwork.

The CHAIRMAN. Something like the Penguin?

Col. CLARK. No, sir. I mean a machine for coming down and raking the trenches and shooting up transports. This is all aside from training machines. Of course, we would have primary and advanced training machines.

Senator NEW. I made no references to training planes. I was asking solely about machines for direct military use. Have we a plane for army observation?

Col. CLARK. We are not building any; no, sir. There was an attempt to redesign one for that purpose, but it is not being built.

Senator NEW. What plane is that?

Col. CLARK. It is a redesigned Bristol fighter.

Senator NEW. Is it successful or otherwise?

Col. CLARK. I am told that it is very unsuccessful, although I have no direct knowledge of it.

Senator NEW. Was the original of that machine satisfactory or is our copy of the original not good?

Col. CLARK. The original was eminently satisfactory for that work, and I think it is considered not only in England but by the Frenchmen that the best machine from the standpoint of vision and all-round work of observation is the Bristol fighter.

Senator NEW. To what do you attribute that lack of success in reproducing the Bristol machine?

Col. CLARK. I think it is much the same there as in the case of the De Haviland 4 except I think that one additional factor has come in there. As I say, it is, first, lack of knowledge on the part of the engineers and the lack of appreciation of the flyer's viewpoint; and, second, I think that in the case of the Bristol fighter—I firmly believe that in the case of the Bristol fighter a large part of the failure is due to antipathy of the Curtiss Co. toward the Bristol design. I think this is due to the fact that they have a very deep-rooted belief that Curtiss designs are better than Bristol designs, and I believe that as long as they have that attitude they could not turn out the machine as it should have been turned out.

Senator NEW. That is a pretty serious reflection.

Col. CLARK. Yes, sir; but I believe that.

The CHAIRMAN. Has the weight of the Liberty motor, as compared with the weight of the Rolls-Royce as it was originally designed, anything to do with it?

Col. CLARK. The Liberty 12 is not an ideal engine for that machine to do that work, but I believe that had the design been up to average all the way through that a really satisfactory machine would have developed.

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The CHAIRMAN. You designed a Bristol of the English models, did you not?

Col. CLARK. Yes, sir; I started that design.

The CHAIRMAN. Did you complete it?

Col. CLARK. I completed it except for a few details that were not susceptible of completion at that time. I mean the addition of throttle, and so forth, controls, which would necessarily come after the first rough model had been built.

The CHAIRMAN. At whose direction did you do that?

Col. CLARK. Col. Deeds.

The CHAIRMAN. To whom did you deliver the plans of the design?

Col. CLARK. To the Curtiss Co.

The CHAIRMAN. Is that the original of their own plans for production?

Col. CLARK. That I do not know, sir. From the time that I delivered those drawings to them last November, I have never been allowed to keep in touch in the slightest way with the Curtiss factory.

The CHAIRMAN. You were never consulted?

Col. CLARK. Not in the slightest.

The CHAIRMAN. Neither by the authorities in Washington or by the Curtiss people?

Col. CLARK. By neither.

The CHAIRMAN. Both knew that you made the designs?

Col. CLARK. Yes, sir.

The CHAIRMAN. Do you know why that was? Was any reason ever assigned to you for it?

Col. CLARK. No, sir; no one has ever told me why. I have something here that may be of interest in that connection. Mr. J. G. Perrin was employed and assigned to assist in the preliminary design that I made. Then, after that design was completed, he was assigned by Col. Deeds to work at the Curtiss factory with the Curtiss engineering force as the authorized Government engineering representative, to advise them and instruct them as things came up.

The CHAIRMAN. Who is Mr. Perrin?

Col. CLARK. He was an automobile engineer. He was chief engineer, I believe, at one time, of the Lozier Automobile Co.

The CHAIRMAN. Did he know anything about flying?

Col. CLARK. No, sir.

The CHAIRMAN. Do you know why he was assigned to keep in touch with the development of the machine at the Curtiss plant instead of you?

Col. CLARK. Yes, sir; I think I do. I was assigned to command McCook Field during its course of construction, which was just about that time and during the first part of its operation, and I believe it may have been that the authorities considered McCook Field more important.

The CHAIRMAN. You were about to refer to some document when I interrupted you. What is that document?

Col. CLARK. Here are exact extracts from a diary that Mr. Perrin kept, and there are some items in this that I think are very significant.

The CHAIRMAN. Are you at liberty to use these?

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Col. CLARK. Mr. Perrin turned that over to me and I think they are of record in the War Department. The diary and report were turned over to Maj. Gray.

The CHAIRMAN. Where is Mr. Perrin now?

Col. CLARK. Mr. Perrin, I believe, is in Washington. He was in Washington a week ago. I did not finish in regard to the contributing causes to what I consider to be the failure in the Bristol, and I think the same thing applies to the De Haviland 4. The third big reason, I believe, for the failure of both the De Haviland 4 and the Bristol fighter was the lack of coordination on the part of the authorities over the production engineering in Washington. That is, there was not coordination between the heads of the various departments. For instance, one man was responsible for the installation of armament, another was responsible for the camera, another for the radio outfit, and another for bombs and bomb sights. There was no head and no coordination between those various departments, with the result that any Tom, Dick, and Harry could go to the Curtiss factory where the Bristol fighter was being developed or the Dayton-Wright factory where the De Haviland 4 was being developed, and he would say with evidently full authority, "I want the camera put in here," and that would necessitate changes in the drawings and specifications in the machine. Another man would want a bomb sight here and another man would say that the machine-gun sight was not on right, each one going up there apparently with full authority. I do not believe any engineering organization could go ahead in that way. I believe that the Curtiss Co., with the best intentions and the best ability in the world, could not have done anything with the machine.

Senator NEW. Have you developed or copied a successful single-seater machine for flying?

Col. CLARK. No, sir.

Senator NEW. What was your recommendation regarding this type, if you made one?

Col. CLARK. I recommended for a single-seater combat plane the Spad, and for a single-seater pursuit the Martinsyde. Neither was ever built. I understand now, one year after my recommendation, they are considering starting in on the Martinsyde.

Senator NEW. Why was not your recommendation carried out; do you know?

Col. CLARK. I think it was purely a lack of confidence in me, especially when they had foreign commissions calling on them who had been through the war, and flyers who had flown at the front. I think they allowed their opinions to have more weight than mine. However, their opinions always conflicted; that is, the British would conflict with the French and the opinions between the different flyers would conflict. When I went over there I found that the only way to get reliable, sound dope was to go right up to the front or right down to the factories, or interview not only one or two flyers from the front, but hundreds of them. Many of them were prejudiced, and it took interviews with dozens of them to come to any sound analysis.

Senator NEW. How about the two-seater fighter?

Col. CLARK. We have none, sir. The most promising development we have in that line is the two-seater fighter that Capt. Le Pere, of

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the French Army, who was allowed to come over by the French Government, has designed and built as an experimental job at the Packard factory. I, myself, designed a machine for this work, but it certainly is not a success as it stands now. It has been built and flown.

Senator NEW. Then, we are doing nothing to produce a two-seater fighter?

Col. CLARK. No, sir; I would not say that. I think that the Le Pere development is very promising.

Senator NEW. But there are none in production.

Col. CLARK. Not within a year or so.

Senator NEW. The Le Pere model has not been accepted?

Col. CLARK. Not to the best of my knowledge; no, sir.

Senator NEW. How about the day bomber?

Col. CLARK. Nothing has been done on that. There have been drawings made of the De Haviland 9, and I believe that McCook Field has gone ahead with a modification of the De Haviland 9, which is called the U. S. D–9, but nothing as far as production is concerned has been done.

Senator NEW. No other production in regard to machines of that type?

Col. CLARK. Nothing that I can think of.

Senator NEW. How about the night bombers, the big fellows intended for long-range attacks?

Col. CLARK. When I returned, and by cable before I returned, I recommended the Caproni triplane to be built to use three Liberty 12-geared motors. A geared motor is, in my opinion, an absolute necessity for that slow-speed work. I said that, in my opinion, if the Handley-Page could be put in production much more quickly than the Caproni triplane, the Handley-Page should be built. There is not a great deal of choice between the two. The Caproni I consider the better, but not enough to warrant any delay in production. As far as I know, nothing has been done about any of them.

Senator NEW. You recommended those machines a full year ago?

Col. CLARK. Yes, sir; I recommended one or the other, but I certainly did not recommend both; and it will be fatal if we attempt to build both and send them to the other side. The matter of handling spare parts for the two machines over on the other side is a serious matter. I believe that our men on the other side will agree with me on that—that it is a fatal error to attempt to build both machines, both the Handley-Page and the Caproni; and I believe, from what I hear, that they are now planning to build them both.

Senator FRELINGHUYSEN. Planning to build the Caproni biplane?

Col. CLARK. No, sir. But it means two machines for the same work, and it means lack of interchangeability for parts.

Senator FRELINGHUYSEN. How does the Caproni biplane compare with the Caproni triplane in effectiveness?

Col. CLARK. The Caproni biplane is considerably better for the type of work that the Italians perform; that is, bombing by day. I saw a squadron of 10 Caproni biplanes go over the lines near Trieste and attempt to bomb a railway station in broad daylight, with no Austrian airplanes going after them, through the barrage, and return safely. If you are operating under conditions like the Italians

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have been operating under, a biplane is better; but for our work on the western front, where you can not go out in the daytime with a clumsy machine, the triplane is certainly better, in my opinion, because it carries three times the number of bombs. That is, if it goes out 100 or 150 or 235 miles, as it is to Essen, you can send out three times as many bombs per one pilot and one bomber; and, in view of the fact that it is pretty precarious whether they are going to get back or not, it is well to drop as many bombs as possible for each man out.

Senator NEW. You believe in night bombing, do you?

Col. CLARK. Yes, sir; I certainly do.

Senator FRELINGHUYSEN. Do you know, from your knowledge, whether the Government contemplates building any of the Caproni triplanes?

Col. CLARK. I have no knowledge of those things. I have been completely out of touch with them for six months, but I understand that they are not going to build any triplanes, but are considering building both the Caproni biplanes and the Handley-Page.

Senator FRELINGHUYSEN. Did you observe the flying of the Handley-Page at Elizabeth?

Col. CLARK. No, sir; I did not see that in flight. I have flown in one in England.

Senator FRELINGHUYSEN. Have you heard any reports of that test?

Col. CLARK. I have heard nothing of any official tests. All I know is what I saw in the paper.

Senator FRELINGHUYSEN. You are familiar with the machine?

Col. CLARK. Yes, sir.

Senator FRELINGHUYSEN. Were those geared Liberty motors?

Col. CLARK. I think they are using the low-compression direct-drive type, not geared. They should be geared for that type, but they are not.

Senator FRELINGHUYSEN. Do you believe that is sufficient power for the Handley-Page?

Col. CLARK. Yes, sir; I believe that if they use two geared motors they can get sufficient power, but they can not do a thing with two direct-drive motors.

Senator FRELINGHUYSEN. Did you observe the trial flights of the Caproni, which was built under the direction of Capt. D'Annunzio at the Standard plant and assembled at Mineola?

Col. CLARK. No, sir.

Senator FRELINGHUYSEN. Carrying three Liberty motors?

Col. CLARK. No, sir.

Senator FRELINGHUYSEN. You have seen no report of that?

Col. CLARK. No, sir.

Senator NEW. Has our Army designed any service machine?

Col. CLARK. The only attempt I know of was an attempt I made at the McCook Field to design a two-seater fighter to mount five machine guns. I designed it around a straight spur-geared Liberty 12-cylinder engine.

Senator NEW. Was it successful?

Col. CLARK. No, sir; it certainly was not successful as first flown, although it had a very good performance. I was never permitted to do any development work on it whatsoever. It was flown, and

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they said that the engine was no good, and that they would not build any more engines. I was not allowed to remain back there, and all development was stopped. I think that I can say that never in history has the first experimental machine of a new type been any good.

Senator FRELINGHUYSEN. What do you mean by a service machine?

Col. CLARK. A machine designed for some one of the five or six military functions at the front. I have here a technical report by Alexander Klemens, who had the chair in aeronautical engineering at the Massachusetts Institute of Technology, on the C–1. It is a report to Lieut. Col. Horner from Alexander Klemens. I might say that the first time this machine left the ground it climbed 10,000 feet in less time than any two-seater machine has ever climbed to that altitude, with the motor turning out 150 horsepower shy of what was promised on the motor. The report is as follows:

From: Alexander Klemin.
To: Lieut. Col. Horner.
Subject: U. S. A. C–1 two-seater fighter airplane.

1. In compliance with instructions from you I submit the following report concerning this airplane:

Military characteristics and vision.—The machine has been flown and landed with full military load, which comprises two forward guns, two rear cockpit guns, and one gun firing through the floor, with full ammunition. The gun firing through the floor is particularly valuable for this type of machine. The firing angles are good and there should be almost no blind spots. The vision is exceptionally good, both front, up and down, and rear.

Longitudinal stability and controllability.—When flown initially with full military load the machine was slightly tail heavy, but with a positive adjustment of the stabilizer, Mr. Johnson, who has piloted the machine several times, finds excellent longitudinal balance and controllability.

Lateral stability and controllability.—The first rudder employed was a little blanketed by the fuselage, and the ailerons were stiff. With a larger, higher rudder, and two hinge supports for the ailerons, the machine responds well to all lateral controls, but its lateral stability is only fair.

Landing and starting.—The machine makes a good get-away and lands well.

Structure.—The rear upper wing spar is of too small a section and requires reinforcement. The opening through the floor weakens the fuselage somewhat, and requires a veneer gusset plate around it. No undue vibration or weakness has been exhibited in flight, but structure may need experimental revision.

Stream line.—The gap between the fuselage and lower wing is somewhat wasteful of resistance. Other parts of the machine require cleaning up from an aerodynamical point of view.

Weight and performance.—With complete military load, including fuel for 3½ hours (400 horsepower near the ground) and the 5 guns, the weight is about 3,900 to 4,000 pounds. This gives a somewhat heavy loading of 9.3 pounds per square foot wing area, but the machine being designed for 475–500-horsepower motor, would give only about 8.2 pounds per horsepower should 475 horsepower be developed. This would compare very favorably with, say, De H. 4 as a fighter, which has 3,550 for 400 horsepower, i. e., about 9 pounds per horsepower.

Radiation.—Radiation constitutes a serious difficulty for this high power. A gap in front of the fuselage, wasteful of resistance, has been used in addition to a forward and underslung radiator. The machine has been flown with gap closed in.

General conclusions.—With experimental revision, strengthening of this structure, and some cleaning up, this machine will be a very interesting airplane design, because of its good military characteristics and vision. The difficulties in the way of successful carry-through are found to be engine and radiator problems. If it were possible to obtain enough power to give 8.2 pounds per horsepower, the machine would have an excellent speed and climb, comparing more than favorably with other machines of this type, but it would be necessary to develop in the neighborhood of 475 horsepower.

2. This report is written entirely from memory.

ALEXANDER KLEMIN.

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The CHAIRMAN. What machine are you now talking about?

Col. CLARK. The C–1, the combat 1.

The CHAIRMAN. Who built it?

Col. CLARK. It was built at the McCook field.

Senator FRELINGHUYSEN. Where is that machine now?

Col. CLARK. At the Wilbur Wright field.

Senator FRELINGHUYSEN. Did it go through the various sand tests?

Col. CLARK. No, sir; because they only permitted me to build just one and that was flown, and it means at least one additional structure——

Senator FRELINGHUYSEN. Who do you mean by "they"?

Col. CLARK. The production department.

The CHAIRMAN. When was your machine constructed?

Col. CLARK. We started construction in the latter part of December, and I was ordered away from the McCook field in January.

The CHAIRMAN. Why were you ordered away?

Col. CLARK. I do not know, sir. I understand that those in authority have made the statement, never to me, however, that my work at McCook field was not satisfactory. That statement has never been made to me in any form.

The CHAIRMAN. Who succeeded you there?

Col. CLARK. Col. Vincent.

The CHAIRMAN. Who appointed you there in the first place?

Col. CLARK. Col. Deeds.

The CHAIRMAN. Were you removed by the same authority?

Col. CLARK. Yes, sir.

The CHAIRMAN. What reason was assigned for removing you?

Col. CLARK. Col. Deeds told me that he had a very important position for me; that he wanted me to come to Washington to sit at his right hand and advise him on all matters pertaining to basic policy. I was never given any duty in Washington. I was sent around from pillar to post. I have not done any useful work since January.

The CHAIRMAN. You did not sit at his right hand or at his left, nor were you consulted in matters of basic policy or otherwise?

Col. CLARK. No. sir.

Senator NEW. Did you recommend any particular types of training planes?

Col. CLARK. Yes, sir; I recommended the Curtiss JN 4 for primary training and the Bristol Scout with the 80 Le-Rhone engine for advanced training.

Senator NEW. Were your recommendations in reference to those machines carried out?

Col. CLARK. In the case of the Curtiss JN 4 the machine that I recommended was not built as it was then designed, but Col. Waldon made several changes in design and the machine was built as he redesigned it. Since that date all of the changes that he made at that time have proven unsatisfactory and the original design has been gone back to and the machine is flying to-day. In the case of the Bristol Scout—it was decided to build an experimental Thomas-Morse machine in place of the Bristol Scout. I only know of three flyers, Maj. B. Q. Jones, Capt. Hammond, of the Royal Flying Corps, stationed at McCook Field, and another, Mr. Hambley, who have flown the two machines, and in the opinion of all three there is no



comparison between the machines. The Bristol Scout is ideal for the purpose and has been developed after years of experimentation. The Thomas-Morse certainly has been unsatisfactory.

Senator NEW. Have you ever heard any reflections on the character of the inspections in the Thomas-Morse works?

Col. CLARK. Not in the case of that work in particular; no, sir.

Senator NEW. Here is a pretty broad question: What has been wrong with our system to account for our failure to produce more successful service machines? Just go ahead and answer that freely in your own way. I want your opinion.

Col. CLARK. First, I think it was a matter of vacillation on the part of those in authority about what to build. They seemed to have confidence in no one person or they did not appoint a board whose decisions they were willing to abide by, and as a consequence they were ruled first by the opinion of one man and then by the opinion of the French Commission and then the British Commission and then the Italians came in. As a result at the end of two or three months of that they were absolutely up in the air and had started on nothing—had changed their orders with manufacturers at least two or three times in each case. Then, I think that there was, and I believe that there still is, a lack of proper organization in the Production Department. When the equipment division was first organized they sent out and got from the business world and the automobile engineering world a great many very capable and very successful men. But they got them without any definite idea, except possibly in one or two cases, of what they were going to do with each man as they brought him in. The idea was that they were all to just come in and "help." They all arrived—no one man knew what his job was and no one could find out what his job was. A paper would come in or a matter would come up for decision and it might be referred to any one of half a dozen different officers. That is, there was no real organization. I do not believe a system like that is sound, and I do not believe we are going to get any place with it.

Senator NEW. Do you think that condition still prevails?

Col. CLARK. I have not been near the Production Department for six months, but I have been told by other officers that that is the condition.

Senator NEW. Colonel, as to our engineers, the engineers who are responsible for redesigning planes, do you think they have had the requisite training or experience to qualify them for the positions they now hold?

Col. CLARK. Senator, of course, I claim to be an engineer for airplane design, and I realize when I state what I am going to state that I take a chance of receiving from you very severe criticism. The only thing that is in my mind is whether this committee is willing to accept my opinion on the thing.

Senator NEW. We are after the truth, but we do not want anybody wearing the uniform to make statements which might subject them to discipline by their superiors.

Col. CLARK. I do not fear that, sir; but it is a matter of whether the committee is willing to consider my opinion on the thing. I may be prejudiced and I may be jealous.

Senator NEW. We will try to give it the weight that we think it merits.

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Col. CLARK. I do not believe that until a man has had considerable technical education and practical engineering training and has had at least three or four years' intimate association with the construction and design and repair of airplanes and association of three or four years' with actual flyers—very close association—I do not believe that he will arrive at a state where he ought to be depended upon to pass decisions on vital parts in airplane design. I can see men who are responsible to-day for the development of our experimental jobs making mistakes in absolutely the most fundamental things, which are at the same time most vital. They are vital as far as the military performance of the airplanes go. In other words, they are now passing through a stage where they know more about airplanes than they ever will again. They have had about a year, and it is my experience that at the end of that length of time you know more than you ever will again. I mean that, in your own opinion, you know more about the thing than you ever will again. You can not make very many mistakes on airplanes.

Senator NEW. You mean that they feel more confident at that stage in their experience that they know all about it than when they know more.

Col. CLARK. Yes, sir; they have a certain amount of knowledge. At such a stage there is no mystery about it, and the mathematics of stability do not amount to anything. After a year things will commence to happen which they can not account for by their knowledge, and they will have less and less confidence as the years go by in their ability and more and more respect for that of others.

Senator FRELINGHUYSEN. Are you familiar with the contract which was given to the Curtiss Co. for 3,000 Spad machines?

Col. CLARK. I am, to some extent; yes, sir.

Senator FRELINGHUYSEN. Was that contract entered into in compliance with your suggestion that we build the Spad single-seater fighter?

Col. CLARK. Yes, sir.

Senator FRELINGHUYSEN. How long after your report was that order given?

Col. CLARK. My cablegram was sent from France in July. My reports—I do not remember the dates of any particular memoranda, but I know this, that immediately after I returned to this city, about the 2d or 3d day of September, we had nightly conferences up to 1 or 2 o'clock every night; that is, Col. Deeds, Col. Waldon, Col. Montgomery, Maj. Horner, Maj. Vincent, and Capt. Marmon and myself, and these recommendations were discussed back and forth during that period. It is my belief that the placing of the order for the Spads took place probably in the middle of September. I could not be sure of that, however.

Senator FRELINGHUYSEN. Is the Spad still a goood single-seater fighter and in use on the western front?

Col. CLARK. It is in use on the western front, and it is doing good work, although it is not the best in the world to-day.

Senator FRELINGHUYSEN. It has not become obsolete?

Col. CLARK. Not obsolete as compared with the machines that our flyers at the front are using to-day. Except in one case, our flyers are flying machines that are absolutely obsolete.

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Senator FRELINGHUYSEN. Do you know why the order for 3,000 Spads was canceled?

Col. CLARK. I was told that it was due to a cablegram from France recommending that we build no single seaters in this country. However, I was never able to locate that cablegram, and I know that officers who have gone over there have made efforts to locate the source of such a cablegram, and they can not find out from where it emanated.

Senator FRELINGHUYSEN. Did you make a report on the S. E. 5, an English single-seater machine?

Col. CLARK. Yes, sir; that was included in my reports. However, I did not consider the S. E. 5 as good as the Martinsyde.

Senator FRELINGHUYSEN. Is the S. E. 5 now being used on the western front?

Col. CLARK. Yes, sir; and I understand very successfully.

Senator FRELINGHUYSEN. More successfully than the Spad?

Col. CLARK. I think that is largely a matter of opinion. I do not believe that any Frenchman will admit that, sir. I do not know of any American flyers who have flown both machines, so it is very difficult to make the comparison. I will say, though, in my opinion, after looking at the interior construction of both machines, that the S. E. 5 is probably a little superior from a military standpoint, but not enough superior to warrant building it in view of the increased difficulties in production.

Senator FRELINGHUYSEN. What are those increased difficulties as against the Spad?

Col. CLARK. The fittings and the wooden parts are harder to build.

Senator FRELINGHUYSEN. In other words, if your recommendations had been complied with, we would have had a large number of Spad single-seater fighters at the front, whereas we have not now?

Col. CLARK. Yes, sir; and we would have had Capronis and Martinsydes and Bristol fighters and De Haviland 9's.

Senator FRELINGHUYSEN. Where would we have procured the engines for the single-seater fighters that you recommended, and for the two-seated machines?

Col. CLARK. The Spad that I recommended uses the 180-horsepower Hispano-Suiza engine, which was being built at that time and is now being built in this country in rather good quantity, I understand, at New Brunswick, N. J. The two-seaters would take the Liberty 12; that is, the De Haviland 9 and the Bristol fighter. The Liberty 8 would have been better adapted to the De Haviland for observation, but we were not able to build them at that time. We anticipated enough trouble in turning out one type of engine, to say nothing of two. I assumed that the only chance we had of getting engines was the Liberty 12.

The CHAIRMAN. For the Spad?

Col. CLARK. No, sir. For that, the 180-horsepower Hispano-Suiza.

Senator FRELINGHUYSEN. Do you know Col. Horner?

Col. CLARK. Yes, sir.

Senator FRELINGHUYSEN. Is he an engineer?

Col. CLARK. No, sir.

Senator FRELINGHUYSEN. What position does he now occupy?

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Col. CLARK. I do not know. The last time I was around the production section he was a sort of executive to handle routine matters for Mr. Potter.

Senator FRELINGHUYSEN. Has he any say in the policy of the Aircraft Production Board at the present time?

Col. CLARK. That I do not know, sir.

Senator NEW. Can you offer any suggestion for bettering our system of airplane production?

Col. CLARK. Yes, sir; I can make suggestions. In the first place, I believe—it will not do any good to make this suggestion—that the business of having one head as a director of military aeronautics and another head as director of aircraft production, each man to all intents and purposes equally powerful, and with no direct head for all the air service over the two of them, is fundamentally unsound. I do not know how it is ever going to work successfully. I do not believe it has ever worked in any organization. In the case of a dispute between these two heads, I do not know who is going to settle the dispute. That is basic, and I probably should not criticise the organization from that standpoint, but even with the organization as it stands I believe that considerable improvement can be made by adopting the system of having under the director of military aeronautics a board—I am speaking now purely of constructing service aircraft and not about training or operation—having under the director of military aeronautics a board of, say, five officers. The president of that board should be permanent and the secretary permanent. The president of this board should be a man picked for his good, general working knowledge of airplanes and their use, and should be a man of mature judgment. The secretary should be permanent and should be a qualified, educated, and experienced aeronautical engineer.

The other three members of that board should be changed at different periods, say, every four months. They should always be men who have come directly from the front where they have been actually flying, and should be chosen from amongst the flyers at the front as those whose judgment of the airplane types to be selected would be the best. That board should make the recommendations concerning the types selected to be built, and on the military specifications for new types. The recommendations of that board should be adhered to to the letter, and should never be changed by the production people. That board makes its recommendations to the director of military aeronautics and the director of military aeronautics submits from time to time requests for types to be built, to the Bureau of Aircraft Production. In submitting these requests he makes no effort to submit engineering data or design drawings or anything of that character. He merely asks that a machine be built as nearly as possible to a certain European type which has been selected. He should describe for this machine the military characteristics which are essential, such as fields of fire for the guns, the number of guns, the disposition of the guns, the number of rounds of ammunition, the fields of vision, the factors of safety, the high speed at the altitude at which they expect to work, the rate of climb, the ceiling, and things like that, making no attempt to solve any engineering problems connected with working out how the desired result is to be accomplished.

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This is turned over to the director of aircraft production, and the director of military aeronautics ceases to have anything to do with it until the director of aircraft production turns back to the director of military aeronautics a certain number, say, three experimental machines that he has built over here entirely from designs that came from the aircraft production board. Then a testing section under the director of military aeronautics tests out these machines—makes sand-load tests to determine the strength and flies them to test their controllability and stability and to ascertain whether or not the required attributes—high speed, climb, ceiling, the characteristics of vision and gunfire, etc., have been met. If the machine is satisfactory, the director of military aeronautics makes requisition on the bureau of production for a certain number of machines, and the machines built must be exactly like the machines which were submitted. Production is not permitted to make any changes which will change the military attributes of that machine.

Senator FRELINGHUYSEN. In other words, at the present time there are too many cooks, and they spoil the broth.

Col. CLARK. Yes, sir; there are hundreds of cooks. There is, as I am told, scarcely an officer in the production department that is not qualified to go out in the field and give an order.

Senator FRELINGHUYSEN. Do you think it is a wise policy to have men in control of production who are interested in the manufacturing of the product?

Col. CLARK. I do not believe I am qualified to speak on that point. It is beyond my experience, but it seems to me that complications certainly might arise that would be pretty bad.

Senator FRELINGHUYSEN. Might that not be the seat of the trouble?

Col. CLARK. Do you mean the seat of the present trouble?

Senator FRELINGHUYSEN. Yes.

Col. CLARK. I do not believe that it is. I do not know, but I do not believe that has anything to do with it.

The CHAIRMAN. What is your opinion of the SVA machine, the Italian fighter?

Col. CLARK. I think it is a very good single-seater. There are a number of reasons why I would rather see the Sopwith Dolphin or the Martinsyde rather than the SVA. There are two primary reasons. First, the method of wing trussing is such as to almost prohibit the possibility of adjusting the angles of the wings to the wind and to each other to correct any slight errors in workmanship or due to warped materials. The wing trussing is absolutely rigid; there are no wires, and you can not change the distance between any two points by means of turnbuckles. What does this mean? In the first place, our inspection is rotten. Our workmanship is not accurate. After only a mediocre inspection our planes are shipped, and they wait on the dock where the wood will become more or less warped, and they may have to wait in the hold of the ship, and then they wait on the other side on the dock, which means that the wood in parts may become warped, and then they are absolutely worthless, because you can not adjust those distances. Those are the fundamental reasons why the SVA is not as good for us as for the Italians. It has not been developed to a sufficient point as regards machine guns, etc. The machine guns are not now placed so that they can be worked from the pilot's seat.

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The CHAIRMAN. Is it not a fact that it is necessary to design planes for engines?

Col. CLARK Absolutely.

The CHAIRMAN. And that one of the developments that we must make before the Liberty engine can be used for the latter types of machines is the designing of a plane for it?

Col. CLARK. Yes, sir.

The CHAIRMAN. Apart from your effort in that direction, do you know of any other engines that have been attempted?

Col. CLARK. Yes, sir; I spoke of Capt. Le Pere's machine, which was very much the same as mine—the same general arrangement as mine—and intended for the same military purposes. I consider his machine better than mine.

The CHAIRMAN. Were those designs of Capt. Le Pere and yourself made at the direction of the production board or as the result of your own voluntary action?

Col. CLARK. They were made by the direction of Col. Deeds.

The CHAIRMAN. Were either of them ever accepted?

Col. CLARK. Mine certainly was not accepted. About Capt. Le Pere's I do not know. I believe the machine is still being tested.

The CHAIRMAN. Where?

Col. CLARK. At either McCook Field or the Wilbur Wright Field. I do not know.

The CHAIRMAN. Were any others, besides yourself, relieved of duty at the McCook Field when you were relieved, or were you the only officer relieved at that time?

Col. CLARK. As nearly as I can remember, I was the only officer who was relieved. I told you that I had heard through roundabout channels that the authorities had intimated, if not stated right out, that I had been a failure as commanding officer at the McCook Field. I have never been given any chance to defend myself along that line, and I believe that if an investigation by the military authorities could be made, in which the opinions of the heads of all departments then at McCook Field and now at McCook Field could be obtained, that I would be more or less vindicated.

The CHAIRMAN. Was any such reason assigned for your removal at the time you were removed?

Col. CLARK. No. I have told you of the only reason which was given.

Senator FRELINGHUYSEN. Did you have any differences with any of the officials of the Dayton Wright Co. or any of the other concerns manufacturing equipment in Dayton during your term of service?

Col. CLARK. I started to make some criticisms about what I considered the salient weak points in the construction of the De Haviland 4 as it was being built at the Dayton-Wright, but I was not permitted to make any suggestions after I had made one or two.

The CHAIRMAN. To whom did you make the one or two suggestions?

Col. CLARK. Mr. Kettering and Mr. Schoonmaker, who were the two engineers out there.

The CHAIRMAN. How soon afterwards were you relieved from duty out there?

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Col. CLARK. I should say about a month after.

The CHAIRMAN. Colonel, you have shown me a copy of what purports to be extracts from a diary and report concerning the construction of the Bristol fighter, redesigned by yourself for the Liberty motor, direct-drive, 12-cylinder engine, the diary and report being those of Mr. J. D. Perrin, to whom you referred. Have you a copy that is free from your notes and interlineations?

Col. CLARK. Not with me.

The CHAIRMAN. Can you make a copy without that?

Col. CLARK. Yes, sir.

The CHAIRMAN. Will you please add it to your statement?

Col. CLARK. Yes, sir.

(The document referred to is here printed in full, as follows:)

WAR DEPARTMENT,
OFFICE OF THE DIRECTOR OF MILITARY AERONAUTICS,
Washington.

Extracts from diary and report concerning design and construction of Bristol Fighter airplane (U. S. A.-0-1), redesigned by Lieut. Col. V. E. Clark for the Liberty direct-drive, 12-cylinder engine; military function Army or corps observation. Airplane designed for artillery-fire control, photographic over tactical areas, and to have speed and armament such as to be able to take care of itself when attacked.

Mr. J. G. Perrin, who has kept the record quoted below, knows more about the history of the attempt at development of this airplane than any other man. He assisted in the preliminary redesign by Lieut. Col. Clark, and was afterward assigned to live in the Curtiss factory, to advise and assist the Curtiss engineering force in the development of this machine.

Below are exact extracts from Mr. Perrin's notes:

"NOTES ON BRISTOL HISTORY.

"Bristol aeroplane, selected by committee sent abroad to pick the best type to produce, arrived in Washington about September 1, 1917. Was placed in Airplane Exhibition Building, Smithsonian Institute Grounds, and draftsmen of the plane design section, Equipment Division, Lieut. Col. Clark in charge, were set to work making drawings of same, assisted by set of British drawings from factory which produced the machine.

"The fuselage of this machine was arranged for 190-horsepower Rolls-Royce engine, and the American reproduction was to carry a Liberty 12.

"Due to the increase in weight (800-615=185 pounds) and length of engine and carrying forward of the center of gravity, the whole engine-supporting structure had to be changed, and the wing location and length of chord likewise, to get increased wing area and to move the center pressure forward to agree with new center of gravity.

"(*a*) At first there were only about three or four draftsmen working in the Airplane Exhibition Building and about five on fifth floor of old Southern Railroad Building, at 119 D Street SE. About October 1 Col. Clark and all his draftsmen were concentrated at the Air Exhibition Building and men were brought in from Detroit and other places, until there were very near 35 or 40 men working in copying the Bristol plane.

"About October 15 the best and only real practical airplane designer (Douglas) left to join the Glenn-Martin Co., of Cleveland, Ohio. It was a mistake to let this man go, as Col. Clark was away so much in conference that the work suffered considerably from lack of direction by men with expert airplane-design experience. The man in direct charge of redesign (Riche) was not a practical designer, although he had a good theoretical education.

NOTE.—Douglas left because he was unwilling to work with Col. Vincent.

"During October work in this building, which was really only a sheet-iron hangar, was seriously handicapped by cold weather, so temporary relief was obtained by curtaining off half the building and putting in oil stoves and gas heaters. In view of contemplated early move of all this work to Dayton, effort was made to put up with these unfavorable working conditions for the short time remaining.

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"In the meantime, it had been decided to have the Curtiss Co. manufacture the Bristol, and sample machine was shipped to Curtiss Co. by express on a special flat car, November 1, 1917.

"Before drawings were finished, Col. Clark's department was moved to Dayton, Ohio (about Nov. 8).

"(*b*) Before drawings were finished November 6, Col. Clark's department (now known as Airplane Engineering Department) was moved to Dayton, Ohio, and took up temporary quarters in the Lindsey Building, as McCook Field buildings were not yet ready. This move interrupted the work to the extent of over a week's delay.

"Another interruption in the work resulted from the move to McCook Field, about three weeks later.

"(*c*) November 17 a large batch of prints was sent to Curtiss Co. by special messenger (some had been sent by mail previously), with the understanding that as soon as enough data was available, a sample machine was to be built, to check up the changes that had been made in the original machine, and after this had been worked out satisfactorily the Curtiss Co. would put same in production—2,000 were ordered.

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"Another large batch of prints taken to Curtiss Co.—Conference Schwable, Weber, Mueller, and Perrin. They stated they would put drawings in shop to construct sample machine. Their chief draftsman (Hoffman) after looking over prints received this date stated they had enough to start sample machine.

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"DECEMBER 7.

"Maj. Shepler, Mueller, Perrin in conference at Curtiss Co. Wrote Clark that Mueller stated would agree to have Bristol sample completed three weeks after receiving Liberty engine, as wanted to have engine in shop before going too far with drawings.

* * * * * * *

"JANUARY 9.

"Col. Deeds et al. here said Bristol was very successful type we were copying. Said Liberty engine production would be ahead of plane production.

"JANUARY 11.

"Last batch of prints (850 in all) and complete parts lists brought from Dayton.

"(*d*) Covering all essential details for a flying model except spark and throttle controls and military equipment, which was undecided, but unnecessary for flying model. It was understood that the Curtiss Co. would have to finish the comparatively few details to complete a flying model and rush the production of one to check Signal Corps drawings and from which complete working drawings would be made. Some draftsmen's errors were discovered which were made much of by Curtiss Co., but when machines were subsequently started from Curtiss drawings just as many mistakes showed up and it required the production of several machines to prove up and correct Curtiss production drawings.

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"JANUARY 27.

"Conference was held by the Government and Curtiss representatives around the sample machine, which was complete as far as skeleton structure was concerned. Thirty-five changes in construction were approved by Green and Butts, many of which were unnecessary and only gave Curtiss Co. alibis for delay in getting into production.

"FEBRUARY 1.

"Maj. Shepler designated Mueller chief engineer of Curtiss Co. to take charge of Bristol design and other airplane work Curtiss was doing. Confirmed by Maj. Grat, February 5.

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"FEBRUARY 9.

"In eight days first three production machines have hardly progressed, due to errors in construction and change in engine-supporting structure made by Curtiss Co. While it was definitely understood that one of the purposes in building sample machine was to check up Signal Corps drawings and to show where new drawings were necessary to cover all parts, yet Curtiss Co. managed so poorly that complete drawing information was still lacking when 25 machines were put into production.

"FEBRUARY 13.

"-Col. Walden here stated that Bristol construction and design was very satisfactory at front.

"FEBRUARY 14.

"Protested to Green of slowness on completion of sample machine and repeated previous complaints about not having a concentrated shop or organization to build sample machines.

* * * * * * *

"FEBRUARY 27.

"Changed number of fuselage bracing wires, although Curtiss had checked up stress analysis January 4 and made what changes they considered necessary.

"FEBRUARY 28.

"Fitted wings and tried out engine during night. Had trouble aligning tail surfaces due to poor workmanship, although heavier tubing was used than in original Bristol.

"MARCH 1.

"Weight flying model in shop.

"The Bristol machine (U. S. A. 01) as originally released to the Curtiss Co. by Col. Clark has a calculated weight of 2,937 pounds and included the following equipment: Liberty engine, two men, fuel, oil, water, Marlin gun and 800 rounds, Lewis gun and mount and 970 rounds 2,937

"Machines as built by the Curtiss Co., with the above equipment, as weighed on the floor ready for flight 3,146

"Difference in weight being due to possible errors in calculation of weight and to larger radiators and other heavier parts added by Curtiss Co. in change of design in details.

"Bristol as now planned includes the following extra equipment:

Extra Marlin gun	23.5	
200 additional rounds	13.5	
Extra Lewis gun	17	
Additional weight of mounting of two guns and changes in construction (estimated)	15	
Camera (changes type—10 focus), 8 extra mag and plates; total, 72 plates	54	
Radio	82	
Bombing outfit (10 23 each), racks, actuating device	283	
Flares for night landing	6	
Very pistol and cartridges	6	
Oxygen tanks (2) and distribution box	26	
Additional weight over original design	525	
	3,146	
Total weight as now planned		3,671

"I am confident when the regular Curtiss production comes through a machine with full equipment will weigh well over 3,700 pounds.

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"Took wings off to send machine to field and found two wing beams ruined, where holes for hinge pins had been drilled off, necessitating whole new wings.

"MARCH 2.

"Took machine to flying field. Wings were damaged during trip to field. Patched up.

* * * * * * *

"MARCH 4.

"Couldn't get engine to run without much effort. Weather very cold. Oil leads not right so oil came out of vent. No heat in hangar, no telephone, no spare parts or portable tools; any drilling had to be done by hand. Flying field in very primitive condition.

"MARCH 5.

"Maj. Smith took machine out, broke tail skid in taking over rough field. After this was patched up took another run, and although engine was missing badly, due to sooted spark plugs, machine flew about five minutes. Had to come down account of engine trouble, and in landing, landing gear was broken. Tubular struts were too light, but tubing was found to be only 8 point carbon. Machine not flown again until March 22—excuses advanced, either bad weather, bad field, or no pilots.

"MARCH 11.

"Maj. Hall here with apparently full information regarding equipment to finish up the Bristol and the actual equipment itself. Discarded Capt. Forman's double-gun mount and made other extensive changes and additions. Started a model machine to be complete in every particular. At this date about 1,402 Curtiss drawings had been released for production. Nine hundred and ninety-five Vandykes had been sent to Dayton for spare parts manufacturers, balance of drawings being retraced to get better Vandykes. With changes Maj. Hall outlines and change in wing-rub construction wanted by Curtiss, about half these drawings will be obsolete and new ones necessary.

"MARCH 12.

"Curtiss Co. finally set aside an experimental job shop for the Bristol which should have been done two months before.

"MARCH 22.

"Bristol given second flight by Lieut. Col. Jones. Flew about 15 minutes with a broken blade on propeller caused by picking up mud in getting off ground.

"MARCH 24.

"Bristol flew near an hour—10,000 feet altitude. Maximum speed on trial 121½—side wind.

"MARCH 28.

"Machine at field caught fire and badly damaged.

"MARCH 30.

"Maj. Hall gave Curtiss Co. go ahead on all changes to bring drawings up to model fully equipped machines. Understand this applies to 400 machines.

"APRIL 5.

"Took new machine to field to replace burnt machine. This was fitted with center-panel radiator, which has taken three months to bring to a point of trial.

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Flying trials have been so long delayed, however, that two machines will be necessary to work out radiator problem, together with other problems, which it would take too long to depend on one flying model. First lot of 25 fuselages being changed to conform to Maj. Hall's model.

"FEATURES OF DELAY IN CURTISS CO. IN NOT GETTING RESULTS OUT OF M. ELLWOOD FACTORY.

"Delay and lack of ability in whipping new organization into shape.

"Elaborate factory system, with enormous overhead.

"Antipathy to Bristol design and an attitude leading to the suspicion of a desire to make the Bristol a failure, so a Curtiss machine would have to be resorted to.

"Lack of speed and concentration in the production of a sample machine to prepare for straight-ahead production.

"Attempting to make sample machine in immense shop instead of a segregated and self-contained department, where work could be watched and rushed to better advantage. This was finally started on March 11, but not fully equipped for a month later.

"Constant effort to change from tried-out Bristol principles of design and to inject changes of construction to cover careless workmanship or poor material.

"Lack of cooperation to complete Signal Corps drawings which were admittedly incomplete, but instead holding to an attitude of showing up incompleteness of same.

"Inexcusable lack of foresight in not arranging for a flying field alongside of new factory. No attempt made to put the field they had (5 miles away from factory) in shape for the test flights they should have foreseen would be necessary. No heat in hangars, no telephone (until Mar. 12), no light for night work, no spare parts, no tools, no concentrated and specially trained organization, and no pilots (until a late date, and he was inexperienced on high-speed machines).

"No concentrated, experienced, or inventive engineering ability in perfecting undeveloped features of design incidental to change of engine. After four months of warning no radiator has been developed as satisfactory for wide-ride radiators. All changes in design have been very crude."

The CHAIRMAN. What have been your duties, if any, since you were called from the McCook field and ordered to report here in Washington?

Col. CLARK. I was ordered first to Washington and then around to airplane factories at Elizabeth, Detroit, and so forth. I was sent once to Indianapolis, ordered down to Langley field, and then ordered on a trip around the country which covered almost all of our schools. The published purpose of this trip was to submit reports to Col. Deeds embodying constructive criticisms of the supply and equipment system. Then I was sent down to Camp Morrison, an aviation concentration camp down in Virginia, where we have about 5,000 men and two hundred and eighty some officers. When I had been down there a short time I was placed in command of Camp Morrison. I have been here in Washington for about 10 days.

The CHAIRMAN. You referred to Langley field in your last answer. Are you familiar with that field?

Col. CLARK. Yes, sir; I am the man who started Langley field.

The CHAIRMAN. Were you engaged there when the testing equipment and activities were transferred from the McCook field?

Col. CLARK. No, sir; I was here in Washington. I went from Washington to McCook field and was there during its construction.

The CHAIRMAN. From your knowledge of the two fields, the Langley and the McCook fields, which, in your judgment, is better adapted to the purpose for which the McCook field is being used?

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Col. CLARK. For work in war time McCook field is a great deal better adapted. For peace-time work Langley field is better.

The CHAIRMAN. Do you consider the McCook field large enough for the purposes and well suited for them?

Col. CLARK. No, sir; I do not think that the field itself is as large as might be desirable. However, I think that the controlling factor in the location of any field like a governmental experiment field, such as the McCook field is, should be availability to expert labor and to material, and for that reason I think you have to be very close to some manufacturing city such as Dayton.

The CHAIRMAN. You could find such a city nearer a seaport?

Col. CLARK. Yes, sir; and we could have used Cleveland, Indianapolis, Buffalo, or Detroit.

The CHAIRMAN. None of those, except Buffalo, are near a seaport?

Col. CLARK. No, sir.

Senator NEW. Colonel, we are very much obliged to you for this information.

Col. CLARK. There is another thing here that I would like to speak about. Here is a letter that I believe is on record in the War Department, written by Mr. Perrin to Maj. Gray, that touches on certain conditions in the Curtiss factory during the development of the Bristol fighter.

The CHAIRMAN. Who was Maj. Gray?

Col. CLARK. He was at one time in charge of production engineering. He has since resigned, I believe.

The CHAIRMAN. Colonel, you have just shown me two letters and a telegram which passed between Maj. B. D. Gray and Mr. J. G. Perrin. Is that the same Mr. Perrin from whose diary and report you have made certain extracts, already referred to?

Col. CLARK. Yes, sir.

The CHAIRMAN. Would it be convenient to put those in the record as a part of your testimony?

Col. CLARK. Yes, sir.

(Letters and telegram referred to are here printed in full, as follows:)

BUFFALO, N. Y., *March 12, 1918.*

Maj. B. D. GRAY,
Production Engineering Department,
Dayton, Ohio.

DEAR SIR: I trust this finds you in Dayton, as I consider the points covered justify consideration and action.

I wonder if you know that the Bristol, to my knowledge, has not been flown again up to Tuesday night since the night you saw the landing gear broken—5th. I know of no earthly reason why a new landing gear could not have been fitted and the machine flown by Thursday, the 7th. There is no bad-weather excuse, as both Thursday and Friday had good flying periods. As regards a pilot, the Curtiss Co. should have arranged for a Government pilot if their own was not available, so that excuse would not pass investigation. Their man Rolfs did not show up at the factory until Monday, the 11th. This is a fair example of the lack of foresight and preparedness the Curtiss Co. has shown throughout this Bristol work.

Mueller must have known that their flying field would have to do considerable cold-weather work, yet there has been no telephone there or any heat or light in their hangars for emergency night work.

While there have been Government changes in gun mounts, etc., and some information relating to accessories has been late in arriving, yet there is no reason for not going ahead vigorously and testing out the essential flying features of the machine just as it is to see if it is fundamentally all right independent of the accessories. In my opinion that machine should be kept in

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the air just as much as possible; there should be two pilots always available and the flying field should immediately be fitted up for doing night work (fitting and adjusting), an automobile for towing always available, and quick means of communication with the factory for getting supplies and parts. A good engineman should be secured who understands the Liberty engine. I certainly believe that the importance of the work justifies preparation so that this trial work is not held up one minute.

Maj. Hall arrived Monday, the 11th, and is changing the double gun mount from the way Mueller and Capt. Forman had it made. They have at last arranged for a separate department to do this work, but have taken a room in a new building which is not entirely finished, so there will be a few days working at a disadvantage.

Now that we have practically all the information regarding the military requirements of the Bristol, I have compiled the following data, which leads to some disturbing conclusions and, in my opinion, some readjustment in the airplane program:

The Bristol machine (U. S. A. 0–1) as originally released to the Curtiss Co. by Col. Clark had a calculated weight of 2,937 pounds, and included the following equipment: Liberty engine, 2 men, fuel, oil, water, Marlin gun and 800 rounds, Lewis gun and mount and 970 rounds	2,937
Machine as built by the Curtiss Co., with the above equipment, as weighed on the floor ready for flight	3,146

Difference in weight being due to possible errors in calculation of weight and to larger radiators and other heavier parts added by Curtiss Co. in change of design in details.

Bristol as now planned includes the following extra equipment:

Extra Marlin gun	23.5	
200 additional rounds	13.5	
Extra Lewis gun	17	
Additional weight of mounting of 2 guns and changes in construction (estimate)	15	
Camera ("L" type, 10 focus), 2 extra magazines, and plates, total of 72 plates	54	
Radio:		
Bombing outfit (1,023 each), racks, actuating device	283	
Flares for night landing	6	
Very pistol and cartridges	6	
Oxygen tanks (2) and distributing box	25	
Additional weight over original design		525
		3,146
Total weight as now planned		3,671

I am confident when the regular Curtiss production comes through a machine with full equipment will weigh well over 3,700 pounds.

And the camera people want the Bristol arranged so it is possible to install camera with 20-inch focal length.

Now, I assume that it is not planned to use all this equipment simultaneously, but with any probable working combination this machine will be greatly overloaded to get proper performance and for the carrying capacity of some of the structure. The landing gear will certainly have to be redesigned.

The supporting surfaces of the Bristol figure out at 450 square feet (wings, 405.5; tail surfaces, 45.5) and, with a weight of 3,700 pounds, we have a surface loading of $\frac{0}{450} = 8.25$ pounds per square foot. Now, the Spad, which is a fast scout machine, only has a surface loading of 7.3, and the original Bristol, with a 190-horsepower Rolls-Royce engine, 6.4, and the British De H. 4 had 6.1.

Figuring wing areas only, which is sometimes a method of comparison we have $\frac{3700}{405} = 9.2$ pounds per square foot.

I do not have the proportions of the Dayton-Wright De H. 4, but I should think they must be up against the same problem.

There may be some angles of the program that I am not posted on, but it certainly seems to me the only way to get under way quickly and to simplify the production is to build a machine for a particular service and concentrate

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on that. For instance, the De H. 4 could be a bomber (the Bristol is certainly not adapted for bombing) and the Bristol a fighter and observation plane. For photographic work it certainly appears as if the large camera would be more effective, but a plane would have to be assigned to this special work for structural reasons and the matter of balance. If this has to be accomplished at the sacrifice of its offensive or defensive ability, such a machine might have to be convoyed by fighting planes.

You may be already aware of the Bristol situation as affected by weight of equipment, as I have spoken of it around here, but I do not see any decision for handling the proposition such as I have outlined.

I should have stated above that the machine you saw in flight Tuesday, March 5, and which Maj. Smith judged O. K. as regards balance, had no equipment, such as guns or accessories, so that the weight was less than 3,000 pounds.

I am working with Lieberman to get the weight per unit of area of the various coats of finishing material used to paint the Bristol parts, but it will be several days before this can be completed in the way it would seem necessary it should be done to incorporate in specifications.

I would appreciate an order from you to the Curtiss Co., directing them to give me a pass to the flying field and to give me an opportunity to see all that is going on in their experimental department on Bristol work.

I believe the above facts regarding the Bristol should be given grave consideration.

Sincerely, yours, J. G. PERRIN.

WAR DEPARTMENT,
PRODUCTION ENGINEERING DEPARTMENT,
SIGNAL CORPS, UNITED STATES ARMY,
Dayton, Ohio, March 14, 1918.

From: Production Enginering Department.
To: Mr. J. G. Perrin, care of Curtiss Aeroplane & Motor Corp., Buffalo, N. Y.
Subject: Bristol situation.

1. Your telegram and letter of the 12th, relative to the Bristol situation, has been received. It is regrettable that nothing has been done in the way of flying this machine since I was there on Tuesday, the 5th, but I understand from Maj. Hall that the weather has not been suitable and, in his judgment, the reluctance on the part of the pilots to fly under unfavorable conditions a practically untried machine is justifiable.

2. Certainly this machine should be put in flying condition at the earliest possible moment and kept in the air as much as possible. Your suggestions relative to night work, if this should be necessary, are good.

3. We have decided to have the D H 4 landing gear applied, with such modifications as may be necessary, and a satisfactory type of tail skid. Maj. Hall is arranging for these matters. There will be nothing done to the 20-inch focal length camera for the present.

4. The question of military equipment is decided to a large degree by the requirements abroad and we are obliged to meet their desires wherever possible.

5. The figures you are getting are very interesting. I think that Mr. Green should be able to get you a pass to the flying field. If not, Maj. Hall will arrange for that. I am turning your letter over to Maj. Hall, with the request that he go into the matter more in detail.

By direction of the Chief Signal Officer of the Army.

B. D. GRAY,
Major, Sig. R. C. A. S.

Copy to Maj. Hall.

[Night letter, prepaid.]

BUFFALO, *March 13, 1918.*

Maj. GRAY,
Production Engineering Dept.,
Lindsey Building, Dayton, Ohio.

Mueller has not yet given machine second test. Hear excuses, but no man-size reason for delay. Have had plenty of good weather, but raining to-night. If field too soft, why not build wooden landing platform? Consider inaction and inability to cope with situation positively criminal. Also see letter mailed this Wednesday morning.

J. G. PERRIN.

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(Col. Clark submitted for the record the following report:)

SEPTEMBER 12, 1917.

Memorandum for Chief Signal Officer of the Army:

I submit the following report on the present status of military airplanes along the western front, with suggestions regarding probable future development. The primary purpose of this report is to set down the general requirements for military airplanes as determined by military necessity, in such a way that those officers held responsible for the production and supply of airplanes may appreciate clearly the viewpoint of the man in the field. It must be expected that two very strong factors, viz.: 1. The man operating the field, and 2, inventors and designers of aircraft, will continually argue toward a great number of types of machines. The man in the field will demand many types partly because (very naturally, when fighting an efficient foe) he is never satisfied with any equipment except the latest and therefore the best, and partly because he wants, for any particular mission, an airplane which has been designed especially for such mission. He is loathe to accept a machine of obsolescent type, or one which is a compromise with a view to endeavoring to perform several functions. The pilot is usually inexperienced in factory methods, and consequently is not acquainted with the great difficulties in trying to produce machines in large quantities by modern factory methods, when the design is being continually changed with a view to improving the machine. On the other hand it is entirely possible that the man (safe on the ground back home) who is endeavoring to produce machines in large quantities is liable, in the stress of work, to forget the viewpoint of the men in the field, who must use the product in the most sternuous kind of service known to history.

In general, the functions of airplanes in modern warfare along the western front are:

1. To help the Army on the ground in successfully performing its operations.
2. To prevent enemy aircraft from doing damage in any way.
3. To inflict direct damage upon the enemy.

We may call the type which is designated to perform functions under the heading 1. Army observation airplanes. These machines are held responsible for the performance of the following functions:

Fire control and artillery, firing against enemy batteries, against enemy strong points near the line, and against enemy infantry in trenches, especially at trench junctions.

Photography of all territory in the vicinity of the line, of the enemy's territory beyond the line as far as may be required, especial attention being paid to objects and sections of territory of particular military interest.

Contact patrol for friendly infantry movements, with the view to keeping grand commanders and covering artillery (especially barrage) commanders informed of the position of the advancing or retiring line during its movement.

General tactical reconnaissance by staff officers.

Rapid transportation of staff officers, and rapid communication of important messages.

The number of Army observation airplanes built and originally supplied will depend upon the strength of the Army on the ground, the amount and character of the work being performed by friendly artillery and infantry, and the general plan of campaign. The number which it will be necessary to supply for replacement will depend upon the degree of effectiveness of the enemy's activities against our Army observation machines, the amount and character of training which our pilots will have undergone, the character of the country over which the machines are flown, and the reliability of the machine itself, as a complete unit.

The primary requirements for this type of airplane in order that it may effectively perform its military functions are:

Provision of effective observation of the ground, by eye and by camera.

Provision for transmitting messages quickly, reliably, and accurately to friendly stations on the ground.

The performance, armament, and maneuvering ability of the airplane should be such that, in the hands of a pilot of ordinary ability, it would stand a good chance in fighting any hostile airplanes.

Two men will be carried. The pilot, who sits in front, should be the observer, and should operate the wireless key, or the camera, and must operate the gun that fires to the front. The second man sits close in rear of the pilot in order that he may communicate readily with him, and is held responsible for the protection of the airplane against attack by hostile aircraft, from above, the rear, or either side. He will be provided with one or two machine guns for this purpose.

If the machine is sent out for the purpose of artillery fire control it is equipped with a wireless transmitting set.

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The military load, which includes two men, armament, instruments, and either a wireless set, or a camera, will weigh about 240 kilograms (528 pounds).

It should be capable of flying continuously at about 90 per cent of its maximum speed, for a distance of about 530 kilometers (330 miles).

The wing loading, with full load carried, should not be more than 31.5 kilograms per square meter (6.45 pounds per square foot). The weight in kilograms of the complete airplane loaded should not be more than 5.5 times the number of horsepower developed at 3,000 meters altitude. The ceiling with full military load should not be less than 5,500 meters. The factor of safety of the main plane structure should be not less than six and one-half for high incidence condition, and four and one-half for low incidence condition.

Starting with full load it should be able to climb to an altitude of 3,000 meters in not over 11 minutes, and should have possible horizontal speed of not less than 185 kilometers per hour at that altitude.

PROPER POWER PLANT.

Assuming: Weight of airplane loaded, 31.5 kilograms per square meter; military load 240 kilograms; weight of gasoline and oil 0.738 kilograms per horsepower (which will permit a flight of about 530 kilometers; weight of power plant, including radiator and water:

Case I (with no device for maintaining constant power at all altitudes): 1.5 kilograms per horsepower at sea level, or 2/.9 kilograms per horsepower at 3,000 meters altitude.

Case II (turbine for air intake, or other device for maintaining power constant at all altitudes): 1.6 kilograms per horsepower.

The ideal power with assumptions as above would be:

Case I: 365 to 385 at sea level; 250 to 265 at 3,000 meters altitude.

Case II: 260 to 280 horsepower.

Typical airplanes for Army observation are the Bristol Fighter (British), the S. I. A.–7B (Italian), and the Brequet–14 (French).

The German L. V. G., with the 235-horsepower Mercedes engine is typical.

It is believed that all of the functions required of an airplane for Army observation can be performed by one type, with the possible exception of special photography from a great height, well behind the lines, where a large heavy camera with great focal length lens is necessary, in order that details on the ground may be brought out satisfactorily. However, it is believed that such special photographic missions may be performed by an airplane of the day bomber type, discussed later, modified slightly for the purpose after arrival in the field.

The second grand division under functions is "to prevent enemy aircraft from doing damage in any way."

Airplanes designed for combat and pursuit will be held responsible not only for keeping enemy bombing airplanes on the far side of the line, but also for keeping enemy army observation airplanes from effectively performing their functions in helping the enemy ground army. From the standpoint of the defensive, the combat and the pursuit types must always protect friendly army observation airplanes from molestation by enemy aircraft in order that these airplanes may perform their functions without interference or interruption. The combat and pursuit airplanes may also be called upon to escort day bombers across, and for some distance beyond, the line. They must protect kite balloons from attack by hostile aircraft.

As strictly offensive weapons the broad function of combat and pursuit types is to drive all enemy aircraft out of the air, destroying them when possible.

The number of combat and pursuit machines built and supplied depends upon:

I. Should a weak and defensive policy be adopted, through choice or necessity, and the enemy granted the balance of power in the air, the number of combat and pursuit machines will depend upon the number of friendly army observation airplanes, kite balloons, etc., which must be protected from hostile aircraft.

II. On the other hand, assuming that we determine to obtain and maintain the balance of power in the air, and adopt an offensive policy, the number of combat and pursuit machines which should be built and supplied will depend upon the total number of airplanes built and used by the enemy, as, in this case, the campaign will be to drive the enemy out of the air through superiority in numbers of fighting airplanes.

I will differentiate between the combat and the pursuit types as, for the present at least, quite different characteristics are demanded. The combat type is the type needed for fighting in the air when both sides elect to "stay and fight it out." On the other hand, the pursuit type is necessary when one side or the other decides, for some reason, to "run for it." It will be shown that quite different characteristics for the two types are demanded.

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For the combat machine the primary requirements, in order that it may effectively perform its military functions, are:

Good climbing ability.

A high degree of celerity of response to control, in other words, excellent maneuvering ability, or "handiness."

Power and reliable armament.

The machine must be capable of climbing well, and maneuvering without loss of altitude, at great altitudes. There should be still a considerable margin of power at an altitude of 6,000 meters.

The structural strength of the wing structure, tail structure, etc., must be great enough to permit and maneuver necessary in aerial combat.

The general characteristics of the airplane to fulfill its requirements are:

The fraction—

$$\frac{\text{total weight of airplane}}{\text{horsepower available at altitude of 6,000 meters}}$$

must be small.

The masses must be well concentrated, the moments of the inertia small, in order that the machine may be handy.

It will be seen that the general characteristics for the pursuit type are practically incompatible with these.

The primary requirements of the pursuit type are:

High speed while going "down hill." This applies to any angle of flight path from the horizontal to the vertical, as in a dive.

Powerful and reliable armament.

The possible horizontal high speed must be great at an altitude of 6,000 meters.

The structural strength must be great enough to permit a long dive and recovery.

The primary general characteristics of the airplane, in order that it may fulfill its requirements, are:

a. The fraction $\frac{\text{total resistance in low incidence condition}}{\text{total weight of airplane}}$ must be small.

b. The fraction $\frac{\text{total resistance under low incidence condition}}{\text{power available at 6,000 meters altitude}}$ must be small.

It is readily seen that this machine is quite different from the combat machine.

For instance, it would be fatal for a machine of the handy, strong climbing, fighting type, to endeavor to run away from a machine of the fast pursuit type in case of a machine gun jamming or ammunition being exhausted. It would be overtaken and brought down invariably. Again, it could not hope to catch a machine of the pursuit type should the latter decide to run away. On the other hand, the pursuit type could not hope successfully to stand up and fight against the machine of the handy, climbing, combat type. I might suggest here that the abandonment of the fighting type in favor of the fast type by the Germans indicates the tendency in their aerial tactics. I mean that Germany has eventually to adopt the rule of running away unless they have great superiority in numbers of airplanes in any particular encounter.

At present the usual practice is for both types to be single seaters.

Discussing the combat type again, the best armament to date appears to be eother three machine guns, two firing to the front through the propeller disk, and one flexible in a vertical plane with field of fire overhead; or one 37-millimeter or 47-millmeter cannon firing shrapnel filled with very large buckshot set to explode at a range of about 75 yards, firing through the propeller hub, and, possibly, in addition, one machine gun, flexible in a vertical plane, with field overhead.

The weight in kilograms of the complete airplane loaded should not be more than 4.5 times the number of horsepower developed at 6,000 meters altitude. The ceiling with full military load should not be less than 7,500 meters. The factor of safety of the main plane structure should be not less than 7 for high incidence condition and 5 for low incidence condition. Starting with full load, the combat machine should be able to climb to an altitude of 5,000 meters in 12 minutes, and should have possible horizontal speed of not less than 200 kilometers per hour at that altitude.

The wing loading should not be more than 30 kilograms per square meter (6.14 pounds per square foot). The military load, including three machine guns, is about 130 kilograms (287 pounds). A flight of about 360 kilometers (225 miles) at practically full power should be possible.

PROPER POWER.

With the above assumptions, and assuming a rotary air-cooled engine (in order to concentrate the masses) weighing 1.64 kilograms per horsepower at 6,000 meters altitude (0.77 kilograms per horsepower at sea level).

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Weight of fuel and oil 0.66 kilograms per horsepower (1.45 pounds per horsepower), which will permit the flight duration above.

The ideal power should be from 160 to 180 horsepower at an altitude of 6,000 meters, or 345 to 375 horsepower at sea level.

On the basis of total loaded weight of airplane per horsepower available, the latest Gnome monosoupape, which develops about 77 horsepower at 6,000 meters (165 horsepower at sea level), is only 87 per cent as efficient for the purpose as the ideal engine. However, largely on account of the great handiness possible with this engine, it appears to be the best to date.

It must be remembered, however, that should some device, such as a turbine to give more air at the carbureter intake at high altitudes, be successfully developed, the rotary engine will be eliminated completely immediately, unless the device be of such character as to permit use with this type of engine. Any engine of fixed cylinder type which will weigh considerably less than 0.16 kilogram per horsepower developed at 6,000 meters' altitude will, of course, be better for the purpose.

Typical modern airplanes of the single seater fighting type are the latest Spad, with 165 horsepower Gnome, and the latest Sopwith, with the same engine. The Sopwith camel with the AR-1, 150-horsepower engine and the Nieuport with the Le Rhone 120 horsepower have given good service. Italy has no machine of this type. To the best of my knowledge Germany has abandoned this type of handy single-seater fighter. The last effort known was the old Fokker with the 100-horsepower Oberursel engine.

While I believe that at the present time it is necessary for us to build machines of the short-coupled, handy, single-seater fighter type, I believe that, owing to the inevitable necessity for abandoning the plan of independent machines (except those for Army observation and night bombing purposes) operating in the air, this type will soon be eliminated. I believe that very soon all fighting and day bombing excursions will be performed with a number of machines (probably in groups of 5 and multiples thereof) in formation. The effectiveness of the excursions will depend entirely upon the formation being preserved intact during all maneuvers. This will militate at once against the handy type as compared to the high-speed type. Of course, should the "constant power at altitude" device eliminate the rotary engine, this will be another cause for abandoning the handy type in favor of the high-speed type.

Taking up again the single-seater pursuit type:

At present this machine carries two machine guns, both firing through the propeller disk, or one cannon, as described above, firing through the propeller hub.

The military load is about 130 kilograms (287 pounds). The pursuit machine should be capable of flying continuously at little less than its maximum power for a distance of about 480 milometers (300 miles). The wing loading with full load should not be more than 38.5 kilograms per square meter (7.88 pounds per square foot). The weight in kilograms of the complete airplane loaded should not be more than 5.5 times the number of horsepower developed at 6,000 meters' altitude. The ceiling, with full military load, should not be less than 7,500 meters. The factor of safety of the main plane structure should not be less than 6½ for high incidence condition and 5½ for low incidence condition.

Starting with full load it should be able to climb to an altitude of 5,000 meters in not over 16 minutes, and should have possible horizontal speed of not less than 220 kilometers per hour at that altitude.

With the above assumptions for the pursuit machine, and assuming: Weight of gasoline and oil 0.57 kilograms per horsepower (1.25 pounds per horsepower) which will permit the above flight radius; weight of power plant, including radiator and water:

Case I (no device for maintaining power constant at all altitudes). 2.88 kilograms per horsepower at 6,000 meters altitude (1.35 kilograms per horsepower at sea level).

Case II (turbine for air intake, or other device for maintaining power constant with change in altitude). 1.45 kilograms (3.2 pounds) per horsepower.

The ideal power would be:

Case I. 150 to 170 horsepower at 6,000 meters (325 to 350 horsepower at sea level).

Case II. 160 to 180 horsepower.

This indicates that, under the conditions assumed, the Hispano-Suiza 170 horsepower (at 1,630 revolutions per minute, high compression, direct drive) would be an ideal engine for the single seater pursuit if a devise were installed to keep the power constant at all altitudes up to 6,000 meters. The high speed of propeller revolution, while a decided disadvantage, might be borne.

It is quite evident that this engine, with the constant power device installed, would be superior to the 165 horsepower Gnome, for all single-seater machines. If the constant power device were developed it would mean one less type of airplane necessary to build. A design would be required which constitute a compromise between the single-seater fighter and the single-seater pursuit.

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Typical airplanes of the single-seater pursuit class are the Martinsyde (British) with the 275 horsepower Rolls-Royce, the S. V. A. (Italian) with the S. P. A. 210 horsepower engine, and the Spad (French) with the 220 horsepower Hispano-Suiza. The German Halberstadt, with the 120 horsepower Argus, and the Albatros III, are successful machines of this type.

I believe that, should a device be successfully developed to maintain power constant with changes in altitude (and I believe that the development of such a device is by far the most important problem connected with aviation material) this will mean an inevitable abandoning of all single seater military airplanes. I say this because, immediately the radial engine is abandoned, extreme handiness is lost, and the percentage of increase in longitudinal moment of inertia brought about by the addition of one more man will be comparatively small. Again, the ideal power, and hence the weight of the power plant, is so great that the percentage increase in total load weight of airplane caused by the addition on one man, becomes comparatively small. Again these increases in longitudinal moments of inertia and weight, must be considered the great advantage in having one more man to operate against the enemy to the sides and to the rear, and in reducing the number of types of airplanes which must be built at home and repaired in the field. As I have said, the tendency in aerial warfare is coming to be to fight in formation rather than by independent machines, and this tendency will eventually bring about the replacement of the single-seater type by the two seater.

IDEAL POWER FOR THE TWO SEATER PURSUIT TYPE.

Assumptions: Weight of airplane loaded, 38.5 kilograms per square meter (7.88 lbs. per square foot).

Military load, 225 kilograms (495 pounds).

Weight of gasoline and oil, 0.682 kilograms per hosrepower (1.5 pounds per horsepower), which will permit a flight of about 564 kilometers (350 miles).

Weight of power plant including radiator and water:

Case I (no device for maintaining power constant with change in altitude). 2.53 kilograms per horsepower at 5,000 meters altitude (1.35 kilograms per horsepower at sea level).

Case II (turbine for air intake, or other device, for maintaining power constant at all altitudes). 1.45 kilograms per horsepower (3.2 pounds per horsepower).

The ideal case would be:

Case I. 220 to 235 horsepower at 5,000 meters, or 425 horsepower at sea level.

Case II. 250 to 260 horsepower.

If it should be considered, by the man at the front, practicable to use the same airplane for Army observation work and for all fighting the machine which would be the result of a compromise would be somewhat as follows: The wing loading, with full load carried, should not be more than 35 kilograms per square meter. The military load will be about 235 kilograms. Assuming a water cooled engine with a successful device installed for maintaining power practically constant up to altitudes of 6,000 meters the ideal power would be about 260.

The third division under functions is to "inflict direct damage upon the enemy." By this is meant bombing operations. These comprise practically all the real damage that it is, at the present time, possible for an airplane to inflict upon the enemy. In comparison to these the slight damage caused by bringing down his airplanes, each containing one or two men only, or shooting up his trenches or truck trains, is negligible.

Under bombing operations, two essential divisions are bombing by day, and bombing by night. Under conditions as they exist in the air at the present along the western front the material damage must be done by night bombers, day bombers being used largely for moral effect, "to give the enemy no rest," except for few special cases where enemy strong points are difficult to locate at night, or when the enemy strong point must be destroyed quickly during the new moon season.

I will discuss the day bomber first.

The primary military functions of the day bomber are:

To bomb important points, such as small objects difficult to find by night, such as headquarters, small ammunition "dumps," small storehouses containing munitions or supplies, small railway junctions, small aerodomes. Also to bomb such communities as it is considered desirable, on account of the moral effect, with the idea of giving the enemy no rest, by day or night. The usual practice will be for a number, say, 25, to fly in regular and rather close formation during day bombing raids.

This airplane will also probably be used to conduct long range reconnaissance strategical reconnaissance, reconnaissance by staff officer, or with camera.

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This machine may be used for special photographic work so far beyond the lines as to necessitate great altitude, demanding a camera of great focal strength and therefore great size and weight.

The number of this type, assuming that the enemy has been driven completely out of the air by fighting airplanes, should depend upon—

The amount of such work that it is considered desirable to perform.

The number of pilots trained and available for this work.

The primary requirements for this airplane in order that it may effectively perform its military functions are:

It must be able to protect itself effectively against all hostile aircraft, which demands good speed at altitude, strong climbing ability, powerful and reliable armament, and a satisfactory degree of "handiness."

Reliable power plant.

Power plant with good fuel efficiency.

Capacity for as many bombs as will not prohibit satisfactory provisions for protecting itself against enemy aircraft as discussed above. I believe that, at the present time, it is not an economical proposition to send a trained pilot and a trained "bombardier" a great distance beyond the enemy's line unless at least 275 kilograms of bombs are carried.

Effective provision for accurate sighting for, and dropping, bombs.

Ceiling should be high enough so that the machine stands a good chance of escaping detection as it crosses the line.

A muffler for the exhaust, capable of being cut on and off at the will of the pilot, is desirable.

Two men are carried.

Two or three machine guns, one firing through the propeller disk, and one or two with all around fire, with good field to the rear. A reliable compass is necessary.

The ceiling with full bomb load and full fuel load, should be not less than 7,000 meters. The possible horizontal speed at an altitude of 5,000 meters should be not less than 200 kilometers per hour. Starting with full load the airplane should be capable of climbing to an altitude of 5,000 meters in not more than 20 minutes. The factor of safety of the main plane structure, for full load, will not be less than six for the high incidence conditions and four for the low incidence condition.

IDEAL POWER.

Assuming: Wing loading (with full load) 37.5 kilograms per square meter (7.68 pounds per square foot); military load (including 275 kilograms of bombs), 500 kilograms; weight of fuel and oil, 1.31 kilograms per horsepower (2.88 pounds per horsepower) which will permit a flight of about 470 kilometers (292 miles) beyond the lines and return; weight of power plant (including radiator and water):

Case I (no device for maintaining constant power at all altitudes). 2.44 kilograms per horsepower at 5,000 meters altitude), 1.3 kilograms per horse power at sea level.

Case II (turbine for air intake, or other device for maintaining power constant at altitudes). 1.4 kilograms per horsepower (3.09 pounds per horsepower).

The ideal power would be:

Case I. 495 horsepower at 5,000 meters (930 horsepower at sea level).

Case II. 520 horsepower.

An engine developing 363 horsepower at 5,000 meters and weighing (complete with radiator and water and constant power device) 510 kilograms (1,120 pounds) would be the ideal engine under the conditions assumed above for a day bomber, with any of the following characteristics:

Distance of objective beyond the lines.	Weight of bombs.
388 kilometers (241 miles)	136 kilograms (300 pounds).
340 kilometers (211 miles)	182 kilograms (400 pounds).
292 kilometers (181 miles)	227 kilograms (500 pounds).

For every 30 miles farther increase in radius to reach the objective, 100 pounds of bombs are sacrificed.

Typical airplanes of the day bomber type are the De Haviland-9 (British), with 300-horsepower Fiat engine, the S. I. A.-7B (Italian) with 200-horsepower Fiat engine, the S. I. A.-9B (Italian), with 600-horsepower Fiat engine, and the Brequet (French) 14-B2, with the 300 horsepower Renault engine.

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The German Gotha twin motor machine (2–260 horsepower Mercedes engines while rather too slow and too unhandy for the purpose, has done some service bombing by day over London.

The fourth and last general class is the type designed for bombing by night. This is the type which in my opinion must be depended upon to inflict real material damage upon the enemy. I believe that the consistent employment of these machines in large numbers on every good night in bombing Germany's munitions factories, factory towns, important railway junctions, large munition depots, the bridges across the Rhine, the Kiel Canal, important docks, submarine bases, and certain cities, would, in a shorter period of time than is possible by any other means, end the war.

Let us suppose that, only for half the time, it will be possible to find a considerable period during some part of the night in which there is clear bright moonlight. Suppose that every time such conditions occur, fleets of several hundreds of night bombing airplanes, each airplane carrying a ton and a half of bombs, start out from large aerodromes located, say, 25 miles in the rear of the lines, and penetrate to Esson, for instance, or Zeebrugge. Each machine locates its objective and drops, say, ten 160-pound bombs of the high explosive type on the factories themselves, and forty 25-pound bombs filled with poisonous gas, and twenty-four 25-pound bombs of the incendiary type throughout the factory town, and returns to its objective.

In the existing phase of the present war, were our night bombing airplanes of sufficient numerical strength, it would be no longer a matter of individual and isolated raids on selected places at which the maximum of injury could be inflicted, but rather a continuous and unrelenting attack on each and every point of strategical importance. Depots of every kind in the rear of the enemy's lines would cease to exist; rolling stock and mechanical transport would be destroyed; no bridge would be allowed to stand for 24 hours; railway junctions would be subject to continuous bombardment, and the lines of railway and the roads themselves broken up nightly by giant bombs to such an extent as to baffle all attempts to maintain or restore communication.

In this manner a virtually impossible zone would be located in the rear of the enemy's defenses, a zone varying from 100 to 200 miles in width. As soon as this condition has been brought about, the position of the defending force must be considered as precarious and, eventually impossible, not only will the defense be strangled from the uncertainty and lack of supplies of all kinds, but ultimately retreat will become impossible. The defending force will find itself literally in a state of siege under the worst possible conditions, for the position will be one in the form of an extended line along which the forces of all arms will be definitely immobile, for the lateral communications will suffer no less than the lines from the rear. In short, a vertiable reign of terror would exist. Such a condition presents all the elements conducive to complete and irreparable disaster.

I can not help believing that such methods would put an end to the war far more quickly than sending one or two million men to line the trenches, with no possible hope of gaining at the very best more than a couple of miles a month.

In this connection it must be remembered that the German forces, when driven slowly back, have, during the process, tremendous advantages because of being on the defensive. Troops advancing upright over open ground, exerting themselves so that their aim will be inaccurate, suffer in loss of men infinitely more than the troops protected in the trenches, under good control, with good rests for aiming their rifles. Barb-wire entanglements, and other obstacles, give the defenders a very great advantage over the advancing troops. These are laid so as to subject the advancing troops to heavy enfilading fire from machine guns and rifles in the trenches. The retreating troops can retire at will through well covered communication trenches. In every case where they retire slightly at some point they will have previously at their leisure chosen carefully, and fortified strongly, advantageous new lines for their trenches. They will have prepared carefully the terrain in front of their new lines so as to leave it clear for deadly fire against our troops advancing. They will have measured and recorded the ranges to certain permanent landmarks in this region so as to make their fire against our troops, advancing over unknown ground, more effective. They will have measured carefully the range from their artillery batteries to the trenches from which they retire, and which will be occupied by our men, in order that they may slaughter our men by shell fire before they can "dig in."

On clear moonlight nights it is not difficult, if the map be studied carefully, and good judgment used, for the pilot of an airplane to find his way and locate the objective. Important factories and depots must necessarily be alongside railroads, and by following railroads it should always be possible to arrive at any given objective. If the pilot should lose the railroads he can always bear west until he comes to the shore line, which, on a good night, is always readily discernible because of the surf, and follow this to the northeast until he comes to some mark which he recognizes and

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which will relocate him on his map and give him a fresh start. Zeebrugge and other towns on the coast are esily found. Essen may be found by following the Rhine.

It is impossible to defend effectively against airplane bombing by night, especially if there be bright moonlight. Suppose an altitude of 9,000 or 10,000 feet be obtained before crossing the line, and maintained until nearing the objective. Mufflers for the engine exhaust should help escape detection or, at any rate, definite location from the ground. Upon nearing the objective the airplane descends to, say, 6,000 feet altitude, and maintains this altitude until after the bombs have been dropped. If there be good moonlight, and the pilot keeps the moon at a certain location with respect to his position and that of the objective, it is absolutely impossible to see the airplane from the ground.

Even if a powerful battery of searchlights, manned by very expert crews, be employed, it is next to impossible to pick up the airplane at this altitude. Even should it be picked up and held in the beams of searchlights, the chances are very small that the airplane will be brought down by antiaircraft gunfire. Defensive airplanes are, at the best, next to useless at night. It may be that the bombing airplanes can get through and arrive at their objective without sufficient warning being given to permit defensive airplanes taking the air and obtaining sufficient altitude to engage before the bombing airplanes have dropped their bombs. Assuming, however, that sufficient warning has been given, airplanes of the fast-fighter type can not be employed at night on account of the very high speed necessary on landing except by very few of the most expert pilots. Even could these be employed, the chances are very small that they will be able to find the bombing machine in the air, and, again, should they by some chance find the bombing machine, it is quite probable that the defending airplanes will not recognize the bomber as being an enemy if they, the defenders, know that the air is filled with defending machines. Small searchlights are used on defensive machines, but, while they do prevent many collisions between defending airplanes wandering aimlessly through the air, they also afford an excellent target for gunfire from the bombing machine, should the latter choose to allow a defender, from whom he can easily see, to come near him. There is no need for the bombing airplane, unless he chooses to deceive the defenders by using the same system of lights as the defending airplanes adopt, to carry any lights whatever. His purpose involves merely flying, in regular course, once across above the objective, then turning, and steering wide of all defenders, returning home by the quickest and safest route. As soon as the heavy bomb load has been released the airplane will quickly rise to an altitude of 12,000 to 14,000 feet, where it will be comparatively safe.

If a great number of airplanes be sent over one given objective, it is best to assign one route for the airplanes traveling at, say, seven or eight minute intervals, to pursue while going out, and another route while returning. Pilots should also be instructed to fly at different altitudes, for instance, A machine at 7,000 feet, B machine at 8,000 feet, C machine at 9,000 feet, D machine at 7,500 feet, E machine at 8,500 feet, F machine at 9,500 feet, G machine at 7,000 feet, etc. By these methods collisions between bombing airplanes would be avoided.

In cases where it is of particular importance to pick out one building from a group that is of special value to the enemy, or when the light conditions during the night are not very good, it is entirely practical to send out the bombers, leaving the aerodrome at such time that they will arrive at the objective exactly at the "crack of dawn." In this way they will be able to drop their bombs before the enemy pursuit airplanes will have been able to take the air and gain sufficient altitude to engage. It is probable that the day bomber would be used for this work on account of its great speed in returning home.

The number of night-bombing airplanes built and supplied should depend solely upon the number of pilots available for this work.

A far lower degree of expertness is required to pilot a large slow night bomber than for a fast fighting machine.

As a matter of fact, the number built and supplied will, in all probability, depend upon steamship space for trans-Atlantic transportation, hangar space at the aerodromes in France, and, even, possibly, upon the appropriation available.

The primary requirements for these machines in order that they may effectively perform their functions are:

Great bomb capacity.

Reliable power plant.

Power plant with good fuel efficiency.

Proper degree of stability and controllability to permit a pilot of ordinary ability, and a very limited amount of training, flying and landing at night.

Effective provision for accurate sighting for, and dropping, bombs.

Accurate compass and other instruments necessary for navigation by night, with provision for reading conveniently at night.

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. Two to five men may be carried. Probably the best practice is a crew of three, a chief pilot, a "bombardier," and one man to man a gun forward or to the rear, as may be necessary, and to act as relief pilot.

The load of bombs which may be carried will depend upon the total power available at an altitude of 3,000 meters, and upon the distance of the objective (which will regulate the initial fuel supply). The ratio of total weight of airplane, with full initial load, to the total power available, should be small enough to permit a ceiling of at least 3,500 meters, starting with full load. The power plant will be divided into two, or possibly three, units. Suppose that two United States Army 12-cylinder engines be installed, if no device is incorporated to maintain the power constant with change in altitude, the total power available at 3,000 meters altitude should be about 450 horsepower. Suppose that the objective lies 250 kilometers beyond the lines, a bomb load of between 900 and 1,200 kilograms may be carried, and the necessary initial ceiling obtained, provided the general design of the airplane be good.

The total weight of the airplane in kilograms with full initail load should not be more than 10 times the number of horsepower available at 3,000 meters. The total weight of airplane, with full initial load, should not be more than 27.5 kilograms per square meter. The machine should have possible horizontal speed, at an altitude of 3,000 meters, of not less than 137 kilometers (85 miles) per hour. Starting with full load the airplane should be capable of climbing to an altitude of 3,000 meters in not more than 27 minutes.

For every 26 kilometers (16 miles) increase in radius necessary to reach the objective, 45 kilograms (100 pounds) of bombs is sacrificed.

Typical airplanes of the night-bomber type are the Caproni triplane (Italian), with three 273-horsepower Isotta-Fraschini engines, the Handley-Page (British), with two 320-horsepower Sunbeam engines; and the Caproni biplane, with three 210-horsepower S. P. A. engines. The German Gotha, with two 260-horsepower Mercedes engines, is typical.

SPECIAL TYPES.

One of the special types which may be demanded by the men at the front will be a type designed to rake the trenches, troops marching in column, truck trains, etc., with machine-gun fire. Such an air plane would be armed with three or four machine guns pointed downward at an angle of about 25 or 30 degrees to the propeller axis, probably firing under the propeller disk. Two men would be carried, both protected from rifle fire from underneath by armor. The gasoline tanks, radiator, engine, etc., would also probably be armored against rifle fire.

Another type, which I believe is an inevitable development owing to the future tactics in fighting with machines in regular and close formation, is a type which will man one or more large cannon, effective at a range up to 1,000 yards. This machine will probably be called a battle plane. Shrapnel containing very heavy buckshot will be used, the muzzle velocity being well over 1,000 feet per second. The problem of controlling the recoil of the gun without racking the fuselage structure of the air plane will be a most difficult one. This has not yet been satisfactorily solved. The Davis gun, in which there is very little recoil owing to the charges being fired in opposite directions, is very unpopular among men who have tried to use it, and will probably never be satisfactory because of the necessarily very limited range in elevation. Squadrons of battle planes flying in formation may reduce the tactics for fighting in the air to a very similar scheme as that used in naval fleet tactics.

The greatest influence on the development of types of air planes in Europe during the war has been the endeavor to counteract the development of the enemy. I believe that the records will show a great number of cases in which the development of a very excellent and advanced design has been summarily stopped because the designer was suddenly called upon to get out a machine the sole purpose of which was to meet a new type just produced by the enemy. Although necessity is the mother of invention, the exigencies of this war have driven the designers of aircraft and engines in Eurpoe to produce equipment far in advance of anything which has been produced in the United States. I believe that it is quite probable that, had the engineers and research men in England, France, and Italy, been given more time, their investigations might have been much more thorough, and productive of better final results. Such a thing as real thorough experimentation has been impossible in England and France during the war.

In order to minimize the number of spare parts supplied to the repair stations in the field and the air-plane depots in France, it will be necessary to reduce the number of types of air planes built and supplied to the five types described above. It is entirely possible that the number may be further reduced, in the very near future, to four, i. e., 1, Army observation; 2, fighter; 3, day bomber; and 4, night bomber. The pilot actually doing the work in the field would like to have many special types

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available, each designed for one particular function: Good to defend, to attack by speed, to attack by climbing and maneuvering, to attack at long range with a cannon, to reconnoiter, to photograph, to control artillery, to bomb during the day, to bomb at night, etc. Then again certain pilots will prefer, or the pursuit type, the Martinsyde, others the Spad, and others the S. V. A., etc.

I believe that probably the most important influence on the conduct of war is the group of men held responsible for deciding upon the types which will be built and supplied to the forces in the field. Such a group should comprise members who are acquainted thoroughly, through real experience, with the practical difficulties in actual service at the front, members experienced in field repair of air planes, members acquainted with the theory and practice in the design of air planes, members acquainted with the theory and practice in the design of engines, and members thoroughly experienced in the manufacture of air planes and engines and factory methods employed. They must, above all, be men of good common sense and the leader of the group should be the broadest gauge, soundest, and most progressive man available.

V. E. CLARK,
Lieutenant Colonel, Signal Corps.

STATEMENT OF MR. GLENN M. TAIT.

Senator NEW. Where have you recently been employed and in what capacity?

Mr. TAIT. At the Thomas-Morse Aircraft Corporation at Ithaca, N. Y.

Senator NEW. In what capacity?

Mr. TAIT. I was in charge of the final assembly, final wing and fuselage assembly, and also in charge of the shipping department.

Senator NEW. You spoke of the final asssembly. What is made at the Thomas-Morse works?

Mr. TAIT. It is an advanced training machine, a speed scout, a single seater.

Senator NEW. And you have been in the employ of the Government; you have been there as an United States inspector?

Mr. TAIT. Yes, sir.

Senator NEW. As such inspector have you had occasion to report any defective parts of that machine?

Mr. TAIT. Who do you refer to?

Senator NEW. Have you had any occasion to report to your superiors any defective parts in the machine being made there?

Mr. TAIT. Yes, sir.

Senator NEW. Can you give us any particular instances of that?

Mr. TAIT. Do you mean Signal Corps numbers on the machines or special machines.

The CHAIRMAN. Anything.

Mr. TAIT. Up to a short time ago I had charge of about eight men and there were lots of instances of parts going through that were not right, but I could not tell the number of machines.

The CHAIRMAN. You can tell us what the parts were and the reports you made concerning them.

Mr. TAIT. The reports were made to my senior inspector and were verbal.

The CHAIRMAN. What was his name?

Mr. TAIT. Otto H. Hamm, stationed at Ithaca, N. Y. Being a training scout it is very light, and the motor is supported by ash struts in the front of the fuselage. Several times those struts have been bored wrong and they have been allowed to plug them and reset the motor and also the longerons of the machine have been bored wrong, and were allowed to be passed.

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The CHAIRMAN. When you say they have been allowed to pass, do you mean that they have been allowed to be passed by the——

Mr. TAIT. By the Government inspectors. The company inspectors at the Thomas-Morse plant are simply there to fulfill the Government contract. They have not in the last two months; it is in the contract, I believe, that the Thomas-Morse Co. are to supply factory inspections and there have been several instances lately where they have passed things to me and I have made an accurate note of them that they said were all right that were wrong, and they knew they were wrong when they put them up to us.

The CHAIRMAN. Have you those notes with you?

Mr. TAIT. I have not. I did not come to Washington with this idea in view, and then a friend of mine told me that he considered it to be my duty to come and see Senator New, and for that reason I am here.

The CHAIRMAN. Are you still employed as an inspector?

Mr. TAIT. No, sir.

The CHAIRMAN. When were you dismissed or discharged?

Mr. TAIT. I put in my resignation on the ninth.

The CHAIRMAN. You resigned?

Mr. TAIT. Yes, sir; but it was requested.

The CHAIRMAN. By whom?

Mr. TAIT. By Capt. Weller, of Buffalo.

The CHAIRMAN. Is he a Government inspector?

Mr. TAIT. He is the officer in charge of the Buffalo district of inspection.

The CHAIRMAN. What reason did he assign to you?

Mr. TAIT. He did not give me any reason. I understood it was because I was holding up production.

The CHAIRMAN. From whom did you understand that?

Mr. TAIT. It is a rumor.

The CHAIRMAN. Was your resignation requested without any previous notice or advisal of the fact?

Mr. TAIT. What led up to it was for the last two months they have been gradually trying to rush production at the expense of quality, and I have been a flyer and have had two or three years' experience, and then also I was in the aviation game before the war started. I was working in the assembly at the Curtiss plant and was a foreman in the Thomas-Morse plant, and I felt probably more plainly the need of strength in certain parts than the average inspector would feel, and when these things began to rush through I began to feel bad about it. I really did not have full authority on assembly. I did all I could do to stop them.

Senator NEW. You say you were a flyer. Where did you learn to fly?

Mr. TAIT. At the Curtiss school at Hammondsport.

Senator NEW. Have you a pilot's license?

Mr. TAIT. Yes, sir.

Senator NEW. How long have you had that license?

Mr. TAIT. Ever since 1912.

Senator NEW. Have you continued your flying from the time that you got your license up to the present?

Mr. TAIT. No, sir; I was in the exhibition game, and that was the only thing which was supporting aviation at that time, and as soon

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as it became a common thing I dropped back into the automobile business.

Senator NEW. Where is your home?

Mr. TAIT. At Middletown, Ind. That is my address.

Senator NEW. How did you happen to get into the Government employ as an inspector?

Mr. TAIT. I went to the plant at Ithaca with the intention of learning the depth control. I was a Curtiss pilot, and I wanted the new type of control, and at that time Mr. Thomas told me that he thought the chances were better in the manufacturing end of it, and I did not take it up, and I accepted a foreman's position in the Thomas factory, and that was, I think, in April, 1917, and I continued in the Thomas Co.'s employ until the last of November of last year, and then I put in my application for the aviation school, or was intending to, but was thrown out on physical examination, and I think it offended the Thomas Co. because I did so, so I left the Thomas Co. and went into the Government employ, and that is how I happened to be in the Government service.

Senator REED. You say that inspection is sacrificed to production?

Mr. TAIT. Yes, sir.

Senator REED. At the Thomas-Morse plant. Just what do you mean by that?

Mr. TAIT. I mean that concessions are given beyond the specifications to allow production, and sometimes those concessions are given by men that have not had experience in aeronautics and I consider they are a dangerous thing when they are given in that way, and I think that they ought to be given by a man that understands thoroughly what strength is required and what it means to have a certain part break. I understand that foreign inspection, English and French inspection, is given the predominant power instead of production, and on this side I understand that production has the power over inspection. I have talked with Army officers and they tell me that.

Senator NEW. In other words, your general complaint is that quality here is sacrificed to quantity?

Mr. TAIT. Yes, sir.

Senator NEW. To an extent that you think is dangerous. Is that right?

Mr. TAIT. Yes, sir; I think it is in some cases.

The CHAIRMAN. What defects, other than those you have previously mentioned, have you discovered there in the material?

Mr. TAIT. I think it is a general reluctance on the part of the inspection, and the inspection is not any too good to start with because the average inspector has not had airplane experience.

The CHAIRMAN. When you were there you did your duty and you discovered some defects. You have mentioned some of them. Are there any others that you yourself discovered?

Mr. TAIT. Yes, sir; such as cracked terminating struts, loose fuselage clips, things that have been rewelded after being made wrong, and at this time on the machine being built there the wing ties are of such a design that they can not be welded and stand heat treatment, and they are going through an operation called dip brazing. In this dip brazing they dip the whole entire fitting into the brazing compound, and I have found several of those fittings when sawed through, and I would see cracks underneath the brazing; that is something that can not be found out by outside inspection.

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The CHAIRMAN. Is this brazing a veneer or covering of some sort?

Mr. TAIT. It is steel parts brazed together with brass spelter.

The Chairman. Were these defects of which you have just spoken typical or the exception occurring here and there in a particular machine?

Mr. TAIT. Probably here and there.

The CHAIRMAN. You would report these things verbally to your superior?

Mr. TAIT. Yes, sir.

The CHAIRMAN. Do you know what he did with them?

Mr. TAIT. Some were passed.

The CHAIRMAN. You mean that notwithstanding your complaint they were permitted to go into production?

Mr. TAIT. Yes, sir.

The CHAIRMAN. In every instance?

Mr. TAIT. Not in every instance.

The CHAIRMAN. Some of the parts were rejected and others were not?

Mr. TAIT. Yes, sir.

The CHAIRMAN. Did Mr. Hamm ever consult you or speak with you about these inspection reports?

Mr. TAIT. Yes, sir.

The CHAIRMAN. What comments did he make upon them?

Mr. TAIT. He said that he could not hold them too close or he would not have production.

The CHAIRMAN. Did he say that more than once?

Mr. TAIT. Yes, sir; several times.

The CHAIRMAN. What was his business prior to his appointment?

Mr. TAIT. He was a graduate of Cornell, an M. E. of last year.

The CHAIRMAN. A mining engineer?

Mr. TAIT. A mechanical engineer.

The CHAIRMAN. A graduate of last year?

Mr. TAIT. Yes, sir.

The CHAIRMAN. A man, then, of little practical experience?

Mr. TAIT. I think he is about 22 years old.

The CHAIRMAN. Did he go from Cornell practically into this factory?

Mr. TAIT. Directly; yes, sir.

The CHAIRMAN. He is a resident of Ithaca?

Mr. TAIT. No, sir; I think he is a resident of Baltimore.

The CHAIRMAN. When was your resignation requested?

Mr. TAIT. July 3; but the request was not made known to me until the 9th.

The CHAIRMAN. Who made it known to you?

Mr. TAIT. Mr. Hamm.

The CHAIRMAN. Did you ask Mr. Hamm what it was based upon?

Mr. TAIT. I think he knew. What he thought and what I thought was that it was on the complaint of the Government production man at Ithaca.

The CHAIRMAN. Who is the Government production man there?

Mr. TAIT. Mr. Robbins.

The CHAIRMAN. What was his business before he entered the Government employ?

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Mr. TAIT. I do not know, When he came he did not know anything about airplane construction.

The CHAIRMAN. When did he come there, about?

Mr. TAIT. About six or eight weeks.

The CHAIRMAN. Before or after you came?

Mr. TAIT. Afterwards.

The CHAIRMAN. How old a man is he?

Mr. TAIT. I imagine about 28 or 29 years old.

The CHAIRMAN. A young man?

Mr. TAIT. Yes, sir.

The CHAIRMAN. What is their present weekly production of machines, about?

Mr. TAIT. They have no regular production. It has gone as high as 18 and as low as 2.

The CHAIRMAN. With what engine is the plane equipped?

Mr. TAIT. Up until a short time ago we used a 100-horsepower Gnome; a rotary engine.

The CHAIRMAN. What have you been using since?

Mr. TAIT. An 80-horsepower Le Rhone.

The CHAIRMAN. You used a rotary type of engine in each instance?

Mr. TAIT. Yes, sir.

The CHAIRMAN. Do you know where those planes were shipped to?

Mr. TAIT. All over the country. I think a large amount of them went to Lake Charles. I think they are the only training scout at Lake Charles, or they were the last time I knew about it.

The CHAIRMAN. Would you have given this information, Mr. Tait, had you not been relieved of your position?

Mr. TAIT. No, sir. I am glad you asked it, because it gives me an opportunity. I could not reach anyone, or thought I could not, under the rules of the Signal Corps, and so in May, in the middle of May, I joined the A. P. L.

The CHAIRMAN. What is the A. P. L.?

Mr. TAIT. The American Protective League, and through it I hoped to get this news to somebody higher up. Instead of that the reports went into the Department of Justice, and the Department of Justice evidently referred it back to the Buffalo office of the Signal Corps, and they sent two men down, supposedly secret service men, or military intelligence men, and those two men, or somebody that they informed, told of all my information, and they told it, and so they put me in a very embarrassing position. My only reason for joining the A. P. L. was to get an outside——

The CHAIRMAN. A medium of communication?

Mr. TAIT. A medium of communication, as everything that goes from an inspector to the district office passes through the senior inspector, and everything that goes from the district office passes through the district office manager's hands, and if either of those gentlemen see fit to kill anything they can stop it. That is, the underinspectors have no right to appeal to any one——

The CHAIRMAN. You can not go over the head of anybody?

Mr. TAIT. Yes, sir. I think that while Mr. Hamm, I suppose, resented it a little bit, still he was very nice about it, and was very sorry to see me go. In fact, when the request for resignation came on July 3, he held it six days because he knew that I would resign as soon as I got it, and then he wrote a letter to me without my requesting it,

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stating that my services had been O. K. and everything was all right. The way that this request for transfer came about was that I saw no way to bring it to the district office except by a request for a transfer.

The CHAIRMAN. Why did you want to be transferred?

Mr. TAIT. I did not care to be transferred, but when you do that you get a chance to give a reason for your request.

The CHAIRMAN. Your purpose, then, was to use that as another method of giving information to those higher up regarding the unsatisfactory conditions of inspection?

Mr. TAIT. Yes, sir.

The CHAIRMAN. I will read this letter, addressed to Capt. Clark, district manager:

A request for transfer. The writer hereby makes request to be transferred. Would prefer location in the Middle West if possible. The reason for this request is that surroundings make it impossible for writer to discharge what he considers to be his duty. For further information the writer refers you to Capt. Whitman.

Mr. TAIT. That letter was not sent to the Buffalo office. It was kept at Ithaca.

The CHAIRMAN. Was it your fault that it was not sent?

Mr. TAIT. No, sir; I delivered it to the senior inspector. Seeing it on the files, I wrote this letter with a postscript.

The CHAIRMAN. The second letter you hand me is a copy of the first with a postscript reading that "this is a copy of the original handed to Mr. Hamm last Monday, to go through regular channels. It has not been sent to you." Did you send that to Capt. Clark?

Mr. TAIT. I sent that directly.

The CHAIRMAN. About how soon was that before you were requested to resign?

Mr. TAIT. Two or three days, I think. This is the letter requesting the resignation.

The CHAIRMAN. The letter requesting the resignation, directed to Mr. Hamm, is entitled, "Transfer of Mr. Glenn M. Tait," and reads as follows:

This office is in receipt of a copy of letter from the above-mentioned gentleman requesting transfer. It is regretted that this office has no authority to transfer a man from one district to another.

2. It is requested that you immediately request the resignation of Mr. Tait. It is believed that he will have no difficulty in finding a position elsewhere.

By direction of the district manager.

JOSEPH F. WELLER.

The CHAIRMAN. You requested a transfer and got a discharge?

Mr. TAIT. I knew that they could not give me a transfer out of the district, which is the reason I requested a transfer.

The CHAIRMAN. As soon as you were informed of the contents of the letter last read you presented your resignation?

Mr. TAIT. Yes.

The CHAIRMAN. To take effect immediately—on July 10th?

Mr. TAIT. Yes, sir.

The CHAIRMAN. Where have you been since?

Mr. TAIT. I spent two days in Ithaca, N. Y.

The CHAIRMAN. You now show me a letter from Mr. Hamm to yourself which you say was given you without consultation:

To whom it may concern:

Be it known that Mr. Glenn M. Tait has been employed by the Signal Corps of the United States Army for a period of seven months with the duties of inspector of air-

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planes at this station, under the supervision of the writer, and has proved to be a conscientious, capable, and direct-spoken man and an exceptionally good mechanic. Mr. Tait has left the employ of the Signal Corps of his own free will, and it is likely that he is seeking other connections.

O. H. HAMM, *Inspector.*

The CHAIRMAN. We are very much obliged to you, Mr. Tait, for your information.

(Whereupon, at 5 o'clock p. m. the subcommittee adjourned until 10.30 a. m., July 17, 1918.)

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AIRCRAFT PRODUCTION.

WEDNESDAY, JULY 17, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at 10.30 o'clock a. m. pursuant to adjournment, in the committee room, Capitol Building, Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Frelinghuysen, Reed, and New.

Also present: Mr. John A. Jordan, Mr. A. A. D. Lang, and Mr. W. F. Ardis.

STATEMENT OF MR. JOHN A. JORDAN—Resumed.

The CHAIRMAN. Tell the committee what interferences were met with in the procuring of raw materials, and what the quality of the raw materials procured was?

Mr. JORDAN. In order to answer that question fully and intelligently—if I had that correspondence here which you have subpœnaed from Sacramento, Cal., it would tell the whole story.

The CHAIRMAN. It is on the way.

Mr. JORDAN. That will not only jog my memory but also check my statements.

The CHAIRMAN. What promises, if any, did you have from the Curtiss people for plans or materials made prior to your refusal to sign the cross-licensing agreement, and how were those promises afterwards performed?

Mr. JORDAN. I saw Mr. Glenn Curtiss in Buffalo before I refused to sign the cross-licensing agreement, and I asked him if he would help us out to the extent of giving us a fair start with the small metal parts which there was some difficulty in obtaining at that time; if he could give us a start on 20 or 25 machines so that we might go ahead with the order, and that would give us a breathing spell in which to bring in the parts from other manufacturers in case he could not continue to supply them. He said, "We will do that all right, and we want to cooperate with you in every way we can." There was some more conversation, but that is the meat of it. So I came back to Washington and got my contract with orders to go to Buffalo and get the blue prints and the specifications, and in Buffalo Mr. Guy and Mr. Morgan took me in their private office and said, "Mr. Jordan, you understand this association matter?" I said, "No; I do not know much about it," and Mr. Guy seemed to do most of the talking, although Mr. Morgan would chip in once in a while, and Mr. Guy said, "As a preliminary to our giving you any plans and specifications, we will expect you to pay a royalty of $240 "—or whatever the figure was—and he went on to explain to me how that was divided between the Curtiss concern and the Wright-Martin concern; that each one would get a part of it, and I said, "You fel-

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lows seem to be getting the worst of it." They were getting about $40 and the Wright people about $200, and he said that the Wright patents expire so much earlier than ours that they will be shut off earlier than we will be. They said, "Anyhow, you have to pay this before we will give you the plans and specifications." I said, "How much of a holdup is this?" And he said, "You bring in here 10 per cent of 1 per cent of your contract and we will let you have the plans and specifications if you will agree to give us the balance when you get back to Sacramento," and I told him, "I do not propose to do any such thing. There is nothing in my contract that calls for the payment of substantially $75,000 to you under any circumstances."

Senator REED. Was that what the royalty or charge would have amounted to on your contract?

Mr. JORDAN. Yes, sir.

The CHAIRMAN. What position did Mr. Glenn Curtiss hold in the company?

Mr. JORDAN. Just about that time there came some shift in the company and Mr. Curtiss seemed to lose his authority. He eventually left the company.

The CHAIRMAN. When you had your talk with Mr. Curtiss was he in authority there?

Mr. JORDAN. Yes, sir; I think he was president at that time.

Senator NEW. I understand that this talk which you have just described was between Mr. Morgan and Mr. Guy.

Mr. JORDAN. Yes. Mr. Curtiss in the meantime had been eliminated.

Senator NEW. You have not yet answered Senator Thomas' question, which was to tell about the interferences that you encountered, except that you have told us they declined to give you the blue prints until you signed the agreement. What happened, if anything, to you with reference to their refusal to give you the parts which they said they would give you?

Mr. JORDAN. I took it up with Mr. Morgan and he said, "We will help you out on that." He said, "We will give you the angles and bending of the plates which can not be shown on a blue print, and I will do that anyhow, and I will send them down to the hotel to you."

Senator REED. Was that before or after you had had the talk about the license?

Mr. JORDAN. That was before. There was very little talk after I got back to Buffalo and got the blue prints.

The CHAIRMAN. Did he ever furnish you with those parts?

Mr. JORDAN. He never furnished me with anything. He afterwards sent out to Sacramento some alleged samples of the parts, but they were useless and did not fit. They were not the correct material and were not in the right shape.

Senator REED. You came to Washington and you arrived at an understanding with the authorities that you would be given contracts, but before your contracts had actually been signed or delivered to you, you were told by the Washington authorities with whom you were dealing that you would get your blue prints, etc., from the Curtiss Airplane Co.?

Mr. JORDAN. No, sir; I understood that the Aircraft Board would give me all necessary blue prints, specifications, and data to carry out my contract. That is the invariable practice in all Government contracts.

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Senator REED. The next step was that you saw Mr. Glenn Curtiss at Buffalo, and you told Mr. Curtiss that you would want the blue prints, and that you would also want certain small metal parts furnished to you until at least you could arrange for the manufacture of them for yourself, and that, in any event, you would want enough of those parts to constitute samples, so that you could get the exact curvatures, which could not be well shown in the blue prints, and Mr. Curtiss assured you that you could have those parts. Did he tell you at that time that you could have enough parts to make some few of these machines to begin with or simply say he would furnish you samples?

Mr. JORDAN. No. He said, "We will help you out." I know Mr. Curtiss personally. My talk with Curtiss was several weeks before I got the contract.

Senator REED. After you had talked to Mr. Curtiss was it on the same visit that you saw Mr. Morgan and Mr. Guy?

Mr. JORDAN. No; I saw Mr. Curtiss but once.

Senator REED. Was it after you saw Mr. Curtiss that you saw Mr. Guy and Mr. Morgan?

Mr. JORDAN. Yes, sir.

Senator REED. How long afterwards? On the same trip?

Mr. JORDAN. No, no; on another trip.

Senator REED. Some days had elapsed.

Mr. JORDAN. Five or six weeks.

Senator REED. And in the meantime you had come back to Washington and closed your contract?

Mr. JORDAN. Yes, sir.

Senator REED. And after you had closed your contract you went back to the Curtiss aeroplane factory to get your blue prints, and you secured these parts. Is that right?

Mr. JORDAN. Yes, sir.

Senator REED. And you saw Mr. Morgan and Mr. Guy?

Mr. JORDAN. First, Mr. Morgan.

Senator REED. First, Mr. Morgan. And you told him that you had come after the blue prints, and that you would want these metal parts. Is that correct?

Mr. JORDAN. That is correct.

Senator REED. Did you tell him that you wanted parts for a number of machines or simply samples?

Mr. JORDAN. I asked him for all the parts that he could possibly furnish. He had the dies and machinery to turn out a greater number of parts than he could possibly use. That covered certain parts which were very necessary, and he said: "Yes; we can bang those out for you," and I said, "All right; we will take all you can ship me up to about 300 machines parts if it is necessary," and he said, "I will not promise to give you any definite amount but will give you whatever I can out of my surplus."

He sent me through the shops with one of his junior engineers to see the working of the shops.

Senator REED. Did you go through the shops with the engineer?

Mr. JORDAN. I did; and he showed me all of the machinery, and I was very much interested.

Senator REED. Do you know that engineer's name?

Mr. JORDAN. No; but I could locate him there.

The CHAIRMAN. Was that before you refused to sign the agreement?

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Mr. JORDAN. Yes; the young fellow showed me all the methods of their spot welding and heat treating, etc. I spent two days there, and everything was very friendly.

Senator REED. Did you talk at the same time about the blue prints?

Mr. JORDAN. Yes.

Senator REED. What was said about the blue prints?

Mr. JORDAN. They showed me the——

Senator REED. What was said about whether or not they would give you those blue prints? I am trying to get at the chronology of this thing. You went there and told them that you would want the metal parts, and they sent a man through the factory with you. Up to that time you had not discussed the question of the cross-licensing agreement, had you?

Mr. JORDAN. No, sir.

Senator REED. Before you did discuss the question of the cross-licensing agreement, was any reference made to the blue prints?

Mr. JORDAN. No; the only reference was the fact that they were digging them out.

Senator REED. Before anything was said about the cross-licensing agreement between you and Mr. Morgan, what was said about the blue prints?

Mr. JORDAN. The cross-licensing agreement was in Mr. Guy's hands. Mr. Guy was handling that end of it, and there had been nothing said about that until Mr. Guy came upon the scene.

Senator REED. I want to know what had been said about the blue prints before anything was said by any one to you about a cross-licensing agreement.

Mr. JORDAN. I gave my letter to Mr. Morgan. You have the letter here. It was an order for the blue prints, and he turned it over to the engineering department, with an order to get the blue prints out. I was in Buffalo four or five days and visited the plant daily, and about the second day after I got the blue prints checked—nothing was said about the cross-licensing agreement until I got them checked, and then they took me in the office and Mr. Guy said, "You understand what is required here before you take those blue prints?" And I said, "Yes; I know partly about it."

Senator REED. What did he say was required?

Mr. JORDAN. He explained that I would have to pay to the Curtiss Co. 1 per cent direct for the use of the blue prints and the flat sum of $240, as I remember it—the contract is here that he offered me—I was to pay that on each airplane which we sold, but the flat sum of 1 per cent on the entire contract would have to be paid direct before we took the blue prints and before I went to Sacramento.

Senator REED. You declined, as you have already said, to be held up, or to pay this $75,000?

Mr. JORDAN. Yes, sir.

Senator REED. What was the next step which was taken?

Mr. JORDAN. I returned to Washington.

Senator REED. You did not get the blue prints?

Mr. JORDAN. I did not.

Senator REED. And you did not get any metal parts?

Mr. JORDAN. I got nothing, and I returned to Washington and laid the matter before Mr. Coffin, and he said, "That is too bad. I do not see any necessity for paying those fellows anything," and he said, "I will see that you get the blue prints, and you go over and

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see Montgomery," and Montgomery sent his brother with me to Buffalo.

Senator REED. Mr. Montgomery held what position?

Mr. JORDAN. He was Col. Montgomery in charge of the contract department.

Senator REED. Did his brother hold any position?

Mr. JORDAN. He was the attorney of the board.

Senator REED. And the attorney of the board went with you to Buffalo and demanded the blue prints, and you got them?

Mr. JORDAN. Yes.

Senator REED. Who did he demand the blue prints from?

Mr. JORDAN. I do not know. They arranged that in the office. I was not present.

Senator REED. Do you know Mr. Montgomery's initials?

Mr. JORDAN. W. W. Montgomery.

Senator REED. Do you know whether he is still in Washington?

Mr. JORDAN. I do not.

Senator REED. When you got the blue prints, were they not complete?

Mr. JORDAN. They were not complete.

Senator REED. When did you discover that they were not complete?

Mr. JORDAN. While I sat there checking them. The first set of blue prints I checked and put them in a bundle, and when I went back the second time I could not get that set, and I had to check a new set. They were very incomplete and badly drawn, and the details would not fit the general plan.

Senator REED. Would it be possible from those blue prints to build the plane you had contracted to build?

Mr. JORDAN. Absolutely impossible.

Senator REED. What occurred in reference to these blue prints?

Mr. JORDAN. I said to Mr. Morgan, "I have not any general-assembly plan." That is, the general-assembly plan of the machine complete. From that general-assembly plan we draw off a detail of the various parts, like the clips and other parts, and when they come together they must all fit in the general-assembly plan in their respective places. That shows where each part goes. I said, "I want this general-assembly plan, and I want it right now." And he said, "I will have that in your hands as soon as you reach Sacramento," and it did not reach me until December.

Senator REED. When were you there?

Mr. JORDAN. About September 30.

Senator REED. You lost two months?

Mr. JORDAN. Two good, long months. I was also short nose-plate plans, which is a vital part of the machine.

Senator REED. You were also short of plans for them?

Mr. JORDAN. Yes; and those parts are the foundation of the engine, substantially. You could not build the machine without them. They did not reach me until some time in January.

Senator REED. The plans, you mean?

Mr. JORDAN. Yes. I wrote to everybody in the department that I knew of—Montgomery, Shepler, and Farwell and to Mr. Curtiss—urging him to send on these blue prints to me, and I could not get them until January. It took us three months to redraw the blue prints which we already had.

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Senator REED. What transpired about the metal parts which had been promised to you?

Mr. JORDAN. I called Mr. Guy on the telephone.

Senator REED. From where?

Mr. JORDAN. From the Iroquois Hotel in Buffalo, and Mr. Guy said, "It is all a mistake. We can not give you any metal parts."

Senator REED. What did he say that in reply to?

Mr. JORDAN. To my question to him. I said, "You promised to send me some metal parts to the hotel and also to ship some to Sacramento," and then he said, "It is all a mistake, and you can not have any metal parts," and in this correspondence which is coming you will find letters pertaining to the same thing, and I wrote to Buffalo appealing to Mr. Morgan on my arrival at Sacramento. I reminded him of his promise to give me samples.

Senator REED. You were in Buffalo and talking to Mr. Guy over the telephone?

Mr. JORDAN. Yes.

Senator REED. And you were in the Iroquois Hotel and he was at the factory?

Mr. JORDAN. Yes.

Senator REED. When was that?

Mr. JORDAN. In the first part of October. I have not the exact date.

Senator REED. You have given that whole conversation, have you?

Mr. JORDAN. Substantially; yes.

Senator REED. Did you not appeal to him?

Mr. JORDAN. Yes; I argued with him and he said it did not make any difference. I asked him if Mr. Morgan was in authority and he said said that he [Guy] was in authority.

Senator REED. Did you tell him that Mr. Curtiss had promised to make those for you?

Mr. JORDAN. I did, and he said that he would assume the responsibility for refusing me.

Senator REED. Did you tell him that Mr. Morgan had promised these metal parts?

Mr. JORDAN. I did, and he said that he would assume the responsibility for the refusal.

Senator REED. Did you finally ask him to give you mere samples?

Mr. JORDAN. I did, and he said it was not their practice to give out samples.

Senator REED. Did you or not tell him that you could not, from the blue prints, make the metal parts without great difficulty, because of the angles and curvatures, which were difficult to reproduce from the blue prints?

Mr. JORDAN. Yes; I told him that, and he said, "You will have to do as we did, and everybody else has to do, and make them fit.

Senator REED. Did you tell him of the fact that Mr. Morgan had sent you out through the factory and shown how these plates were made and fitted up with dies to make the parts?

Mr. JORDAN. Not to Mr. Guy; no.

Senator REED. In general, you did go through the situation with him and you reviewed the history of it, and he insisted upon his declination and he would not let you have these parts?

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Mr. JORDAN. Yes, sir; absolutely. I said, "Does Mr. Morgan's, the president's, word go?" And he said that he himself was in authority.

Senator REED. This occurred after you had declined to sign the cross-license agreement?

Mr. JORDAN. Yes, sir.

Senator REED. How long afterwards—on the same visit?

Mr. JORDAN. On the same visit on which I got the plans, a day or two afterwards.

Senator REED. You got the plans after you had gotten the lawyer of the board and he had gone up with you and they had been practically compelled in this way to turn over the plans, and it was on this same visit to Buffalo, a day or two later, that you had this conversation, and they refused to give you the parts?

Mr. JORDAN. Yes.

Senator REED. And the first refusal you had for these parts was after you had refused to sign the contract for $75,000?

Mr. JORDAN. Yes; all the row occurred after that refusal. Up to that time I guess I could have had the factory.

Senator REED. Do you mean by that statement that everything appeared as though they wanted to be accommodating?

Mr. JORDAN. Very.

Senator REED. And they were willing to give you practically everything that you needed?

Mr. JORDAN. Yes.

Senator REED. And to facilitate the carrying out of your contract?

Mr. JORDAN. Yes, sir.

Senator REED. But after you refused to sign the agreement they refused to deliver you anything—the blue prints, the metal parts, or anything else?

Mr. JORDAN. Yes.

Senator REED. And they finally did deliver the blue prints after you had made a trip to Washington and gone up there with an attorney of the board?

Mr. JORDAN. Yes, sir. I was just going to say that Mr. Morgan said to me in an offhand way, "Mr. Jordan, why don't you be a good dog?"

Senator REED. What did he say that in connection with?

Mr. JORDAN. After I refused to sign. That means in the contracting business——

The CHAIRMAN. Did you sever your connection with the Liberty Iron Works, in San Francisco, as a result of any differences or controversies?

Mr. JORDAN. There was no material controversy, only they thought I was not getting along fast enough as manager of the thing.

The CHAIRMAN. There was no friction there which has impelled you to sever your connection with the company?

Mr. JORDAN. Not a particle. What brought me to Washington more than anything else was not to criticize what was behind us, but what is in front of us; it is because these men are sending out bad parts.

The CHAIRMAN. At what flying field?

Mr. JORDAN. The Mather Flying Field, at Sacramento, Cal.

The CHAIRMAN. Maj. Emmons was the commander of that field?

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Mr. JORDAN. Yes, sir.

The CHAIRMAN. When did he tell you that?

Mr. JORDAN. About June 25; somewhere along in there. He said that "the inspection of planes coming in here is simply rotten."

The CHAIRMAN. Is he using them at all?

Mr. JORDAN. Yes; but he has been repairing them in his own field, and one vital part of the machine is the little bell pull that controls the afterrigging and the elevator and the afterpart, and he is reinforcing that by putting a piece of tubing inside of it. They were also soldering up and putting plates on the side of the rocker arm.

Senator REED. Who was doing that?

Mr. JORDAN. Maj. Emmons's man.

Senator REED. That did not apply to the Liberty Iron Works only, but the other three works out there as well?

Mr. JORDAN. The Fowler Co. and the United States Aircraft Co., and I have been told that Maj. Emmons shipped back five machines to the United States Aircraft Co.

Senator REED. Where is their factory?

Mr. JORDAN. Redwood.

Senator REED. Who shipped them back?

Mr. JORDAN. Maj. Emmons.

Senator REED. What is Maj. Emmons's first name?

Mr. JORDAN. Delas Emmons, at the Mather Field. He not only made that statement to me, but also to Mr. Edgar Williams, the chairman of the Civil Service Commission of the State of California. Here is a telegram from Mr. Williams, in which he says:

Maj. Emmons, commandant of Mather Field, tells me inspection is rotten and they have discovered many glaring defects.

The CHAIRMAN. The committee will now take a recess.

(Subsequently the chairman wired for additional information on this matter, which is here printed in full, as follows:)

WASHINGTON, D. C., *July 17, 1918.*

Maj. D. C. EMMONS,
Commanding Mather Flying Field, Sacramento, Cal.:

Mr. Jordan, of Sacramento, testified this morning before the Senate Subcommittee on Military Affairs that you said to him in substance about June 25 that training planes coming in were rotten; that you had been repairing them in your own field; that a vital part of the machine is the little belt pull controlling the after rigging, the elevator, and the after part, which you had to reenforce by placing tubing inside of same; also that you soldered up and put plates on the side of the rocker arms; also that you returned to the United States Aircraft Co. at Redlands five machines delivered to your field. Please forward copy of your record regarding this subject, together with statement covering the subject fully and oblige Senate Subcommittee on Military Affairs.

C. S. THOMAS, *Chairman.*

WAR DEPARTMENT,
SIGNAL CORPS AVIATION SCHOOL,
MATHER FIELD,
Sacramento, Cal., July 19, 1918.

From: Maj. Delos C. Emmons, Air Service, National Army.
To: Senator C. S. Thomas, chairman of Senate Subcommittee on Military Affairs.
Subject: Statement concerning conditions of airplanes delivered to Air-Service School, Mather Feild, Sacramento, Cal.

1. In compliance with your telegram dated July 17, 1918, copy attached, I am inclosing herewith a statement covering in detail just what faults were discovered with every airplane assembled at this field and including other faults

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which were present but not discovered until the airplanes had been flown. I hope this statement includes the information desired by the Senate Subcommittee on Military Affairs.

2. The first part of my statement is intended to correct that part of Mr. Jordan's testimony in which I am quoted. The second part is a compilation of plane-inspection reports and trouble reports.

3. In this connection it is desired to state that flying began at this school on June 17, 1918; that approximately 50 different airplanes have flown approximately 150,000 miles without serious injury of any kind to either pilots or passengers.

DELOS C. EMMONS,
Major, Air Service, National Army.

WAR DEPARTMENT,
AIR SERVICE TRAINING STATION MATHER FIELD,
Sacramento, Cal., July 19, 1918.

1. I hereby certify that Mr. John A. Jordan, ex-vice president and general manager of the Liberty Iron Works of Sacramento, Cal., which company had manufactured and delivered to this school 12 airplanes visited my office at Mather Field, Sacramento, Cal., on or about June 25, 1918, and offered his assistance as an aeronautical engineer; that during my conversation with Mr. Jordan I stated to him that some of the airplanes delivered to this field were in rotten condition, meaning that they were unsafe to fly. I also stated to Mr. Jordan that certain weak or defective parts were being replaced at this school and that certain repairs were being made at the Liberty Works of Sacramento, Cal.

I further stated to Mr. Jordan that on many of the airplanes supplied the elevator-control assembly, a vital part of the airplane, was weak and that I was having these parts reinforced before permission would be given to fly the airplanes.

I did not state to Mr. Jordan that we were soldering up and putting plates on the side of the rocker arms. However, I did state that, as soon as it could be arranged to do so, rocker arms would be cast at this school which I believe would be stronger than those supplied.

No airplanes have been delivered by the United States Aircraft Co., Redwood, Cal., to this school. Six surplus airplanes delivered to this school in error were returned to the Fowler Aircraft Corporation, San Francisco, Cal.

2. I further certify that the attached report, compiled by the Post Engineer Officer, covering in detail just what faults have been discovered with the airplanes assembled at this school, is correct to the best of my knowledge and belief, as I have personally observed many of the faults enumerated.

DELOS C. EMMONS,
Major, Air Service, National Army, Commanding.

MATHER FIELD, *July 19, 1918.*

Memo to commanding officer:

1. I submit the following report of trouble and faults found on ships assembled to date, along with subsequent faults that developed after flying.

2. The first in order are the twenty-four hundred series airplanes, manufactured by the Fowler Airplane Corporation, of San Francisco, Cal., as follows:

Ship No. 2405. Fuselage warped, necessitating realignment; cross member safety wire on turnbuckle very loose.

Ship No. 2406. Fuselage warped, necessitating realignment; short right-upper elevator control wire; one outer-left flying wire missing; one aileron-control wire not soldered at thimble.

Ship No. 2407. Fuselage warped, necessitating realignment; loose safety wire on turnbuckles of compression strut brace wires in fuselage; axle stream line space bar cracked; wooden control stick loose in socket; wing-struts fittings twisted; elevator and aileron-control wires too short; engine bed cross member cracked. Ends of this cross member very loose in master strut. Space had been filled with $\frac{3}{16}$ wooden wedge, which loosened and dropped out.

Ship No. 2408. Fuselage badly warped, necessitating realignment.

Ship No. 2409. Elevator and aileron-control wires too short; one end of aileron-control wire was not soldered at the wire wrapping below thimble.

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Ship No. 2410. Elevator control wires corroded so that rust could be scraped out from between wires with a pen-knife; rudder control wires improperly soldered at thimble so that wire wrapping at thimble was flexible and easily bent; elevator control wires too short; right front brace on landing gear split; clevis pin was in clevis on elevator pylons instead of bolt, nut, and cotter; cotter pin hole in bolts on wing skid sockets improperly drilled, so that cotter pins could not be used.

Ship No. 2413. Fuselage warped, necessitating realignment; no safety wire on turn-buckle on internal brace wire; fuselage clevis pins rusted; motor bed cross bearer compression member too small for mortised hole in master strut No. 3; then wooden wedge used fill space.

Ship No. 2414. Fuselage warped, necessitating realignment; one dead wood wing strut.

Ship No. 2416. Wood control stick loose over taper socket; one aileron control wire thimble not soldered.

3. The second in order are the thirty-six hundred series of airplanes, manufactured by the Curtiss Airplane and Motor Corporation, of Buffalo, N. Y., as follows:

Ship No. 3621. Fuselage warped, necessitating realignment; base of forward cabane on right wing beveled in wrong direction where it fit in socket, necessitating replacement.

Ship No. 3626. Hurnbuckle eye on landing-gear brace wire improperly threaded, necessitating replacement; left rear landing gear strut $\frac{1}{4}$ inch short; ailerons not varnished.

Ship No. 3628. Left front landing gear strut $\frac{1}{4}$ inch short; wing strut dead wood; one right lower wing strut fitting too far ahead on wing section; brace wire loop between sections 6–7, right side of fuselage, found broken; right front landing gear strut $\frac{7}{16}$ inch too long.

Ship No. 3629. One right front flying wire $\frac{3}{4}$ inch too long; left rear landing gear strut $\frac{1}{2}$ inch too long.

Ship No. 3635. Fuselage warped, necessitating realignment; right landing gear strut $\frac{3}{8}$ inch too long; right aileron warped; left lower wing panel $\frac{3}{8}$ to $\frac{1}{2}$ inch more camber than right wing panel.

Ship No. 3637. Fuselage warped, necessitating realignment; Pyrene extinguisher empty.

Ship No. 3644. Fuselage warped, necessitating realignment.

Ship No. 3652. Rudder badly warped; was replaced; fire extinguisher leaking.

Ship No. 3653. Fuselage warped, necessitating realignment. One outer left panel strut $\frac{1}{16}$ inch too long; linen torn near leading edge on four wing panels, and on stabilizer; rawhide guide on elevator control wire torn out of fuselage.

Ship No. 3655. Right front and right rear landing gear struts $\frac{3}{8}$-inch too long; horizontal stabilizer warped.

Ship No. 3656. Left front inside flying wire $3\frac{1}{2}$ inches too long.

Ship No. 3657. Aileron control wires short; bolt on rear seat support broken; replaced.

Ship No. 3660. Left aileron warped.

Ship No. 3661. Four false ribs on trailing edge of lower wing broken, necessitating repairs; fuselage warped, necessitating realignment.

Ship No. 3663. Loose fittings on lower wing panels throughout; left aileron warped.

Ship No. 3664. Fuselage warped, necessitating realignment.

Ship No. 3668. Fuselage warped, necessitating realignment.

Ship No. 3670. Turnbuckle on right stagger wire, center section, missing.

Ship No. 3671. Stabilizer warped; pyrene leaking.

Ship No. 3672. Left aileron $\frac{1}{2}$-inch short; vertical fin warped.

Ship No. 3674. Right front center section strut too short; left rear center section strut too short; left aileron badly warped.

Ship No. 3675. Could not obtain proper stagger due to center section struts being improperly beveled at their base, thereby bottoming in the socket; left rear center section strut $\frac{1}{8}$-inch short.

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Ship No. 3678. Right lower wing panel leading edge badly warped; turnbuckle eye or shank undercut, and loose in turnbuckle; replaced.
Ship No. 3679. One wing strut warped; replaced.
Ship No. 3680. Left aileron warped.
Ship No. 3681. Wing hinge fitting on upper left wing fitted too high on wing section and affected dyhedral and angle of incidence; one front flying wire 12 inches too long.
Ship No. 3682. Fuselage warped, necessitating realignment; one stagger wire 1 foot and 5 inches too long.
Ship No. 3684. Left rear landing gear strut ¼-inch too long; right front landing gear strut ⅜-inch too long.

4. The above detail report of troubles in assembling were compiled at time of assembly, and, in many instances, trivial defects are noted, as our men are required to check up every part of the ship and report anything unusual.

5. The third in order are the 10 Liberty planes of the thirty-nine hundred series, numbered 3991 to 4000, inclusive, manufactured by the Liberty Iron Works, Sacramento, Cal.; these ships were delivered to the field and partially assembled by their workmen.

These were the first ships put in commission, and, owing to the lack of department organization, defects were not reported by ship number. After the résumé of troubles was taken and was corrected by our mechanics who had charge of final inspection, they were placed in flying service.

The following general defects, however, were noted:

The fuselage bolts to the rear of station 6 were not cotter pinned, but the prick punching was of higher order than in the Fowler; control sticks were very loose in their sockets, and in some cases bottomed on the toggle joint on shaft underneath; carburetor control levers were connected in the opposite direction from the usual practice of a forward motion to open; clevis yokes on aileron and elevator control links were very loose; doping and varnish were generally poor on both wink and fuselage, and in some cases seemed to have but one coat of very thin varnish; wires seemed to be not properly stretched or tested by manufacturer; after first flight, loose landing, flying and drift wires developed; landing gear wires were connected to struts by means of eyebolt through struts at improper angle to correspond with angle of the brace wire, causing the eyebolt to bend under the usual stress and strain. Fowler and Curtiss planes had no such defect, inasmuch as they employed an extended lug bent to the proper angle.

Common complaints after ships have had flying service:

Gasoline tanks.—Up to date gasoline tanks in the following ships, to wit: Nos. 3612, 3640, 3657, 3664, and 3677, manufactured by Curtiss Airplane Corporation, and Nos. 3993, 3998, and 4000, manufactured by Liberty Iron Works, are opening up or cracking along the riveted seam. In every instance this has been at the sides about 8 inches up from the bottom. This may be caused by grade of metal used, method of riveting, or expansion and contraction of the sides of the tank by action of gasoline within. This fracture occurs between two lateral felt-lined wooden strips used as spacing members, apparently, to retard this expanding or contracting motion or vibration. Consequently we are making an additional spacing member to prevent the inward and outward action of the metal, which may prevent further fractures at this point. However, it is our general opinion that the design is faulty, and we should not rely on the stick strip to prevent such action as causes this fracture.

Bent axles.—1. Axles on the following ships have bent under the usual shock on landing: Ships 2406, 2410, 2415, and 2416 of the Fowler Airplane Corporation of San Francisco, Cal. Ships 3612, 3665, and 3669 of the Curtiss Aeroplane & Motor Corporation of Buffalo, N. Y. Ships 3996 and 4000 of the Liberty Iron Works of Sacramento, Cal.

2. Some of these axles have been straightened cold and do not appear to be of the proper grade of metal, as they continue to bend.

3. Samples of axles are now being examined by Mr. J. H. Howell, chief engineer of the San Francisco district, Bureau of Aircraft Production, San Francisco, Cal.

Wood control sticks.—Wood control sticks were used in both the Fowler and Liberty airships. Are constantly being refitted. They seem to shrink and loosen under service.

Landing gear struts.—1. Of landing gear struts broken to date, eight have been found dead wood in ships 3996 and 4000 of the Liberty Iron Works.

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2. As you will note in the "Ship Assembly Report," a great many of these landing gear struts are found short. This holds good in all three makes of machines at this field.

Inner plane struts.—A great many of these struts have been found to be too short on all three makes of airplanes.

Longerons.—1. Fowler ship 2408 turned over and upper ash longeron between station No. 6 and No. 7 broke. Sample of wood now in hands of district office, Bureau of Aircraft Production, San Francisco, for examination.

2. Fowler people have replaced all No. 6 and No. 7 struts on their ships with ash at this field.

3. The breaking of this longeron proved where wood screws were used to spread metal seamings in position on longerons. These screws were unnecessarily large and extreme length. One break took place at a place where two wood screws were on a line through the cross section undoubtedly weakened the member.

4. No. 6 and No. 7 vertical spruce struts broke and showed evidence of insufficient strength at this point.

5. Mr. H. A. Hamm, district wood engineer, advises us that after investigation it has been necessary to use ash or oak at this station.

Fuselage at station No. 5.—1. It has been found that ordinary tension brought upon the landing gear wires which terminate directly under station No. 5 caused twisting of the lower longeron at this point.

2. Investigation proved that a compression strut was necessary in addition to the steel compression member which is located above the longerons, installed at the right point to prevent the longerons springing under strain.

3. Engineer Howell, of the district office, Bureau of Aircraft Production, San Francisco, has agreed upon this point and has ordered the manufacturers of this district to provide this extra compression member.

Wings warping.—1. Internal drift wires were found loose on the following ships: 2405, 2407, 2409, 2414, 2415, and 2416 of the Fowler manufacture.

2. Fabric ripped open showed wires lay slack. Mechanics of this field and the Fowler Aircraft Corporation are adjusting these wires.

3. W. W. Norton, senior inspector at the Fowler factory, states: "Internal wing wires have been examined and found still too loose.

4. "Wings in planes 2415 and 2416 bear the stamp of the California Aviation Co. of Los Angeles, by whom they were made. Almost all the Fowler planes carry one or two wings made by this concern.

5. "Requested that Fowler company send men to correct this fault." Request granted.

Propellers.—1. The Jacuzzi propellers were very poorly varnished and seemingly made of a soft wood which is susceptible to injury on contact with earth thrown up when warming up motor.

2. In some instances the laminations have parted and do not stand but very little service. Copper tipping would possibly prevent this, but it is the general opinion that the fault lay in the process of gluing.

Switches.—1. Motor in ship 3632 went dead at low altitude, causing a forced landing, wrecking the plane.

2. It developed upon investigation that the magneto circuit had become grounded. Upon examination of switch it was found that the primary lead or live wire from the magneto to the switch wire, attached to the center binding post of the switch, had come in contact with a small spiral spring on side, this spring being grounded to the body of the switch. The circuit traveled along the rod-connecting switch, touching the brace wire where the ground connected along the steel-wire electric conduit to motor base.

3. It is necessary in order to prevent a recurrence of this trouble to lead the ground and dead wire to center terminal, and would suggest that switches be more adequately insulated.

Fuselage brace wires.—1. Loops on fuselage brace wires on Fowler planes are of a different shape than those of Curtiss manufacture and are much narrower across the loop. The opinion is that when wire stretches the lower portion of loop slides into the sleeve. However true this may be, many wires were found loose after short service.

Control wires.—1. Control wires on Fowler, Curtiss, and Liberty planes have been found too short in coupling; turnbuckle wires were drawn so tight that operation became difficult.

2. Would suggest that threads in all eyebolts entering turnbuckle be made of sufficient length to accommodate variation of alignment. The end of this thread section can then be cut off where they bottomed.

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Center-section struts.—Center-section struts in both Curtiss and Fowler planes have come either too short or too long, causing considerable difficulty in alignment.

Ship's nose heavy.—1. Ship 2417, Fowler Corporation, was found nose heavy and could not be corrected by stagger.

2. The Fowler Corporation sent mechanics from San Francisco to attempt to correct fault by moving motor bed but finally gave it up.

3. Upon investigation we found that station No. 4 was five-sixteenths of an inch too far to the rear. Some radical change will have to be made and station No. 4 moved to proper place. As yet nothing has been done.

4. Would recommend that plane be shipped back to Fowler Corporation for correction.

Frayed wires.—1. Nearly all control wires, especially ailerons, become frayed inside of 40 hours' service.

2. This condition required completely changing guides installed to rawhide-lined fittings.

3. The Fowler and Liberty concerns are now both changing to rawhide guides accordingly.

Elevator-control assembly.—1. Very poor design and construction is apparent on this member of all three models, Fowler, Curtiss, and Liberty.

2. This was one of the most serious defects we found in construction of planes.

3. This member is constructed from thin tubing as a cross member, with a double-lever bell crank on both ends where the wire cables are attached, operating the elevator. This member is back of the rear seat. A center lever is employed to connect with the control stick. Considerable force is brought to bear upon this center lever in operating elevators. This lever is of frail construction, made up of thin sheet steel, terminating with a ball-drop forging.

4. In the Liberty ships this ball drop forging is joined to the lever with one single rivet in addition to very light spot welding.

5. The lever itself is fastened to the tubing with a single taper pin. This lever becomes loose after the first flight on these machines through the taper pins loosening and wearing in the thin support from the steel tubing.

6. This matter was taken up immediately with the chief engineer of the Liberty Iron Works, Mr. McManus, who stated that he had broken the spot welding on this part with a sharp blow, not on the lever, but on the tubing adjoining.

7. We immediately dismantled all cross levers on the 10 Liberty ships we had on this field. The ball joints were repinned and brazed to the lever and the lever repinned and brazed to the shaft. In addition a reinforcement of extra tubing was inserted inside the original tubing.

8. Later the thin side plates of which this lever was constructed sprung in service, and this part is also reinforced either by brazing a reinforcement of sheet metal or making a hardwood block, bound with linen and taped.

9. The alteration of this part has been authorized by the district office, Bureau of Aircraft Production, at San Francisco, Cal.

I, S. C. Coon, Captain A. S. S. R. C., engineer officer, Mather Field, Sacramento, Cal., do hereby certify that the above statement of faults and defects in aeroplanes is correct in every detail to the best of my knowledge and belief.

S. C. Coon,
Capt. A. S. S. R. C., Engineer Officer.

(Whereupon the committee took a recess until 1.30 o'clock p. m.)

AFTER RECESS.

At 1.30 o'clock p. m. the committee reassembled, pursuant to the taking of recess.

STATEMENT OF MR. A. A. D. LANG.

Senator New. Mr. Lang, state your name and address.
Mr. Lang. A. A. D. Lang, New York City.
Senator New. You are engaged in business where?

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Mr. LANG. Jamaica, Long Island, and Whitestone, Long Island, N. Y.

Senator NEW. What line of business?

Mr. LANG. Making and designing airplane propellers.

The CHAIRMAN. How long have you been in that business?

Mr. LANG. I have been making airplane propellers since 1909.

The CHAIRMAN. Where did you first begin the work of making propellers?

Mr. LANG. In England, sir.

The CHAIRMAN. You are a native Englishman, are you?

Mr. LANG. I am. I have been in this country only a little over a year.

The CHAIRMAN. Were you engaged in the making of propellers in England?

Mr. LANG. Yes, sir.

The CHAIRMAN. When did you come to this country?

Mr. LANG. I arrived in this country on the 12th of May of last year.

The CHAIRMAN. Under what circumstances did you come here?

Mr. LANG. I was manufacturing airplane propellers in England and I had a plant which still bears my name and is still manufacturing airplane propellers for the British Government. There was a slight difference between the people with whom I was associated and myself. I started this plant with two men and a boy. In those days airplane propellers were not required in quantities and I was doing experimental work, and not manufacturing. The war came on and the business grew to about 500 men, and the business was then—I am an engineer and not a business man—and the result was I had to just leave it. I was going into the British Army and I was advised to see Col. Lassiter, and I went to see him and he thought it was an extremely good idea for me to come to this country, and I went to the Director of War Organizations at the War Office in London, and he wrote this letter to me. He says:

> The bearer was the founder and original proprietor of the Lang Propeller Works, which is now a highly successful enterprise, and is patronized by the Royal Flying Corps. He can explain his position. It occurred to me that he might be a good free agent in the event of this Government requiring any assistance in this country or on the other side.
>
> GEN. CHARLTON.

Col. Lassiter gave me a letter with this inclosing a letter to Gen. Squier. I arrived in Washington on the 28th of May last year, and I endeavored to see Gen. Squier and he was not there, and it was simply that I was unfortunate. I did meet Col. Waldon, through a personal friend, and altogether spent three days with him. On the last day I met Col. Deeds but did not meet Mr. Coffin at that time. I produced all these letters, of which I have quite a sheath here, explaining that I am in my way an expert propeller maker and designer, and they told me that they had plenty of propellers and did not require any and what did I want? And I said that I wanted nothing in particular but I might be of assistance to them if they would like to give me a position of any kind; that I would be very pleased to take it. I could supervise aircraft production. I offered them my services for anything they would like to give me as inspector or designer or manufacturer under the Aircraft Production Board.

The CHAIRMAN. As a manufacturer of propellers?

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Mr. LANG. Yes, sir; or in any other sphere which had purely to do with propellers. They told me very politely that they did not require my services, but if they did they would let me know, but they did not even take the address. I left Washington and went to Canada, and was there given a certain amount of interesting interviews with certain people up there. Gen. Horrne gave me an order and contract for 200 propellers right away, and those I manufactured for the Canadian Airplanes (Ldt.).

The CHAIRMAN. Did you make them in Canada?

Mr. LANG. No, sir; in New York, on Long Island. I was training men all the time against the time when I imagined the propellers would be required. On about the 14th of August—I did not bring the papers with me, because I did not know what your committee wanted me for—I was sent for by telegraph to see a Maj. Sligh—Maj. Chapres R. Sligh.

Senator NEW. By whom were you sent for?

Mr. LANG. By Maj. Charles R. Sligh.

Senator NEW. In Washington?

Mr. LANG. About the 14th of August, 1917.

Senator NEW. Tell us what Maj. Sligh's duties were.

Mr. LANG. He was in charge of the purchasing of materials of wood for anything apparently made purely of wood, and he was in charge then of propeller purchasing and production, and he was made a major. He was first of all Mr. Sligh and on or about the 14th he had received the rank of major. I came down to see him and he said, "Are you prepared to manufacture propellers?" and I said, "Yes, I am." He said, "Do you need any finance?" I said, "No, thank you. I have arranged for finance in New York." And he said, "How deeply have you arranged for this finance?" and I said, "It is all arranged. There is nothing to be said about it." He said, "That is a pity. If you wish to go to Grand Rapids, Mich., there are some bankers there who would be very glad to meet you."

Mr. W. F. ARDIS (treasurer of the Lang Propeller Co.). Was this a propeller concern in Grand Rapids?

Mr. LANG. No; it was purely a woodworking plant that could go very easily into the manufacture of propellers. I told him I was extremely sorry, but could not do it. He said I had better think it over. "We can quote anything up to a million in capital." "You can take a train and arrive there in two or three days," he said, "and they will be pleased to meet you and show you the place," etc. I have since learned, but I can not swear to it, but I believe the name of the plant was the Sligh Furniture Co. I told Mr. Sligh that I could not go. I told him I could not go because I had already made my arrangements in New York. We were already manufacturing these propellers.

Senator REED. You had learned the fact to your own satisfaction but you can not swear to it. Please tell us upon what you base that opinion. Tell us your authority for it.

Mr. LANG. A lumber dealer named J. O. Stewart came down to our plant at Jamaica.

The way the matter came up was this: that the old Sligh Furniture Co., of Grand Rapids, had been turned into a propeller plant and it had a large order for something like 8,000 propellers.

Senator REED. You are going to tell us how you got this information. Somebody came down there?

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Mr. LANG. He said, "Have you got many orders here?" I said, "No; I have, practically speaking, no work to do at all." I was doing, I think, four experimental propellers at the time for the Signal Corps and I think that was why he was in the plant. He said, "Other plants seem to have plenty of work," and I asked him if he knew the names of the plants, and he said that as far as he could gather it was the Sligh Furniture Co., and they were getting these large orders. I had received no orders at all from the Signal Corps at the time. I heard nothing more at all from the Signal Corps at the time. I heard nothing more at all from Maj. Sligh, I should say, for two months, that would be about October or September. In the meantime I had got some orders for about, probably not more than a dozen experimental propellers for the Navy Department, and I was doing this and wanted some lumber, and I had purchased a carload of lumber which was coming through from the West, and I was informed that Maj. Sligh was the right man to give me assistance to get this carload through. His reply was, as I had no contract from the Signal Corps, he could not give me any assistance in getting the lumber. But I afterwards got it through.

Senator REED. Did you tell him that you had contracts with the Navy?

Mr. LANG. Yes, sir. We had quite a correspondence about it.

Senator REED. Could you get those letters?

Mr. LANG. Yes, sir.

(The matter referred to by Senator Reed was subsequently submitted and is here printed in full, as follows:)

COUNCIL OF NATIONAL DEFENSE,
AIRCRAFT PRODUCTION BOARD,
Washington, July 31, 1917.

LANG PROPELLER CO.,
280 Madison Avenue, New York City.

GENTLEMEN: It is possible that this board may desire to contract for propellers independently of aircraft manufacturers. If you have facilities for manufacturing these, we will be pleased to have you file with us immediately a statement of what your facilities are, which should state what your factory facilities are and also your financial ability and your experience; how many thousand you could manufacture a year and your price for different woods in birch, quartered sawed oak, walnut, and mahogany.

Very truly, yours,

AIRCRAFT PRODUCTION BOARD,
By CHAS. R. SLIGH.

NEW YORK CITY, *August 6, 1917.*

COUNCIL OF NATIONAL DEFENSE
(AIRCRAFT PRODUCTION BOARD),
Washington, D. C.

Attention Mr. Charles R. Sligh.

GENTLEMEN: We thank you for your letter dated July 31 in regard to the possible requirements for aeroplane propellers in the near future.

We have perfected our plans for the manufacture of propellers and have incorporated under the name of the Lang Propeller Co. of America (Inc.) and will commence business with a paid-up capital of $50,000. At the present moment we have our works at Southampton, Long Island, which we are using largely for experimental purposes and for training workmen for the peculiar needs of our business.

We are investigating the suitability of several localities in or near New York which we shall equip with machinery now on order. The size of the plant we have in view will depend entirely upon the demand that shall exist for our product.

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We already have submitted one or two sample propellers to the Canadian Government, who have asked us to be prepared to furnish large quantities of propellers to them for their schools in Canada. If your board is likely to require propellers in quantity it will materially affect the plant we propose taking over and our general scheme will have to be slightly reorganized from its present lines. The writer spent three days toward the end of May in Washington and endeavored to discover what the prospect might be for propellers, and your letter of July 31 is the first and only intimation regarding the situation we have had from Washington.

We are prepared and can immediately start preparing for whatever production may be required and can make firm promise for 10,000, 15,000, and up to 25,000 propellers per annum. Should a greater number than this be required we can within a very short time enlarge our manufacturing facilities to meet such demand.

The writer is the founder and originator of the Lang Propeller (Ltd.) (of England), which is probably one of the largest concerns of its kind in the world, and it is fair to say that upward of 60 per cent of the propellers now used in the Royal Flying Corps and the Royal Naval Air Service bear the writer's name at the present moment. The writer has letters which he shall be pleased to submit to your board from various officials in London that will establish his status.

The writer has spent the past seven years exclusively to the design and manufacture of aeroplane propellers, and until the early part of this year has been in full charge of the Lang Propeller plant at Weybridge, England, which is still in operation and bears his name.

Regarding the price of propellers, it is somewhat difficult at this particular moment to quote definite prices, due to the lack of knowledge of Government specifications and requirements; also the difficulty in arriving at the best timber to adopt, due to the scarcity of mahogany and walnut now prevailing. At the moment we are carrying out tests on various grades of American timber, which is abundantly available, and will be glad to let your board know in detail when we have satisfied ourselves as to the results of these tests and what we consider can be used advantageously. We are now endeavoring to get prices on walnut and mahogany, but our wide experience in using the timber that is kiln dried and insufficiently seasoned force us to the conclusion that it would be inadvisable to use any timber that can not be procured in quantity, dry, and ample to meet the demand for immediate use.

We might also mention that the writer has spent considerable time in arriving at satisfactory glues, methods of inspection, jigs, etc., which will facilitate the manufacture of Lang propellers in this country, and no doubt the writer's very wide experience, when called upon, would be of service in his chosen line.

Awaiting with interest your further communications,

Yours, faithfully,

LANG PROPELLER CO. OF AMERICA (INC.).

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, August 9, 1917.

MR. A. A. D. LANG,
30 East Forty-second Street, New York City.

DEAR SIR: Yours of the 6th has been received. If possible, I would like to have you come over here and see me personally, as I think I am in position where I can put you in touch with the people who have the factory facilities already and will put up anywhere from $100,000 to $150,000, if necessary, in engaging vigorously in the manufacture of propellers.

Please advise me by wire if you are coming and when. I will be in the city up to 2 o'clock Saturday and will not be back until Monday morning at 9 o'clock, but I would prefer to see you to-morrow evening if possible.

Very truly, yours,

CHAS. R. SLIGH.

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NEW YORK CITY, *August 30, 1917.*

COUNCIL OF NATIONAL DEFENSE,
Office of the Chief Signal Officer, Aircraft Production Board,
Washington, D. C.

Attention of Mr. Charles R. Sligh.

GENTLEMEN: You will probably recall the writer and Mr. Lang visiting you some two weeks ago. Since then we have arranged for the manufacture of propellers in quantity.

We shall be glad to know the requirements of the United States Government, as we are now negotiating a contract with the Canadian Government, and feel that the United States should have the first call upon us.

We understand from our last conversation that the only propellers the United States Government is buying at the present time in quantity are for the Curtiss type JN machine.

We await with interest your early response, and beg to remain,

Very truly, yours,

LANG PROPELLER CO. OF AMERICA,
Per ——— ———.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, September 6, 1917.

From: Maj. Chas. R. Sligh.
To: Lang Propeller Co. of America, 30 East Forty-second Street, New York City.
Subject: Propellers.

1. This division has decided that it was advisable to make its contracts with companies who have an organization and an established factory with facilities to justify our orders, and all the orders available at present have been disposed of this way.

2. If at any future time you have the facilities for doing this, we will take the matter of contract up with you later.

CHAS. R. SLIGH,
Major, Signal Corps.

NEW YORK CITY, *September 6, 1917.*

COUNCIL OF NATIONAL DEFENSE,
Aircraft Production Board, Washington, D. C.

Attention of Charles R. Sligh.

GENTLEMEN: We have issued order for one carload of Philippine mahogany to S. S. Spiro, to be shipped from San Francisco to New York City.

This mahogany is for aeroplane propellers, both for the Government and for other manufacturers building aeroplanes for the Government.

We understand you issue a special order to the railroad to rush shipment through to its destination. If possible, would appreciate this order at an early date as convenient.

Very truly, yours,

LANG PROPELLER CO. OF AMERICA,
Per L. T. MORLAND.

Our order issued to S. S. Spiro, 505 Fifth Avenue, New York City.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, September 7, 1917.

From: Maj. Charles R. Sligh.
To: Lang Propeller Co. of America, 30 East Forty-second Street, New York City.
Subject: Shipment of mahogany from San Francisco to New York City.

1. We have your favor of the 6th instant, in reference to shipment of mahogany from San Francisco to New York City. We are not aware that you are under contract with the United States Government to furnish propellers, and therefore we could not consistently put out any orders to facilitate the movement of your particular freight.

Yours, very truly,

EQUIPMENT DIVISION,
CHAS. R. SLIGH,
Major, Signal Corps.

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WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, October 17, 1917.

From: Maj. Charles R. Sligh.
To: Lang Propeller Co., 30 East Forty-second Street, New York City, N. Y.
Subject: Purchase request for four propellers

1. We are issuing to-day through this office purchase request for four propellers; one each from the following drawings: 8–27, 8–29, 8–30, 8–31, of which blue prints are attached to the order. This purchase request is issued at the request of Lieut. Col. V. L. Clark.

2. The above propellers are to be right-hand screws and to be made in accordance with specifications No. 29500. As this is an emergency order we request that you proceed immediately with the manufacture of these propellers and that you immediately reply to us, stating your price for the same.

By direction of the Chief Signal Officer.

CHARLES R. SLIGH,
Major, Signal Corps.
By G. E. L.

OCTOBER 19, 1917.

From: LANG PROPELLER CO. OF AMERICA (INC.).
To: Maj. Charles R. Sligh, Signal Corps.
Subject: Purchase request for four propellers.

1. We have your communication of October 17 containing purchase request for four propellers, issued by direction of the Chief Signal Officer at the instance of Lieut. Col. V. L. Clark.

2. We respectfully invite your attention to our communication of August 30 to you and your reply thereto of September 6; also to our communication of September 6 to you and your reply thereto under date of September 7.

3. In the interim we have closed additional contracts with the British and the Canadian Governments and various manufacturers who are building planes for the United States Government.

4. Therefore, much as it would delight us to comply with a purchase request issued by direction of the Chief Signal Officer at the instance of Lieut. Col. V. L. Clark, we are obliged to decline this purchase request transmitted by you and shall return the formal order if and when received.

GENERAL MANAGER.

OCTOBER 24, 1917.

From: LANG PROPELLER CO. OF AMERICA (INC.).
To: Capt. A. C. Downey, Signal Corps.
Subject: Order for four 4-blade propellers.

1. We respectfully invite your attention to our communication of October 17, 1917, addressed to Maj. Charles R. Sligh.

2. We also invite your attention to the fourth paragraph of the above-mentioned communication, and in accordance therewith we are returning under separate cover your department order for four 4-blade propellers, No. L20145, with blue prints attached.

GENERAL MANAGER.

OCTOBER 27, 1917.

From: LANG PROPELLER CO. OF AMERICA (INC.).
To: Lieut. Col. V. L. Clark.
Subject: Specially designed propellers.

1. This office is in receipt of your communication addressed to Mr. Dashwood Lang of October 26 regarding the designing and building of some propellers for the United States 12-cylinder 400-horsepower engine, to be mounted in the D. H. 9 Bristol fighter.

2. It will give this company great pleasure to be of any assistance to you in the design and development of a suitable propeller for the 12-cylinder motor mounted in the D. H. 9 machine.

3. We request that you fill out the inclosed inquiry blank, upon receipt of which we will expedite manufacture and shipment with the least possible delay.

GENERAL MANAGER.

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WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, October 26, 1917.

From: Office Chief Signal Officer.
To: Lang Propeller Co., 30 East Forty-second Street, New York City.
Subject: Cancellation of order No. 20145.

1. With reference to your letter of October 24, 1917, and your letter of October 17, 1917, addressed to Maj. Charles R. Sligh, setting forth your inability to undertake work for the Signal Corps at this time, you are advised that order No. 20145 is hereby canceled.

By direction of the Chief Signal Officer.

A. C. WALSER,
First Lieutenant, Signal Corps, U. S. R.

WAR DEPARTMENT,
OFFICE OF THE CHIEF SIGNAL OFFICER,
Washington, October 26, 1917.

From: Office Chief Signal Officer.
To: Mr. Dashwood Lang, care of Lang Propeller Co., 30 East Forty-second Street, New York, N. Y.
Subject: Propellers.

1. This office would be interested in a proposition relating to your designing and making up several propellers for the U. S. 12-cylinder 400-horsepower engine as mounted in the D. H. 9, and in the Bristol fighter.

2. It is suggested that a satisfactory arrangement might be for this office to purchase two propellers of each of several designs, the purchase price of the two propellers being sufficient to cover the expense incurred in the design in each case.

3. It is requested that you communicate with the undersigned at the aeronautical experimental station, Signal Corps, McCook field, Dayton, Ohio.

By direction of the Chief Signal Officer.

V. E. CLARK,
Lieutenant Colonel, Signal Corps.

Mr. LANG. I have done quite a great deal of experimental work. I have made quite a number of propellers, both for the Army and the Navy Departments, and now I have a pure cost-plus plant working entirely for the Navy, and the Jamaica plant is to-day out of work, and it is on the point of being shut up with 100 extremely skilled men, and I have reason to believe that our work is as good or better than others in this country.

Senator REED. Have you told us all the reasons that you have to think that this Sligh concern was the one which was being referred to by Maj. Sligh?

Mr. LANG. It has been mentioned so many times to me by so many people that it was so. It was small talk but I attached that much importance to it; I had every reason to believe it was so.

Senator NEW. Did you receive any orders from the Signal Corps since Maj. Sligh was connected with the service?

Mr. LANG. Not through Maj. Sligh. I received, I think, an experimental order for three propellers through a major or captain who is doing experimental work that did not come through Maj. Sligh's bureau.

Senator REED. Do you remember that man's name?

Mr. LANG. I think it was Capt. V. E. Clark, probably he is now Gen. Clark. That was just for one or two experimental propellers.

Senator REED. Has there been any complaint about the character of the work you have done?

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Mr. LANG. One propeller we made burst at Pensacola back in March, I think it was. That situation has been cleared up, and I am not held criminally negligent by the Navy in any way for the workmanship. I went down to Pensacola last week and straightened up the work there. This is the only time anybody can criticise any of our work.

Senator REED. What was the story of that?

Mr. LANG. The Navy Department has a number of flying boats coming out, and had no propellers for them and called upon us to do the experimental designing upon these propellers, which we did do. Before we could test any propeller at all I was given, of course, the power curve of the Liberty motor to work to, and the power curve of the Liberty motor in December and January was one day at one place and at a different place the next day. It was still in its experimental stages and the motor was varying very much in power. It was 300 horsepower at 1,600 revolutions and 300-horsepower at 1,800 revolutions, and this propeller went down to Pensacola, and whether or not the motor had any more power than the power curves showed I do not know, but the propeller went up to 1,856 revolutions and the propeller burst. All those designs have been since rectified, and I am in very close touch with the Bureau of Steam Engineering. No work I have ever done for the Army can be criticized adversely.

Senator REED. As I understand your statement in regard to the propeller you made in the first place, you were required to make an experimental propeller?

Mr. LANG. Yes, sir.

Senator REED. I suppose that in making that experiment the idea of the designer is to get a propeller that will take a hold of the maximum amount of air on a revolution and yet have the propeller stand the strain.

Mr. LANG. Exactly.

Senator REED. You get the factor of safety reduced pretty low. You do not have a very large factor of safety?

Mr. LANG. No, sir.

Senator REED. Because, like building an engine or anything else about an airplane the question of weight and all those things have to be considered. Now, the engine on which this experimental propeller was to be employed was likewise in an experimental stage?

Mr. LANG. Exactly.

Senator REED. And they would constantly get greater power out of it?

Mr. LANG. Yes, sir; all the time.

Senator REED. And since certain parts of that engine broke down when they got additional power it may be that that was the reason and you think it is the reason that your propeller gave out?

Mr. LANG. That is exactly what happened, and it was probably partly due to my design. The design may not have been exact at the time. Propeller designing is very, very difficult to do, though with all the text books that we have to-day it is mostly still a matter of rule of thumb, and the rules to-day are not necessarily the same rules as were in existence six months ago.

Senator FRELINGHUYSEN. Was that a solid or laminated propeller?

Mr. LANG. Laminated, sir.

Senator FRELINGHUYSEN. There was a weakness in the lamination?

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Mr. LANG. The burst took place at the hub where the plates join into the hub of the propeller where they are joined to the motor, and that is where all the stresses are concentrated due to centrifugal forces. That is generally where the propeller will burst if it bursts at all.

Senator FRELINGHUYSEN. Were there any fatalities at all?

Mr. LANG. No, sir. I went down and shook hands with the officers who were in the boat when the propeller burst, and so we are friends again.

The CHAIRMAN. How many propellers could you turn out a month if you had an order at your Jamaica plant?

Mr. LANG. We have been doing about 100 propellers a week since about the 1st of February.

Senator NEW. That is, 100 propellers at the Jamaica plant?

Mr. LANG. Yes, alone.

Senator NEW. What is the average number of propellers required for a single-propeller machine, including spares?

Mr. LANG. It should be generally three, including spares.

The CHAIRMAN. That is a minimum number?

Mr. LANG. That is the minimum number for the machine in use in this country. When they are going across the water they can not use anything in them but the best article, and a propeller with a slight blemish which could be used on a training machine would be taken out, so it frequently goes up to five or six.

The CHAIRMAN. But the minimum number is three?

Mr. LANG. Yes, sir.

The CHAIRMAN. Does that hold good with the large machines which are fitted with more than one engine?

Mr. LANG. You generally reckon on three spare propellers for each motor or each power unit.

The CHAIRMAN. So that the number of propellers required is as 300 per cent as compared to the number of planes?

Mr. LANG. Yes, sir; if I might make one criticism. I do not wish to quote matters from the other side, but everybody has to walk before they can run. The whole matter is as I see it, the matter of propeller inspection and production to-day in this country after having been in the same situation exactly on the other side is this: It is not only the same with propellers but with motors and everything else. The inspection is the most vital part of their organization. The inspection in this country at the moment is extremely lax. It is not their fault. It is due to the fact that probably the flying men of to-day—we will say there are 100 flying men and 100 flying machines 18 months ago. They are now numbered in thousands. Each department has to expand, and the inspection department is being equipped to-day and is being gradually got into being, but in the interim we are doing work that I would be most glad to have any criticism on at any time. It has been the policy of the department who are purchasing such things as propellers and airplanes to go out broadcast and take anyone in who has ever seen a piece of wood.

The gentleman who makes this table may make 10 tables and it does not matter to him a bit if those tables vary one-tenth of an inch. The man who is making propellers to-day in this country, most of them, are the men who have been making furniture and many other things which are not as good as furniture. All sorts of

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people are making propellers and are making them cheaply and they would not stand inspection. If this matter is put up to the Signal Corps or any other department they will say, "Yes, but Lang Co.'s prices are very high." I contend that the propeller is an article which is subject to enormous stresses and can not be too well made and should not be put out too cheaply. A blue print is handed to 10 different men. They would say, "There is not much in a propeller. It is just glued together, and we can make it for, say $55, and make a handsome profit." They have gotten those propellers for $55. They can not get a propeller which is an efficient propeller made efficiently and safely at that price. That is probably what will happen if inquiries are ever made as to why we do not get any work. The Thomas-Morse Aircraft Corporation buy all their propellers from us, and have never questioned our price.

The CHAIRMAN. That establishment is at Ithaca?

Mr. LANG. Yes, Ithaca, N. Y. It is an extremely good firm and it is extremely pleasant to do business with a firm of that type, and they give us all their experimental work and they say, "We are producing a machine and we want you to turn out three propellers," and they get the best material in those three propellers and they say, "What is your price on 300?" And we give them a price, and then they say, "Go on with the work," and they say, "We have never seen any better work." We are not making a million dollars out of it. We are very nearly broke to-day, to show that we are not profiteers.

The CHAIRMAN. What is the character of the wood that you use?

Mr. LANG. I will go back five years ago and say that all propellers were made of black American walnut. It is extremely tough and the tensile strength is higher for its weight than any other wood known. It has many other excellent qualities. It glued very well, due to the construction of the fiber of the wood and we used nothing but black American walnut.

The CHAIRMAN. Is it used abroad?

Mr. LANG. It was used exclusively in England and France until in 1915 they discovered that the call for this other material had grown out of bounds, and we looked around for lumber. The air board in London consulted me and I tried out many kinds of material and we decided that Honduras mahogany or true Mexican mahogany would serve the purpose with almost as good results, although we had to alter the design slightly. Honduras mahogany was easy to procure in 1915 on the other side before the stock of Honduras mahogany being bought for furniture was limited, and the stock had gone away. The British Government has depleted the stock of Honduras mahogany very seriously, and the consequence is we have now to use green wood and dry it. We season it, kiln it. It is extremely difficult to get it kilned.

The CHAIRMAN. Is that Mexican mahogany green mahogany?

Mr. LANG. Green mahogany. Back in October I saw the difficulty of being able to procure enormous stocks at that time of Honduras mahogany. Now, my firm alone is using about 3,000 feet a day alone. So with 100 British firms there is an enormous drain on raw material. I came to this country as a stranger and I learned of a wood called Tanguile mahogany from the Philippines, and I tested it and found that the tensile strength was good and that it was extremely uniform in density, so I had an order for a number of

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propellers of tanguile mahogany and they threw up their hands in fear and said the thing was impossible and that it could not be done, and that the propellers would not be accepted.

Senator NEW. You say that you did that with the Signal Corps. With whom was that correspondence?

Mr. LANG. That correspondence finally filtered through to a Maj. Rose. I think he is at Dayton. Most of that was done with Lieut. Ryerson here in the Southern Railway Building.

Senator REED. What became of that?

Mr. LANG. I pleaded with them to use this lumber and said there are enormous stocks of this tanguile mahogany. I suggested that we use it for propellers of 200 horsepower or 150 horsepower, and they said it was perfectly preposterous, and it could not be done, and in the meantime they consulted with their lumber expert in Washington, whose name I think is Williams, and I began to find out that it was extremely difficult to make any headway regarding the mahogany. But the Bureau of Steam Engineering of the Navy said, "We are delighted to hear of it."

In the meantime Ensign Monteith, at the Bureau of Steam Engineering, was extremely glad to do everything he could to help us. We made two propellers out of tanguile mahogany designed for the Liberty motor similar to the propellers we had made from Honduras mahogany. There is a copy of a report in the Bureau of Steam Engineering to the effect that we designed a propeller with a 300-horsepower with a 37 per cent overload for 10 hours, and it showed no signs of fracture or of fatigue. Now, I pleaded for the use of this Philippine mahogany; I am accounted an expert. I designed the propeller, and I should be given more or less consideration in the matter of what to make them out of. I have now, I think, two days ago or three days ago—we got permission on the strength of that spinning test that took place at the Westinghouse Co. to use tanguile mahogany in our Liberty motors. The whole matter seems to be this; it is a pity, I must say. I have a certain amount of knowledge on this subject—to be treated as a naughty boy all the time and told that I do not know anything about it when the so-and-so furniture company can make propellers for $50 that I can not make them without loss.

The CHAIRMAN. Do you know whether the British and French use this tanguile mahogany?

Mr. LANG. I think they have not even heard of it. It has not to my knowledge ever come to Britain or France.

Senator REED. Of course, if you have really discovered the wood which will do this work, it is a highly important thing. It is a thing, at least, which would seem to me in the present situation that the mere suggestion by a man who has any decent claim to being an expert ought to have been acted on instantly because of its possibilities.

Mr. W. F. ARDIS. In February the word was in the air that our propeller requirements for the 1918 program would require at least 50,000,000 feet of Honduras mahogany.

The CHAIRMAN. Do you mean the American program?

Mr. ARDIS. Yes, sir; for propellers alone. We canvassed the market and situation and found that there was possibly available 5,000,000 feet against this 50,000,000. It was Mr. Lang's contention that every foot of Honduras mahogany which was available in the

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country should be conserved for combat machines. At that time we were only making training machines in this country. They were not organized as far as the propeller is concerned, and it was to the end of the conservation of this Honduras mahogany for the combat machines and for the heavier machines in this kind of work that Mr. Lang looked around to find something which would be perfectly suitable for training propeller work, and he put his attention to the making not of combat propellers but of training propellers, for which this tanguile mahogany which he did find was a suitable wood.

The CHAIRMAN. Let me ask about the date of the test of these two propellers which you speak of.

Mr. ARDIS. It was Saturday and Sunday three weeks ago.

The CHAIRMAN. Where?

Mr. ARDIS. At the Westinghouse Co. I was not there. It was done under Navy and Signal Corps observation.

Senator NEW. Are you connected with the Lang Propeller Co.?

Mr. ARDIS. Yes, sir. I am the treasurer of the company.

Senator NEW. You spoke of Mr. Williams here as an inspector in Washington.

Mr. LANG. He is an inspector really, I believe. He is an inspector as much as he is anything else. He says this is to be used and that is to be used.

Senator NEW. You spoke of him as an inspector a few moments ago?

Mr. LANG. He is H. K. F. Williams, I think.

Senator NEW. Where does he come from?

Mr. ARDIS. He is head of the Mahogany Bureau for the Signal Corps.

Senator NEW. Do you know what his business was before he came to Washington?

Mr. LANG. Yes, sir; he is an ex-partner of Ichabod T. Williams, of New York.

The CHAIRMAN. What was his business?

Mr. ARDIS. Hardwoods. They virtually control the Honduras mahogany.

Senator NEW. Do you know from what source the Signal Corps has accepted the lumber that it has approved for use in the making of propellers?

Mr. LANG. They have approved a number of woods. They have approved walnut, true Honduras mahogany, white oak, beech, poplar, oak, and cherry. They have suggested that we make propellers from time to time out of cherry, poplar, and beech. They said if your price is high you can reduce your price by using cheaper lumber. I do not consider it the right thing to use this lumber. Beech, poplar, and cherry are all three timbers which are grown in various different localities. Some grow on top of the hills, some in the valleys, and some on the side of the hills. They grow all over the whole country and you can buy them all over the country. You take a piece of wood from a tree grown in northern Maine and a similar one from a tree grown in the South. Simply because their names are cherry, chestnut or beech does not indicate that they are the same lumber.

Senator REED. The fibre is affected by climatic conditions and by altitudes?

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Mr. LANG. Exactly and as to whether the ground is swampy. I will even say it is possible to determine quite easily with a magnifying glass which side of a tree a piece of lumber has been cut from, whether from the north or from the south side of a tree. The reason I have been fighting or contesting this mahogany use has been largely this; the mahogany tree is a very large tree. The density variation is very slight; that is to say, if you take the butt of the tree the density of the wood at the bottom near the ground is very much higher than the density is higher up. That is due to the way that the trees grow, of course. In the mahogany tree you will get 20 feet of clear run before the branches break out. That means this, that you can take a clean plank of lumber 20 feet long and the density variation per foot is very much less than if you have to spread that variation beyond 20 feet. The difficulty is in balancing your propeller, so you do not want great variation in the density of the material you are using. Also the mahogany tree is very large with a bell, 45, 50 or 60 inches, whereas you take the birch trees, and they are not very large. Cherry trees have many knots and limbs growing out on them and that is one of the reasons I have stuck to my guns in the mahogany situation.

The CHAIRMAN. What are your facilities for getting it?

Mr. LANG. I believe the facilities to-day for getting Honduras mahogany are limited.

The CHAIRMAN. I mean Tanguile mahogany.

Mr. LANG. I believe Tanguile mahogany is being piled up in the Philippines at about 100,000 feet a week.

The CHAIRMAN. What are your facilities for getting it from the Philippines to America?

Mr. LANG. Since this test has been made I think the Navy Department will now make it their business to see that this material is brought over from the Philippines.

The CHAIRMAN. They will bring it over if it is determined that it is the right wood to use for this purpose.

Mr. LANG. Yes.

Senator NEW. You say it is being piled up in the Philippines at the rate of 100,000 feet a week?

Mr. LANG. Yes, sir.

Senator NEW. That is not any too much.

Mr. LANG. That is being done with no market. It is simply to keep their mills running. They are prepared directly they get the word from the Navy Department they can develop it.

Senator REED. Do you understand that the man really in control here for the Government in the choice of materials to go into the propellers is the partner in a concern which controls Honduras mahogany?

Mr. LANG. Yes, sir.

Senator REED. And you have found some difficulty in convincing him that Tanguile mahogany might supersede the Honduras mahogany?

Mr. LANG. Yes, sir. I have never seen Mr. Williams personally on the subject because he has simply given me his edict when I came to see Lieut. Ryerson, or whoever it was. He would say, "There is what you can use. Take it or leave it."

Senator REED. Did he give you any answer?

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Mr. LANG. The reason was that it was not satisfactory material. That is all I could ever get. All I got was verbally from Lieut. Ryerson.

Senator FRELINGHUYSEN. It is natural to assume it was Mr. Williams, is it not?

Mr. LANG. Yes, sir.

Senator REED. If at the present time the Honduras mahogany is commanding a very high price——

Mr. LANG. A very high price.

Senator REED. About how much is it bringing?

Mr. LANG. About 35 cents a foot super.

Senator REED. How thick?

Mr. LANG. One inch thick.

Senator REED. A square foot?

Mr. LANG. Yes, sir.

Senator REED. That is $350 for a thousand feet.

Mr. LANG. Yes, sir.

Senator REED. What can Tanguile mahogany be procured for?

Mr. ARDIS. About $250—that is, under the same classifications. The propeller classification is 8 inches and up in width and 1 inch thick and that same classification applies in propeller stock.

Senator FRELINGHUYSEN. What sizes do you have to use to veneer a propeller? What is the length, width, and thickness?

Mr. LANG. That varies from 8 inches in width and 6 feet in length up to 14 inches in width and 10 feet in length.

Senator FRELINGHUYSEN. How thick?

Mr. LANG. One inch at the least.

Senator REED. Don't you cut these pieces into thinner parts than an inch?

Mr. LANG. When I say an inch I should say that it comes slightly under an inch, but roughly speaking you can call it an inch.

Senator FRELINGHUYSEN. The edges are tapered off in the curve of the propeller. Can you procure any old woods from furniture, second hand, that you can use in making propellers?

Mr. LANG. It is extremely difficult.

Senator REED. How soon are you going to use steel?

Mr. ARDIS. That has been tried.

Senator REED. It has not worked?

Mr. ARDIS. It has not stood the test.

Senator FRELINGHUYSEN. Has maple ever been approved by the Signal Corps?

Mr. ARDIS. I am not sure. I have an idea it is not to-day on the list. The great difficulty being with these northern lumbers we have been talking about is that you can make propellers out of them, their strength is thoroughly satisfactory, but the tendency of the wood is very much to warp after the blade has been finished.

STATEMENT OF LIEUT. COL. T. H. BANE, SIGNAL CORPS.

Senator NEW. Col. Bane, you are an officer of the Signal Corps?

Col. BANE. Yes, sir.

Senator NEW. How long have you been connected with it, and by what avenue did you enter the Army?

Col. BANE. I graduated from West Point in 1907.

Senator NEW. In 1907?

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Col. BANE. Yes, sir.

Senator NEW. And you have been in the Army ever since?

Col. BANE. I have.

Senator NEW. When did you become connected with the Signal Corps, or the aeronautical department?

Col. BANE. I went to San Diego in October, 1916, to learn to fly. I was detailed with the Signal Corps then.

Senator NEW. You are a practical flyer?

Col. BANE. Yes, sir.

Senator NEW. I would like you to give your opinion, in your own way, of some of the reasons for the present situation of our aircraft production.

Col. BANE. I believe the main and probably the most important reason is a lack of organization in the handling of such a big undertaking. Secondly, there is a lack of proper aeronautical engineering ability, or, at least, there is the fact that such aeronautical ability as exists has not been used to the best advantage. It is a question of automobile engineers assuming that they can manufacture airplanes without reference to men who are practical flyers and aeronautical engineers.

Senator NEW. Have we availed ourselves of such aeronautical engineering talent as we have in this country?

Col. BANE. I think not, sir.

Senator NEW. Would it not have been possible also for us to have availed ourselves of that kind of talent from our allies?

Col. BANE. Yes, sir. I am sure that we could have obtained aeronautical engineers had we asked for them from England, for example.

Senator NEW. But you think, as I understand you, then, that one of our mistakes has been that we have relied upon automobile engineers rather than upon aeronautical engineers?

Col. BANE. Yes, sir; automobile and other kindred trades. Mechanical engineers with no knowledge whatever of aircraft have been allowed to pass upon the same.

Senator NEW. If there are defects in our organization, will you state just what you think those defects are?

Col. BANE. Our present organization is as follows: Gen. Kenly is in charge of the department of military aeronautics, which has charge of all the training of aviators and the operation of aircraft. Mr. Ryan is charged with production. The original agreement left the engineering question in the air and made no one responsible.

The CHAIRMAN. You say the original agreement. What do you mean?

Col. BANE. I should have said the proclamation of the President. That leaves the question of engineering in the air. The production people feel that they should control entirely the engineering end of the game, and they have been doing so. There is no head or chief of the air service. A single head to the two divisions could quickly, by the use of common sense, settle many questions that now remain unsettled or must be carried to the Secretary of War. The result is that we get nowhere. We are unable to get anywhere. No one is running us. We feel that is vitally wrong and that there should be a common head to go to and force the other men to listen to reason.

Senator NEW. Who, in your opinion, should be responsible for the design of aircraft?

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Col. BANE. The men who must fly the machines and use them, by all means. In my opinion the military use of aircraft is too closely related to the design of same to allow a commercial and nonmilitary organization to control the design, armament of aircraft, and equipment.

Senator NEW. As a matter of fact, by whom is the greater part of our designing being done now?

Col. BANE. By the Bureau of Production, sir.

Senator NEW. By the Bureau of Production?

Col. BANE. Yes, sir. It is under their control. Of course, we are practically doing nothing but copying designs. We have originated practically nothing.

Senator NEW. You say the Bureau of Production. Now, some one in the Bureau of Production does that for them.

Col. BANE. Yes, sir.

Senator NEW. Are the different plants and companies that are operating under the Bureau of Production allowed a great deal of latitude in that respect?

Col. BANE. I can only answer from my personal observation. I feel that they are given full latitude to make changes. As an instance I may cite the case of the Bristol fighter. It was turned over by what was then the aircraft engineering section of the Signal Corps, in charge of Lieut. Col. Clark, It was sent to the Curtiss Co. with a wing loading of 7.1 pounds per square foot. It now has a wing loading of 9.2 pounds per square foot. Col. Clark has never been consulted, nor has he ever seen the machine since, and has never been to the Curtiss Co. since the original drawings were sent there.

Senator REED. He is a practical flyer?

Col. BANE. He has not been flying recently. He has been in the designing game. He did fly up to the time he left McCook Field, about four months ago.

Senator NEW. You are speaking of Col. Clark?

Col. BANE. Yes, sir. He is a practical flyer.

Senator NEW. He designed the Bristol fighter for a wing load of 7.1 pounds per square foot, and that has been changed at the Curtiss works so that the wing loading is now 9.2; is that correct?

Col. BANE. The figures from which I determined that its present loading is 9.2 pounds were given me yesterday at the Curtiss plant. They indicated 9.2. I will say that the machine has been recently changed in many respects. The late weights were not available. They are being made to-day. We will have them to-morrow, I think.

Senator REED. The Bristol fighter has been the occasion of many fatal accidents, has it not?

Col. BANE. Yes, sir.

Senator REED. The wings, we are told, give out. In your opinion, has this load which was put upon the plane, this additional load, anything to do with that?

Col. BANE. Yes, sir. That is the cause for the present situation, I think. The difficulty has been that the fabric comes off. You can not point to the wing loading and say that that is entirely responsible, because there are other things to point out. For example, the fabric was not properly doped. We also thought that the rib spacing on the Bristol was too great. It has been changed now from 15 inches to 7½. Then there is the question of spacing of stitching.

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That was 6 inches, and that has been lowered to 4 inches. Then they have added recently a cotton fabric weighing 8 ounces per square foot.

Senator REED. The extra heavy weight aggravated all the more the deficiencies in construction?

Col. BANE. Yes, sir.

Senator REED. And one of the principal causes of accidents is the extra heavy load?

Col. BANE. I think so; yes, sir.

Senator REED. That extra heavy load might perhaps be carried if there was better construction?

Col. BANE. It affects the maneuverability of the airplane. Planes are not ordinarily loaded as high as 9.2 per square foot, no matter how small. You do not load that heavily. With such a heavy loading there is a decided tendency to stall quickly, when the power fails and consequently to spin.

Senator REED. What you mean is this: There has been an overloading of the wings, and that overloading of the wings itself would constitute a great element of danger?

Col. BANE. Yes, sir.

Senator REED. And in addition to that you have had improper construction?

Col. BANE. Absolutely.

Senator REED. And even if the construction is of the best, you still think that the excessive load on the wings makes the plane a very dangerous thing?

Col. BANE. Yes, sir. I have figures on foreign planes and American planes. Running down the column, I see that none of them are loaded that heavily. I have before me a table of performances of service airplanes.

Senator NEW. I think we have that table.

Senator REED. What is the wing load?

Col. BANE. The wing load, taking the English Bristol fighter, is 6.5.

Senator REED. Give us the wing loads of the different machines.

Col. BANE. The Armstrong-Whitworth is 5.6. The BE 2–C is 5.8. The BE 2–D is 5.3. Suppose, Senator, I would just state they range from 5.6 to 8.4.

Senator REED. Without giving the names of the machines, can't you give the wing load of each of them?

Col. BANE. Yes. They are as follows: 5.6, 5.8, 5.3, 5.9, 5.7, 6.9, 6.5, 9.6; the figure 9.6 is a monoplane; 7.4, 7.4, 7.5, 8.4, 7.7, 7.6, 8; 8, 7.1, 7.7, 8.2, 7.5, 8.4, 8.2, 6.2, 7.5, 6, 7, 6.9, 7.6, 8, 7.9, 6.7, 6.2, 6.3, 6.4, 6.5, 7.3, 4.8, 5.2, 6.4, 6, 8.2, 7, 7.4, 7.6.

Senator NEW. So that it would appear from this table that no biplane carries a wing load of more than 8.4.

Col. BANE. Yes, sir.

Senator REED. Now, how does it happen that the monoplane can have a greater weight upon it and yet sustain it?

Col. BANE. The monoplane must necessarily have a load that is heavier, because it has only one surface.

Senator REED. A monoplane is of heavier construction than is employed in a biplane?

Col. BANE. Yes, sir.

Senator REED. So that the fact that the monoplane carries 9.6 pounds per square foot affords no reason why a similar weight could be carried by a biplane properly built?

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Col. BANE. No, sir.

Senator NEW. Col. Bane, have you had occasion to make any recent investigation of the Bristol fighter?

Col. BANE. Yes, sir. I returned this morning from Buffalo, where Col. B. Q. Jones, Maj. H. S. Martin, and myself were called in a conference with Mr. Landon, of the Production Bureau, with regard to the Bristol fighter.

Senator NEW. What was the occasion for them calling you to Buffalo?

Col. BANE. There was recently an accident in which a man named Hale was killed and a pilot named Sharpe was severely injured, due to the wreck of a Bristol fighter at Buffalo.

Senator NEW. Hadn't there been a similar accident a short time ago, on the 10th of June, in which Pilot Rader and an observer lost their lives in a plane of the same type?

Col. BANE. Yes, sir. There were two previous accidents, one at the Wilbur Wright field, in which Pilot Doolittle was severely injured, due to the fabric coming off the left wing. The other accident was at Dayton, in which Rader and Connors were killed, due to the same defect—the fabric coming off the wing.

Senator NEW. What was the result of the investigation that you officers made yesterday of the Bristol?

Col. BANE. We decided to recommend that they stop production at once of the Bristol fighter, and that the disposition of the Bristol fighters now practically completed be taken up and settled at a conference at Washington on Thursday of this week between the Production Division and the department of military aeronautics.

Senator NEW. Can you tell us how many of those machines there are?

Col. BANE. We were told that 200 were practically completed and about 400 others were in various stages of completion.

Senator NEW. So that there are 600 of those machines that are now to be put into the discard?

Col. BANE. As far as the figures go, that is approximately correct. I do not know the exact figure, however.

Senator REED. Before we leave this question of the weight of the wings, I would like to ask something more about that. That Bristol fighter is really, in its general lines, a copy of the English Bristol fighter, is it not?

Col. BANE. There have been so many changes that I would hardly say it would be recognized as a copy of the English Bristol fighter.

Senator REED. They started with the English Bristol fighter?

Col. BANE. Yes, sir.

Senator REED. Who made those changes? Did the Production Department or the manufacturer or the flyer make them?

Col. BANE. The aviators have had nothing whatever to do with it.

Senator REED. Do you know whether the spread of the wing surface of the present American Bristol fighter is substantially the equivalent of the English Bristol fighter?

Col. BANE. Exactly the same.

Senator REED Tell us the weight of the engine that was employed in the English Bristol fighter, or of the two engines, and also tell us what the character of the engine was.

Col. BANE. May I refer to my table?

Senator REED. Certainly. That is just exactly what we want.

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Col. BANE. Seven hundred and ten pounds is the weight of the Rolls-Royce engine in the Bristol fighter.

Senator NEW. Seven hundred and ten pounds. The weight of the Liberty 12 is what?

Col. BANE. Eight hundred and twenty-five pounds.

Senator NEW. So that there is an increase of 115 pounds, at least, in the matter of the engine?

Col. BANE. Yes, sir.

Senator REED. You have given the weight of the Rolls-Royce. What other engines were used in the Bristol fighter?

Col. BANE. The 200 Hispano-Suiza.

Senator NEW. What was the weight of that?

Col. BANE. Five hundred and fifteen pounds for the 200 horsepower Hispano-Suiza engine.

Senator REED. What other type of engine was used in the Bristol fighter?

Col. BANE. There are several others. I can not tell you offhand.

Senator REED. All those machines that they have had accidents in that you have referred to have been equipped with the Liberty motors?

Col. BANE. Yes, sir; all of them. I have not the figures showing what other engines have been used in the Bristol fighter.

Senator REED. But the ones generally used have been the Rolls-Royce and the Hispano-Suiza; is that correct?

Col. BANE. Yes, sir.

Senator REED. The difference in the weight of the engines you have given accounts in part for the difference in the load, but what else have they done to increase the load of the Bristol fighter besides putting in a Liberty 12 engine?

Col. BANE. The Bristol machine, as originally released to the Curtiss Co. by Col. Clark, had a calculated weight of 2,937 pounds. This included the following equipment: Liberty engine, two men, fuel, oil, water, one Martin gun, 800 rounds, one Lewis gun, scarf mount, 970 rounds. The machine as produced by the Curtiss Co. with the above equipment, weighed 3,146 pounds. The Bristol has since had the following equipment added: One extra Marlin gun, 23.5 pounds; 200 additional rounds, 13.5 pounds; one extra Lewis gun, 17 pounds; additional weight of mounting of two guns and changes in construction, 15 pounds; camera, L type, 10-inch focus, 2 extra magazine plates, etc., 54 pounds; radio apparatus, 82 pounds; bombing outfit, 283 pounds; flares for night lighting, 6 pounds; pistols and cartridges, 6 pounds; oxygen tanks, two, 25 pounds; making a total additional weight over the original design of 525 pounds. This resulted in a total weight of 3,671 pounds. However, in the process of construction of the machine it has been decided to leave off the bombing equipment, weighing 283 pounds, but the machine still weighs approximately 3,700 pounds. I have not the exact weight, They gave me two figures, but it is close to 3,700 pounds.

Senator REED. Before your testimony is printed you will perhaps get the exact weight.

Col. BANE. I will change that to say that the machine now weighs 3,662 pounds. That is the figure they gave me. I am certain that is correct.

Senator REED. You said that when Col. Clark released the machine with the Liberty motor it weighed 2,937 pounds.

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Col. BANE. On paper—engineer's calculation.

Senator REED. But the Liberty motor itself was an increase in weight over the English motor that had been previously employed in this character of machine.

Col. BANE. Yes, sir.

Senator REED. So that even as originally released there was an increase of something like 115 pounds over the Rolls-Royce engine, and something like 400 pounds over the machine when equipped with the Hispano-Suiza engine.

Col. BANE. That is approximately correct.

Senator REED. The Hispano-Suiza engine was being manufactured in this country before this, was it not?

Col. BANE. Yes, sir.

Senator REED. And has been manufactured since?

Col. BANE. The 150 and the 180; yes, sir.

Senator REED. And yet they never secured that engine for use in this Bristol fighter?

Col. BANE. No, sir; no attempt has been made to secure it.

Senator REED. And yet that is an engine that would weigh nearly 400 pounds less than the Liberty engine.

Col. BANE. It was thought it would not develop enough horsepower.

Senator REED. But they are making a larger one that weighs considerably less than the Liberty and does develop sufficient horsepower?

Col. BANE. The 300-horsepower Hispano-Suiza; yes; but that is still in an experimental state.

Senator REED. You said that it was thought it did not have power enough, but the British were using it right along, were they not?

Col. BANE. Yes, sir; but they wanted more power; they preferred more power. It was also thought that the British would put some more powerful engine into it before we could get it into production. The Liberty was the only powerful engine then available, so it was used.

Senator REED. Would a skilled aeronautical engineer have weighted this Bristol fighter with its present construction as it has been weighted?

Col. BANE. No, sir; certainly not.

Senator REED. Would a skilled aeronautical engineer have permitted the character of construction which is now being employed on the Bristol fighter?

Col. BANE. No, sir; he would not have.

The CHAIRMAN. What particular individual made these changes which resulted in such an increase of weight?

Col. BANE. I understand that Col. E. J. Hall and Mr. Mueller, of the Curtiss Aircraft Corporation, made these changes. I know that no reference was ever made to the original designers, Col. Clark and his force, at McCook field.

Senator REED. Is Col. Hall a flyer?

Col. BANE. He is not.

Senator REED. Is he an aeronautical engineer?

Col. BANE. He is not.

Senator REED. Is he an automobile engineer?

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Col. BANE. A manufacturer of aeronautical motors, of the Hall-Scott Co.

Senator REED. What about Mr. Mueller; is he a flyer?

Col. BANE. No, sir.

Senator REED. An aeronautical engineer?

Col. BANE. No, sir.

Senator REED. What was his occupation?

Col. BANE. He is a mechanical engineer, sir, and a very successful one, I understand. I do not know exactly what line.

The CHAIRMAN. Is he the general manager of the Curtiss Co.?

Col. BANE. I think not.

Senator NEW. He is the chief engineer of the Curtiss Co.

The CHAIRMAN. That is what I meant to say.

Senator REED. If I understand you correctly, all of these machines which have been completed will probably be condemned. Would it not be possible to use those machines for flying with safety if they took away from them all of this military load that has been added to them?

Col. BANE. That is a question that is going to be decided to-morrow, whether we can take that machine and strip it and use it for some one purpose.

Senator REED. For training, for instance?

Col. BANE. Training, for instance.

Senator REED. We have got plenty of training planes, have we not?

Col. BANE. But we require the service type of machine.

The CHAIRMAN. Would it be possible to strip the machines of the added weight, the weight which has been superimposed by Mr. Hall and Mr. Mueller, and then use them with the Hispano-Suiza engines?

Col. BANE. That question will be taken up. The Hispano-Suiza engine is now being tested in the English-built Bristol fighter.

The CHAIRMAN. What type?

Col. BANE. The 300-horsepower Hispano-Suiza. Of course, the machine built for the Liberty engine has been changed so that it is not the English machine any longer.

Senator REED. I want now, if you please, to ask a little more in detail about the parts and the construction of the wings which you spoke about some time ago. You said something about the stays being far apart, I believe.

Col. BANE. The ribs.

Senator REED. Those ribs are very light, are they not?

Col. BANE. Yes, sir; they are very light. They are thin wood with lighting holes in them.

Senator REED. Was the defect you have referred to one which an aeronautical engineer would have readily discovered and known?

Col. BANE. Well——

Senator REED. I will put the question in a different way. Would a skilled aeronautical engineer have built these planes with the ribs 15 inches about?

Col. BANE. I think not, sir. That is a question, I guess, about which the engineers might differ. It is a question, however, of load to be carried.

Senator REED. Would he have done it when he knew he was going to put the load on that has been put on this machine?

Col. BANE. No, sir.

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The CHAIRMAN. Isn't that entirely an impracticable load for a machine of that type?

Col. BANE. Yes, sir; it is absolutely so, sir.

Senator NEW. What about the Liberty motor for the Bristol plane? Is it adapted to it, in your judgment? Is the Liberty 12 engine adapted for use in the Bristol plane?

Col. BANE. Whenever you change the engine for which the plane was built you practically have to redesign the entire plane. It is possible that you could make a machine along the lines or similar to the English Bristol with the Liberty 12, but to take the English Bristol and merely make some slight modifications so as to put the Liberty 12 in is not right and it should not be done. It is a patched up and botched-up job and could not be made successful, in my opinion. One more difficulty is that the Liberty cylinders are placed at 45°. They are very high and you can not see out over the machine. Your visibility is ruined in the Bristol fighter due to the shape of the engine.

Senator NEW. I would take up the subject of the De Haviland 4.

The CHAIRMAN. I would like, Senator New, before you do that, to ask one or two questions with regard to the accident.

Senator NEW. All right.

The CHAIRMAN. Col. Bane, what, in your judgment, was the cause of the accident to the Bristol plane last Monday?

Col. BANE. The fact that it was too heavily loaded. When the engine stopped the pilot attempted to turn to get back into the field. Due to its heavy loading, it almost immediately stalled and went into a spin. Of course, the pilot turned too flat; he should have banked up steeply and nosed the machine downward. Or better still, he should have landed straight away. The plane did not have the gliding capacity that a light machine would have.

The CHAIRMAN. Was this a private test?

Col. BANE. I can not say. I think it was merely a flight to test some equipment on the plane.

The CHAIRMAN. Was the pilot a Government pilot?

Col. BANE. I do not know that.

Senator REED. What made the engine stop; does anybody know?

Col. BANE. They were not able to determine. They think perhaps the gravity tank, which contains but a few gallons of gas, was used to get off the field, and that the pressure tank was not put in. He may have run out of gasoline. The thing was so thoroughly wrecked that they were really not able to determine the cause.

Senator REED. But the engine stopped?

Col. BANE. It did stop. The cocks were closed on the main tank. It is possible that he closed them. All pilots are afraid of fire, and when they know they must make a forced landing they shut off the main gasoline tank. The pilot himself was not killed.

Senator NEW. We are also making in this country the De Haviland 4, are we not?

Col. BANE. Yes, sir.

Senator NEW. What was the De Haviland 4 originally?

Col. BANE. It is a day bomber and a long-distance reconnaisance machine.

Senator NEW. A British machine?

Col. BANE. Yes, sir; equipped with the Rolls-Royce engine.

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Senator NEW. We have undertaken to make them in this country?

Col. BANE. Yes, sir.

Senator NEW. Do they make it exactly like the British model, or have we made changes in the model?

Col. BANE. Very few, and only minor changes. The machine is almost an identical copy of the British DH–4.

Senator NEW. Is the DH–4, in your estimation, an entirely satisfactory airplane?

Col. BANE. No, sir; it is not. The performance of the DH–4 is not as high or as good as the performance of the British DH–4.

Senator NEW. What is the reason for that?

Col. BANE. It may be the motor; it may be the propeller. It certainly is, to a great extent, the radiator.

The CHAIRMAN. Do you think the position of the carburetor on the machine has anything to do with it?

Col. BANE. Yes, sir. The tests made by Capt. Lepere indicate that you can get more horsepower with the Liberty by taking the carburetor out of the V and putting it down.

Senator REED. Putting it down where?

Col. BANE. Taking it out of the V. You can put two on each side, or put them on the end.

Senator REED. Why does that mere shifting make this difference?

Col. BANE. The cylinders are set on an angle of 45°. This is a big, duplex, zenith carburetor, and it takes up the entire space in that V, making a poor manifold, full of angles, and the gas passages in the cylinders are very bad, as a result. If you have a straight passage it is better. By putting the carburetor in the rear, you have a long, straight passage without a lot of angles, and it is much more satisfactory. They will come to that later on.

Senator NEW. You said, I believe, that you thought one reason why the American-built De Haviland 4 was less satisfactory than the British machine of the same type was owing to a change in the motor.

Col. BANE. Yes, sir. We use a different motor.

Senator NEW. What motor is used in that machine by the British?

Col. BANE. The Rolls-Royce 360-horsepower.

Senator NEW. And what motor by the United States?

Col. BANE. The Liberty 12.

The CHAIRMAN. Is the Rolls 360 a 12-cylinder machine?

Col. BANE. Yes, sir.

The CHAIRMAN. Then you think the Rolls-Royce is better adapted to a plane of that design than the Liberty motor; is that correct?

Col. BANE. I would like to put it differently.

The CHAIRMAN. Which ever way you please. What we want to get is your explanation of the matter.

Col. BANE. The Rolls-Royce is rated at 360, and it turns up always 360. The Liberty, on the other hand, is rated at various horsepowers, from 400 to 452. I have before me the fifty-sixth report of the comptroller of the technical department of England, in which they have a test of the Liberty 12.

The CHAIRMAN. Is this a British report?

Col. BANE. Yes. They say the power of the Liberty 12, full power is 375, at 1,657 revolutions per minute. At nine-tenths full power, which is normal, it is 350, at 1,610 revolutions per minute. In other words, I feel that the Liberty does not constantly turn up as

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high a horsepower as the Rolls-Royce. I believe that this can be and will be corrected. There are a great many things that are being worked upon. The radiation, for instance, is not satisfactory, and the intake manifold, already mentioned, is not satisfactory. The intake passages into the cylinder from the manifold to the valve proper are full of angles and pockets that are now being worked upon. All these points will increase the efficiency of the Liberty motor so that at a later date it will probably be a more powerful engine.

Senator NEW. But as matters stand to-day, is it less satisfactory than the Rolls-Royce?

Col. BANE. Yes, sir. That, of course, is my own opinion.

Senator NEW. You say that the DH–4 is not an entirely satisfactory airplane. You have also said, I believe, that its primary purpose was for use as a day bomber.

Col. BANE. A day bomber and a long-distance reconnoissance machine.

Senator NEW. And a long-distance reconnoissance machine. What radius of operation has the DH–4?

Col. BANE. I have a recent test which was made at the Wilbur Wright Field. The radius at full throttle was given as 1 hour and 53 minutes.

The CHAIRMAN. Was that test made last May?

Col. BANE. The latter part of May or the first of June.

The CHAIRMAN. That is very low, is it not?

Col. BANE. That is very low.

Senator NEW. I want to digress just one moment to bring out one point. What is the gasoline capacity of the DH–4 as made in this country? Is it the same at all places of manufacture?

Col. BANE. It is not. At the Dayton-Wright plant, as it is being produced, it now has a capacity of 66 gallons. At the Fisher Body Corporation, it has a capacity of 88 gallons.

Senator NEW. You mean the carrying capacity?

Col. BANE. The tanks hold that much.

Senator NEW. One holds 66 gallons of gasoline and the other 88 gallons of gasoline; is that correct?

Col. BANE. Yes, sir.

Senator NEW. Is there any reason for that; and if so, what is it?

Col. BANE. The Dayton-Wright plant got into production first on DH–4 machines with the 66-gallon tank. By this time it had been determined that the Liberty motor consumed at full throttle approximately 36 gallons of gas per hour, so that the Fisher Body people saw the necessity, as everyone saw it, of increasing, if possible, the gasoline capacity, so they built and put in a tank holding 88 gallons. That is, the combined capacity of the two tanks is 88 gallons.

The CHAIRMAN. With that consumption it would be impossible, whatever the endurance of the engine might be, to run two hours with only 66 gallons of gas and a consumption of 36 gallons per hour.

Col. BANE. Yes, sir.

Senator NEW. I desire now to ask a question which refers to the military aspect of this matter. What disadvantage would it be to the commander of a squadron to have his planes carrying different loads of gasoline? In other words, would it place him at a disadvantage if he had a squadron of airplanes turned over to him with which to make a raid and part of them carried 66 gallons of gasoline while the rest carried 88 gallons of gasoline?

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Col. BANE. Yes, sir. He would be in the position of a cavalry commander with lame horses. He would have to take the gait of the poorer horses. In other words, he can only go as far as the small capacity will carry him.

The CHAIRMAN. It is something like a convoy with a fleet of transports, where there is a difference in capacity of knots per hour.

Col. BANE. Yes, sir.

Senator NEW. With the 66 gallons of gasoline, a De Haviland plane has a capacity of 1 hour and 40 minutes in the air.

Col. BANE. That is approximately correct.

Senator NEW. And all the machines that are made at the Dayton-Wright factory carry the 66-gallon tanks? Is that true?

Col. BANE. I have that data from Mr. McClellan, dated July 3. All tanks will be provided with electrically driven tanks and they will be bullet proof tanks at a later date.

The CHAIRMAN. No change in the capacity?

Col. BANE. I do not understand they will change the capacity, but they will have an electrical feed instead of the pressure feed. That is all the data I have.

The CHAIRMAN. Would the electrical feed be substituted for the pressure feed, or do they co-exist?

Col. BANE. No, sir; there would be a substitution. The pressure feed is unsatisfactory on account of the fire danger.

The CHAIRMAN. In your judgment, can the consumption of gas per hour be reduced without impairing the efficiency of the plane?

Col. BANE. That is hard to tell. I am not enough of an engine expert to know. I should think that is pretty high.

In this connection I would like to state that this condition should not hold. If the Fisher Body Corporation can get 88 gallon tanks in the machine they can do it at the Dayton-Wright Co. The reason it is not done is that the production people want to ship the planes overseas.

The CHAIRMAN. I suppose that is due to the public clamor for shipments.

Col. BANE. It is too bad they are not shipped standard—that is, all alike.

Senator NEW. Is the DeHaviland 4 suitable for use as an observation plane?

Col. BANE. Yes, sir; it can be used. In fact, that is about the only use to which it can be put due to its limitations as to radius. It can be throttled down and used satisfactorily as an observation plane.

Senator NEW. As a matter of fact, you state that that is about the only use to which it can be put to best advantage?

Col. BANE. Yes, sir. Of course it can be used for short distance reconnaisance and photographic work, but it can not go long distances. It can not do much bombing work.

Senator NEW. The radius is limited to that of an observation plane.

Col. BANE. Yes, sir.

Senator NEW. What steps are being taken, if any, to manufacture fighting planes of other designs? Of course, I have no reference to training planes.

Col. BANE. We have the English Bristol with the 300 Hispano-Suiza. We are now experimenting with it. Capt. Le Pere has turned out a large machine with the Liberty 12, which has been tested, but

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it is not entirely satisfactory, due to propeller and radiator difficulty. He is now experimenting with a second machine on which I have no report. Then we have the Caproni and the Handley Page, and we have the USD-9, which is a copy of the DH9, which is almost the same as the DH-4, with 50 square feet of additional wing spread. Three of these are being built at McCook Field and will be turned over to the Department of Military Aeronautics for test very shortly.

Senator REED. That is, single machines are being built experimentally?

Col. BANE. That is all; yes, sir.

Senator NEW. Nothing is yet known as to whether the designs will be approved or not?

Col. BANE. No.

The CHAIRMAN. What about the SE-5?

Col. BANE. That is going into production. I believe they have the drawings completed and will start shortly. It is a single seater machine.

Senator NEW. What are the prospects for improvement in the general situation with reference to aircraft production, if there are any prospects?

Col. BANE. We feel that there are not many prospects. The whole situation is very discouraging. We feel that if the bureau of production would confine themselves entirely to producing something that the military people approve of and want, a great deal more progress could be made. A great deal of time is now being devoted to testing freak models of airplanes and producing such machines, without consulting people who could almost at a glance state that such a machine has no part in the military program.

The CHAIRMAN. Don't you think it is a good idea to test new types of machines?

Col. BANE. Yes, sir; on paper. You can eliminate two-thirds of them on paper by standards that everyone knows about, except the production division.

The CHAIRMAN. You mean it is known by men of experience in aeronautics?

Col. BANE. Yes, sir. I have in my office men every day with models. After a great deal of persuasion I am able to convince most of them that they have no military value. There is nothing mysterious about the construction of aircraft. It is perfectly standard. It is not at all mysterious. The British are probably head and shoulders ahead of the rest of the world, and we could not go far wrong in following in their footsteps in view of the fact that we are so young at this game.

Senator NEW. Having asked you a previous question and having elicited the answer which you gave, I will ask you what, in your judgment, ought to be done here to improve this situation?

Col. BANE. I believe that there should be one head of the Air Service. I believe that the engineering features—the organization—should include in its personnel military aviators with a knowledge of the use of military aircraft so as to, if possible, avoid some of the glaring mistakes that have been made in the past. In this connection I would like to add that I believe it would not do any good to turn over to the bureau of aircraft production military aviators with a knowledge of aero dynamics for the reason that they have had in the past such men and they failed to use them or to take their advice.

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I believe that the engineering problem could be controlled by the man who controls the operation of aircraft.

The CHAIRMAN. Why could not an engineering organization be made to bridge over any difference between the present dual organization? In other words, why couldn't the engineers consist, as you say, of men in and out of the military service, without having full control over the type for production?

Col. BANE. If you can get an organization that would not be under the control of production, I should think it would be satisfactory.

The CHAIRMAN. Say, for instance, under the joint control of Ryan and Kenly.

Col. BANE. I do not believe that a man can have two masters and satisfy both of them.

The CHAIRMAN. That is absolutely axiomatic if the two masters are pulling in different directions, but if the men could act as partners—and they should be partners in a matter of this sort—why couldn't some such arrangement be made?

Col. BANE. I think that basically such a thing is impossible for the reason that the man who wants to use the plane and wants to make a modification——

The CHAIRMAN. What such a man says ought to go.

Col. BANE. That is the reason I say he should control the matter.

The CHAIRMAN. You may be right. I wanted to get your view of the situation.

Senator NEW. You spoke a while ago of our following the British system. I would like to ask you with reference to the British system for directing changes in their machines as the occasion for changes manifests itself.

Col. BANE. The British have the following system: They have what they call three classes of changes. A class 1 change means that all people operating that plane or manufacturing that plane will immediately incorporate the change in the plane before it goes again into the air. In other words, it is a vital change that affects the safety of the machine, we will say.

Senator NEW. And the safety of the man in it?

Col. BANE. And the safety of the man in it; yes, sir. That is class 1. A class 2 change is a change that is made, or should be made, in the field, or at the different stations, as soon as possible, but it is not vitally important. A class 3 change is a change that will be put into future production. It need not be incorporated into machines already in service.

The CHAIRMAN. They act in future.

Col. BANE. Yes, sir. This system is used by the British very satisfactorily, and in this way the entire service is kept informed as to the status of the machines. When a machine fails, they know whether it fails as a result of some defect that is being corrected, or not. In this country we have no such arrangement. I wrote a memorandum to the Production Division telling of this British system. I received in reply a statement to the effect that it was very interesting.

The CHAIRMAN. When was that?

Col. BANE. That was during the month of June.

The CHAIRMAN. What particular individual replied?

Col. BANE. The memorandum was answered by Mr. Kellogg. That did not help me a great deal. The fact that it is interesting

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does not help. Those things should be done; they are vitally important. The British have found it necessary. We are constantly placed in this position: A plane is flown at Mineola. The crank shaft breaks. We do not know if it is a new one or an old one. I have never been informed what numbered motor this crank shaft was in. I write a memorandum to Mr. Potter. He does not know. He writes to the factory to find out. In 10 days, possibly, we find out that this was one of the old crank shafts.

The CHAIRMAN. Couldn't you find out directly from the commander of the Mineola field?

Col. BANE. The commander at the field would only know by taking measurements. The commander of the field does not know the dimensions of the interior parts of the motor. The only way he could find out would be to measure and compare with the drawings.

The CHAIRMAN. The machines are numbered?

Col. BANE. Yes, sir; that would be a direct check. If we knew in which serial number this change was incorporated we would know if there was an old crank shaft in the motor or a new one.

The CHAIRMAN. And if the old crank shaft would break, naturally it should not be used at all.

Col. BANE. That would be our idea, but that would stop production.

The CHAIRMAN. When you consider that lives are lost as a result, that should be the ruling consideration.

Col. BANE. I could give you another sample. The British people found out that it was necessary to put a stream line steel tube from the leading edge or main spar or front spar of the stabilizer to the lower longerons.

Senator NEW. In what machine?

Col. BANE. The DH4. Away back last May I asked Col. Vincent, at McCook Field, why they did not incorporate such a change in this machine. In my opinion, the tail was not safe, and the British had found it so. He said he was then arranging to have it done. That was May 5. Col. Sempille arrived recently from overseas with drawings showing this change. I have asked recently that these machines be held up, stating that I considered this of vital importance. They assured me that the change has not been made yet, but they are trying to obtain the steel tubing in order to ship it overseas and have it put in over there. They do not want to hold up production for anything.

Senator NEW. I was about to ask you, Colonel, one final question, and that was if you think that steps are being taken to correct the deficiencies in the DH–4 machine? Your last answer, however, seems to indicate that you do not think so.

Col. BANE. I think they have these things in mind. They are working on them slowly and perhaps eventually they will be corrected. They are not getting out their drawings and they are not notifying us when they make the changes.

The CHAIRMAN. Is not the separation of the aviation from the Signal Corps, and the establishment of a separate military bureau a very desirable and beneficial change?

Col. BANE. It should be so, sir; theoretically. The air service having grown to such an extent at the present time, I should say that it would be very desirable. At present, however, I think we are worse off than we were six months ago.

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The CHAIRMAN. You mean the military service?

Col. BANE. Not so much the military service.

The CHAIRMAN. I am talking about the production side.

Col. BANE. We have our difficulties, also. We are not exactly on Easy Street. We have our faults as well as the bureau of production.

The CHAIRMAN. Perhaps I did not make myself clear. The matter of aviation in the Army was identified with the Signal Corps. It was all under one head. Now, under the President's order appointing Gen. Kenly, aviation has been separated entirely from the Signal Corps.

Col. BANE. That is a great advantage; yes, sir.

The CHAIRMAN. Of course, that does not solve the problem.

Col. BANE. No, sir.

Senator NEW. I think that is all, Col. Bane. We thank you very much for coming.

STATEMENT OF MAJ. B. Q. JONES.

Senator NEW. Maj. Jones, you are connected with the Signal Corps and the aviation department, I believe.

Maj. JONES. Yes, sir.

Senator NEW. In what capacity?

Maj. JONES. At the present time I am assigned to the department of military aeronautics.

Senator NEW. You are assigned to the department of military aeronautics?

Maj. JONES. Yes, sir; and am awaiting transfer from the Production Division.

Senator NEW. Are you a graduate of the Military Academy?

Maj. JONES. Yes, sir.

Senator NEW. What year?

Maj. JONES. 1912.

Senator NEW. How long have you been connected with the Aviation Department?

Maj. JONES. Since December, 1913.

Senator NEW. Are you a practical flyer?

Maj. JONES. Yes, sir.

Senator NEW. What experience have you had as a flyer in the service of the Army?

Maj. JONES. I have been flying since the end of 1913 almost continuously, except for the winter of 1915–16, when I took a course in aeronautical engineering at Boston Tech.

Senator NEW. What has been your association with the Production Division lately?

Maj. JONES. I was loaned over there temporarily with the idea that I would be used in the airplane production engineering department, but they did not use me, so I asked Gen. Kenly to take me back, which he has. I am now awaiting transfer.

Senator REED. Where were you loaned?

Maj. JONES. To the Production Division.

Senator REED. Where did they keep you.

Maj. JONES. They had me in the production engineering department.

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Senator REED. But where?

Maj. JONES. In the office here in Washington.

Senator REED. You were not out with the manufacturers here.

Maj. JONES. No, sir.

Senator NEW. What types of planes have we for training purposes?

Maj. JONES. The JN4D, which is a preliminary training plane; the JN4H, which is the same machine with a 150 Hispano-Suiza motor. It is being used because it has more horsepower and can thereby carry more of a load, which is necessary for training. It is simply a makeshift until we can get service types to finish up training. We also have the Thomas-Morse, which is a machine to be used for training in pursuit work. It was also a machine that was adopted and put into production against the recommendations of the flyers. The Bristol scout, which I flew when I was in Europe, is certainly a much better machine. This, I believe, was recommended as the single-seater pursuit machine for training, but was not put into production. We also have the Standard J–1, of which 1,600 were ordered against the recommendations of the flyers, and I believe just lately these have been ordered not flown.

Until quite recently I was chief of training, but upon my return from abroad I was relieved, so I do not know so much about the matter. I am not strictly up to date on training matters, in other words.

Senator NEW. You say these machines were ordered against the advice of the flyers?

Maj. JONES. Yes, sir; both the Thomas-Morse and the Standard J–1.

Senator REED. What flyers do you mean?

Maj. JONES. I mean flyers associated with what was then known as the Equipment Division.

Senator REED. Who are they?

Maj. JONES. Maj. Martin I know was one of them. He was most intimately associated with that division. Col. Clark was also one of them. He was more or less in and out of town. He was sent abroad to pick types.

The CHAIRMAN. What types did the flyers recommend?

Maj. JONES. We wanted the JN4D, and the Bristol scout, which is a copy of one of the best little scout machines that has been developed abroad for the 80-horsepower LeRhone motor or the 100-horsepower Gnome.

Senator NEW. Why were so many types of planes built?

Maj. JONES. The excuse given for the Standard J–1 was that they could not get enough Curtiss motors, as I remember it now. Therefore they had to use the Hall-Scott.

Senator NEW. And the Hall-Scott was adopted?

Maj. JONES. It has never been a satisfactory motor. I had considerable experience with it at San Diego, Cal., when I had charge of the aero repair shop out there. At that time I was not connected with the Washington office, so my personal recommendations were not asked for. Because there was so much trouble getting satisfactory Thomas-Morse machines, the Standard Co. had developed what they called, for a trade name, the M Defense machine, which I flew. It was very satisfactory. In order to get something for training, I recommended that they put them into production. The trouble with the Thomas-Morse machines was in diving. The whole

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tail would vibrate very badly, making it very dangerous to fly. There was considerable trouble in eliminating that vibration. We had trouble with that machine right along, as can be expected from any new machine. I had gotten disgusted with it and wanted them to put into production something that we could get and that would be as satisfactory as could be expected. The whole thing would have been settled had they put into production the Bristol scout brought over here for that purpose, which I flew when I was abroad in order to verify reports I had heard of it. It is a very nice, strong machine.

Senator NEW. What types are they using for training purposes?

Maj. JONES. The JN4D and JN4H. They are building the Thomas-Morse. I know some of the M Defense machines are being built, but there is quite a wrangle on now about those machines.

The CHAIRMAN. Which machine?

Maj. JONES. The M Defense machine.

The CHAIRMAN. That is the machine that is being constructed at Plainfield, N. J.?

Maj. JONES. Yes, sir.

Senator REED. What is the De Haviland 4 used for?

Maj. JONES. It is primarily ysed for long-distance day bombing work. It is being abandoned, however, for the De Haviland 9. The reason is to get the pilot and the passenger together for communication in the air.

Senator REED. Is that a pretty good machine?

Maj. JONES. The De Haviland is really a marvelous machine as designed by the British. At first the De Haviland was flown with a motor rated at about 220 horsepower. It permitted of a tremendous range in new power plants. They are now using the Eagle rolls, which is rated at 375, without affecting any material change in the design. It is quite a feat to be able to shift power plants.

Senator NEW. You mean to use different motors?

Maj. JONES. Yes. They have shifted up and up without interfering with production.

Senator NEW. Who determines the types of planes that are to be built?

Maj. JONES. Until recently the Production Division not only determined that, but determined how they were to be built, where they were to be built, in what quantities they were to be built, and, from my experience in training, they also determined where they would be sent, because ever since last December I tried to get a service type machine for training, guns, and ammunition, but was unable to get them. Although we wanted them very much, we were unable to get them because they were shipped overseas. They seemed to be more anxious to ship the stuff overseas than they were to have training satisfactorily carried on in this country. Last March a statement came out in the newspapers to the effect that they were shipping machines overseas faster than they were able to train the personnel. Of course, they were, because we could not get the equipment with which to train the personnel.

Senator NEW. What is the present working arrangement between the Production Division and the Division of Military Aeronautics?

Maj. JONES. I can tell you what the working arrangement is supposed to be, but what it actually is, is another matter entirely. Due to a hundred and one different matters, it does not work out.

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The Division of Military Aeronautics, upon conference with the Production Division, determines what machines shall be put into production. The Bureau of Production builds the machines. The Bureau of Production informs the Department of Military Aeronautics of any strength tests, or other tests, in which the Department of Military Aeronautics would be interested, and the Department of Military Aeronautics has representatives present. After the planes are completed they are supposed to be presented to the Department of Military Aeronautics, which decides whether they shall be accepted and turned out for operation by the service. No mention is really made as to who shall decide technically on engineering matters. The inference that I gather is that production shall be responsible for such matters. On the other hand, it turns around, and one infers that in order for the Department of Military Aeronautics to pass on these things they must have a trained technical staff. I think that technical and engineering matters were not left out purposely, but were left out because whoever drew up the agreement did not realize the importance of it, or it never occurred to them.

The CHAIRMAN. Do you mean the order of the President?

Maj. JONES. No, sir. It is a joint agreement between Gen. Kenly and Mr. Ryan, approved by the Chief of Staff.

Senator NEW. How do you think that agreement really works?

Maj. JONES. Well, it does not work. It never will work as long as a production man who knows nothing of either the active service end or the real airplane engineering is allowed to control. It is impossible for a man, whose whole record of success depends entirely upon statistics of production, to pay much attention to other features, especially if it is a matter with which he is unfamiliar.

Senator REED. Pay much attention to what other feature?

Maj. JONES. To the service end.

Senator NEW. What is the trouble in production now, and what is the remedy for it, in your judgment?

Maj. JONES. The trouble, as I see it, in production, starts with entire ignorance—not entire ignorance, but almost entire ignorance—with regard to proper aviation and engineering, and a lack of adequate personnel throughout the Production Department, starting right from the Production Division itself and extending out through all the factories. There is a lack of proper organization. The remedy for it, as I see it, is to give to the so-called youngster aviators some responsibility. It is because they are youngsters that they will not give it to them. They simply have no power. They do not pay attention to the young aviators. Give them responsibility, or at least recognize, or attempt to recognize, the aviation end and the engineering end. Then develop an organization and be willing to let the organization function. It is removing from the central heads the control of a lot of matter which, in a proper organization, should never have passed through their hands.

Senator REED. Let me put that in different language. You mean, in other words, to put some competent men in charge of production, or some people who know something about flying and something about aviation engineering?

Maj. JONES. Yes, sir.

Senator REED. And not leave it to a lot of people who know nothing about it, except as they have picked it up from books or from a study on the ground.

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Maj. JONES. That is it.

Senator REED. You think that some men who has been in the air ought to have something to say about the machines that are going into the air?

Maj. JONES. Yes, sir.

Senator NEW. Is there any parallel organization that our service might follow?

Maj. JONES. Yes, sir; the British.

Senator NEW. Describe that to us. Tell us how it works.

Maj. JONES. Briefly, the whole technical or engineering end is actually controlled by the service people, and the production people build what they are told to build. That is what it is, briefly. You can get an idea of the whole organization and the whole system of working in detail of the royal air force from the board, consisting of Gen. Brancker, Col. Sempille, and Sir Henry Fowler, that was sent over here on this one matter, I believe.

Senator REED. Are they flyers?

Maj. JONES. Gen. Brancker and Col. Sempille are flyers. They are flying all the time.

The CHAIRMAN. They came over at different times, did they not?

Maj. JONES. No, sir. They came over at the same time. They came over particularly on this job, I believe.

The CHAIRMAN. That was recently?

Maj. JONES. Yes, sir. They landed here the 12th of June.

The CHAIRMAN. I would now like to ask something about the accident to the Bristol fighter last Monday. You went up there didn't you?

Maj. JONES. Yes, sir.

The CHAIRMAN. What, in your judgment, was the primary cause of that accident, or what were the causes?

Maj. JONES. The primary cause was that the machine requires more than average ability to fly it. The secondary cause was the pilot was a flyer who did not have this ability.

The CHAIRMAN. Was the machine, in your judgment, overloaded?

Maj. JONES. Any machine that is loaded beyond 9.1, as that was, is an overloaded machine.

Senator REED. You say "beyond" that. Do you mean beyond that or loaded to that?

Maj. JONES. Loaded to that. With such heavy loading you get into the scout class, i. e., machines designed especially for speed. To get speed you must have small wing surfaces, which gives heavy loading. That means that it will land fast and is tricky. I know of no machine other than the Moranne parasol or the Bristol monoplane that will load above that.

The CHAIRMAN. Do I understand you to say the smaller the machine the heavier the load?

Maj. JONES. Not necessarily. It depends upon the purpose for which the machine is designed.

The CHAIRMAN. The scout machine would carry a heavier load, because it had smaller wings?

Maj. JONES. No, sir.

Senator REED. Heavier in proportion, he means.

Maj. JONES. This machine loading is that of the scout class. It was really designed for artillery observation. It can not be loaded

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to that extent. The British load is about 6.5. The more lightly loaded a machine is, the less tendency it has to stall.

Senator REED. This machine we are now speaking of stopped, did it not?

Maj. JONES. Yes, sir; it was heavily loaded, and consequently tricky. When the engine stops suddenly, the machine stalls very quickly and will "spin" easily.

Senator REED. If it had not been so heavily loaded, the man could have gotten out?

Maj. JONES. If it had not been so heavily loaded, he would not have gotten into the spin, although any machine above 7.5 pounds is tricky. If you lose any power at all, the machine stalls very fast. It takes more than the average pilot to fly them. If we were to turn them out now we would have a lot of fatalities.

Senator NEW. Have we built airplanes in this country for service at the front?

Maj. JONES. The D H–4 is to be completed and sent over there.

Senator NEW. Do you know how many of them have been completed?

Maj. JONES. No, sir; I have not the figures on that.

Senator NEW. Nor how many have been sent abroad?

Maj. JONES. No, sir; I have not the figures on that.

Senator NEW. That is one type of so-called combat plane that we have made in this country for use on the front in France, is that correct?

Maj. JONES. That is one type of plane that we have made and completed and sent. I was informed, not officially, that they are sending parts of the Handley-Page. That has not been officially sand-tested or given an official trial.

Senator NEW. Have you tried the Handley-Page abroad?

Maj. JONES. No, sir.

Senator NEW. You said that you were over on the other side?

Maj. JONES. Yes, sir.

Senator NEW. Were you sent over by this Government?

Maj. JONES. Yes, sir. I was sent over to go into training methods.

Senator NEW. That was the purpose?

Maj. JONES. Yes, sir; to learn all I could about training.

Senator REED. When was that?

Maj. JONES. I left in the middle of April and got back in the middle of June.

Senator REED. Of this year?

Maj. JONES. Yes, sir.

Senator REED. After that they displaced you as chief of the flying squadron?

Maj. JONES. Yes, sir.

Senator REED. Who did that?

Maj. JONES. The Chief of Aeronautics.

Senator REED. Who is he?

Maj. JONES. Gen. Kenly, I guess. It came in an order. I do not know who was responsible.

Senator REED. You do not know the reason for it?

Maj. JONES. Officially, I do not. No, sir.

Senator NEW. Do you regard the DH–4 as a satisfactory machine? Just give us your impressions, as a practical aviator, of the DH–4

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machine. Tell us for what purpose it is suited, for what purpose it is unsuited, and give us your estimate of the DH–4 as made in this country, in your own way.

Maj. JONES. Any statement I may make on the DH–4 must be affected by what I know the conditions are in our squadron on the front.

Knowing what I do know, I will say that this machine can be used for anything except pursuit work—the single seater—because I know they are using antiquated machines purchased from the French that were discarded by them a year and a half ago. They are using the Sopwith, 1½ strutter. It has been declared unsafe by the French and British for observation work. They are using the AR equipped with the Renault 220, which has a ceiling of only 10,000 feet. They use the Spad two-seater, which is unreliable and unsatisfactory. The 220-horsepower Hispano Suiza was so unreliable and so unsatisfactory that a standing order not to fly the machine more than 6 kilometers behind the Hun lines was issued. They were using a few French Braguet machines and the Sampson, which is a French machine. In comparison with those the DH–4, provided it is satisfactory as determined by service usage, would be a much better machine in my opinion, because it would have a better performance in climbing and in speed. I know that the Liberty is more reliable than the Hispano Suiza 220. On the other hand, no type of mahine can be declared satisfactory until service has proved it to be so, not only as regards general construction but also as to all the equipment and accessories that are installed. I know that the British have really developed but few machines that have stood up under service conditions. The Sopwith Dolphin, I was informed, was about to be changed because of structural weaknesses that had developed after long-continued use. This machine was very popular with the British as a single-seater pursuit machine.

Senator REED. Was that equipped with the Hispano Suiza engine?

Maj. JONES. They have about half a dozen different types of Hispano Suiza engines. Any geared Hispano of the lower horsepower is unsatisfactory.

Senator REED. How about the ungeared?

Maj. JONES. They are quite unsatisfactory, but they have built what they call the Hispano Suiza Vyser, that develops something like 200 horsepower or over. I flew a Sopwith Dolphin with one of those.

Senator REED. I notice in this official table which we have been furnished that the Dolphin with the Hispano Suiza engine is given a credit for a ceiling of 23,500 feet.

Maj. JONES. Yes, sir. It is a high-altitude machine.

As an illustration how machines are sometimes proved not entirely satisfactory until long after they have been in service, we can take this particular Sopwith-Dolphin. British fliers informed me while I was abroad that the wings of this machine were failing, due to the fact the machine did not "follow thru" in coming out of a dive. By that I mean if the elevator control is used too suddenly, instead of coming out of the dive in a proper flight path, the machine rotates about its lateral axis, the air strikes the planes at a very high angle of incidence at a very high speed, causing a terrific stress on the wings

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Senator REED. Of course, these gestures you have made can not go into the record. I wish you would translate them into words later on when this record comes to you for revision. That is not a criticism, you understand.

Maj. JONES. Yes.

Senator REED. We are simply trying to get this record in such shape that others who read it may understand it.

Maj. JONES. The reason I spoke of those things was to show how long it takes to develop a type. To say that the DH4 is satisfactory is going too far. I would not say that it is. These things take time to correct. The present machine, as compared to the one to be used in a year from now, will probably be ridiculous.

There is another thing that I do not like about this. They put everything in it. Instead of using it as a day bomber in which you can carry bombs and guns for protection, they have also made provision for a camera. That is for high altitude photographic work. They are also using it for a night bomber, and that seems to me to be ridiculous. It is too fast. They will crash.

Senator REED. In other words, they are trying to use it as a family horse—a horse with which they may go to town, plow, and do various other things.

Maj. JONES. Yes, sir; that is it.

Senator REED. What do our troops need over there now?

Maj. JONES. Anything that will fly.

Senator REED. I mean what should they have?

Maj. JONES. They ought to have the Bristol fighter; they ought to have the DH9; they ought to have the SE5; they ought to have the Sopwith Camel.

Senator REED. How about the Spad? Is that a good machine?

Maj. JONES. It is not as good as the SE5.

Senator REED. What ought they to have in the way of bombing machines?

Maj. JONES. The D H 9.

Senator REED. Is that heavy enough for long-distance bombing?

Maj. JONES. That is what the British are using it for.

Senator REED. What about the Caproni and the Handley-Page?

Maj. JONES. They ought to have the big night bomber, the pusher type, but personally I am adverse to the super-Handley with the four motors, because the effective circling is not as high as a dirigible. The dirigible can be shot down because it is not a high altitude machine and because it is not maneuverable. If they can be shot down at an altitude of 14,000 feet I should see no reason why the super-Handley-Page can not be shot down. I would advocate a smaller bombing machine, never with a crew of more than three.

The CHAIRMAN. Your criticism of the Handley-Page has reference to the type which has been produced across the seas, and which was destroyed the other day?

Maj. JONES. Yes, sir; that is the one. It costs a tremendous amount to build it, and the shipping facilities are such that the question should be considered very carefully.

Senator REED. Do you think there would be much danger of hitting a Handley-Page from the ground at an altitude of 10,000 feet?

Maj. JONES. Day or night?

Senator REED. Either one.

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Maj. JONES. Very much danger in the day and considerable at night. That is the super-Handley. By that I mean the big four-motor machine. I was in Paris on two bombing raids and I was in London on one bombing raid. The barrages were so effective that the planes never really got over their objectives. The night defense tactics of the pursuit squadrons are becoming effective. When I was in London they shot down seven planes. That was at night, too.

Senator REED. I can understand, of course, how you can get these large planes with another airplane up in the air.

Maj. JONES. But it is very difficult. It is practically impossible to see anything when you are flying at night. You can fly almost next to a plane without seeing it.

Senator REED. I mean that I can understand how they can be struck if you can see them, but as to this barrage, if they are struck during it, it is merely due to the fact that they have the air so filled with missiles that these planes simply come in contact with them, and it is not due to the aim of a single machine.

Maj. JONES. That is true. Most of the German machines have a crew of three.

Senator NEW. How is the German Gotha compared to the Caproni, for instance?

Maj. JONES. I think it has about the same capacity. I haven't the exact figures. I can get them for you if you wish. The Caproni, the Handley-Page, and the Gotha are all about in the same class, as well as I can remember. According to these figures, the largest Caproni weighs 13,755.

Senator REED. Is that the triplane?

Maj. JONES. I think so. The one that the Standard built is 76 feet. That is a shorter one. The gross weight is 10,000 pounds.

Senator REED. The Handley-Page?

Maj. JONES. The Handley-Page is about the same—14,000 pounds; that is, the biplane. The Handley-Page has two motors as against three in the Caproni. The gross weight of the Gotha is about 8,600 pounds. The Caproni that we are now making is 10,000 pounds, and the Handley-Page, as we make it, is 14,000 pounds. As the British make it, it is 12,230.

Senator REED. Is what they call the super Caproni the triplane?

Maj. JONES. That is the super.

Senator REED. Have you seen that?

Maj. JONES. No, sir.

Senator REED. That is the kind they are building for England?

Maj. JONES. I do not believe they are building any for us.

Senator REED. But they are not building it?

Maj. JONES. No, sir; I do not think they are. It is 8,600 for the Gotha against 9,918 for the Caproni and 12,230 for the Handley Page, foreign make. The French Caproni weighs 8,752 pounds.

Senator REED. Then it appears that Great Britain, France, and Italy are using the Caproni to some extent?

Maj. JONES. I did not know that the British were.

Senator REED. I am stating that on other information. I have seen pictures of the super Caproni. It was said that the British had purchased it. What their motives and reasons were I do not know, of course.

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The CHAIRMAN. What is your opinion of the Italian SVA scout plane?

Maj. JONES. I have just seen it. I have not flown it. I have not seen it since I have been here. Offhand I would not give an opinion without knowing more about it.

The CHAIRMAN. You are not sufficiently acquainted with it?

Maj. JONES. I have not had any experience with it.

The CHAIRMAN. How long were you at the front, Major?

Maj. JONES. I was in France for one week, but I flew everywhere, so that I got around and covered a great deal of ground that people who were there longer did not cover.

The CHAIRMAN. While you were in France how many American squadrons were flying?

Maj. JONES. When I was in France there were five squadrons actually operating on that front, one pursuit at Dunkirk, two pursuit at Toul, and two observation squadrons at Ourche. This was the latter part of May—the 26th and 27th.

The CHAIRMAN. You mentioned five squadrons. Were they the only ones?

Maj. JONES. At that time that was all. At Amanty there were three or four squadrons waiting for equipment in order to go on the front. At Colombey Les Belles there were more to go. There were in actual operation only five squadrons.

The CHAIRMAN. How many machines were they equipped with?

Maj. JONES. The two pursuit squadrons were equipped with the Nieuport type 28, with 150-horsepower Gnome motors.

The CHAIRMAN. How many machines?

Maj. JONES. They were about to receive a full complement.

The CHAIRMAN. What is a full complement?

Maj. JONES. Eighteen planes per squadron.

Senator REED. How many did they have at that time?

Maj. JONES. I do not remember exactly what they had. The observation squadrons were supposed to have an initial complement of 18 planes per squadron, and a replacement of 50 per cent the first month, and thereafter it was to be at the rate of 33⅓ per cent. Up to the time I left, which was May 26, the squadron had received one plane for replacement, as I remember it. Of the planes in the first squadron, they only had four machines in commission.

The CHAIRMAN. How about the second squadron?

Maj. JONES. The second squadron was equipped with the French AR. I do not know how many machines they had. I know that the first squadron had not received anything but one replacement. They had been on the front since April 4.

The CHAIRMAN. It is a fact that the line occupied by the American troops is protected by allied flyers as well as our own?

Maj. JONES. Our troops are scattered and mixed up with the French and British all the way up and down the front.

The CHAIRMAN. Then that would follow, as a matter of fact.

Maj. JONES. That would follow, as a matter of fact. The only sectors in which our planes were actually operating were in the Toul sector, and one squadron at Dunkirk.

The CHAIRMAN. That was the 27th of May?

Maj. JONES. That was the 27th of May.

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Senator REED. How many should we have for an Army of 1,000,000 men over there? What would be the proportion?

Maj. JONES. The organization has changed so much and it is so uncertain that I can not do other than by giving you an approximation of what I know to be the British. Otherwise I can not say.

Senator REED. Give us that approximation.

Maj. JONES. I do not like to be quoted. This is from memory. I can give it exactly later on.

Senator REED. Do that, please. Supply that information later on.

Maj. JONES. Yes, I can give it exactly. I can gather the information that you want.

Senator REED. I want to know what flying corps we should have for an army of 1,000,000 men.

Maj. JONES. For army of 20 fighting and 10 replacement (base and training) divisions plus corps, army, general headquarters, quarters, and line of communication troops, total, about 1,300,000 men, the American Expeditionary Force program of September 18, 1917, called for 386 service squadrons, 264 park squadrons, and 69 balloon companies.

(Thereupon, at 4 o'clock p. m., the committee adjourned until Thursday, July 18, 1918, at 2 o'clock p. m.)

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AIRCRAFT PRODUCTION.

THURSDAY, JULY 18, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at 2 o'clock p. m., pursuant to adjournment, in the committee room, Capitol Building, Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, and New.

STATEMENT OF MAJ. HAROLD S. MARTIN.

Senator NEW. Maj. Martin, with what branch of the military service are you connected?

Maj. MARTIN. I am in the Department of Military Aeronautics.

Senator NEW. With the rank of major, I see by your insignia?

Maj. MARTIN. Yes, sir.

Senator NEW. By what avenue did you enter the Army? Are a graduate of the Military Academy?

Maj. MARTIN. I graduated from the Military Academy in 1913 and spent two years with the Infantry, and since then I have been in the Aviation Section.

Senator NEW. Have you been abroad—that is, have you been in France since the United States entered the war?

Maj. MARTIN. I was in France and England from January until May.

Senator NEW. In 1918?

Maj. MARTIN. Yes, sir.

Senator NEW. How did you happen to go abroad?

Maj. MARTIN. It was requested by the chief of the air service, American Expeditionary Forces, that I be sent to France for the purpose of looking into the design of aeroplanes.

Senator NEW. Into the designing of aeroplanes?

Maj. MARTIN. Yes, sir.

Senator NEW. Did you make any recommendation with reference to that subject on your return to this country?

Maj. MARTIN. I was a member of a board appointed by the chief of the air service with three other officers for the purpose of determining what types of airplanes should be produced in the United States for the year 1919.

Senator NEW. Who was the chief of the air service at that time?

Maj. MARTIN. Brig. Gen. B. D. Foulois.

Senator NEW. Gen. Foulois was then in France?

Maj. MARTIN. Yes, sir.

Senator NEW. And the request for you came from Gen. Foulois?

Maj. MARTIN. Yes, sir.

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Senator NEW. Who were the other members of the board?

Maj. MARTIN. Lieut. Col. Dodd, Lieut. Col. Harms, Maj. Harmon, and myself.

Senator NEW. Did that board make any recommendations, either while abroad or following its return to this country?

Maj. MARTIN. I brought back the proceedings of the board when I returned to the United States the last of May. Later a cablegram was received from Gen. Pershing stating that the proceedings of the board were approved in principle.

Senator NEW. Gen. Pershing said they were approved in principle?

Maj. MARTIN. Yes, sir.

Senator NEW. What can you tell us about the recommendations of that board?

Maj. MARTIN. Do you want me to go into details? It is quite a long thing. We recommended nine types of machines.

Senator NEW. I would like to know what types of machines were recommended by the board.

Maj. MARTIN. The board recommended nine types of machines to be built in the United States. One was a single seater machine, either a Martinsyde or Sopwith-Dolphin, with the 300 horsepower Hispano-Suiza motor.

Senator NEW. With the 300-horsepower Hispano-Suiza motor?

Maj. MARTIN. Yes. The second was a single-seater machine using the 320 A B C Dragon Fly engine. The exact machine was not definitely determined upon by the board, because three machines are now being built in England and will be tested, and the best one of the three will be the one selected. Another was a single-seater machine using the 170 A B C Wasp engine. The same remark apply to this machine as applied to the other A B C engine. A third was a two-seater pursuit machine using the 300 Hispano-Suiza motor. The machine selected was to be (1) Bristol fighter, (2) an experimental machine with the 320 A B C Dragon Fly.

The CHAIRMAN. was this report in writing?

Maj. MARTIN. Yes, sir. I was going to suggest that you might have the report in writing.

The CHAIRMAN. Then I suggest that you just put in that report.

Maj. MARTIN. All right, sir.

Senator NEW. We will have it understood then that the report will be made a part of your testimony.

Let me ask you this question: I note that in recommending the Bristol, your recommendation was for a Hispano-Suiza motor to be used?

Maj. MARTIN. Yes; the 300-horsepower Hispano-Suiza.

Senator NEW. The 300-horsepower Hispano-Suiza motor?

Maj. MARTIN. Yes, sir.

Senator NEW. You did not contemplate using the Bristol with the 12-cylinder Liberty?

Maj. MARTIN. No, sir.

Senator NEW. Were the recommendations of your board followed, and if so, to what extent were they followed?

Maj. MARTIN. The proceedings of this board were for the production of machines in the year 1919. The only steps that have been taken so far have been to send a commission abroad to get the drawings and samples of these machines, and up-to-date information

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on them. I left England just at the time when most of these machines were about to be tested.

Senator NEW. What types of planes are now being built in this country?

Maj. MARTIN. For training machines, first, the Curtiss J. N.–4D.

Senator NEW. Independently of training machines, I mean.

The CHAIRMAN. Planes other than training planes.

Senator NEW. Yes. What planes other than training planes are being built in this country?

Maj. MARTIN. There is only one machine being made in any numbers in the United States at the present time, and that is the De Haviland 4. One or more of the following machines are being built: Handley-Page, Caproni, Byplane U. S. D. 9, which is a modification of the English De Haviland 9A, and the S. E. 5. Of course, orders exist for large numbers of these machines, but outside of the one or two none have been built.

Senator NEW. You mean, then, that one or two specimen machines are being built for test?

Maj. MARTIN. Yes, sir; and the Bristol Fighter is also being constructed.

Senator NEW. What do you know about the Bristol Fighter having been abandoned?

Maj. MARTIN. I was one of the three officers who lately went to Buffalo to determine exactly what should be done in the case of the Bristol Fighter. We agreed unanimously that production should be immediately stopped on this machine, as it is unsuitable for the purpose for which it is intended, or for any other purpose.

Senator NEW. What were the reasons? Just state briefly the reasons for the recommendation of your board that the Bristol machine be discarded.

Maj. MARTIN. We believed that the Bristol is unsafe; that it will serve no military purpose, and at best will only do what the present De Haviland 4 will do. There seems therefore to be no object in having two entirely different machines which are supposed to do the same thing.

Senator NEW. I understood that this recommendation of your board was to be considered by the production department this morning?

Maj. MARTIN. Yes, sir.

Senator NEW. Do you know whether or not it was considered?

Maj. MARTIN. No, sir; I do not know.

Senator NEW. You do not know whether any action was taken on it or not?

Maj. MARTIN. No, sir.

Senator NEW. Let me ask you this: Was the De Haviland 4 included in the list of machines that you recommended for 1919 production?

Maj. MARTIN. No, sir.

Senator NEW. It was not.

Maj. MARTIN. No, sir.

Senator NEW. Why not?

Maj. MARTIN. The English are substituting the De Haviland 9 and 9–A for the De Haviland 4, and both of these machines are better than the De Haviland 4.

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Senator NEW. In other words, the De Haviland 4, you think, is antiquated?

Maj. MARTIN. I think we may say that it is a little behind the times, outside of the criticisms of the machine itself.

Senator NEW. I do not quite understand that.

Maj. MARTIN. I mean there are faults with the De Haviland that we are making that the English De Haviland has not; that there are certain faults in our De Haviland that are not met with in the English De Haviland.

Senator NEW. Can you tell us briefly what they are? Are they structural faults?

Maj. MARTIN. There are certain structural faults which have not yet been corrected. That is the main idea.

Senator NEW. Is anything being done to correct those faults?

Maj. MARTIN. The Department of Military Aeronautics has repeatedly tried to get this information from the production department, but in most cases only general replies have been received, and these replies are often contradictory.

Senator NEW. You mean that you can not get any satisfactory information now from the production department?

Maj. MARTIN. I mean that very often we can not get any information, and from past experience we view most of the information received with suspicion.

Senator NEW. Just what do you mean by that?

Maj. MARTIN. I mean that we get reports as to performance of machines, and when later on we test the machines ourselves there is a big falling off in the reported performances.

The CHAIRMAN. As to speed?

Maj. MARTIN. As to speed and climb.

The CHAIRMAN. And endurance?

Maj. MARTIN. Yes, sir.

Senator NEW. Where are these tests made on which the reports of which you complain are based?

Maj. MARTIN. The tests are made at McCook field, Dayton, Ohio.

Senator NEW. From whom, particularly, do these reports come? I know that they come from the production department, but what individuals, if you can name them?

Maj. MARTIN. We get most of our information of this nature from Mr. Potter, from Mr. Kellogg, and Col. Vincent.

Senator NEW. Col. Vincent is in charge at the field, is he not?

Maj. MARTIN. Col. Vincent is in command of the Airplane Engineering Department and McCook field is really a branch of that department.

Senator NEW. Then, Col. Vincent would send those reports forward to Mr. Kellogg and Mr. Potter, and they would simply again forward the reports that he makes to them; is not that the ordinary course of business?

Maj. MARTIN. Yes, sir; although they sometimes come direct.

Senator NEW. You say that subsequent tests made by your department officially have not sustained the reports made by the testing officers at the field?

Maj. MARTIN. No, sir.

Senator NEW. What has been the character of that difference?

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Maj. MARTIN. The reports from McCook field are invariably better than those we obtain.

Senator NEW. They report results, in other words, that you can not obtain. Is that correct?

Maj MARTIN. Yes, sir.

Senator NEW. Is that universally true or are there any exceptions to that?

Maj. MARTIN. No, sir; I do not think so. It is a difficult thing, of course, to make a very general rule on it. We have received very little from them.

The CHAIRMAN. Speaking in a general way, that is the rule?

Maj. MARTIN. Yes, sir.

Senator NEW. What types of planes are now being built for training purposes?

Maj. MARTIN. The Curtiss JN–4–H, the JN–4–D, and Thomas Morse S4C. They are the only machines which are being built for training at present.

Senator NEW. Other types were built until recently, were they not?

Maj. MARTIN. Yes, sir.

Senator NEW. What were those types?

Maj. MARTIN. The Standard J–1. A great many Standard J–1's were built, the use of which has temporarily, at least, been abandoned.

The CHAIRMAN. Why?

Maj. MARTIN. They are entirely unsatisfactory for training purposes.

Senator NEW. Can you tell us how many of those machines have been abandoned, and where they are?

Maj. MARTIN. I have only hearsay testimony, but I believe the number is around 1,200 or more. They are now in storage in various parts of the United States.

Senator NEW. Those are machines for which the United States has paid and they are now in storage in various fields, and the use of them has been entirely discontinued. Is that correct?

Maj. MARTIN. For the present, at least; yes, sir.

Senator NEW. Can you tell us, approximately, what the cost of those machines was, if you have that figure in mind?

Maj. MARTIN. The prices have varied a great deal. The original price was $6,500 without the engine, the engine costing in the neighborhood of $2,500.

Senator NEW. What was the engine used?

Maj. MARTIN. The Hall-Scott 4-cylinder engine.

Senator NEW. Have there been any other types of training planes abandoned?

Maj. MARTIN. There are several types which we used to a certain extent, a limited extent, in training, which are no longer being made; but no other types have been abandoned because of being unsatisfactory.

Senator NEW. I speak of types that have been manufactured in quantity and the use of which has been discontinued after large numbers of them had been accepted.

Maj. MARTIN. No, sir; no others.

The CHAIRMAN. Let me ask you, Major, why these planes were unsatisfactory. Is it due to defects in the materials or structure, or in the engine, or all of them together?

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Maj. MARTIN. The engine of the Standard machine is responsible for almost all of the trouble met with.

The CHAIRMAN. Can they be equipped with other engines and be made serviceable, in your opinion?

Maj. MARTIN. I would not recommend using the J–1 as long as the Curtiss JN–4–D was available.

The CHAIRMAN. I am speaking of the Standard. Is the J–1 the Standard?

Maj. MARTIN. Yes, sir. I believe that if the J–1 Standard had a reliable power plant installed, considerable training could be done with that machine.

Senator NEW. What would you regard as a reliable power plant? In other words, what would you regard as a reliable motor? I presume that is what you mean.

Maj. MARTIN. Yes, sir. For a water-cooled engine, the Curtiss OX–2 and the OX–5 are very reliable engines for training purposes.

Senator NEW. Can you approximate what the expense of making that substitution would be, taking the Hall-Scott engine from the J–1 and substituting the Curtiss OX–2?

Maj. MARTIN. It would cost approximately $3,000 per aeroplane.

The CHAIRMAN. Something over $3,500,000 altogether for the 1,200 planes.

Senator NEW. You have said, I believe, that you thought the machine could be put to some use.

Maj. MARTIN. Yes, sir.

Senator NEW. With that sort of a substitution?

Maj. MARTIN. Yes, sir.

Senator NEW. Would you then regard it as a first-class training plane?

Maj. MARTIN. No, sir.

Senator NEW. You would not?

Maj. MARTIN. No, sir.

Senator NEW. What types of training planes do you think should be built?

Maj. MARTIN. I believe that training could be satisfactorily done in this country with the following types of machines:

(1) Curtiss JN–4–D, for preliminary training.

(2) Bristol scout or Nieuport, with 80-horsepower Le Rhone engine, for advanced training in pursuit work, the later training in pursuit work to be supplemented by practice with service types.

(3) The VE–7, for training in observation work.

(4) The Curtiss R–4, with the Liberty 12, for training in bomb dropping.

With reference to the Ve–7, the objection to it is that it uses a very expensive engine, which is rather difficult to maintain. It, however, is an existing type and therefore is mentioned.

Senator NEW. Who now determines what types of planes shall be built?

Maj. MARTIN. It is supposed to be the function of the Department of Military Aeronautics.

Senator NEW. You say it is "supposed to be the function"?

Maj. MARTIN. Yes, sir.

Senator NEW. Do they exercise that function or are they interfered with in any way?

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Maj. MARTIN. It is only recently that this has been decided to be a function of the Department of Military Aeronautics, and therefore it is difficult to say whether our recommendations will be concurred in. Previously the machines which were produced were determined upon largely by the Equipment Division of the Signal Corps, and they often decided upon types without reference at all to those who were interested.

With the previous organization, of course Gen. Squier was the head, and if he approved of a certain project there was little that could be done, and I believe that machines were built and ordered to be built without reference to what actually should have been built. In other words, I believe it was largely a question of production and not a question of getting the airplanes which would fulfill the requirements.

The CHAIRMAN. It was quantity instead of quality, in other words?

Maj. MARTIN. Yes, sir.

Senator NEW. Maj. Martin, what is the present working arrangement between the production division and the division of military aeronautics?

Maj. MARTIN. The Department of Military Aeronautics is to advise the Bureau of Production what is desired in the way of performance for the different types of machines. The production department is to build the necessary number of sample machines and then submit them to the Department of Military Aeronautics, which will determine whether they are satisfactory or not.

Senator NEW. Does this arrangement work satisfactorily?

Maj. MARTIN. I do not think it can possibly work satisfactorily, for the reason that a great deal of money and time will be wasted. I do not believe that the Production Department includes in its personnel individuals who are competent to decide what should be built and what should not be built. It is, of course, probable that we will eventually get some satisfactory machines, but before that is done an immense amount of time, labor, and money will be expended. The Production Department should include in its personnel officers who can definitely decide whether a machine should or should not be built, and if built, what changes, if any, should be made. As organized at present, they can not do this.

Senator NEW. You think that the absence of officers or officials possessing these qualifications is one of the troubles with the Production Division now, do you?

Maj. MARTIN. Yes, sir.

Senator NEW. Is there any other trouble with it, in your judgment?

Maj. MARTIN. I believe that the Production Department is still entirely too optimistic as to what will be done. Another objection to the present organization is the fact that there is no single head.

Senator NEW. I was just going to ask you what the remedy for it is.

Maj. MARTIN. Another fault with the Production Department, I believe, to be the fact that they have little organization in their department at the present time. It is very difficult to find a man who will decide this or that.

Senator NEW. What do you think the remedy for it is, Major, if there is a remedy?

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Maj. MARTIN. There should be a single head to the Air Service. The only remedy for lack of organization is to get some one who will create an organization.

Senator NEW. Is there any organization anywhere that you know of after which we might pattern and whose lines we might follow to good effect or with good results?

Maj. MARTIN. I do not think there would be any mistake in adopting the British organization. Of course, in our entire service we are very short of capable men along the lines of aviation. We have not had enough experience as yet. The English organization, from what I have seen of it, works very well. It is a little slow.

Senator NEW. Can you give us, briefly, an outline of the British organization?

Maj. MARTIN. The head of the British air organization is the air minister. He has a council to advise him. There is, roughly, only one department of the air service in England; that is, they have not two separate branches such as we have. The technical department is a part of production. However, most of the officers or officials in the British air service are men of actual experience in aeronautics, and I believe, of course, that organization is largely a question of individual ability more than any chart which will indicate the different functions. I would suggest that there are at present several British officers in Washington who could give a much clearer and more accurate account of the organization of the British at the present time than I can.

Senator NEW. I think that is all I have to ask Maj. Martin.

STATEMENT OF MAJ. FRANK E. SMITH.

The CHAIRMAN. Maj. Smith, since you last appeared before us, the committee has determined to call you for the purpose of asking, briefly, a few questions regarding the various aviation fields in Dayton. The committee has heard of three fields in Dayton, the Wilbur Wright, the McCook, and the Dayton-Wright Fields. Do you know of any other training field or aviation field at Dayton?

Maj. SMITH. There has been another field authorized, based on a recommendation made by Gen. Squier, on March 28, 1918, at which time he requested of The Adjutant General of The Army that in view of the fact that production was then upon them in aeroplanes every machine should be tested, and that these tests should be made in fields to be acquired at Dayton, Ohio, Buffalo, N. Y., Detroit, Mich., and Elizabeth, N. J., and asked that $1,047,000 be appropriated for that purpose.

The CHAIRMAN. He asked that of the production board?

Maj. SMITH. No, of The Adjutant General, and that was approved by The Adjutant General and made effective on the 11th day of April, 1918.

The CHAIRMAN. At that time the Government had secured the Wilbur Wright and the McCook Fields, had it not?

Maj. SMITH. Yes, sir.

The CHAIRMAN. While the Dayton-Wright people were using the Dayton-Wright Field for their own purposes?

Maj. SMITH. Yes, sir; at the expense of the Government, however.

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The CHAIRMAN. The Dayton-Wright Field, then, is used by the Dayton-Wright Co., but the Government pays the expense by way of rental for that field.

Maj. SMITH. As I understand the situation out there, the experimental field, which is known as the South Morrain Field, is a property which belongs to practically the same people who own the Dayton-Wright factory, but the expense incidental to the buildings and to the experiments that are carried on on that field come under the experimental contract with the Dayton-Wright factory, for which the Government reimburses them.

The CHAIRMAN. Acting upon the recommendation of Gen. Squier and the approval of The Adjutant General, what other field was acquired?

Maj. SMITH. Another field closely adjoining the plant of the Dayton-Wright factory was leased, or a lease was drafted for execution, by the Dayton-Wright Co. The property in question belongs to what was known as the Morain Development Co.

The CHAIRMAN. Who constitute the Morain Co.?

Maj. SMITH. In the course of the negotiations in connection with the lease our approval officer in Dayton was asked to pass upon it, and it developed that Col. Deeds was a stockholder in the Morain Development Co.

The CHAIRMAN. Were Mr. Talbott and Mr. Kettering also stockholders?

Maj. SMITH. Not so far as I know, but I am not informed on that subject. I think not. It was the Schantz estate, as far as we could ascertain. So far as we could find out the balance of the stock in the Morain Development Co. belonged to the Schantz estate.

The CHAIRMAN. That is, exclusive of what Deeds owned?

Maj. SMITH. Yes, sir.

Senator REED. What proportion of the stock did Deeds own?

Maj. SMITH. We ascertained this from Col. Deeds himself. After this matter was referred down to me, I referred it to Mr. Potter, then assistant chief of the Bureau of Aircraft Production. He referred it back and asked me to go to see Col. Deeds, which I did.

The CHAIRMAN. That is, after you ascertained from the authorities out there that Col. Deeds was interested that fact was reported to Mr. Potter?

Maj. SMITH. Yes; reported by myself.

The CHAIRMAN. And Mr. Potter requested you to see Col. Dedes?

Maj. SMITH. Yes, sir. Col. Deeds stated that he was the owner of approximately 25 per cent of the stock, that he was not concerned in securing profits for himself on that particular stock, and if there was any way of doing it he would be very glad to see that the profits were turned back to the Government in the event of the execution of the lease.

The CHAIRMAN. You said, I think, that the lease was made out and sent on here?

Maj. SMITH. Yes, sir.

The CHAIRMAN. That lease was drawn from the Morain Development Co. to whom?

Maj. SMITH. To the Dayton-Wright Aeroplane Co.

The CHAIRMAN. Why was the lease made in that form?

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Maj. SMITH. The least apparently was made in that form in order that the Dayton-Wright people might profit not only by the lease but by the expenses in connection with the lease.

The CHAIRMAN. In what respect?

Maj. SMITH. To the extent of 15 per cent, which is the same percentage as they receive under the cost-plus contract.

The CHAIRMAN. That is to say, that the lease as drawn would have resulted in 15 per cent profit plus cost?

Maj. SMITH. Yes, sir. In explanation of that I may say that the Dayton-Wright people proposed that this lease and payments of rental and all expenses in connection with that new field would be considered by them as an element of cost under their cost-plus contract by which the Government would have been obliged to pay them cost plus 15 per cent.

The CHAIRMAN. On that additional expense?

Maj. SMITH. Yes, sir.

The CHAIRMAN. That is, pay them 15 per cent additional on expense account for the manufacture of machines?

Maj. SMITH. Yes, sir.

Senator REED. To state it differently, that means that having had a contract for the manufacture of certain machines on which they were entitled to 15 per cent profit on the moneys paid out and expended by them, they proposed to treat this land and the improvements which were to be made upon the land exactly as though it was money expended in the manufacture of machines.

Maj. SMITH. That is true.

Senator REED. And collect for the mere purchase of that land 15 per cent, or the mere rental of the land, 15 per cent upon the money paid for the rental?

Maj. SMITH. That is correct.

Senator REED. And for the buildings upon the land 15 per cent?

Maj. SMITH. That is correct.

Senator REED. And for the grading 15 per cent, etc.?

Maj. SMITH. Yes, sir.

(Informal discussion followed).

The CHAIRMAN. Did you at any time prior to the making of the South Morain lease make any recommendation to Mr. Potter regarding the general subject of leases to the Aviation Department?

Maj. SMITH. Yes, sir.

The CHAIRMAN. About what date was that?

Maj. SMITH. April 13, 1918.

The CHAIRMAN. What form did that recommendation take?

Maj. SMITH. It took the form of a letter or memorandum to Mr. Potter.

The CHAIRMAN. Can you furnish the committee with a copy of that letter?

Maj. SMITH. Yes, sir; I have a copy here.

APRIL 13, 1918.

Memorandum for Mr. W. C. Potter.

1. Referring to Gen. Squier's letter of March 28, by Col. Deeds, in connection with development of flying test fields, at Dayton, Ohio: Buffalo, N. Y.; Detroit, Mich., and Elizabeth, N. J., which was authorized by the Adjutant General, Roy D. Harper, on April 11, and referring more particularly to Col. Deeds's letter to you of April 12, and letter from the Dayton-Wright Airplane Co., by H. E. Talbott, of April 11, would advise as follows:

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2. It is the opinion of this office that all leases of land made for the purpose of these test fields should be made by the Government, and in the name of the Government, with option of purchase by the Government at a later date, if it is deemed advisable by officials of the Government to do so. These leases should be made by some one delegated from the Construction Division in charge of Col. Edgar.

3. It is the opinion of this office that all leveling, grading, seeding, fencing, construction of hangars, shops, or, in fact, any work in connection with these fields, should be conducted by the Construction Division under direction of Col. Edgar.

4. In our judgment contractors should not be permitted to burden cost-plus contracts, or experimental work, supplementary contracts, with any work in connection with these experimental fields, as the Government has the Construction Division, which is competent to take in hand both the leasing of the property and the building of the fields, thereby saving the profit which would otherwise accrue to the cost-plus contractor if the latter is allowed to handle the situation on his own account.

5. The saving involved by having the Construction Division handle this work for us, and assuming that they will make just as good bargains as the contractors could, will be approximately 15 per cent of $1,047,000, or $157,000.

6. All papers, including map of the proposed purchase of land for the Dayton field, are returned herewith.

FRANK E. SMITH,
Major, Signal Corps.

The CHAIRMAN. What prompted you to send to Mr. Potter the memorandum of April 13?

Maj. SMITH. Mr. Potter was absent from the city. A letter came in from Mr. Talbott, at Dayton, dated, I believe, April 11, regarding their going ahead with this field. Mr. Potter's secretary brought the original papers to me. He asked my judgment in connection with the matter on the general proposition.

Senator REED. Which field was this?

Maj. SMITH. The proposed new field at Dayton, commonly called the South Morain Field, and also pertaining to the other fields that Gen. Squier had asked for.

The CHAIRMAN. Can you furnish the committee with a copy of that letter of Talbott to the department?

Maj. SMITH. Yes, sir.

THE DAYTON WRIGHT AIRPLANE CO.,
Dayton, Ohio, April 11, 1918.

Mr. W. C. POTTER,
Office Chief Signal Officer, Washington, D. C.

DEAR SIR: Your telegram of the 5th instant regarding flying field.

We have to say that this field has been definitely located as set forth in the accompanying map. It consists of approximately 180 acres. We are having engineers stake out the field for grading and will proceed at once to put it in shape for flying. As a large part of the field is now in condition for flying, no delay will occur in this regard. This work will be rushed to completion.

We understand the hangars for this field will be the standard steel and corrugated iron hangar adopted by the Signal Corps, and will be sent to us to be erected by us. The Dayton Wright Airpalne Co. are leasing this ground at a flat rate per annum, but on account of the complications liable to ensue in reference to roads, telephone and telegraph lines, etc., the expense of changing these, if necessary, together with all taxes, must be carried as an expense by the Dayton Wright Airplane Co. in addition to the flat rental. I know this method is contrary to the desire of the Signal Corps, but in this particular instance the owners insist upon these conditions and we have no other recourse than to accept.

It occurs to us that all of this expense can be covered, this work done, and the operations carried on under our experimental contract No. 2713. Please advise if this is satisfactory.

Yours, very truly,

H. E. TALBOTT,
Chairman of the Board.

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The CHAIRMAN. In Mr. Talbott's letter I find this statement.

The Dayton-Wright Airplane Co. are leasing this ground at a flat rate per annum, but on account of the complications liable to ensue in reference to roads, telephone and telegraph lines, etc., the expense of charging these is necessary, together with all taxes, must be carried as an expense by the Dayton-Wright Co. added to the flat rental. I know this method is contrary to the desire of the Signal Corps, but in this particular instance the owners insist upon these conditions and we have no other recourse than to accept.

It occurs to us that all of this expense can be covered, this work done, and the operations carried on under our experimental contract No. 2713. Please advise if this is satisfactory.

Is the contract there referred to one under which the Dayton-Wright Aeroplane Co. is permitted to carry a similar expense under its cost plus arrangement?

Maj. SMITH. It is a separate contract, Senator, for experimental work at their South field. It is separate from their regular plus contract.

The CHAIRMAN. But is the expense which the Government incurred in securing that South field under the special contract a basis for cost-plus compensation to the Dayton-Wright Co.?

Maj. SMITH. The basis of the experimental contract No. 2713, as I recall it, is a profit of 12½ per cent.

The CHAIRMAN. In other words, there is the same arrangement, but a different percentage?

Maj. SMITH. Yes, sir.

The CHAIRMAN. Upon receiving this letter from Mr. Talbott, of April 11, you made this recommendation to Mr. Potter, under date of April 13?

Maj. SMITH. Yes, sir.

Senator REED. Is that statement that you make in the letter that the Government had an organization and equipment so that it could transact this business and do this work an accurate statement of facts?

Maj. SMITH. Yes, sir; so far as I know.

The CHAIRMAN. What was the result of that suggestion to Mr. Potter?

Maj. SMITH. The final result has been that Mr. Potter has instructed that all leases for these experimental test fields at the points of Dayton, Detroit, Buffalo, and Elizabeth shall be made in the name of the Government, and that the construction work shall be undertaken and carried on by the construction division, or the name of the division that may take its place in the Government service, thus relieving the contractor of such expenditure and saving the Government the profit that would otherwise accrue.

The CHAIRMAN. Was it also determined to take options for the purchase of the land by the Government?

Maj. SMITH. Not in our conversation. He may have issued detailed instructions.

The CHAIRMAN. But not to you?

Maj. SMITH. No, sir.

The CHAIRMAN. Acting upon that instruction, was the lease from the South Morain Co. to the Dayton-Wright Co. approved?

Maj. SMITH. The new field was to be known as the Acceptance Field, named by the Dayton Wright people. Mr. Potter instructed Mt. W. W. Montgomery to draft a proper lease and to submit it to the General Staff with a notation that Col. Deeds was an interested

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party, and ask them to arrange in some manner that the Government might be protected and that the lease might be in accordance with law, as it was necessary, in his opinion, that we have that particular land.

The CHAIRMAN. What action did the General Staff take on Mr. Potter's recommendation?

Maj. SMITH. None as yet.

The CHAIRMAN. None as yet?

Maj. SMITH. No, sir; we have had it up in the last 24 hours.

The CHAIRMAN. As a matter of fact, it has not been completed?

Maj. SMITH. No, sir.

Senator REED. When was this reference made that you speak of?

Maj. SMITH. Starting April 13.

Senator REED. When was it they took the field?

Maj. SMITH. Thereabouts.

Senator REED. That is a field that they have acquired since we went out there?

The CHAIRMAN. It was in process of acquirement then, but nothing was said to us about it.

Has the Government taken possession of the field or the Dayton Wright people?

Maj. SMITH. Not officially.

The CHAIRMAN. Have they actually?

Maj. SMITH. No, sir; I think not.

The CHAIRMAN. Has the Government expended any money upon it?

Maj. SMITH. The Government has spent no money itself.

The CHAIRMAN. Now, Major, to which of the other fields at Dayton was the lease made to the Dayton Metal Products Co.?

Maj. SMITH. The McCook Field.

The CHAIRMAN. Does it still stand that way?

Maj. SMITH. The original lease was dated November 16, 1917, and was to run until July 1, 1918, at which time it was to be extended for such period as the Government might desire. I have no information as to what has been done since July 1, 1918.

The CHAIRMAN. Then, so far as you know, that lease is a lease from the owner of the ground to the Dayton Metal Products Co.?

Maj. SMITH. Yes, sir. The Government paid the Dayton Metal Products Co. something over $9,500 for six months' use of the field, from January 1 to July 1, 1918.

The CHAIRMAN. Do you know whether the expense to which the Government has gone in preparing that field for the purpose for which it was secured is used as a basis for profit to the Dayton Metal Products Co.?

Maj. SMITH. No, sir; that was not true. The expenditure on the land and the erection of buildings was all performed by the Government at the Government's expense.

The CHAIRMAN. And with which the lessee has nothing to do?

Maj. SMITH. Yes, sir.

The CHAIRMAN. Can you give the committee a statement as to the amount of money expended up to date by the Government upon McCook field?

Maj. SMITH. Up to the 1st of July there had been expended at McCook field for land and buildings—that includes rental of the land, grading of the land, and the buildings placed thereupon—

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$750,000. There had been expended in upkeep and the maintenance of McCook field, $2,040,000, or a total of $2,790,000.

The CHAIRMAN. Of what does that consist?

Maj. SMITH. I have not the details.

The CHAIRMAN. I mean, generally speaking.

Maj. SMITH. It will include testings that are carried on there, the pay roll, and miscellaneous supplies.

Senator REED. Those things ought not to be put into the price of the field because that is really a matter of expense incident to the war?

The CHAIRMAN, Yes; that is my reason for asking the question. That is an unavoidable expense, perhaps. But, so are they all.

Now, tell us about the Wilbur Wright field.

Maj. SMITH. The total expenditure at the Wilbur Wright field, for which I have not the buildings separately, is $2,800,000, or approximately the same as at McCook field.

The CHAIRMAN. Does that include the large warehouse which adjoins the Wilbur Wright field?

Maj. SMITH. It does not include the large warehouse, which is entirely separate from building construction.

The CHAIRMAN. Have you the figures on that?

Maj. SMITH. I can put them in the record later. I might add that at the Wilbur Wright field there is a gunnery school that had expended up to July 1 a total of $2,087,000.

Senator REED. That was not included in the figures which you gave?

Maj. SMITH. No, sir. That makes a total expenditure at the Wilbur Wright Field of $4,887,000 up to July 1.

Senator REED. When you get those figures straightened out so that we will know what is in the nature of the creation and maintenance of the field proper, I would like to have them in the record.

The CHAIRMAN. In other words, Senator, you want it itemized?

Senator REED. I want to know the cost of the field, not what has gone upon the field.

The CHAIRMAN. You can add that later on?

Maj. SMITH. As near as I can get at it now, the cost of the buildings and land at McCook Field was $750,000 on July 1.

Senator REED. How many acres of ground?

Maj. SMITH. Two hundred.

Senator REED. Have we a contract for the purchase of that ground?

Maj. SMITH. I have a copy of the lease here. There is no mention made of the Government's right to acquire this property under the lease.

Senator REED. Do you know of any separate contract giving that right?

Maj. SMITH. No, sir; but the lease in question expired July 1, 1918. I am not familiar with the renewal, although there are renewal clauses in here for the next shree years.

Senator REED. That is the Wright Field?

Maj. SMITH. Yes, sir.

The CHAIRMAN. Did you have similar experiences with the locations of the new fields provided for in the order of last March at Buffalo, Detroit, and Elizabeth?

Maj. SMITH. No, sir.

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The CHAIRMAN. No such suggestions were made with regard to them?

Maj. SMITH. No, sir.

The CHAIRMAN. Is there any purchase privilege in the Wilbur Wright Field contract?

Maj. SMITH. Our file copy of the lease at the present time is in the hands of the Department of Justice. It is not available to me just now, and I can not answer that question.

The CHAIRMAN. That is to say, Mr. Hughes has that lease?

Maj. SMITH. Yes, sir.

Senator REED. Maj. Smith, can you tell us how much money has been expended on the production of the Liberty motor?

Maj. SMITH. Yes, sir.

Senator REED. I will thank you if you will give us that statement later on.

Maj. SMITH. I will see that a statement of that sort is submitted to you

STATEMENT OF SERGT. ALEXANDER KLEMIN, M. S. E., EIGHT HUNDRED AND SEVENTH AERO SQUADRON, McCOOK FIELD, DAYTON, OHIO.

Senator NEW. State your name to the stenographer, please.

Sergt. KLEMIN. Alexander Klemin.

Senator NEW. You are a sergeant in the Aviation Section?

Sergt. KLEMIN. Yes; o the Signal Corps. That is what I am enlisted as. I am in the Air Service now.

Senator NEW. Stationed at what point?

Sergt. KLEMIN. McCook Field.

Senator NEW. In what capacity?

Sergt. KLEMIN. I am in charge of the aeronautical research department, M. S. E.

Senator NEW. What experience have you had that qualifies you for that position?

Sergt. KLEMIN. I was in charge of the department of aeronautical engineering at the Massachusetts Institute of Technology and was consulting engineer to a number of companies.

Senator NEW. Name some of them?

Sergt. KLEMIN. The L. W. F. Engineering Co., the Connecticut Aircraft Co., and I did some work for the Standard Aeroplane Corporation and a number of other companies. I did work for them at different times.

Senator NEW. I want to ask you if you will please state the relation of engineering to production.

Sergt. KLEMIN. Do you mean the aeroplane engineering department as it now stands?

Senator NEW. Yes, sir.

Sergt. KLEMIN. The main work at the field is getting the English design and turning it into an American proposition, so that we get all the English drawings with the English motor, and we adapt that to the Liberty 12, or whatever motor we intend putting in. We build three of these ships at McCook Field while working out the drawings, or as soon as we finish the drawings, and if the ship turns out satisfactorily, and so on, why, the drawings will be turned over

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to the Director of Aircraft Production, and I suppose from there they will go to the production engineering people, but I have no official knowledge of that. I know what we do. We get these machines ready for production.

Senator NEW. If your effort with your initial machine is satisfactory, then the drawings are turned over to the production department upon which they are to proceed in order to get production in quantity?

Sergt. KLEMIN. I presume so. I have no knowledge of procedure, because I am interested in purely technical work.

Senator NEW. What use has been made of such aircraft talent as we have in this country in the designing and production of aircraft here?

Sergt. KLEMIN. I now speak mainly from hearsay, sir, because the original attempts to secure aircraft talent in this country occurred before I joined the service, and I was not much concerned with what the Government did in that sort of thing. As far as I know, they tried to get man like Charles Day, of the Standard Corporation, to take commissions. Those men, earning, say, $10,000 a year as chief engineers—and Mr. Day's case is a concrete case—and probably earning just as much from their shares of their stock, and so on, were not altogether anxious to enter into the Government service. That is one concrete case that I know. The same thing happened with one of Mr. Day's assistants. They did, however, take in as many as they could, but there are very few men in the country who know anything about aeronautics.

Senator NEW. What do you know, if anything, about the replacement of the people who did know something of aviation engineering by automobile engineers and others like them, who have had no experience with aviation matters?

Sergt. KLEMIN. I think there was a tendency amongst automobile engineers who, in some ways, were well qualified to enter the industry, to underrate the difficulties of building an aeroplane, and who thought that if they started in and got an English drawing and so on, they could probably turn out as good a machine as the airplane engineers.

Senator NEW. Has that belief on their part been borne out by the facts?

Senator KLEMIN. Well, I think possibly that the air-plane engineers might have made a quicker job of certain things.

Senator NEW. Will you tell us why it was that Lieut. Col. V. E. Clark was blamed for the defects in the Bristol fighter?

Sergt. KLEMIN. I have no information that is accurate enough to answer that question. I was not in Col. Clark's office at the time. Since I have been at the field we have had nothing to do with the Curtiss Bristol fighter. The only Bristol fighter we have been interested in is the Bristol fighter with the Hispano-Suiza engine.

Senator NEW. Do you know anything of the special difficulties under which Lieut. Col. Clark labored in that matter, with reference to the development of the Bristol fighter?

Sergt. KLEMIN. No, sir; I have not any knowledge of that.

Senator NEW. I thought, Mr. Chairman, that the sergeant had special knowledge on this particular point, and that was the principal reason I summoned him here.

Senator REED. You say you have had to do with the Bristol fighter that uses the Hispano-Suiza engine.

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Sergt. KLEMIN. Yes, sir.

Senator REED. To what extent have you had experience of that kind?

Sergt. KLEMIN. We have had the English Bristol fighter out on the field, sir, and I helped to run the performance test of that machine, and I also helped in designing that ship for American production.

Senator REED. Did the machine that you got from England with the Hispano-Suiza engine in it do good work?

Sergt. KLEMIN. Yes, sir.

Senator REED. You then made the machines from that?

Sergt. KLEMIN. We are now making them.

Senator REED. Did you ever make one and complete it and use it?

Sergt. KLEMIN. No, sir. That will be done in a couple of months' time.

Senator REED. You find the English Bristol fighter equipped with the Hispano-Suiza engine a satisfactory machine?

Sergt. KLEMIN. Yes, sir. It is no faster than the DH4, but it is more maneuverable, and I think it is a good combat machine.

Senator REED. Do you think you are going to have difficulty in reproducing that flying machine in this country, or do you think you can put the Hispano-Suiza engine in it and make it all right.

Sergt. KLEMIN. I do not think we are going to have the slightest difficulty.

Senator REED. You are not going to put in the Liberty 12?

Sergt. KLEMIN. I think the Bristol fighter was not built originally to take such a big motor. It was built for a motor of about 200 horsepower of 300 horsepower. They fit very well, but if you start to put in a 400-horsepower engine into a plane which was originally designed to take a 200-horsepower engine you are going to get into difficulties right off the bat; that is to say, whoever decided to do that made a radical mistake.

Senator REED. What does that mistake consist in?

Sergt. KLEMIN. For a certain size plane and a certain size of area of wings, you can have an engine of so much horsepower and no more. For instance, if somebody had brought out an 800-horsepower engine and told me to put it in a DH-4, I would say it was impossible.

Senator REED. It would be impossible because it would have what effect?

Sergt. KLEMIN. There is a vicious circle. If you put too heavy an engine into the plane you have first the extra weight of the engine, and of course the whole plane weighs more. Then you ought to have more wing area.

Senator REED. And if you do not, what happens?

Sergt. KLEMIN. She is overloaded.

Senator REED. And the pressure is too great?

Sergt. KLEMIN. The landing speed is too great. You may get through the air all right, but you land at too high speed. If you take an engine that is too heavy and do not make proper allowance for wing area and the size of the plane you have this vicious circle, and you end by making a mess of the whole thing.

The CHAIRMAN. Then there is the increase of the propeller blast, too.

Sergt. KLEMIN. That might be taken care of.

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Senator NEW. Is it not true that the increased strain put upon a machine by putting in it a motor of much heavier horsepower than the one for which it was originally designed is apt to make it a dangerous proposition?

Sergt. KLEMIN. Yes, sir; it is.

Senator REED. Would it not be likely, if you put in a motor heavier than the machine was designed for, and also more powerful, to wreck the wings or tear the canvas off, and make some of the parts give way?

Sergt. KLEMIN. It might very well do that. You would have to study the whole thing afresh. You would have to examine every spar and strut in the machine afresh to see whether you had reached the limit. Although I have never made a stress diagram of the Bristol fighter myself, I can imagine that if you take a 400-horsepower engine and put it in it, you will make it unsafe. I am not making that argument based on that particular machine, but just on general principles which are true in the case of any machine.

Senator NEW. Do you know why the Bristol scout was not built?

Sergt. KLEMIN. No, sir.

Senator NEW. Do you know why the Martinsyde was not built?

Sergt. KLEMIN. No. sir.

Senator REED. Now, as a matter of fact, is it not true that the men who have had experience in flying have had very little to do with production?

Sergt. KLEMIN. Col. Clark had some experience. Do you mean production or designing?

Senator REED. I mean in the production of the machine and the inspection of the work of getting it produced.

Sergt. KLEMIN. Yes. I think on the whole they have had little to do with it. The difficulty is that the flyers and engineers are generally two different types of men and the best flyer is not always the best production man. You can not utilize him in production, although he thinks he can run a factory.

Senator REED. But an engineer who understands the stress and the strain that have to come on the machine, the balancing of the parts, and all that, ought to be given a very large part in the production, ought he not?

Sergt. KLEMIN. He ought to be given a very large share of the work of designing the machine and the getting out of the drawings, and then he ought to be able to go through with the tests.

Senator REED. The inspection ought to be supervised by a man of that type.

Sergt. KLEMIN. He ought to take a general interest in the inspection, but it is too big a job to design a plane and carry on production and inspection at the same time.

Senator NEW. I think it was rather with reference to designing than production that you asked the question.

Senator REED. Yes.

Sergt. KLEMIN. In designing it is almost impossible to find a man who has all the various matters which have to be considered at his fingers' tips. They are men whose temperaments differ. There are men of certain temperament who are best fitted for one part of the job and one man can hardly take care of the whole matter. You ought to give the designer large scope and then let the flyer give his

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opinion of it. The flyer, by the way, should be as highly trained a man as you can get. If an ordinary automobile flyer goes up and then comes down, he tells you things that are of no value to you at all. If, on the other hand, you get a flyer with a technical education, or some kind of an Army officer with large experience in the air, and also a technical education, to start with, although he may not be a good designer, his opinion is valuable. He can talk to you in more technical language and understand you better than the pilot who is simply a pilot.

The CHAIRMAN. When did you first enter the Government service?

Sergt. KLEMIN. I enlisted on November 27, 1917.

The CHAIRMAN. You enlisted in the Aviation Service?

Sergt. KLEMIN. Yes, sir.

The CHAIRMAN. From what State?

Sergt. KLEMIN. I enlisted in Washington.

The CHAIRMAN. Here?

Sergt. KLEMIN. Yes, sir.

The CHAIRMAN. Were you employed in Washington in the Aviation Service before——

Sergt. KLEMIN. Before going into the service proper, sir, I was ployed by the Navy as an expert. I used to come up to Washington.

The CHAIRMAN. Where did you live at that time?

Sergt. KLEMIN. Boston.

The CHAIRMAN. How long have you lived in Boston?

Sergt. KLEMIN. Three years.

The CHAIRMAN. When did you take your course at the Boston Technological School?

Sergt. KLEMIN. I graduated in 1915. I mean, I took the post graduate course in 1915. That is the only one that concerns aeronautics.

The CHAIRMAN. Where were you when the war broke out?

Sergt. KLEMIN. In England.

The CHAIRMAN. When the war broke out between England and Germany, I mean?

Sergt. KLEMIN. I was in England, sir.

The CHAIRMAN. How long had you been in England at that time?

Sergt. KLEMIN. I had been in England for about 15 years.

The CHAIRMAN. What was your business over there?

Sergt. KLEMIN. I was teaching and consulting engineer.

The CHAIRMAN. Then you came over after the war began and took the course in technology?

Sergt. KLEMIN. Yes, sir. I had made all arrangements to come over here.

The CHAIRMAN. You had made arrangements before the outbreak of the war to come over?

Sergt. KLEMIN. Yes, sir.

The CHAIRMAN. How long had you been engaged in aviation in Great Britain?

Sergt. KLEMIN. I was engaged in it but not in a direct way. I was engaged in this way, that people would come in to see me. I had a small consulting practice, and people would come in to ask me to help them out in the reports that came out.

The CHAIRMAN. Are you a native of England?

Sergt. KLEMIN. No, sir; Russia.

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The CHAIRMAN. What is your age?
Sergt. KLEMIN. Thirty.
The CHAIRMAN. Did you go to Germany or to Austria between the declaration of war and the time you came over here?
Sergt. KLEMIN. No, sir.
The CHAIRMAN. Have you ever been in that country?
Sergt. KLEMIN. I think I have been one day in Strassburg.
The CHAIRMAN. Just one day?
Sergt. KLEMIN. Yes, sir.
The CHAIRMAN. Was that before the declaration of war?
Sergt. KLEMIN. Yes, sir. That was when I was a boy.
The CHAIRMAN. When did you leave Russia?
Sergt. KLEMIN. I do not know. It was at the age of 3 or 4 years.
The CHAIRMAN. And you came to America?
Sergt. KLEMIN. Yes, sir.
The CHAIRMAN. Have you been naturalized?
Sergt. KLEMIN. Yes, sir; three months ago.
The CHAIRMAN. When did you declare your intention to take out papers?
Sergt. KLEMIN. I suppose it was three and a half or four years ago.
The CHAIRMAN. That was while you were staying in Great Britain?
Sergt. KLEMIN. No, sir; while I was here.
The CHAIRMAN. While at the Boston Technological School?
Sergt. KLEMIN. Yes, sir.
The CHAIRMAN. Where did you make your declaration?
Sergt. KLEMIN. At Boston.
The CHAIRMAN. Was it your intention to become a citizen of the United States before the war broke out?
Sergt. KLEMIN. I had always intended to come to the States, sooner or later, to live.
The CHAIRMAN. When you and your parents left Russia, you left with no intention of returning?
Sergt. KLEMIN. No, sir.
The CHAIRMAN. Your parents came with you?
Sergt. KLEMIN. Yes, sir.
The CHAIRMAN. Did your father take out naturalization papers?
Sergt. KLEMIN. No, sir.
The CHAIRMAN. Where did he live in America?
Sergt. KLEMIN. In San Francisco.
The CHAIRMAN. And were you educated in San Francisco?
Sergt. KLEMIN. No, Sir; in England.
The CHAIRMAN. How old were you when you left your father's domicile?
Sergt. KLEMIN. He is over in England now.
The CHAIRMAN. Your father is still living?
Sergt. KLEMIN. Yes, sir.
The CHAIRMAN. How long since you have been a member of his household?
Sergt. KLEMIN. I do not know.
The CHAIRMAN. In other words, when did you go to work for yourself; that is what I mean.
Sergt. KLEMIN. Ten years ago, I suppose.
The CHAIRMAN. You are now 30 years of age?
Sergt. KLEMIN. Yes, sir.

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The CHAIRMAN. Did you have anything to do while in the service of the Navy or the naval department of aviation, or the Army down here, with the drafting of designs?

Sergt. KLEMIN. While I was at Boston I was in charge of the wind tunnel. Dr. Hunsacker found that he wanted somebody with my training to help him out on certain dynamical problems and so he made an arrangement by which I should come to Washington to help him out.

The CHAIRMAN. That is the extent of your experience here in the matter of designing for the Government?

Sergt. KLEMIN. Yes, sir. Previous to that I designed machines for private firms.

The CHAIRMAN. How long have you been at Dayton?

Sergt. KLEMIN. I have been at Dayton since December.

The CHAIRMAN. Do you know Commander Barry?

Sergt. KLEMIN. No, sir.

The CHAIRMAN. Do you know an aeronautical engineer by the name of Crane?

Sergt. KLEMIN. Of the Simplex Co.?

The CHAIRMAN. Yes, I believe so.

Sergt. KLEMIN. I have met him several times. I can not say that I know him very well. I have met him.

The CHAIRMAN. Do you know a man by the name of White?

Sergt. KLEMIN. No, sir.

The CHAIRMAN. Have you heard anything about the recent establishment of a board of purely aeronautical engineers for the purpose of passing upon these various planes that are being made and making suggestions with regard to improved designs?

Sergt. KLEMIN. No, sir.

The CHAIRMAN. I think that is all.

Senator REED. You are now drawing a sergeant's pay?

Sergt. KLEMIN. Yes, sir.

Senator REED. You made very much more than that before you enlisted?

Sergt. KLEMIN. Yes, sir. I was making about $9,000 a year, but I got worried.

The CHAIRMAN. Are you a man of family?

Sergt. KLEMIN. No.

Senator REED. You mean you wanted to get into the service?

Sergt. KLEMIN. I was trying to work for the institute and the Navy and was running two schools, and I made a mess of it.

The CHAIRMAN. I think that is all.

(Whereupon, at 4 o'clock p. m., the committee adjourned until Friday, July 19, 1918, at 2.30 o'clock p. m.)

* * *

WITTEMANN-LEWIS AIRCRAFT CO. (INC.),
Newark, N. J., July 29, 1918.

Hon. C. S. THOMAS,
Chairman Subcommittee Committee on Military Affairs,
United States Senate.

MY DEAR SENATOR THOMAS: Herewith find copy of letter to Hon. John D. Ryan, chairman Aircraft Production Board, Washington, D. C., delivered by us to his secretary July 17, 1918, in accordance with the conversation our secretary had with Mr. Ryan on July 12, 1918, which we herewith request be made a part of our testimony, attached to the copy of the testimony of Mr. Mois H. Avram, dated Friday, July 19, 1918.

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This letter covers the negotiations our secretary had, representing us, with Mr. Ryan, Mr. W. C. Potter's assistants, Mr. M. W. Kellogg, and Mr. Kellogg's assistants, Lieut. Col. Bane, Maj. H. S. Martin, and Lieut. W. W. King, Military Aeronautics Division, United States Army.

This letter was written with Mr. Ryan's concurrence, after Mr. Ryan had stated that the reason the Wittemann-Lewis Aircraft Co. did not secure a contract in the past from the aircraft authorities of the Government was due to the belief that the Wittemann-Lewis Co. was a small company, with a small organization, which did not have the facilities to manufacture planes in a large way. The statement of Mr. Ryan above quoted was a conclusion which he formed after our secretary's original interview with hin on Jun e 17, 1918. At that time Mr. Ryan said to our secretary:

"This is the first time I have ever heard of the Wittemann-Lewis Co., therefore, of course, I do not know anything about it. I shall see Mr. Potter at noon, and we will go to the bottom of this and get all the facts, and see why this company did not get a contract. We shall see if there is any good reason."

Also find herewith copy of the testimony of Mr. M. H. Avram and Mr. Paul Wittemann, which we return, according to your instructions, with corrections and additions attached thereto.

Yours, very respectfully,

THE WITTEMANN-LEWIS AIRCRAFT CO.,
By REDMOND F. KERNAN, *Secretary*.

WITTEMANN-LEWIS AIRCRAFT CO. (INC.),
Newark, N. J., July 17, 1918.

Hon. JOHN D. RYAN,
Chairman Aircraft Production Board,
Washington, D. C.

MY DEAR MR. RYAN: I am indebted to you for the interviews I have had in connection with the interests of the company that I represent. On July 12, after our conversation, you expressed a willingness to receive a communication from me in review of statements I had previously made. I am furnishing it in what follows.

The distinctive factors of our company, together with the features of its product that we rely upon for recognition by the Aircraft Production Board, are as follows:

1. The Wittemann brothers have had experience in flying airplanes from boyhood.
2. We have been manufacturing airplanes for 12 years.
3. These airplanes have had recognition from the Aeronautical Society and have been flown by flyers of unquestioned reputation, such as Allan Adams, formerly chief instructor at Mineola; Edward Stinson, chief tester for Curtiss Aeroplane Co.; Capt. Thomas S. Baldwin, United States Army; Ensign Clinton D. Backus; Leonard W. Bonney; John Petrie; Bud Mars; George W. Beatty; Sergt.-Pilot Dean; Ivan Lamb, R. F. C.
4. Mr. Lewis, of our corporation, has been an instructor in flying in this country and in Europe.
5. Since 1917, as an integral part of our management and in production, Mr. Avram, of Slocum, Avram & Slocum, has had daily active connection with the company.
6. The completed organization of our company has been made ready to meet the requirements of quantity production under Government contracts, accompanied with the usual specifications of the Aircraft Production Board.
7. This corporation is exclusively engaged in the production of aircraft; it has never had any other kind of business and desires none other.
8. Its planes have met the tests of practical flyers and Government experts.
9. "Quality" and "Safety First" have been our watchwords.
10. The Wittemann-Lewis Aircraft Co. has no casualty list; there has been no death nor serious accident to a flyer of any of its planes.
11. The combined talent of the Wittemann-Lewis Aircraft Co. and Slocum, Avram & Slocum, enables the former to build any type of aircraft, to furnish ample resources, and to perform and dispatch its work to meet emergency requirements of the Government.

For the purpose of correcting some wrong impressions about the company, and particularly the impression that it is a small organization incapable of producing airplanes according to the specifications of the Aircraft Production Board on an equitable contract, or in any other manner the Government desires its aid in winning the war, I make the following running comment for your information, with copies of some letters and other documents.

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Covering a period of over two years, this corporation has, at no inconsiderable expense, done everything within their power to acquaint the Government with their experience and knowledge of the aircraft art, their exceptional manufacturing ability, and their strong desire to aid the Government in building competent airplanes to help win the war.

The record of the negotiations to date would seem to show conclusively upon its face a lack of continuity in reaching a proper estimate of the merits of the company, largely due to shifting its consideration from one representative of the Government to another. With no desire whatever to make animadversion, it will be necessary to speak of persons as I go along. In a conversation I recently had with Mr. Morris W. Kellogg, assistant production manager of the Aircraft Production Board, in reply to my question as to why the Wittemann-Lewis Aircraft Co. was not given a contract, he said, "I do not know." When I asked him what this opinion of the matter was, he said, "Personally, I think it is a damned shame—a damned outrage that they didn't get a contract."

Similar expressions of opinion have been heard from other patriotic men who have endeavored for months past to secure governmental recognition of the aircraft manufacturing ability of the Wittemann-Lewis organization, combined with the mechanical engineering and productive power of Slocum, Avram and Slocum.

Capt. J. K. White, head of the Legal Department, Aircraft Production Board, who conducted the investigation inaugurated as a consequence of the charges preferred by Mr. Moïs H. Avram in his letter to Mr. Howard E. Coffin, chairman, the Aircraft Board, April 17, 1918, made a favorable report on the ability of the Wittemann-Lewis Aircraft Co. Capt. White stated to me that in his opinion the Wittemanns did not receive a contract because the impression was conveyed to the members of the Aircraft Board that the Wittemanns were seeking to secure the consent of the Government to adopt their own particular designs of aircraft, and not that they sought a contract with the Government to manufacture aircraft according to the plans and specifications of the Aircraft Board.

As a result of the above investigation and the facts brought out, Mr. W. C. Potter, production manager, Aircraft Production Board, believed so strongly in the ability of the Wittemann-Lewis Aircraft Co. to produce air craft satisfactorily to the Aircraft Production Board that he promised Charles R. and Paul W. Wittemann that he would allow them to figure on some drawings of aircraft which he expected to receive by May 15. In order to confirm this detail of his conversation with the Wittemanns, Mr. Potter called in his secretary and dictated a memorandum, the substance of which is about as follows:

"The Wittemann-Lewis Aircraft Co. is to receive drawings of either the Bristol or De Haviland machine to figure on from 250 to 500; or else the Handley-Page or Caproni machines, to figure on as many as they will have capacity for. These drawings will be sent to them immediately upon completion May 15."

Mr. Potter promised to mail the Wittemanns a copy of this memorandum. We have not received it up to date. The drawings referred to were never received. The promises were not fulfilled.

In reference to the statement that the Wittemann machine was not acceptable to the military aeronautics division, the following are the facts as we undertand them: The completed report has been made in secret, and a copy of same has been denied us. Capt. Grant, Mr. Kellogg's assistant, said that the blue prints of the Vought training machine, which were promised to be delivered to us to figure on June 15, would not be ready for delivery until about July 15, and that the reason for this delay was because Mr. Vought, the inventor, was suffering from an attack of appendicitis.

I told Capt. Grant that from what Charles R. Wittemann (whom I considered one of the best aircraft engineers in the country) had stated to me, I believed the large number of deaths occurring daily among aviators in the Army service was due in part to the lack of perfection in design and manufacture of some of the training machines they were compelled to use. Capt. Grant demurred to this, and said in addition that the Vought blue prints they were waiting for were believed to be improvements on the machines they were now using, and, further, that improvements were constantly being made in all machines used in training. Following my statement that we had three new training machines in our factory, which we considered superior to the training machines now in use, and that it was a strange system which would not consider giving them a trial to demonstrate their efficiency because of the illness of the inventor whose blue prints had been accepted in secret, Capt. Grant suggested that we send our machine to McCook Field, Dayton, Ohio, for trial. We agreed to do this. Before we could go on with the matter our plane had to be inspected at our factory. On June 28 Mr. Kellogg ordered this plane inspected. The matter then passed from the jurisdiction of the Aircraft Production Board to the Military Aeronautics Division.

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Lieut. W. W. King made the inspection July 2. Our factory report shows that he carefully inspected the machine and spoke favorably of its strong and efficient construction, and particularly of our plans for production. He made no unfavorable criticism. He asked for drawings showing the wing fittings connecting the wings to the fuselage, for filing purposes and also for checking. He stated that he would recommend an Hispano-Suiza motor, believing the machine would be an excellent one for advanced training, with that make of motor. Lieut. King had flown our original machine at Mineola, L. I., when he was in training at that station and was well acquainted with our workmanship. He was satisfied with that machine and stated that he always said we manufactured a good machine. He also examined several other machines and flying boats we had at the factory. His only criticism of the particular training machine which he was detailed to inspect was that he thought it might be necessary to install "stick" control instead of Deperdussin control, which was only a minor change that could be installed quickly; and he also thought the direction rudder appeared to be a little large. Upon leaving, Lieut. King said he would like to have an opportunity to try out this particular machine, and, if possible, fly it to Dayton, saying he believed it would be a very easy trip for it to make and that he felt it would prove up in every respect. These statements of Lieut. King show clearly that the machine had passed his inspection and that his report would be a favorable one. It was a favorable report.

Lieut. King's written official report was made to Maj. H. S. Martin. On July 12, 1918, Maj. Martin personally told me Lieut. King's report was favorable and that his own report was unfavorable, and that in making his (Martin's) report he had in mind also his "personal inspection of the same machine last year at the Mineola flying field, and that his report at that time was an unfavorable one." Maj. Martin also said that his own report stated they had enough types of training machines now and that they did not want another.

I told Maj. Martin that the machine which Lieut. King inspected and reported favorably upon was not the same machine which he had personally inspected last year, but was an improvement upon that machine; that the machine which he had inspected last year and had reported unfavorably had, however, since that inspection made over 300 flights, had never killed anyone, never had an accident, and that there had not been an expenditure of a single cent for repairs on this machine. I said that this was eloquent testimony to the engineering and manufacturing ability of the Wittemann Bros., and especially of their knowledge of this modern day art.

I have the most absolute confidence in the honesty and integrity of Regular Army officers, I do not believe there was any malicious prejudice in the mind of Maj. Martin when he put his unfavorable report against the favorable report of Lieut. King, but I do believe there was in his mind a subconscious prejudice against our machine and in favor of a machine the blueprints of which are not at this writing completed, a if accepted is to take the place of the training machines now in use. His personally knowing the inventor of the other machine, and his intimate acquaintance with that machine has no doubt affected his judgment. Is not the system which admits of such a condition wrong? Is it not unfair to Maj. Martin and ourselves? Words fail me when I see that its results put at risk unnecessarily the lives of so many of our young aviators now in training. Look at the list of deaths daily, from the use of the present type of training machines, and then think that the system under which these machines are used may leave the decision as to the proper type to any one man. The thought to me is appauling.

This decision should be made by a board composed of the greatest aeronautical engineers in the world. The men who decide on the production of machines by experimental manufacturers should by law be compelled to personally fly in the type of machine they order for our soldiers to fly and risk their lives in.

The millions of American citizens, whose sons are now in, or about to join our Army, would favor such a law, and condemn one inexperienced man's opinion as the court of last resort in the selection of a particular type of training machine.

That we are new and inexperienced in war, is a lame, inefficient excuse for this one-man system.

When the righteous wrath of American fathers and mothers is aroused over the shortcomings of this system, no man or set of men in our Government can stand up and hide behind the words, "I did not know."

The American people may stand now for a waste of material and money. They will never stand for the waste of the lives of the young and innocent men and boys who are cheerfully giving up their lives so that the world may live.

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As against the report of Maj. Martin, read copy of a letter written by Sergt.-Pilot D. I. Lamb, Royal Flying Corps, who was a stranger to our company, and its engineers and builders, when this letter was written:

NEW YORK, *June 6, 1918.*

WITTEMANN-LEWIS AIRCRAFT CO. (INC.), *Newark, N. J.*

GENTLEMEN: It gives me great pleasure to give you my opinion of your machine that I flew over the city of Newark dropping Liberty Loan literature.

It is the easiest machine to handle either in the air or on the ground that I have ever flown—and I have flown more than 40 types.

I do not believe it possible to build an easier machine to land as it is very stable and has an extraordinary slow landing speed.

The machine flew itself while I was dropping literature with both hands although there was a very bumpy wind. The only control I used while circling over the city was the rudder and found the machine would take the correct bank on turns without any other effort on my part.

Both the climbing and gliding angles were excellent and the machine showed very high speed considering the engine power and the load carried.

The design, workmanship, and reliability leaves nothing to be desired for any purpose, even war, if a larger power plant were installed.

Thanking you again for the pleasure of flying your machine and other courtesies, I remain,

Very sincerely, yours,

D. I. LAMB,
Sergeant-Pilot, Royal Flying Corps.

How consistently this letter agrees with Lieut. King's report as to the qualifications of an up-to-date flying machine. We could produce many more similar letters from actual flyers, who know nothing about the intricacies of finances, piano or automobile manufacturing, or their connections with aircraft production as a power for winning the war.

In December, 1917, Lieut. Ridlon made an investigation and report on the ability of the Wittemann-Lewis Aircraft Co. to produce machines according to Government specifications. We understand that his report was a favorable report, and that he recommended that this company be given a contract. This proves the Aircraft Production Board's belief in our ability. No action was ever taken by the Aircraft Production Board subsequent to Lieut. Ridlon's report.

As further proof that the Aircraft Production Board believed we were large enough and had an efficient organization we submit the following evidence of record between our company, the Curtiss Aeroplane & Motor Corporation, and Senator Frelinghuysen. This shows a contract was offered us by the Aircraft Production Board, which we could not consistently accept because of the stand of the Curtiss Aeroplane & Motor Corporation. This took place before Slocum, Avram, and Slocum were made production managers:

BUFFALO, *September 20, 1917.*

WITTEMANN-LEWIS AIRCRAFT CO.,
Newark, N. J.

DEAR SIRS: This is to advise you that the blue prints and specifications covering the parts for the JN4 machines which you intend to manufacture, have been completed and are ready for delivery to you.

We inclose herewith form of agreement, in duplicate, which we would ask that you execute, returning both copies to us, together with your check for $500 as provided in the said agreement.

Upon receipt of this agreement, duly executed by you, together with the check, we will execute and return one copy of the agreement for your files and deliver to your representative the blue prints and specifications hereinbefore mentioned so that he may check same and give us a receipt therefor.

Yours, very truly,

CURTISS AEROPLANE & MOTOR CORPORATION,
B. A. GUY, *Secretary and Treasurer.*

This agreement, made this day of September, 1917, by and between the Curtiss Aeroplane Co., a corporation of the State of New York, having its principal office at Buffalo, N. Y., party of the first part, and the Wittemann-Lewis Aircraft Co., a corporation of the State of New Jersey, having its principal office in the city of Newark, party of the second part.

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In consideration of the promises and agreements hereinafter contained the party of the first part hereby promises and agrees to deliver to the party of the second part a set of drawings, designs, specifications, and bills of material covering aeroplane model known as JN military tractor, and designed and built by the party of the first part.

The party of the second part, in consideration thereof, promises and agrees to pay to the party of the first part one per cent of the selling price of all aeroplanes or parts thereof manufactured by the party of the second part according to said drawings and designs and upon which the said party of the first part hold good and valid patents, and also to pay to the party of the first part the sum of two hundred dollars for each and every aeroplane known as the military tractor so manufactured, all such payments to be made to the party of the first part not later than the tenth day of each month for all aeroplanes or parts thereof manufactured during the preceding month.

The party of the second part has this day paid to the party of the first part the sum of five hundred dollars in payment of one per cent charge on the first fifty thousand dollars of aeroplanes or parts thereof which shall be manufactured by the party of the second part, it being expressly understood and agreed that said payment of five hundred dollars shall remain the property of the party of the first part, even though the party of the second part shall not manufacture and sell aeroplanes or parts thereof equaling the sum of fifty thousand dollars.

The party of the second part further agrees that it will not permit or allow such drawings, designs, and specifications to be read, copied, photographed, or otherwise used by any persons other than the employees of the party of the second part, and that the party of the second part will return the same to the party of the first part in the event of the dissolution or termination of the business of the party of the second part for any reason whatsoever, it being understood that such drawings, designs, and specifications are merely leased to the party of the second part during such time as it shall desire to make aeroplanes according to such drawings, designs, and specifications.

In witness whereof the parties hereto have caused this agreement to be signed by their respective duly authorized officers and their respective seals to be hereunto affixed the day and year first above.

CURTISS AEROPLANE CO.,
By ——— ———,
Secretary and Treasurer.

WITTEMAN-LEWIS AIRCRAFT CO.
By ——— ———.

———

BUFFALO, *November 6, 1917.*

The WITTEMANN-LEWIS AIRCRAFT CO.,
Newark, N. J.

DEAR SIRS: Replying to your letter of October 30: In regard to the first change you desire in the agreement we sent you, I do not think it advisable to make the change suggested by you, as the fee mentioned in the third paragraph on the first page of the agreement applies only to our aeroplane model known as the Jn military tractor and does not cover any machines that may be manufactured according to your own designs.

In regard to the second change which you desire in place of the fourth paragraph on page 1 of the agreement, where we ask a deposit of $500, we feel that this request is only fair to cover the expense of furnishing a set of drawings and changes which may occur from time to time, this deposit to be credited against the 1 per cent license fee as it accrues, and a further payment to be made when the accruals exceed $500. We do not feel that under the circumstances we should be asked to furnish information pending your receipt of order from the Government without such payment, and believe that in furnishing this information we are helping you to obtain such an order, and we should be reimbursed accordingly.

Yours, very truly,

CURTISS AEROPLANE & MOTOR CORPORATION,
B. A. GUY,
Secretary and Treasurer.

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MARCH 6, 1918.

Hon. J. S. FRELINGHUYSEN,
United States Senate.

DEAR SIR: This is in reply to your communication of the 28th asking us to furnish you with information with reference to Col. Horner's statement that we had been offered a contract for 300 spares, etc.

About September 1, 1917, Mr. S. D. Waldon (now Col. Waldon) offered to permit us to submit figures on spare parts to be manufactured from designs of the Curtiss Aeroplane Co., and instructed Mr. Hutchison Scott, who was then second vice-president of our company, to call on Maj. P. L. Shepler in Buffalo, stating that he would instruct Maj. Shepler to give us an order for the 300 parts. Lieut. Farwell then stated that the order would be ready the following day, whereupon Mr. Scott summoned our Mr. C. R. Wittemann to Washington. Lieut. Farwell gave them a list of parts with a sealed letter to Maj. Shepler and instructed them to go to the Curtiss factory. On arrival at that factory at Buffalo, they were refused the blue prints, but Maj. Shepler said he would take the matter up with the Curtiss officials. Finally, Messrs. Wittemann and Scott were taken to the office of Mr. B. A. Guy, the secretary and treasurer of the Curtiss Co., who stated that we would have to enter into an agreement with the Curtiss Co. and that the form of agreement would be forwarded for execution in about 10 days' time.

On September 20 the Curtiss Co. sent us a letter and form of contract (copies inclosed). From this you will notice that in order to manufacture the parts it would be necessary for us to pay to the Curtiss Co. 1 per cent of the selling price of the parts plus the sum of $200 on each plane. Likewise, that we pay them the sum of $500 in advance, being 1 per cent on a possible order of $50,000.

We sought the advice of our counsel, Mr. Loren N. Wood, who suggested that under the circumstances he thought the Curtiss Co. would be willing to modify the agreement, at least in two particulars, and we thereafter wrote the Curtiss Co. a letter dated October 30, a copy of which is inclosed. To that we have received a reply dated November 6 (copy inclosed). We did not feel that, in order to bid upon Government work we should be compelled to pay the Curtiss Co. $500 in advance, although we were quite willing to pay for the expense in having the necessary blue prints made upon which our bid was to be based.

On February 28, at our request, we were granted an interview with Col. Horner, at which time he referred to an interview he had had with you and asked why we had not accepted an order for 300 spare parts. He was then informed of the agreement which the Curtiss Co. required and especially of the causes to which we have above referred. He was also advised of our plant, organization, and that we had been in business for 12 years, during which period we have built approximately 300 aeroplanes for some of the best known aviators and which have been flown all over this country as well as in foreign countries. He was also advised of the report made by Messrs. Slocum, Avram & Slocum submitted on December 2, 1917, a copy of which we are sending you under separate cover. Col. Horner stated that he did not know of these facts nor of the report.

We are able to contract for and deliver 600 machines in the first 12 months and 100 machines per month thereafter. We believe that we are in an exceptional position, with an established plant, equipment, and an organization of experienced men. We are desirous of serving our country in the manufacture and production of aeroplanes and we can not understand why we, who are one of the oldest manufacturers of aircraft in this country, have not been given an opportunity.

Respectfully, yours,

WITTEMANN-LEWIS AIRCRAFT CO. (INC.),
By C. R. WITTEMANN, *President.*

There is a long record covering a period of over two years which proves conclusively that Government aircraft authorities believed thoroughly in our competency to manufacture aeroplanes. Its recital here would only accentuate the Government's policy of promise and nonperformance so far as we were concerned.

From its beginning our company has been engaged exclusively and continuously in the manufacture of progressive aircraft and its accessories. It has a record of 300 complete machines. Every machine manufactured has been flown successfully.

There has never been a fatal accident or death due to the use of these machines.

Our present plant at Newark, N. J., contains 12,000 square feet of floor space. It is fully equipped with all necessary machinery. We can turn out now one complete machine of our type, or one of similar proportions according to Aircraft Production Board specifications, each week. We could put into use immediately available addi-

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tional floor space on these premises that would increase this production 100 to 200 per cent.

Should the emergency demand, we are in a position to commence immediately the erection of our large factories on our recently acquired property with an approach to the Hackensack River. This location was selected by a board of engineers as the best site in the Greater New York for an aeroplane manufacturing establishment, flying field, waterway for demonstrating flying boats, and as a possible Government aircraft base.

It would not require over 10 weeks to erect the first units of our plant. At that time the first machinery would be installed and would be ready for operation.

As I stated to you, our plan of production will be under the combined forces of Slocum, Avram & Slocum (Inc.), and the Wittemann-Lewis Aircraft Co. The guiding mind of the entire production program will be Mr. Mois H. Avram, president and chief engineer, Slocum, Avram & Slocum (Inc.), New York, and Newark, N. J. Mr. Avram is now superintending the production of several millions of dollars of the most intricate and difficult material for the Procurement Division, Artillery Section, Ordnance Department, United States Army. He is a member of the American Society of Mechanical Engineers, the American Society for the Advancement of Science, the Aeronautical Society of America, the Society for the Promotion of Engineering Education, and is a lecturer on industrial engineering at New York University.

He is the organizer of the campaign to raise $4,500,000 for New York University.

He is chairman of the New York University engineering fund committee, of which Mr. Finley J. Shepard, Mr. Howard C. Seaman (treasurer of the E. W. Bliss Co.), Prof. Collins P. Bliss, and Dean Charles H. Snow, are members.

He is the organizer of the endowment plan which has been adopted by the New York University in connection with its school of applied science. The basic thought in this plan is to develop the engineering capacity of America to meet the unusual requirements of such conditions as are involved in the problems of the world's war, and is certain to have a tremendous influence in helping this Nation to win the world's war.

Mr. Avram's attainments are of such high order that the Ordnance Department, United States Army, upon learning of them, gave his corporation, Slocum, Avram & Slocum, contracts to the extent of several millions of dollars for the manufacture of gun sights, range finders, and other difficult and intricate ordnance matériel which the Government required quickly.

Mr. Avram is a production director who works along scientific lines, with a practical working vision to always anticipate mechanical manufacturing requirements and to have the men and the machinery on hand to meet these requirements at the moment they are needed.

Our location gives us the benefit of the greatest labor market in the world. Mr. Avram's qualities of production leadership are based in part upon his remarkable ability to seek and find the highest type of mechanical engineers, and expert and thoroughly efficient machinists, and no man knows this particular market better than he does. His human sympathy, tact, and practical attainments in directing men enables him to establish an esprit de corps throughout an organization which is a prime necessity in these days to facilitate patriotic production.

Under Mr. Avram's direction, our establishment, when completed as stated above, will give us a capacity of four machines every day by the seventh month of operation, making the first delivery toward the end of the fourth month. This production can be increased to 20,000 machines of the scout machine type or similar proportions, within a period of 12 months after our production has reached four machines a day.

It takes longer and it is more difficult to create a strong and proper production organization than to build a large plant. Now if it is a question of speed in order to win the war, which one of the two should our country choose, to use the existing organization or the existing plants without organization?

Inclosed herewith find copy of letter dated May 2, 1918, written by Mr. Avram to the New York Times, which contained many valuable suggestions to the Government regarding the proper manner in which to handle the aircraft situation for the purpose of quick and efficient production, and by this to help win the war. Since this letter was written, the Aircraft Production Board has incorporated many of the suggestions set forth, and is on the way to adopt others.

That letter is but one of Mr. Avram's timely contributions to aid in winning the war, which is always his dominant thought.

When the President and Congress organized the Aircraft Board and gave it $1,000,000,000 to carry out its program, the basic thought was to make aircraft to win the war quickly. That was the patriotic duty of that board to America and to the world.

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There was no thought to subsidize or protect financial interests involved in the automobile, piano, or other similar industries from loss by the natural operation of the world war.

The statement of Capt. Clarke, plant facilities division, Aircraft Production Board, was made to Mr. Avran and myself July 10, 1918, that the output of the automobile industry had been reduced by the Government authorities to 20 per cent and would in all probability be completely wiped out in 60 days; that therefore, in view of this calamity, he believed it would be the policy of the Aircraft Production Board to adjust its placing of all orders for construction so as to meet this deficiency and thus protect the automobile industry.

The statement made by Mr. W. C. Potter, April 20, 1918, to the Wittemann brothers, that the placing of orders to manufacture aeroplanes by the Aircraft Production Board would have to take into consideration the requirements of the piano industry, shows the same line of thought.

We know that you will agree with us that the intent and purpose of the President and Congress, and we believe it is your intent and purpose, was to manufacture aeroplanes quickly and thus put forward all the power of this Nation to win the war at the earliest day. We know it was not their intent and purpose to protect from loss and bankruptcy any interest or industry, and we do not believe it is yours.

Any other policy than this would wreck the chances of America and our allies in our God-given task of winning the world's war. Any other policy would aid His Imperial Majesty, William the Hun, the unspeakable, heir presumptive to the throne of hell.

Yours, very respectfully,

WITTEMANN-LEWIS AIRCRAFT CO.,
By REDMOND F. KERNAN,
Secretary and Sales Manager.

COPY OF LETTER WRITTEN TO NEW YORK TIMES MAY 2, 1918, BY MR. MOIS H. AVRAM*

MAY 2, 1918.

After so much has been said that is not at all favorable to the Aircraft Production Board, one would expect that the silence of the members of such a board presages a good omen, that a surprise is in store for this patient and liberal Nation.

The two Senate committee reports, and the Marshall committee's report, however, are all in agreement that a revolutionary reorganization of this vital branch of the Government's war program is necessary if it is to be a success and with the Germans hammering away toward the North Sea, there must be, there will be, no "if."

Of course, "first-aid" legislation was sure to be introduced in the two Houses and as soon as some of these bills become law our President can set the reform machinery in action. We have indeed read the most bombastic forms of criticisms of those accused of failing in the air program, but no direct or carefully balanced criticism has yet come from the industrial engineer. He is the one person who, realizing the task of accomplishing vast engineering feats, is not so quick or ready to advance theories unless they are the vanguard of preconceived plans resulting from an investigation or previous experience.

Politicians and critics of the administration have had a deal to say about this engineering problem, but the affair is altogether too serious for us, as a Nation, to be satisfied with balanced phrases. Engineering success is dependent on the efficient assembling of scientific truths which have done duty, over and over again, in "overalls."

In planning so vast a problem as the aircraft must have proved to be, "the truths which have done duty" may not have been either selected as a premise to work from or if they were, they might not have been used rightly. This is due in a large measure because we as a Nation have been apathetic for years to the subject, took no practical part in aircraft until war darkened the earth, and perhaps we have a guilty conscience in the matter so that those who have been assigned to this task, so filled with thrilling responsibilities, have for the moment forgotten that, in dealing with so large and urgent a demand for airplanes, they were just lifting a child from its cradle whose treatment for its proper development was not that accorded to a child but that to a full-grown adult. The airplane enterprise of the United States prior to our entering the war was, as yet it seems to be, as this undeveloped child. The allies alone possessed the adult which we seem to have neglected as a measure of precaution and quick action.

Enough has been said regarding what would have been best for the Aircraft Board to have done. It should have selected the best allied plane and motor and built these in quantities in this country. It is all true but constantly hammering on the point without suggesting something constructive as a plan around which the air

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program can be quickly rebuilt, will do nothing but further embarrass the Administration.

We have also read so often in our newspapers that separating the Aircraft Board from the Signal Corps or creating a minister or secretary of aircraft responsible to the President would immediately cure the situation. All these suggestions point out one single thing—that the aircraft problem stands quite by itself and it calls for the most simple and reasonable form of operation rather than a web of many ramifications where it is hardly possible to understand or find who has really the final word. It has been shown by experience that in the mess of the aircraft operation at Washington it usually takes one a few days to find out whom he is to see regarding a particular question; when he finally discovers his place it takes a few days more to get an interview, only to meet a youngster perhaps who has been given the responsibility to place large orders and decree the fate of many anxious airplane men. If an attempt is made to reach the men presumed to be atop, it is again found that they are many, and if any is reached, it may not take long to face the "youngster" again with the same result.

If a private enterprise were placed in the same position, two things would happen:

(1) There would be a single head to whom dissatisfied claimants could come freely as a last resort and from whom fair treatment of the question could be obtained.

(2) This head would employ competent men to take charge of respective departments who would be fired if they lacked concern for the success of their departments.

The success of the business demands such a procedure. If responsibility in the operation of an enterprise of any type were not left to the judgment of one single head, it would be almost impossible to place the guilt in case of mismanagement. Therefore, concentrating the powers now distributed among many in connection with the aircraft program in the hands of one single man delegated to reorganize what we now possess in the shape of aircraft material, or even to start anew to plan for a program that will supply us with machines of all types as soon as is consistent with the needs of our Army.

Two of the chief requisites in the production of war material are—

(1) The country's ability to concentrate large amounts of material so that it can be obtained and operated upon quickly.

(2) Concentrated brain power, so that the findings and experience of a set of men can be used for uniform production at one point as much as possible, for in the art of aircraft, which has not yet passed into the realm of science, it is almost impossible to conceive that, let us say, 100 manufacturers of automobiles or pianos, or men merely possessingn nerve, could organize and produce the required airplanes. The aircraft brain power did not and does not exist in many of the airplane companies that have been organized for this very special field of industry.

For this very reason this minister of aircraft or all-intrusted head, or, better still, "director general" (as proper an appellation as that of Mr. Schwab's with the Emergency Fleet Corporation), should have vested in him the authority to organize, equip, and construct an aircraft arsenal, or a number of such arsenals, which should concern themselves with and be responsible for the production of airplanes of the best standard types now actually in use at the various war fronts, and also for the production of the best types of motors of proved success used abroad and here, or, better still, in order to give such a large production plant the proper and a greater impetus, strengthen it with the incentive usually existing when private interests operate such a plant, which should have the same form of organization as proposed for the Government arsenal.

As a part of this aircraft arsenal there might be a large experimental laboratory to develop American engines and planes, and where the ideas of all inventors may be weighed and appraised and not only a verdict rendered on their merits but also developed most diligently, and while it is my personal belief that as a rule an invention is more successfully developed by private interests, I believe that an experimental laboratory should be part of the aircraft arsenal, purely as a war measure, so that carefully selected boards can make studies of such inventions, and being equipped with thorough data and facts on which to base comparisons, these experts will be able to make quick tests and carry them out into being either with or without an inventor's assistance.

Of course, the present board should complete as much of its program as it can and the unexpended balance should be turned over to the new head who will also be protected against a repetition of the board's errors by being in possession of its complete records. If the present board should become short of funds to carry out its program, the entire work in progress should be transferred to the appointed "Director General," whose powers should extend so as to permit him to bring into his plan of organization only such men of the present board as he would need or consider competent, permitting many to serve with other departments more suited to their worth and ability, while others would serve in the Regular Army.

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For many months, now we have been expecting an airplane miracle from automobile methods and experience. The mathematics of the air are as yet a little uncertain, still are in need of a Euclid. It was natural enough that the Aircraft Board should align its administration with men identified with the automobile industry, for none other contains so many of acknowledged ability, but these men are not magicians. The output of automobile concerns under the leadership of known production engineers is not the work of a day, nor a year. We look upon these mammoth plants running day and night, with amazement, not considering that these are the results of 10 or 15 years planning and developing.

Nor should aircraft engineering be confused with automobile engineering. The principle involved in quantity production is not the same, for while automobile engineering is dependent on the exact science of engineering, the mathematics of aircraft engineering are most incomplete, nor have they yet been properly applied to the production of airplanes. Aircraft engineers have become such through years of hard experiment, and their usefulness in connection with aircraft production can come only through actual knowledge of aircraft.

Neither automobile production engineers nor aircraft engineers alone can be expected to put through the requisite quantity production of airplanes. One is needed to provide quantity production—the other to see that the production is right.

Irrespective of what seems to have been a grave oversight in not associating aircraft and production engineers to a greater extent than was done, what perhaps contributed to retarding production was the spreading of the airplane contracts all over the country. To my mind it is quite as important to merge all the airplane factories as it is to merge the control of airplane production in one head, whose powers as already indicated shall be impregnable, for the principal reason that such centered authority can only become efficient without interference, as the inefficiency of a single head can more quickly be noted and consequent change rapidly made than would be the case if a body of men—no matter how able they separately may be—were to jointly head an enterprise, for it is difficult to place responsibility on any but a single individual.

Ordinary private enterprises to-day, many of which due to the war became very large ordnance corporations, are guided by the hand of one man whose vision is not obstructed by the bigness of the job. Behind this man is the "organized brain power" of perhaps a few men, about whom a vast organization can easily be built. It is the organization power back of the mills that keeps them running, and not the extent of plant or equipment.

The whole situation, sensed a little more clearly from newspaper fragments of the two Senate reports, indicates a pressing necessity for an aircraft arsenal which shall house the joint efforts of the production and the aircraft engineers under the forceful guidance of the "director general." With such an arsenal under proper direction, the chances of producing large quantities of airplanes of one type would be greatly increased. An aircraft arsenal need be nothing more nor less than an enlarged reproduction of a smaller plant (with the addition of a laboratory as mentioned above). Where an airplane plant turning out 500 machines calls for 30 distinct departments, a sufficient area properly located might be provided for the aircraft arsenal to accommodate 30 buildings, under the roof of each, a certain part or parts to be made as previously assigned to it. A large building for assembling the machines would be necessary, of course.

One of the weak tendencies of the Aircraft Board, in my opinion, was in its adherence to the theory that it is cheaper and quicker to take over various buildings, provided only they are large enough—buildings originally planned for quite a different object and try to accommodate them to aircraft production. It is more efficient, and certainly less difficult to plan out special buildings than it is to fit airplane construction to wrong buildings. This is being proved all the time, as old buildings which should long ago have been turning out planes have been until recently in a process of alteration.

Such a national aircraft arsenal should draw together the best production engineers—many of whom are not now in the Government service—and out of the 50 aircraft engineers it is claimed we have in this country, five of the very best be appointed assistants to the director general and those departments requiring it, put under the direction of a production of an aircraft engineer, or both, subject to duties outlined in advance.

In my opinion, this would guarantee the production of reliable planes in sufficient quantities to help win the war. It is obvious that concentrated effort has greater advantages than effort distributed all over the map; especially does it hold true in connection with those types of airplanes needed to win the war—nor do my remarks apply to other types if the Aircraft Board has made considerable advance with them. This same deduction, as to concentrating production, applies to the production of airplanes much more readily than to ordnance.

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When dealing with metal production one has something definite to work with, but it is hardly so with materials used in the production of airplanes. Irrespective of this, even in ordnance, everyone can see and understand why such large ordnance private corporations as the Bethlehem, E. W. Bliss Co., and others have made so great a success—the reasons being that each one had its "director general."

It is neither impossible nor very difficult to establish such arsenals, out of which twelve, twenty, or even twenty-five thousand planes could be turned out, for unlike shipbuilding wharfage, space and docking facilities are not necessary. The actual manufacture of a plane presents no difficulties, but it is essential that the aircraft minister be guided by a working plan, fully laid out, and which can be deviated from only in the smaller details.

The plan of concentrating such a large output might be criticized by some who believe that the division of a large production order into small units throughout the country might prevent the repetition of mechanical errors. The time for discussing this is past, as is shown by the breakdown of the Aircraft Production Board which operated under such a prejudice.

In any event a wholesale "speeding-up" of the Nation's aircraft program is urgently needed and planes, equipped with motors must be turned out by the thousands in place of the endless stream of changing plans and specifications that have been circulating back and forth among the various bureaus of the Signal Corps headquarters. But then the management of the whole board has perhaps erred in the direction of discretion. Valor is needed for the mastery of the air and 'tis youth that wants to climb, higher still and higher. The blue sky, forever young, confounds the doubts of age, and when the air produces its Napoleon, he will be no graybeard, but a flashing-eyed youth. I am not pleading for any amateur performance or program, but trying to indicate the direction where speed is. Conservatism drops automatically with flights from the earth.

The ideals which the Aircraft Board was so concerned about have brought upon its head the criticism that it was concerned only with "tinkering" and that its directors were "swivel-chair" theorists. This is unfortunate. This "tinkering" must continue, but not by the Production Board, for as the "Science of Aeronautics is in a state of constant and rapid development," the British cabinet says, "Improvements in engines and planes are being constantly worked out."

For this reason we must all rise to the need of preparation by calling for all our technical schools to get ready for a complete course in aircraft engineering. As a lecturer in industrial engineering in the schools of applied science of New York University, I hope it will see the light in this matter. I believe it is up to the various societies of aeronautics to set to work to form a committee of the foremost aircraft engineers who can cooperate and collaborate with teachers of engineering, the object being to work out a complete, carefully planned course of aircraft engineering, which should be offered free to all engineering schools.

We must work on the premise that airplane production will be one of the great industries of the future, both for pleasure flying and as a common carrier, as well as the great means of our country's defense. We must therefore not delay to create the facilities needed for the proper development of aircraft.

It is important to bear in mind that whatever the delay in delivering airplanes, the tasks of our present administration are stupendous and can not be compared with any other phase of earthly problems requiring such a change in the governmental organization. Those who stay at home and read the newspapers must realize very quickly that a 12-month period is indeed small to expect to accomplish in it what has so far been done. If the Aircraft Board has failed to do all it promised there are other departments of the Government that have done better than expected. A spirited reorganization and persistent action will rapidly raise the aircraft to the level of all expectations and the greatness of its results may yet exalt us in admiration of its work at the front.

Yours, very truly,

M. H. AVRAM.

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AIRCRAFT PRODUCTION.

FRIDAY, JULY 19, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The committee met pursuant to adjournment at 2.30 o'clock p. m., in the committee room, Capitol Building, Senator Thomas (chairman) presiding.

STATEMENT OF MR. MOIS H. AVRAM.

The CHAIRMAN. Mr. Avram, where do you live?

Mr. AVRAM. New York City, at 66 Fort Washington Avenue.

The CHAIRMAN. What is your business?

Mr. AVRAM. Industrial production engineer.

The CHAIRMAN. How long have you followed that occupation?

Mr. AVRAM. Over 10 years. I have been a lecturer on industrial engineering at the New York University.

The CHAIRMAN. Are you acquainted with the Wittemann-Lewis Aircraft Co.?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. They are located in Newark, N. J.?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. How long have you known of that enterprise?

Mr. AVRAM. I have known them since the beginning of 1917.

The CHAIRMAN. What is the business of that corporation?

Mr. AVRAM. Aircraft production and the manufacture of airplanes.

The CHAIRMAN. Have you any personal knowledge as to how long it had been in that business before you became acquainted with it?

Mr. AVRAM. That is really covered by my report. As I understand it, they were in business over 12 years there. They have never been in any other business.

The CHAIRMAN. If I understand you, this corporation was engaged in the manufacture of aircraft for 12 years prior to the declaration of war by this country against Germany?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. About 12 years.

Mr. AVRAM. Yes, sir.

The CHAIRMAN. Where are their factories located; that is, in what city and what State?

Mr. AVRAM. Newark, N. J., on the Lincoln Highway.

The CHAIRMAN. Have you any personal knowledge of any efforts or negotiations between the company and the Aviation Production Board or other representatives of the aviation program in Washington?

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Mr. AVRAM. The efforts were constant without any cessation at all.

The CHAIRMAN. About when did they begin? When I ask these questions I want you to understand, of course, that I do not expect the act date in all cases.

Mr. AVRAM. They began, I think, immediately after war was declared.

The CHAIRMAN. That was immediately after the 6th of April, 1917?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. What did you have to do with those negotiations?

Mr. AVRAM. We were called in.

The CHAIRMAN. When you say "we," you mean the firm?

Mr. AVRAM. I represent my firm, Slocum, Avram & Slocum (Inc.), industrial engineers, our business being to investigate and report to financial men on production and otherwise. We do that right along. We were called in in connection with Wittemann and Lewis, and we made an elaborate report for the Production Board after they had failed to get anywhere with the Aircraft Production Board.

The CHAIRMAN. That report is a very elaborate one, is it not?

Mr. AVRAM. Quite so; and we stand on it.

The CHAIRMAN. It covers all the history and potential conditions and capacity for production, etc., of this company?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. Was a copy of that report given to the public authorities here?

Mr. AVRAM. It was submitted. I submitted it to Mr. Deeds personally, in December.

The CHAIRMAN. Do you mean Mr. E. A. Deeds, afterwards Col. Deeds?

Mr. AVRAM. At that time the head of the Aircraft Production Board.

The CHAIRMAN. You submitted it, when?

Mr. AVRAM. December 6, 1917. I would like permission to explain.

The CHAIRMAN. Yes; go ahead.

Mr. AVRAM. When we prepared this report it was understood that we did not come in any investigation of that sort where we have to help to get the contracts; that is not our business, but Wittemann-Lewis could not deliver it to any officials of importance.

The CHAIRMAN. Why?

Mr. AVRAM. They could not get interviews. I smiled. I knew that it should not be difficult to get interviews with anybody on the question of preparation for war. I offered my services. I offered to deliver it myself and it took me three days to deliver it, and the only way I could deliver it was to wait in the hall until I thought I recognized Mr. Deeds. I took a chance. I delivered the report into his hands. He said, "I will look into this and deliver it to Mr. Shepler." That is all I could do. I did not do any more. I wanted to deliver the report that they could not deliver.

The CHAIRMAN. You say you were here for a period of three days which was spent in an effort to deliver to some properly constituted authority this report?

Mr. AVRAM. I only wanted to deliver it to Mr. Deeds.

The CHAIRMAN. What effort, during those three days, did you make to have a conference or a meeting with Mr. Deeds?

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Mr. AVRAM. The only man I could see or could reach was his secretary, a young Lieut. Harvey. I am not sure of his name. I think that is right. He insisted that I could not see Mr. Deeds. He said he had conferences. There was conference after conference. He said that he would leave that particular day or that he was in a meeting. While I do not want to say that that was not so, the fact remains that I could not see him for that length of time. I met him the way I explained before.

The CHAIRMAN. You tried to see him on each of those three days?

Mr. AVRAM. Yes, sir. I had nothing else to do. I came to deliver that report.

The CHAIRMAN. How long before had that report been completed?

Mr. AVRAM. How long did it take to prepare it?

The CHAIRMAN. No. You had completed the report before the 6th of December. When did you finish that report?

Mr. AVRAM. We finished on December 1.

The CHAIRMAN. It was delivered to Mr. Deeds five days afterwards?

Mr. AVRAM. Five or six days afterwards; yes, sir.

The CHAIRMAN. Did you have anything to do with efforts made previous to the delivery of that report on behalf of this corporation to secure work?

Mr. AVRAM. No.

The CHAIRMAN. You did not?

Mr. AVRAM. No.

The CHAIRMAN. Subsequent to that time, did you?

Mr. AVRAM. I interviewed Lieut. Farwell. He was assistant to Mr. Shepler.

The CHAIRMAN. Where was Shepler's office?

Mr. AVRAM. At 119 D Street.

The CHAIRMAN. Now, tell as briefly as you can what took place between you and Lieut. Farwell.

Mr. AVRAM. Lieut. Farwell, the minute I mentioned the name Wittemann, said, "That is a lemon."

The CHAIRMAN. That was his reply?

Mr. AVRAM. Yes, sir. I looked at him in disgust and disappointment, because an ordinary business man would not do that. I asked him why he thought so. Then I explained to him that we had not known much about Wittemann for very long, but that we had gone into it exhaustively. I said that with what they have and what is planned for them to have they have more than any concern that had nothing and was not in the aircraft business before.

The CHAIRMAN. About what date was that?

Mr. AVRAM. It was December 19.

The CHAIRMAN. This was after you delivered the report?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. My question had reference to what, if anything, had occurred, of which you had knowledge before that report. Did you see any of the people before that?

Mr. AVRAM. No, sir.

The CHAIRMAN. Then this interview with Lieut. Farwell, in which he characterized this enterprise as a "lemon," took place in the middle of December after you had delivered to Deeds a copy of that report?

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Mr. AVRAM. Yes, sir.

The CHAIRMAN. Now proceed.

Mr. AVRAM. I started to analyze briefly the whole situation of the Wittemann-Lewis affair, arguing along the lines of the report, and I finally succeeded in getting from him a promise that he would send an inspector to the plant. Inspector Ridlon arrived at the plant on December 22, and remained two days in New York.

The CHAIRMAN. In New York?

Mr. AVRAM. In New York and Newark.

He went into it thoroughly and interviewed the people. He asked us to investigate Wittemann and Lewis, the people whom it was proposed to finance, and looked over their plant at Newark, and went to the new property at Hasbrook Heights, the flying field which the Wittemann-Lewis Company arranged for and purchased with a view to developing a large plant over there. As far as I am concerned personally, I never have heard anything as to what became of the report. Nothing came of it. Lieutenant Ridlon evidently submitted the report.

The CHAIRMAN. Did he give you a copy of it?

Mr. AVRAM. No, sir.

The CHAIRMAN. Did he tell you what it would contain?

Mr. AVRAM. Before he left he indicated that he was fully satisfied as to the situation, but we did not know the contents of the report.

The CHAIRMAN. Who were the people in New York to whom Lieut. Ridlon was referred as willing to finance the Wittemann-Lewis Co.?

Mr. AVRAM. I have not asked permission to mention the name. Is it necessary for me to answer? Personally, I have no objection. I would have been glad to answer the question if I had known it was going to come up and could have been prepared. I did not know it would come up. I know that I would have received permission to give that information. It is one man and his associate.

The CHAIRMAN. One of the representatives of the company is in the room, and I imagine that it is for him to say whether you shall tell.

Mr. AVRAM. The men interested financially, or who were at that time to become interested financially——

The CHAIRMAN. I am asking about now.

Mr. AVRAM. He is an outsider. I do not think Mr. Wittemann would tell. I think he would be in the same position.

The CHAIRMAN. Well, whoever it was, did the lieutenant express to you any opinion regarding his financial ability and the intention to finance this enterprise?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. He did?

Mr. AVRAM. Yes. If I were to mention his name, you would be able to tell that he is able to do it.

The CHAIRMAN. I do not want you to betray any professional confidences, or what you think should be so construed.

Mr. AVRAM. I can write the name, if you wish it, the minute I get to New York.

The CHAIRMAN. You say that you have never seen a copy of that report?

Mr. AVRAM. No.

The CHAIRMAN. Did you have any further conferences down here with any of the production authorities.?

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Mr. AVRAM. I recall one. That was the last of my working connection with them. That was Mr. Lowry, representative of Wittemann-Lewis, and Lieut. Farwell, in Shepler's office.

The CHAIRMAN. What was the date?

Mr. AVRAM. January 18.

The CHAIRMAN. Of this year?

Mr. AVRAM. Yes, sir.

The CHAIRMAN. What occurred?

Mr. AVRAM. I recall that Lieut. Farwell stated that the report was satisfactory and that an order should be forthcoming.

The CHAIRMAN. Was that stated in the presence of——

Mr. AVRAM (interposing). Col. Shepler and Mr. Lowry.

The CHAIRMAN. That then, terminates your identification with this question?

Mr. AVRAM. Yes; at that time.

The CHAIRMAN. After which time you have not been directly connected with it?

Mr. AVRAM. No.

The CHAIRMAN. You have not been connected with their efforts to secure work?

Mr. AVRAM. Except that we remained thereafter as their production engineers, in connection with plant development and quantity production for them, but not anything regarding knowledge of aircraft, because that is not our business. That is their business.

The CHAIRMAN. I understand that.

Mr. AVRAM. We felt right along and we advised the bankers that a combination of production engineers and men who knew aircraft would give results.

The CHAIRMAN. You were employed, if I understand the situation, by the Wittemann-Lewis Co. in your capacity as industrial engineer to make a report regarding all phases of the company's business and their capacity for production for the satisfaction of the Government, and also for the satisfaction of those who might be called upon to finance it for them.

Mr. AVRAM. Yes, sir.

The CHAIRMAN. And your report was delivered in both directions?

Mr. AVRAM. We made a favorable report to the financial men.

The CHAIRMAN. How long a time did you spend in making that report and in making your investigations, etc.?

Mr. AVRAM. I think we spent two months. We employed a number of engineers in various lines. We have a large staff of engineers.

The CHAIRMAN. With this end in view?

Mr. AVRAM. Yes, sir. You might ask some bankers in New York as to our engineering ability to handle production.

The CHAIRMAN. No. Your capacity is presumed until somebody else questions it.

(N. B.—Mr. Wittemann's testimony follows:)

WITTEMANN-LEWIS AIRCRAFT CO. (INC.),
Newark, N. J., July 31, 1918.

Hon. C. S. THOMAS,
Chairman Subcommittee Military Affairs Committee,
United States Senate, Washington, D. C.

HONORABLE SIR: I am herewith inclosing a copy, corrected, with the insertions of the various letters and memorandums requested for your records.

Also a copy of conferences, etc., in which Mr. Hutchinson Scott, at that time second vice president of this company, took prominent part, particularly to an informal

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inspection of our machine at Mineola with the various dates in the left-hand column.

I believe that the contents of this will be interesting data to include in my testimony, particularly since this same Capt. Martin, now Maj. Martin, has again taken it upon himself to contradict Lieut. W. W. King's report on our later model, recently.

Thanking you for your many courtesies, in this matter, I am,

Respectfully, yours,

PAUL W. WITTEMANN.

(Outline written by Mr. Hutchinson Scott. Submitted as part of the testimony of Paul W. Wittemann.)

In reference to the Wittemann-Lewis military tractor biplane:

Messrs. Charles R. Wittemann, S. C. Lewis, and Hutchinson Scott proceeded to Washington with the idea of ascertaining why the Wittemann-Lewis Aircraft Co. had not been given a contract for aeroplanes, the Wittemanns being the oldest aircraft builders in the country. They had filed their proposal for machines under the proper schedules and the bid was regular in every respect and put in by a company actually engaged in such manufacture, contracts having been awarded all other bidders of good standing except the Wittemann Co.

Col. Thomas Cruse, now Gen. Cruse, had the kindness to escort these gentlemen to the aeronautical division of the Army and personally introduced them to Maj. Mitchell, Col., now Gen. Squires being absent. After a short conversation Maj. Mitchell informed these gentlemen that as fast as they could build and deliver machines of the training type at the station at Mineola they would be accepted and paid for, if they came anywhere near the specifications or could meet the requirements incident to such service. Owing to work on hand it became necessary for the Wittemann Co. to have additional quarters, and they consequently leased a building in Newark, N. J., and as soon as the necessary machinery could be installed began and completed a training type Army biplane.

This machine when completed was delayed for a period of six weeks owing to the fact that all good aviators had joined the Army and the services could not be secured. Where they were at leisure the weather was so inclement that flight was impossible.

The machine was, after one short flight, flown directly from the factory to Mineola. The aviator was Mr. Allan Adams, United States civilian instructor at Mineola, who has the American reputation of being the best there is in the United States or in Canada.

Mr. Adams was to make a trial flight, but finding the machine to be so perfect he did not return to the factory, but continued his flight and landed on Governors Island, where he closely inspected the English Vickin machine at that place. The flight to Mineola was then resumed and he was so pleased with the machine he took quite an extended tour, testing out its stability and ability thoroughly; the wind during portion of the flight was southwest, puffy, and blowing from 25 to 35 miles per hour.

The machine was landed on the field at the United Stated Army aviation station at Mineola Sunday. The commanding officer of that station on Monday issued orders that no machine except Government machines be allowed to land on that station.

On the request of Mr. Scott to test the machine in any manner deemed best, the commanding officer declined unless he received positive instructions from Washington to do so. Mr. Scott and Mr. Wittemann proceeded to Washington and had an interview with Col. Saltzman who stated they wanted all the good machines they could obtain but it would be proper to take the matter up with Col. Bennett's department as such matters came directly under his charge. They proceeded to the Mills Building and as Col. Bennett and assistant were at that time in Canada, they were referred to Capt. Harms. Capt. Harms appeared to be a young gentleman who had just taken up aeronautics and had a superficial knowledge of the subject. After quite a discussion on the subject, he stated he would instruct the commanding officer at Mineola to test the machine. A few days after this Mr. C. R. Wittemann and Mr. Scott saw the commanding officer, Capt. Kilner, who stated that he had not received the proper authority. A week elapsed and no test being made, Mr. Wittemann and Mr. Scott were informed by employees of the station that the machine had been most carefully scrutinized, photographed and inspected by the officers and the Curtiss expert. As no authority or test had been made after expiration of two weeks, Messrs. Wittemann and Scott proceeded to Washington to ascertain the difficulty.

They proceeded to the Mills Building, and called on Col. Bennett who had just left for the Munsey Building. They proceeded to the Munsey Building and Mr. Scott saw Col. Bennett and outlined the situation as clearly as possible. Col. Bennett informed Mr. Scott that Mineola was no longer an experimental or test station. When Mr. Scott asked Col. Bennett what he should do in the matter, Col. Bennett said he hadn't the faintest idea. Messrs. Witteman and Scott proceeded to War Department

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and saw Col. Saltwell who most kindly telephoned to Capt. Harms in reference to all papers in this matter. Capt. Harms stated they had been sent to Capt. Clark in the Munsey Building and the matter was in his charge. Messrs. Wittemann and Scott proceeded to Capt. Clark's office and briefly stated the case to Capt. Clark and Capt. Clark said he knew nothing whatever about the matter and it did not come under him. Messrs. Wittemann and Scott returned to War Department and saw Col. Saltwell who telephoned to Capt. Harms. Capt. Harms's conversation was not heard, but Col. Saltwell said, "I distinctly understood you to say Capt. Clark had this matter in charge."

Capt. Harms reply was not heard and Col. Saltwell hung up the phone and stated "I understand the machine you refer to has been condemned by the officials at Mineola." Messrs. Wittemann and Scott then proceeded to the Munsey Building to see Mr. Waldron, who declined to see them as he was entirely too busy, but received other visitors, civilians, during their stay in the office. They, however, met Maj. Hutton, who knew nothing of aeronautics. They asked him what can the department guarantee in shape of contract covering a period of three years if sufficient money is utilized to put up a modern large factory with large output, training school, and capability of manufacturing every portion except covering and wire. He replied that no statement will be made until after passing of appropriation. Messrs. Wittemann and Scott called on Capt. Clark and asked him what type of machine did they desire, and would he kindly give drawings and specifications to work on.

He replied that the manufacturer must submit drawings and details of construction and it appeared they would be given an order. Mr. Wittemann returned to the Mills Building and saw Col. Bennett, who, while extremely busy, received him and dictated a letter in their presence, to the commanding officer stationed at Mineola, ordering him to inform the department as to whether the officials at Mineola could spare or have time to test the Wittemann-Lewis plane. Mr. Scott tried to have Col. Bennett include the order that if they did or when they could find time to make such test and report to Washington, but this was refused. Messrs. Scott and Wittemann returned to New York and on May 2 proceeded to Mineola. Capt. Kilner being busy, they took up the matter with Capt. Bretts, the adjutant of the post, who referred them to Capt. Martin. In an interview with Capt. Martin, they referred to the fact that their machine had been condemned by Mineola without any test. Capt. Martin stated that he had examined the machine and found many faults that made it unfit for service, and he would recommend that it was not purchased. After a little time, Capt. Martin produced a copy of the letter which condemned the machine and verbally stated the main objections. These objections were listened to by Messrs. Wittemann and Scott with utmost courtesy and interest. They consisted of trivialities that were absurdities, but they refrained from any but courteous comment and did not even smile. They avoided hurting the young man's dignity, or his wonderful confidence in his knowledge of aeronautical matters, being superior to that possessed by any one else in this country.

The objections to the machine were somewhat as follows: Bolts joining landing gear to body were not straight. The curve at this point necessitated a curved bolt. The landing gear, being of a new type, was condemned, although of the most modern, simple, and effective known. The exhaust, being overhead, was condemned, although this is now considered the best practice abroad; it avoids pouring noxious gases, oils, etc., in face of pilot and observer and obscuring their vision. He objected to some of the wires being heavier or stronger than the standard turnbuckle. He objected to the tail landing skid, although of latest and best approved pattern. He objected to the lightness of some wires, although stronger than actually required. He objected to the heavy wires on each side of the observer's seat, as that person could not leave with rapidity he deemed essential. He objected to the color of the machine. It is painted a battleship gray to reduce visibility. He objected to a small amount of play in the control, this being similar to the wheel of an automobile. He objected to the fact that the Curtiss shoulder control was not installed, and that the Depp control has been discarded for a long time, and all modern machines are equipped with the Depp control. He objected to the exhaust, as it was cracked. The crack was a surface crack in the metal. We may have overlooked some of the more ridiculous objections, but the main are given and the full details are on file in the department, embodied in his letter. This young man condemns the machine and bases such condemnation on the above-mentioned grounds. After he had looked over the machine, he was encouraged to expand and, under general influence of admiring audience, who hung on his words, he stated that he could not understand how anyone that had ever built a machine could possibly turn out such a mass of blunders.

From his conversation I gathered that he was educated in the Curtiss factory and had never as yet flown in anything but a Curtiss machine. He confidently stated

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that the Army would not consider any other machine except the Curtiss for training purposes, and that nothing but the Curtiss JN type was worthy of consideration. Messrs. Wittemann and Scott earnestly thanked Capt. Martin for his courtesy and information and left the station. He condescended to say that the Curtiss machine was open to improvements and if we followed his advice we might turn out a creditable machine.

The analysis of the above gives the following, which stand out with a distinctness that is obvious:

Capt. Harms misled Messrs. Wittemann and Scott when he stated the commanding officer at Mineola would be forthwith to test the machine.

Capt. Harms misled Capt. Saltwell when he stated that the matter was in charge of Capt. Clark.

That in conversation with Capt. Clark he stated that manufacturers must submit drawings and specifications of this machine.

Capt. Martin condemns a machine in every point that differs from the Curtiss and will not pass any other.

That Capt. Clark approved of the color and also our proposal to use a new color to render the visibility of the machine even less, which if successful could then be adopted for the scout and battle planes.

Of course, if the officers in charge of reports and tests are so wedded to the Curtiss type that no other will be passed, the aeronautical industry must, as far as the Government is concerned, be left entirely in their hands, and the brains, experience, tests, capital, and ability of all others be pushed into the background and forced to wait a commercial business of sufficient volume to warrant further expenditure of capital in enlarging plants to meet a very grave and serious crisis that is of immediate and pressing importance.

It is not to be understood, or even thought, when reading the above that any charge of bribery or similar matters is intended. It is merely the result of conditions where the officials have been brought up to believe either by advertising or by being trained in Curtiss school, factory, selling force, and other parts of their organization, that the Curtiss machine is the only one that is worthy of consideration.

Capt. Martin kindly remarked in his approval of the main strut fittings on the Wittemann model:

Whereas we recognize the fact that the young men who have the inspection of machines and on whose recommendation the officials base their final judgment are earnest and act according to their understanding, they have been trained by the Curtiss Co. We understand from Capt. Martin the fact that he had never flown in any other machine. Yet this gentleman's opinion can condemn without a test a machine built by a company that has been making machines for 11 years, devoting their time exclusively to the work, taking advantage of failures of others and improvements both here and abroad that show merit. This gentleman uses his immature and undigested information in regard to aeroplanes and condemns a machine without any test or trial, a machine that has the approval and admiration of the best practical aviators in this country. The letter from Allan Adams, their own civilian instructor, is inclosed.

Owing to the present conditions every manufacturer except Curtiss, no matter what their experience may have been, their standing and reputation as a builder, must be judged and condemned by such

STATEMENT OF MR. PAUL W. WITTEMANN.

The CHAIRMAN. Where do you live?

Mr. WITTEMANN. At present I am living at 305 Academy Street, Jersey City, N. J.

The CHAIRMAN. Are you one of the officers of the Wittemann-Lewis Aircraft Corporation?

Mr. WITTEMANN. Treasurer.

The CHAIRMAN. Who are the other officers of the company?

Mr. WITTEMANN. Charles R. Wittemann, president; Samuel C. Lewis, vice president; and Redmond F. Kernan, secretary.

The CHAIRMAN. How long has the Wittemann-Lewis Co. been a going concern?

Mr. WITTEMANN. Since 1906.

The CHAIRMAN. What has been its business?

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Mr. WITTEMANN. Manufacturing, designing, and developing of aircraft and accessories exclusively.

The CHAIRMAN. To what extent had you conducted that business prior to the declaration of war with Germany?

Mr. WITTEMANN. At the time of our declaration of war against Germany we were about the fourth or fifth largest concern in America.

The CHAIRMAN. What was your capital at that time?

Mr. WITTEMANN. At that time our capital was $75,000, although we had a greater assets than that.

The CHAIRMAN. What was your estimated production capacity at that time?

Mr. WITTEMANN. At that time we had an estimated production capacity of one machine per week of the standard type of training machine such as we had been building.

The CHAIRMAN. What machine had you been building?

Mr. WITTEMANN. At that time?

The CHAIRMAN. Before the war?

Mr. WITTEMANN. We built most of our own kind of machines.

The CHAIRMAN. Well, you can name some of them, can't you?

Mr. WITTEMANN. The monoplanes, biplanes, hydroplanes, and seaplanes.

The CHAIRMAN. Had you built the JN-4?

Mr. WITTEMANN. No; all our own designs.

The CHAIRMAN. Satisfactory flying planes?

Mr. WITTEMANN. Every one, except, of course, the experimental machines, some of which were not.

The CHAIRMAN. How large a force of skilled workmen had you in your organization?

Mr. WITTEMANN. We had up to 40 men.

The CHAIRMAN. After the declaration of war, please state what activities, if any, the company exercised in trying to secure orders.

Mr. WITTEMANN. Just at the time of the declaration of war we had finished the development of training machines in special compliance with the specifications of the Aviation Section of the Signal Corps.

The CHAIRMAN. That is before the war?

Mr. WITTEMANN. It was completed just after war was declared.

The CHAIRMAN. When did you get the contract for that?

Mr. WITTEMANN. We never got a contract for them. They requested us to develop a machine, after which they promised to give us business.

The CHAIRMAN. When did the Signal Corps request you to develop that machine?

Mr. WITTEMANN. It was at the conference held in Washington between my brother, Charles R. Wittemann, Samuel C. Lewis, and Mr. Scott, at that time second vice president. They had a conference with Maj. William Mitchel.

The CHAIRMAN. Give the date.

Mr. WITTEMANN. It was October 16, 1916.

The CHAIRMAN. And that machine, you say, had just been completed?

Mr. WITTEMANN. After that conference they stated that if we could build a machine that could be flown successfully from our factory to Mineola, Long Island, they would accept that machine and place an order for 20 more.

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The CHAIRMAN. When was this machine ready for test?

Mr. WITTEMANN. It was ready to get the test on April 16.

The CHAIRMAN. Ten days after our declaration of war?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. Was the test successful?

Mr. WITTEMANN. The machine rose from Newark and flew directly to Mineola.

The CHAIRMAN. What engine was used in that machine?

Mr. WITTEMANN. The Hall-Scott 90.

The CHAIRMAN. Who flew?

Mr. WITTEMANN. Alan Adams, at that time chief instructor at the Mineola training service school.

The CHAIRMAN. In the Government service?

Mr. WITTEMANN. Not in the service, but a civilian instructor.

The CHAIRMAN. As a result of that test did you come down to see about the contract?

Mr. WITTEMANN. Yes, sir. That machine was flown to the field, and as per our promise a two-hour advance notice was given them that the machine was on the way, so that they might have an opportunity to do a little reconnoisance work. They sent up probably five or six machines to find this machine coming in. Of course, at the same time, Mr. Adams attempted to evade them and successfully did that. He had the machine on the field tied down in front of headquarters 15 minutes before the first man came back. It remained on the field 30 days, during which it rained at least once a day, and then the sun shone, and it was subject to bad treatment.

The CHAIRMAN. Wasn't it under shelter at all?

Mr. WITTEMANN. No, sir; it was in the open.

The CHAIRMAN. Were there no hangars there?

Mr. WITTEMANN. There were, yes, sir; but they were mostly filled. There were a number of other machines standing on the field.

The CHAIRMAN. Did you attempt to obtain shelter for it?

Mr. WITTEMANN. Yes, sir; but they said they could not provide shelter for it.

The CHAIRMAN. Did that result in injury to the machine?

Mr. WITTEMANN. It did not.

The CHAIRMAN. It stood the weather conditions?

Mr. WITTEMANN. Perfectly. At the expiration of these 30 days, why, we turned the propeller over three times for the sake of priming the motor, and on the fourth time it went right away, and the following morning Mr. A. Adams flew it to the adjoining field.

The CHAIRMAN. Why didn't you leave it there?

Mr. WITTEMANN. Because they refused to give us a test.

The CHAIRMAN. What was the reason assigned for that?

Mr. WITTEMANN. I can give you a more accurate statement from this. [Indicating paper.] On the request of Mr. Scott to test the machine in any manner deemed best the commanding officer declined unless he received positive instructions from Washington to do so. Mr. Scott and Mr. C. R. Wittemann proceeded to Washington and had an interview with Col. Saltzman, who stated they wanted all the good machines they could obtain, but it would be proper to take the matter up with Col. Bennett's department, as such matters came directly under his charge.

The CHAIRMAN. Then you set out to see Bennett?

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Mr. WITTEMANN. Yes, sir. Col. Bennett was not there, so they were sent to Capt. Harms, and he stated that he would instruct the commanding officer at Mineola to test the machine. A few days later Mr. C. R. Wittemann and Mr. Scott saw the commanding officer, Capt. Kilner, who stated that he had not received the proper authority. After a week's time had elapsed, during which period no test was made, they were informed that the machine had been carefully photographed and inspected by the officers and the Curtiss experts. This information was obtained from Army boys that were about the field.

The CHAIRMAN. Were these officers told on this occasion of the understanding under which this machine had been constructed?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. Do you know what reply was made to that?

Mr. WITTEMANN. Well, at that time they made the reply that Mineola was no longer a testing ground, and that it would probably have to be removed to Langley field. Work at Hampton, Va., at that time had barely started in order to put it in shape as any kind of a testing field.

The CHAIRMAN. Who said that?

Mr. WHITTEMANN. Col. Bennett.

The CHAIRMAN. Col. Bennett?

Mr. WITTEMAN. Yes, sir.

The CHAIRMAN. Was any offer made to take it to the Langley field?

Mr. WITTEMANN. Yes, sir. That was made toward the middle of June. I believe it was June 6.

The CHAIRMAN. Before we get to June, let us get back to the Mineola field. You say that you flew the machine from the Mineola field to an adjoining field. What field was that?

Mr. WITTEMANN. That was where Camp Mills is now.

The CHAIRMAN. Was that a Government field or a private field?

Mr. WITTEMANN. The L. W. F. people had a hangar on it, which we rented.

The CHAIRMAN. What tests were made?

Mr. WITTEMANN. There the machine was kept flying daily, all day long.

The CHAIRMAN. By some one in your employ?

Mr. WITTEMANN. Men in our employ, and Army officers, a Royal Flying Corps man, and other civilian aviators. One of the severest tests was made by Edward Stinson. He was at that time the chief tester for the Curtiss Co.

The CHAIRMAN. He was sent there to test it?

Mr. WITTEMANN. By a party who was interested in purchasing some of the machines, with a view to establishing a private school in Oklahoma. It was put through all kinds of tests that you could possibly put it through, and through tests which no one believed it would stand up under.

The CHAIRMAN. Why did you discontinue flying there, if you did discontinue?

Mr. WITTEMANN. On July 2, 1917, we discontinued flying there through the sale of the machine to this party, in addition to three others. The machine was then withdrawn and we started work immediately, because it was a rush order. We had to get these ma-

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chines under way quickly, and had the motors ordered. Then the Aviation Section denied us the delivery of those motors, whereupon the contract, of course, automatically canceled itself.

The CHAIRMAN. That is, you made a contract to build three of those machines for other parties?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. And as the Government canceled or countermanded the order for motors, you were unable to deliver them?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. What became of them?

Mr. WITTEMANN. They are still at the plant, with the money tied up.

The CHAIRMAN. Now, go ahead and tell us, as briefly as you can, what efforts, if any, were made by your company to secure Government work in aeroplane construction?

Mr. WITTEMANN. That was started in January, 1915.

The CHAIRMAN. 1915?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. I prefer, unless Senator New objects, that you give your experiences after we went into the aviation business, so to speak, or after this aviation production board was organized.

Mr. WITTEMANN. Only after the board was organized?

The CHAIRMAN. After the declaration of war.

Mr. WITTEMANN. I have quite a lot that preceded that.

The CHAIRMAN. You had got no contracts prior to that time?

Mr. WITTEMANN. No, sir; although we bid on all except one.

The CHAIRMAN. Your efforts date back to 1915, but without success, except as you were ordered to build this one machine?

Mr. WITTEMANN. In October, 1916. That was a verbal request.

The CHAIRMAN. After you built that machine and after you flew it successfully, tell what took place with regard to manufacturing machines.

Mr. WITTEMANN. There was a continuous succession of interviews held in Washington between my brother, Charles R. Wittemann, and Mr. Scott. Mr. Scott remained down here permanently all last summer, and he was sent from pillar to post, so to speak, interviewing all the officers that he could get hold of, and the chief one was Lieut. Farwell, who had made promises and who had written some letters, some of which we have here, in which he recognizes the capabilities and facilities of our plant and organization.

The CHAIRMAN. If you have any letters upon that subject that you would like to incorporate in the record, just identify them.

WASHINGTON, *August 18, 1917.*

From: A. D. Farwell.
To: Mr. Hutchinson Scott, care of New Willard Hotel, Washington, D. C.
Subject: Plant of Wittemann-Lewis Co.

1. Regarding your request, permit me to say you have presented the facilities of the Wittemann-Lewis Aircraft Co. to this division in a very thorough and concrete manner, and we are giving it careful consideration. We realize that the Wittemann-Lewis Co. is one of the oldest aeroplane manufacturers in the country, and we are giving that fact, together with your facilities, our most careful attention.

2. Mr. Sheplar, who is in charge of the plane production department, is thoroughly acquainted with your facilities, and we wish to assure you that this company has not been turned down.

3. We were not able to give them an order for training planes, but by far the largest part of our program is still ahead of us, and while we can not say definitely at the present time whether an order can be placed with them, you can rest assured that they

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will receive proper attention, and that your efforts in their behalf will not be neglected by this division. Since you are permanently here in Washington, when we are ready to negotiate with this company we will get in touch with you at once.

Very truly, yours,

EQUIPMENT DIVISION.
(Signed) By ALBERT D. FARWELL.

Mr. WITTEMANN. I may say a few more words, then, in regard to the testing of the machine at Langley field?

The CHAIRMAN. Very well. Was this machine sent to Langley field?

Mr. WITTEMANN. No. They advised us under date of June 7, 1917, that the plane could be tested as soon as we set the machine up at the aeronautical experiment station and proving grounds, Hampton, Va. The request was signed by Henry Souther. That was June 27, 1917. Now, that was after the machine had been severely used and bounced around and subjected to outside weather conditions, and it was hardly fit to send out for testing. The motor had been considerably run down after probably 300 flights.

The CHAIRMAN. What reply did you make.

Mr. WITTEMANN. The reply was that since we had some new machines under way would it not be more advisable to test one of the new machines after they came out. They replied that it would be a good deal better to do that. Directly after that reply we received information from them, on June 21, that absolutely no new types of machines would be considered since they had decided upon the JN–4 Curtiss machine and the Standard machine.

The CHAIRMAN. What date was it you were notified that your type of plane would not be considered because they had selected the Standard and the JN–4? What is the other one?

Mr. WITTEMANN. The Standard. I think it was model H. Then there was the Curtiss JN–4.

The CHAIRMAN The Standard and the Curtiss JN–4?

Mr WITTEMANN. Yes; the Standard and the Curtiss JN–4.

The CHAIRMAN. About what date was that?

Mr. WITTEMANN. I believe it was about the first part of July.

The CHAIRMAN. That notification came under the signature of what person?

Mr. WITTEMANN. It came in a verbal conversation between Lieut. Farwell and Mr. Scott, who then stated that they could not consider any concern that could not produce at least 500 machines in 12 months. There was probably no concern that could do that at that time.

The CHAIRMAN. Five hundred in 12 months?

Mr. WITTEMANN. Yes, sir. They could not do it without equipping for it. We made arrangements for it. Following that, on August 6, he made the statement that they could not consider anything less than 1,000 planes in order to come near the program. We proceeded to make arrangements. We had already made some arrangements. We had made arrangements with the Brill Co. to take over the Stevenson plant, which is now the Standard Co.

The CHAIRMAN. Did you notify Lieut. Farwell?

Mr. WITTEMANN. We notified him. Lieut. Farwell apparently told Mr. Curwin and his associates the same thing that he told Mr. Avram, whereupon Mr. Curwin thought it more advisable to with-

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draw from the association than to go ahead with it thereby causing a severe injury.

The CHAIRMAN. You said a while ago that you had some written memorandum.

Mr. WITTEMANN. Yes, sir. It is a résumé of the memorandum of Mr. Curwin to the J. J. Brill Co., of June 12.

The CHAIRMAN. What was the capacity of the Brill Co.?

Mr. WITTEMANN. The capacity of that plant would have developed up into 1,500 machines in 12 months.

The CHAIRMAN. What was the business of the Brill Co.?

Mr. WITTEMANN. They were car manufacturers. The Stevenson plant was owned by them. It was empty. They wanted us to manage it while they financed it.

The CHAIRMAN. If I understand it, you were prepared to meet the capacity requirements of the Production Board as fast as they informed you of those requirements?

Mr. WITTEMANN. Exactly.

The CHAIRMAN. Did you report that to them?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. What difference did that make in their action?

Mr. WITTEMANN. It merely led on to further conversations that gradually smothered out again.

The CHAIRMAN. Did you invoke the intercession of Senator Frelinghuysen at any time?

Mr. WITTEMANN. At one time in a conference Mr. Scott suggested that it be brought to the attention of Senator Frelinghuysen; that is, it was presented to him in a letter dated August 16.

The CHAIRMAN. I have here a copy of a letter from Senator Frelinghuysen, dated August 18, 1917, to S. D. Waldon.

Mr. WITTEMANN. Yes; that is right.

The CHAIRMAN. Together with a letter of the 22d of August, 1917, from Mr. Waldon to Senator Frelinghuysen.

Mr. WITTEMANN. That is right.

The CHAIRMAN. And the Senator's reply upon the 28th of that month, which I suppose you have in your possession, too.

Mr. WITTEMANN. No; I have not got that copy. I had a copy of the letter written to Senator Frelinghuysen on August 22, and the letter of August 16, written by Mr. Scott to the Senator.

The CHAIRMAN. I think I have that, with the exception of page 5, which seems to be missing. I think that should go in also. Page 5 is not among these papers.

Mr. WITTEMANN. I have it here.

The CHAIRMAN. When this transcript is sent to you for correction, I wish you would have that letter inserted. You can make a copy of it, and that will not mutilate your files.

Mr. WITTEMANN. All right.

AUGUST 16, 1917.

HON. J. S. FRELINGHUYSEN,
United States Senate, Washington, D. C.

SIR: The Wittemann-Lewis Aircraft Co., of Newark, N. J., has been interested for the past 16 months in the securing of orders for airplanes. To date, it has been unsuccessful, and the undersigned is this day advised that all contracts for airplanes of training type have been let and that the entire supply of such machines necessary for the training of American military aviators is thereby provided for.

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Following is a statement of the history of the Wittemann-Lewis Co., its standing in the airplane world, and a recital of its endeavors to obtain governmental business.

History.—The Wittemann-Lewis Aircraft Co. is composed of the brothers Charles, Paul, and Walter Wittemann, and S. C. Lewis, a flyer of note, who has trained many of the French and Russian officers.

The three Wittemann brothers secured their education at as many different schools of technology. To this was added practical knowledge through construction of gliders and airplanes and through actual flying experience of the principles of aerodynamics, flight, and internal combustion engines.

They began in 1904 to work in aerodynamics, experimenting with gliders, as did the Wright brothers, Voisins, and other famous men of flying history. With the production of engines in any way suitable for airplanes, they began experimentation with power-driven machines and were easily successful.

Reputation.—They became widely known through these experiments and there came many orders for experimental and standard-type machines for exhibition and other purposes. In the course of time they attained an enviable reputation for sincerity, square dealing, ability, and quality of work. At no time were they ever large contenders for business, and it is well known that until the past year there were but two or three concerns in the entire country which did any volume of business in the manufacturing of airplanes.

Organization of the company and dealings with the Government.—In view of the suddenly increased demand for aircraft, the Wittemann-Lewis Aircraft Co. was formed with the added services of S. C. Lewis.

In November, 1916, Gen. Thomas Crouse introduced Mr. Charles R. Wittemann, Mr. S. C. Lewis, and Mr. Hutchinson Scott to (then) Maj. Mitchell, assistant to (then) Col. Squier.

In the presence of the above-named gentlemen Mr. Mitchell stated that he knew the Wittemann firm and that the Army needed planes; that just as fast as the Wittemanns could build training type planes and deliver them to the Mineola Field, the machines would be inspected and accepted and paid for within two weeks if they were approved.

In accordance with these expressions of opinion, a factory in Newark was acquired and as soon as possible a training-type machine was built and exhibited at the aero show in February last, where it received favorable comment.

For the first time in American aviation history this machine was flown from factory to destination—from the Newark plant to Mineola. The pilot was Allan S. Adams, one of the instructors at the Army Aviation School at Mineola.

The day after the machine was delivered at the field a general order was published forbidding any machine except those of the Army landing at this point. Mr. Scott, of the company, requested that a test be made of this machine. It was thereupon stated by the commanding officer that in the absence of instructions to this effect, he could make no test until officially notified.

Mr. Scott proceeded to Washington and saw Col. Squier's assistant, who stated they desired all training type machines that could be produced that were good and referred him to Capt. Harms.

Mr. Harms referred Mr. Scott to a Mr. Walker in the Munsey Building. He, Mr. Scott, was then passed to Maj. Hutton, who could do nothing. Maj. Sautells could not aid. Mr. Waldon was seen and stated that nothing could be done as Mineola was no longer a testing station and the machine could not be tested at that point. In the meantime, this machine was allowed to remain exposed to the elements and it rained most of the time for six weeks. The Wittemann-Lewis Co. then obtained the use of a hangar on Hempstead Plains and with its aviator almost gave daily demonstrations of this plane's ability. For about two months this machine was handled by many of the best known aviators and pronounced to be the best training-type machine they had ever handled.

Attached is record of Mr. Stinson's tests. Within three weeks after these demonstrations began an official order was posted on the hangar notifying the Wittemann-Lewis Co. that only Government machines would be allowed to fly over or in the vicinity of Mineola field. At the request of Mr. Scott, permission was later granted the company to fly the machine.

Despite the weeks that the machine was subject to all the elements and to all sorts of flying, looping, diving, and the like, and the carrying of many passengers, no repairs or alterations were necessary and the machine is at present in perfect condition. During all these flights the machine outclassed, in speed, at least, the Army machines of higher power. The machine was likewise handier in maneuvering.

A representative of the Wittemann-Lewis Co. came to Washington and proffered all its facilities, and also stated these would be increased and such facilities would be placed at the disposal of the Government.

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The capacity of the present factory is 600 machines in 12 months and this capacity could be increased with utmost rapidity until a maximum of 15 machines obtained—4,500 machines yearly; 200 machines a year could be built with the present facilities. The vice president of the campany was delegated to remain in Washington at the disposal of the Aircraft Production Board.

Mr. Scott for the last two months has called repeatedly on the Aircraft Production Board and to date has been unable to see any of the heads of such board. He has been able to meet minor officials only. He met Mr. Farwell, Mr. Shinn, Mr. Stokes, and a request for an interview with higher officials has been refused. Mr. Stepler refused to see him on August 14, although passed up to him by Mr. Shinn. On August 5 Mr. Scott waited until 5 p. m., and although he sent a letter of introduction from Senator Frelinghuysen to Mr. Waldron, the latter referred him to Mr. Stepler, who would not see him. Finally, on August 16, after being turned down by all other officials, was granted an interview by Mr. Farwell. Col. Boruff, of California, was present during this interview and had hereunto subscribed his name as verifying the facts as stated.

Mr. Farwell stated: (1) The board was familiar with the Wittemann-Lewis Co.; (2) the factory had been inspected, (3) the entire allotment of training type machines had been contracted for, (4) the Wittemann-Lewis Co. had not been included in the contract, (5) that amoong such contracts some had been let to firms that had never built an airplane, (6) they had let contracts to Dayton-Wright Airplane Co. and the Fisher Automobile Co., in both of which companies, it is understood, Mr. A. E. Deeds is an officer, while at the same time is an official of the Aircraft Production Board and a member of one of the board of the Council of National Defense.

Conclusion.—The statement then results in the fact that the Wittemann-Lewis Aircraft Co., composed of men with international reputation, has been unjustly and persistently overlooked and ignored, subjected to unwarranted expense, time, and trouble, and discriminated against in favor of corporations which have had no experience whatever in this class of work. And this at a time when the country requires the best and the exertion of every effort.

The above submitted for your earnest consideration and whatever action you in your judgment may deem to be for the best interest of the country at large.

I beg to remain,

Yours, sincerely,

(Signed) HUTCHISON SCOTT.

The CHAIRMAN. Did you ever get any business from the Production Board?

Mr. WITTEMANN. We have had several offers, but we never actually received any after all these different promises. On August 29 Mr. Waldon had promised Mr. Scott that we would be given a contract for Monocog (?) body planes. That was a type similar to the L. E. F. Co.'s type. They asked for deliveries on the contract to the extent of 600.

The CHAIRMAN. With what result?

Mr. WITTEMANN. No result.

The CHAIRMAN. But you did contract for some spare parts?

Mr. WITTEMANN. Following that, on September 11, Mr. Scott had another conference with Lieut. Farwell and Mr. Waldon to find out why we did not get anything out of the previously promised contracts. Then instructions were issued—I presume this was Maj. Shepler; it says Stevens here—to give us a contract for sufficient spare parts to keep us busy until they required our facilities.

The CHAIRMAN. That was for 300 spares.

Mr. WITTEMANN. They placed it at 300. There was a variety. There was from 30 of one thing to 300 of another thing, etc. On the whole it amounted to an order of approximately $300,000.

The CHAIRMAN. What date was that?

Mr. WITTEMANN. That list was given to Mr. Scott and Mr. C. R. Wittemann on September 12, I believe.

The CHAIRMAN. They were to be manufacturing the spare parts?

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Mr. WITTEMANN. The spare parts.

The CHAIRMAN. The designs were to be furnished by the Curtiss Co.?

Mr. WITTEMANN. The designs were to be furnished by the Curtiss Co. Then they were to send to the Curtiss Co. to get the blue prints, as they had no additional sets down there, and Mr. Scott and Mr. Wittemann went directly to Buffalo.

The CHAIRMAN. Let me call attention to a letter from Mr. C. R. Wittemann to Senator Frelinghuysen, which I think will shorten the examination. This letter is dated March 6, 1918, and reads as follows:

WITTEMANN-LEWIS AIRCRAFT CO. (INC.),
Newark, N. J., March 6, 1918.

Hon. J. S. FRELINGHUYSEN,
United States Senate, Washington, D. C.

DEAR SIR: This is in reply to your communication of the 28th, asking us to furnish you with information with reference to Col. Horner's statement that we had been offered a contract for 300 spares, etc.

About September 1, 1917, Mr. S. D. Waldon (now Col. Waldon) offered to permit us to submit figures on spare parts to be manufactured from designs of the Curtiss Aeroplane Co., and instructed Mr. Hutchinson Scott, who was then second vice president of our company, to call on Maj. P. L. Shepler in Buffalo, stating that he would instruct Maj. Shepler to give us an order for the 300 parts. Lieut. Farwell then stated that the order would be ready the following day, whereupon Mr. Scott summoned our Mr. C. R. Wittemenn to Washington. Lieut. Farwell gave them a list of parts with a sealed letter to Maj. Shepler and instructed them to go to the Curtiss factory. On arrival at that factory at Buffalo, they were refused the blue prints, but Maj. Shepler said he would take the matter up with the Curtiss officials. Finally Messrs. Wittemann and Scott were taken to the office of Mr. B. A. Guy, the secretary and treasurer of the Curtiss Co., who stated that we would have to enter into an agreement with the Curtiss Co. and that the form of agreement would be forwarded for execution in about 10 days time.

On September 20 the Curtiss Co. sent us a letter and form of contract (copies inclosed). From this you will notice that in order to manufacture the parts it would be necessary for us to pay to the Curtiss Co. 1 per cent of the selling price of the parts plus the sum of $200 on each plane. Likewise, that we pay them the sum of $500 in advance, being 1 per cent on a possible order of $50,000.

We sought the advice of our counsel, Mr. Loren N. Wood, who suggested that under the circumstances he thought the Curtiss Co. would be willing to modify the agreement, at least in two particulars, and we thereafter wrote the Curtiss Co. a letter dated October 30, a copy of which is inclosed. To that we have received a reply dated November 6 (copy inclosed). We did not feel that, in order to bid upon Government work we should be compelled to pay the Curtiss Co. $500 in advance, although we were quite willing to pay for the expense in having the necessary blue prints made upon which our bid was to be based.

On February 28, at our request, we were granted an interview with Col. Horner, at which time he referred to an interview he had had with you and asked why we had not accepted an order for 300 psare parts. He was then informed of the agreement which the Curtiss Co. required and especially of the causes to which we have above referred. He was also advised of our plant, organization, and that we had been in business for 12 years, during which period we kave built approximately 300 aeroplanes for some of the best known aviators and which have been flown all over this country as well as in foreign countries. He was also advised of the report made by Messrs. Slocum, Abram & Slocum, submitted on December 2, 1917, a copy of which we are sending you under separate cover. Col. Horner stated that he did not know of these facts nor of the report.

We are able to contract for and deliver 600 machines in the first 12 months and 100 machines per month thereafter. We believe that we are in an exceptional position, with an established plant, equipment, and an organization of experienced men. We are desirous of serving our country in the manufacture and production of aeroplanes and we can not understand why we, who are one of the oldest manufacturers of aircraft in this country, have not been given an opportunity.

Respectfully, yours,

WITTEMANN-LEWIS AIRCRAFT CO. (INC.),
By C. R. WITTEMANN, *President.*

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This agreement, made this .... day of September, 1917, by and between the Curtiss Aeroplane Co., a corporation of the State of New York, having its principal office at Buffalo, N. Y., party of the first part, and the Wittemann-Lewis Aircraft Co., a corporation of the State of New Jersey, having its principal office in the city of Newark, party of the second part.

In consideration of the promises and agreements hereinafter contained the party of the first part hereby promises and agrees to deliver to the party of the second part a set of drawings, designs, specifications, and bills of material covering aeroplane model known as JN military tractor, as designed and built by the party of the first part.

The party of the second part, in consideration thereof, promises and agrees to pay to the party of the first part one per cent (1%) of the selling price of all aeroplanes or parts thereof manufactured by the party of the second part according to said drawings and designs, and also to pay to the party of the first part the sum of two hundred dollars ($200.00) for each and every aeroplane so manufactured, all such payments to be made to the party of the first part not later than the 10th day of each month for all aeroplanes or parts thereof manufactured during the preceding month.

The party of the second part has this day paid to the party of the first part the sum of five hundred dollars ($500.00) in payment of the one per cent (1%) charge on the first fifty thousand dollars ($50,000.00) of aeroplanes or parts thereof which shall be manufactured by the party of the second part, it being expressly understood and agreed that said payment of five hundred dollars ($500.00) shall remain the property of the party of the first part even though the party of the second part shall not manufacture and sell aeroplanes or parts thereof equaling the sum of fifty thousand dollars ($50,000.00).

The party of the second part further agrees that it will not permit or allow such drawings, designs, and specifications to be read, copied, photographed, or otherwise used, by any persons other than the employees of the party of the second part, and that the party of the second part will return the same to the party of the first part in the event of the dissolution or termination of the business of the party of the second part for any reason whatsoever, it being understood that such drawings, designs, and specications are merely leased to the party of the second part during such time as it shall desire to make aeroplanes according to such drawings, designs, and specifications.

In witness whereof, the parties hereto have caused this agreement to be signed by their respective duly authorized officers and their respective corporate seals to be hereunto affixed the day and year first above written.

CURTISS AEROPLANE CO.,
By .....,
Secretary and Treasurer.
WITTEMANN-LEWIS AIRCRAFT CO.,
By .....

The CHAIRMAN. That is in accordance with your understanding of the matter?

Mr. WITTEMANN. Exactly.

The CHAIRMAN. Accompanying this letter I find a copy of an agreement dated the —— day of September, 1917.

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. That seems to be a proposed agreement between the Curtiss Co. and the Wittemann-Lewis Co. I will show this to you and ask you if that is a copy of the contract which the Curtiss Co. and the Wittemann-Lewis Aircraft Co.——

Mr. WITTEMANN (interposing). It has the Curtiss seal on it.

The CHAIRMAN. It has the Curtiss seal upon it?

Mr. WITTEMANN. Yes, sir.

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The CHAIRMAN. Among these papers which I have in my hand I find the following copy of a letter from the Curtiss Co., dated September 20, 1917, to the Wittemann-Lewis Co.:

BUFFALO, U. S. A., *September 20, 1917.*

WITTEMANN-LEWIS AIRCRAFT CO.,
Newark, N. J.

DEAR SIRS: This is to advise you that the blue prints and specifications covering the parts for the JN4 machines which you intend to manufacture have been completed and are ready for delivery to you.

We inclose herewith form of agreement in duplicate which we would ask that you execute, returning both copies to us together with your check for $500 as provided in the said agreement.

Upon receipt of this agreement, duly executed by you, together with the said check, we will execute and return one copy of the agreement for your files, and deliver to your representative the blue prints and specifications hereinabove mentioned so that he may check same and give us a receipt therefor.

Yours, very truly,

CURTISS AEROPLANE & MOTOR CORPORATION,
B. A. GUY, *Secretary and Treasurer.*

The CHAIRMAN. Do you recall receiving that letter?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. As accompanying this agreement?

Mr. WITTEMANN. Yes, sir; they were both together. The other copy of the agreement I have here.

The CHAIRMAN. Among the papers there is also a copy of a letter dated October 30, 1917, purporting to be from your company to the Curtiss Aeroplane Co., suggesting changes in the agreement. The reasons given are that you do not want to encumber with this fee machines or parts that are manufactured in accordance with your own designs, and also that the prices indicated by the Government are so much below what it will be necessary for you to receive and that you have no assurance whatever that you will obtain a contract; you do not feel that you are in a position to spend $500 for drawings and specifications just to use for making a bid to the Government.

Do you remember that?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. That letter was sent to the Curtiss people?

Mr. WITTEMANN. Yes, sir; on October 30.

The CHAIRMAN. I also find a purported copy of a reply, in which the Curtiss Co. declined to permit the amendments which are proposed.

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. All of these will go into the record.

OCTOBER 30, 1917.

CURTISS AEROPLANE CO.,
Buffalo, N. Y.

GENTLEMEN: Referring to the form of agreement which you sent us on September 20, there are two changes which we would like to have inserted.

(1) At the end of paragraph 3 on the first page, a clause reading as follows:

"It is understood by the parties that the party of the second part is now and has been designing and manufacturing aeroplanes and parts and it is not intended by this agreement that the party of the second part shall by reason of this agreement be obligated to pay to the party of the first part any sums of money for manufacturing aeroplanes or parts in accordance with its own drawings, designs, and specifications."

(2) In place of the fourth paragraph on the first page, a paragraph to read as follows:

"The party of the second part agrees to pay to the party of the first part the sum of $500 immediately upon the acceptance of an order for one or more machines or parts thereof, to be manufactured in accordance with said drawings and designs which shall

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be in payment of the 1 per cent charge on the first $50,000 worth of aeroplanes or parts thereof which shall be manufactured by the party of the second part, it being expressly understood and agreed that said payment of $500 shall remain the property of the party of the first part even though the party of the second part shall not manufacture and sell such aeroplanes or parts thereof equalling the sum of $50,000."

The reason for considering the first clause is obvious; namely, that we do not want to encumber with this fee machines or parts which are manufactured in accordance with our own designs. The reason for the second is that the prices indicated by the Government are so much below what it will be necessary for us to receive that we have no assurance whatever that we will obtain a contract, and we do not feel that we are in a position to spend $500 for drawings and specifications just to use for making a bid to the Government. Of course we are quite willing to pay whatever expense you have incurred in having this set of blue prints struck off for our use and to have you protect yourselves in any way that you deem necessary against any use of them at this time for any other purpose than preparing a bid. At the time it was suggested to us by the Government that we submit a bid under these plans and specifications we received the impression that the payment of 1 per cent would only be upon the machines or parts manufactured, and that was the basis of our undertaking to submit a bid

Kindly advise us if this is agreeable to you.

Yours, very truly,

WITTEMANN-LEWIS AIRCRAFT CO. (INC.),
———— ————, *President.*

BUFFALO, U. S. A., *November 6, 1917.*

THE WITTEMANN-LEWIS AIRCRAFT CO. (INC.).
Newark, N. J.

DEAR SIRS: Replying to your letter of October 30. In regard to the first change you desire in the agreement we sent you, I do not think it advisable to make the change suggested by you, as the fee mentioned in the third paragraph on the first page of the agreement applies only to our aeroplane model known as the JN military tractor, and does not cover any machines that may be manufactured according to your own designs.

In regard to the second change which you desire in place of the fourth paragraph on page 1 of the agreement where we ask a deposit of $500, we feel that this request is only fair to cover the expense of furnishing a set of drawings and changes which may occur from time to time, this deposit to be credited against the 1 per cent license fee as it accrues, and a further payment to be made when the accruals exceed $500.

We do not feel that under the circumstances we should be asked to furnish information pending your receipt of order from the Government without such payment, and believe that in furnishing this information we are helping you to obtain such an order, and we should be reimbursed accordingly.

Yours, very truly,

CURTISS AEROPLANE & MOTOR CORPORATION,
B. A. GUY, *Secretary and Treasurer.*

Mr. WITTEMANN. There is one more interesting point. On October 30, the same day this letter was written, Mr. W. W. Montgomery, head of the legal department, entered into an agreement with the Curtiss Co. to call in any such agreements as had been made and as were outstanding, and to return any moneys that had been collected from any concern entering into such agreement.

The CHAIRMAN. Can you furnish a copy of that letter when you correct your testimony?

Mr. WITTEMANN. Yes, sir; I can give you a memorandum.

The CHAIRMAN. Let me see that letter, please.

Mr. WITTEMANN. That was not in a letter. That was at a conference.

The CHAIRMAN. Let me see the statement.

Did the Curtiss Co. ever modify its demands on you?

Mr. WITTEMANN. No, sir. They wrote the letter six days after they entered into that agreement. They had not any right to do that, in the first place.

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The CHAIRMAN. You have called my attention to the following memoranda [indicating], which is dated Tuesday, April 24, 1918, and which reads as follows:

Conference with Capt. J. C. White, Mr. W. W. Montgomery, Messrs. C. R. and P. W. Wittemann. Mr. W. W. Montgomery was called in by Capt. White. He stated that shortly after October 1, 1917, they first heard of the Curtiss Co. sending out agreements similar to the one herewith referred to. It is, however, remembered by Messrs. Wittemann and Scott that while on their visit to the Curtiss Co. at Buffalo, Mr. Guy, in the presence of Maj. Shepler, said thay would have to enter into an agreement (the contents of which were not stated), and later Maj. Shepler stated to Messrs. Whittemann and Scott that any fee or overage that would have to be paid to the Curtiss Co. might be added to our contract price.

Mr. MONTGOMERY also stated that he personally, on October 30, 1917, entered into an agreement with the Curtiss Co. purchasing the right to manufacture the Curtiss JN-4 machines in whole or in part at any of the plants the Signal Corps may designate, without any further fee or agreement between the Curtiss Co. and the manufacturer.

The CHAIRMAN. Did you notify the Curtiss Co. of that.

Mr. WITTEMANN. We did not become acquainted until April 24, 1918.

The CHAIRMAN. Did you notify them of that circumstance after you became acquainted with it.

Mr. WITTEMAN. No, sir.

The CHAIRMAN. Then, the situation is substantially this: While the Government officials suggested a contract for 300 spare parts, they referred you to the Curtiss Co. for the plans, which company declined to give you the plans until you had signed a contract with them (a copy of which has been placed in the record) which you declined to do.

Mr. WITTEMAN. Yes, sir.

The CHAIRMAN. Did you ever get any other work from the Government?

Mr. WITTEMAN. After the report of Slocum, Avram and Slocum was handed in, and Mr. Ridlon made that report supposed to have been very favorable, as was stated by Maj. Shepler and Lieut. Farwell, not to me, but I have heard it said that he stated to Mr. Avram, Mr. Charles R. Wittemann and Mr. Lowry that Lieut. Ridlon personally stated that he did hand in a favorable report to the effect that we were in a very excellent position to take care of any size contract that we asked for or contemplated, and both Lieut. Farwell and Maj. Shepler agreed to that thought.

The CHAIRMAN. But you have not got Government work up to date?

Mr. WITTEMANN. They also stated they would see that we got a contract as soon as the new appropriation would come out.

The CHAIRMAN. When was that statement made?

Mr. WITTEMANN. That statement was made in the early part of January.

The CHAIRMAN. Before Mr. Ryan was placed at the head of aviation production?

Mr. WITTEMANN. Yes, sir, just about the time that Mr. Potter came in.

The CHAIRMAN. He came in later than January.

Mr. WITTEMANN. In February, just a little before.

The CHAIRMAN. Have you any contracts yet?

Mr. WITTEMANN. No, sir.

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The CHAIRMAN. If, in the fall of 1917—the late summer or fall of 1917—the Government had placed with your company contracts for the production of machines at the minimum rate of 500 per year, could you have turned them out?

Mt. WITTEMANN. Yes, sir; more than that.

The CHAIRMAN. If you had been informed by Lieut. Farwell that the Government would make contracts only with those capable of turning out 1,000 machines per year, could you have performed that contract?

Mt. WITTEMANN. Yes, sit. We would have had the Brill property.

The CHAIRMAN. Did you inquire as to whether contracts were being let in other directions for less than 500 machines?

Mr. WITTEMANN. Yes, sir. We could not get definite information.

The CHAIRMAN. Did you inquire of these officers whether that was or was not the fact?

Mt. WITTEMANN. They declined to familiarize us with the facts.

The CHAIRMAN. But did you inquire?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. And received an answer to the effect that they did not care to discuss these things with you?

Mr. WITTEMANN. They did not exactly make that statement, but they always got around it through some other channel.

The CHAIRMAN. Did Mr. Scott leave the employ of your company?

Mr. WITTEMANN. Yes, sir; they are Mr. W. C. Teter and his associates, of New York City.

The CHAIRMAN. Why?

Mt. WITTEMANN. A point came up at one time as to some flat accusations that he had made of some of the members of the Aircraft Board that he was not exactly sufficiently positive of to justify him in making them in respect to whether they were true or not. It had been suggested to him that it was not good policy and might injure us in the future. Thereupon, on his own accord, he stated that it might be better, in view of these statements, that he temporarily withdraw from the company.

The CHAIRMAN. You are requested, if consistent with business conditions, to give the committee the names of such bankers, firms, or individuals as were prepared to furnish the necessary financial assistance to the company for the execution of its contracts with the Government.

Mt. WITTEMANN. Yes, sir.

The CHAIRMAN. Please state what, if any, negotiations your company has had with Mr. W. C. Potter regarding Government work.

Mr. WITTEMANN. There was one conference held with him on April 20.

The CHAIRMAN. What occurred?

Mt. WITTEMANN. It was between Mr. C. R. Wittemann, Mr. Potter, and myself, at which time we discussed with him the actual conditions of the company, with which he was apparently not acquainted. He seemed to be acquainted with some of the facts. He took the stand that they could not consider giving any more orders to concerns that would have to expand. After arguing the question with him at con-

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siderable length, he decided to promise us these drawings. However, we have never received them.

JULY 30, 1918.

Hon. C. S. THOMAS,
Chairman Subcommittee, Military Affairs Committee,
United States Senate, Washington, D. C.

DEAR SIR: In reference to the conference held between Messrs. W. C. Potter, Charles R. Witteman, and Paul W. Witteman on April 20, 1918, Mr. Potter was first given a brief outline of the Witteman-Lewis Aircraft Co., which was prepared at the suggestion of Dr. Charles D. Walcott, of the Smithsonian Institute, at a conference between him and Messrs. Charles R. and Paul W. Witteman. After Mr. Potter read this outline, we discussed the work that this company has done and the efforts that had been made to procure a contract. Mr. Potter stated that he was well acquainted with our work, but that up to that time they had nothing to give us. We then asked him that if there were sufficient contracts to give out to start a number of new plants besides those already in existence, there assuredly must have been sufficient work to give us a contract, to which he perfectly agreed. Mr. Potter then stated that they were not going to consider the expansion of any more plants, as they were contemplating the use of existing piano factories, which, in his belief, were exceptionally well equipped for the manufacture of airplanes.

To this we told him of some inspections that we had made of piano factories, where we found they were practically equipped for woodworking only, and, as far as machinery was concerned, not enough to properly start work on an airplane in the woodworking line only, constituting about 40 per cent of airplane manufacture.

After this Mr. Potter stated that they could not afford to let all of these industries go under because of the depression of that business owing to war conditions; and we asked him whether he thought it more advisable to let the equipped airplane plants go under or the unskilled plants go under, and whether it was not only essential, but highly important to utilize the existing airplane plants, particularly since they have put the whole of their life's work into the development of the airplane and gaining of the necessary experience to conduct aircraft production.

To this Mr. Potter emphatically agreed and stated that he expected the completion of drawings of several machines by May 15 and at that time would permit us to figure on one of them. In order to confirm this, he called in his secretary and dictated a memorandum about as follows:

"Witteman-Lewis Aircraft Co. ought to receive drawings of either the Bristol or De Haviland machines to figure on from 250 to 500, or else the Handley-Page or Caproni machines to figure on as many as they would have capacity for, and these drawings will be sent immediately upon their completion, which should be May 15."

Before leaving Mr. Potter's office he promised to mail us a copy, which to this day has not been received.

Very respectfully, yours,

WITTEMAN-LEWIS AIRCRAFT CO.
By ——— ———,
Treasurer.

The CHAIRMAN. Did anybody see Mr. Potter again in June?

Mr. WITTEMANN. I attempted to see him once after that, about three weeks later, but he was too busy and I could not see him. He was going to New York that afternoon.

The CHAIRMAN. Mr. Wittemann, are you a native American citizen?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. And your brother is?

Mr. WITTEMANN. Yes sir. The entire family.

The CHAIRMAN. The entire family are American citizens?

Mr. WITTEMANN. Yes. I was born and raised on Staten Island and I never moved from that place.

The CHAIRMAN. And your parents?

Mr. WITTEMANN. My mother was born in St. Louis; my father was born in Europe and came to this country about 52 years ago.

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He was naturalized immediately afterwards. You have that in that letter [indicating].

The CHAIRMAN. My purpose in asking is to meet any possible suggestion that that was a reason for some of these things.

Mr. WITTEMANN. Yes. That was advanced as a possible theory, as having something to do with this.

The CHAIRMAN. The Germanic name borne by some members of the company might have something to do with it.

Mr. WITTEMANN. Yes, I understand, but could never find trace of it any time.

The CHAIRMAN. Is there anything else you care to say?

Mr. WITTEMANN. I do not think there is anything else that would add anything to it. There is a letter here written on April 18, from Col. L. S. Horner. Do you wish me to read it?

The CHAIRMAN. That is what date?

Mr. WITTEMANN. April 18, 1918. That was received in Newark on the day that we were down here.

The CHAIRMAN. To see Mr. Potter?

Mr. WITTEMANN. Yes, sir. We stayed over until Monday. He had merely prepared a so-called report consisting of half a dozen sheets or so, in an effort to show that we were not entitled to the business. After that I prepared this form and submitted it to him. Then Capt. J. C. White, who was acting as legal adviser, putting it altogether, has practically decided the whole thing in our favor.

The CHAIRMAN. Did you or representatives of the company have any conferences here with Capt. White?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. What are his initials?

Mr. WITTEMANN. J. C. White, I believe.

The CHAIRMAN. Of the Aviation Production Board?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. Please state about when that was.

Mr. WITTEMANN. Of the legal department.

The CHAIRMAN. The legal department of the Aviation Production Board. Please state its purpose and what was said and done?

Mr. WITTEMANN. He was preparing this report for Lieut. Col. Horner. I believe his initials are L. S. He had gathered together just a few sheets which did not seem to bring much weight to anything.

The CHAIRMAN. A few sheets of what?

Mr. WITTEMANN. Of memoranda which he had taken from the files, and so on. We had them straightened out in a very short time. Whatever he thought he could blame on us, we turned over and put the blame on them. They took the stand that we were prejudiced against the Aircraft Board.

The CHAIRMAN. Did he give you any reason why you were prejudiced?

Mr. WITTEMANN. He assumed we were. His actual words that he used, if I can remember them, were, "Get this grouch out of your system."

The CHAIRMAN. Was his attitude to the effect that the board should not let contracts to competent men who were prejudiced?

Mr. WITTEMANN. I am unable to answer that, as to whether that was his attitude or not, although it did appear that way.

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The CHAIRMAN. Well, state his attitude.

Mr. WITTEMANN. Following that conference Capt. White had asked us to prepare the complete report, which we did.

The CHAIRMAN. Is that the report which Mr. Avram made?

Mr. WITTEMANN. No, sir; that is this report, the entire memorandum of the entire negotiations.

The CHAIRMAN. The report that you selected, then, was composed chiefly of memoranda of interviews?

Mr. WITTEMANN. Yes, sir; and correspondence.

The CHAIRMAN. Was that submitted to Capt. White?

Mr. WITTEMANN. That was submitted to Capt. White in the original form; yes, sir.

The CHAIRMAN. When was that?

Mr. WITTEMANN. On May 8, about.

The CHAIRMAN. Of what year?

Mr. WITTEMANN. Of 1918. It was approximately May 8.

The CHAIRMAN. Have you had any reply from Capt. White?

Mr. WITTEMANN. We came down with it. We brought it down with us.

The CHAIRMAN. Have you had any reply?

Mr. WITTEMANN. We spent three days in straightening the whole thing out, and he arrived at the conclusion that the whole thing was just a misunderstanding on the part of the Aircraft Board, and that there was absolutely no reason or plausible excuse why we should not get contracts.

The CHAIRMAN. Did he give you a written statement to that effect?

Mr. WITTEMANN. No, sir. I asked him for a written statement or report that he drew up, but he never did it.

The CHAIRMAN. But he verbally acquitted you after this showing?

Mr. WITTEMANN. Absolutely.

The CHAIRMAN. Of entertaining any prejudice against the board or its officers, or of any misconduct which would interfere with a fair deal from the Government?

Mr. WITTEMANN. Absolutely, and in addition he stated that there was no reason why we should not have a contract, and that there was every reason why we should.

Mr. AVRAM. I understood from the report that they objected to a letter which I wrote to Mr. Coffin.

Mr. WITTEMANN. Yes. That letter I have here. Would you like to read that letter? That was one of the serious objections the day we were in conference with Mr. Potter. Mr. Potter had it on top of his file and Mr. Kellogg had it on top of his file.

The CHAIRMAN. When you had the conference with Mr. Potter in April was any reference made to a letter of the 17th of April addressed to Mr. H. E. Coffin.

Mr. WITTEMANN. It was right on the top of each man's file.

The CHAIRMAN. To Mr. Coffin from Mr. Avram?

Mr. WITTEMANN. Yes, sir.

The CHAIRMAN. Is the letter which I now hand you a copy of it?

Mr. WITTEMANN. Yes, sir; that is a copy of it.

The CHAIRMAN. Will you attach a copy of that letter to your testimony when it is sent to you for correction?

Mr. WITTEMANN. Yes, sir.

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APRIL 17, 1918.

Mr. H. E. COFFIN,
Chairman the Aircraft Board, Washington, D. C.

MY DEAR MR. COFFIN: Upon my return from Washington, I found your letter of April 9 in reference to the Wittemann-Lewis Aircraft Co.

I trust that my communication of March 12, handed to you by Mr. Bezner, has not given you the impression that I considered the Aircraft Board to be an executive body dealing with contracts. I know quite well that it is not, which was one of the main reasons why neither the Wittemann-Lewis people nor our concern has approached your board.

We regret to say, however, that experience has proven that every means was employed to properly approach those in charge of the letting of contracts and that very little attention has been paid to the fact that this company can be of great service to the Government in producing airplanes.

I have personally arrived at some very definite conclusions—the main one being that the power of letting contracts was left in the hands of men who perhaps in their previous experience were not placed in as important positions as the ones they now occupy with the aircraft situation and who were not familiar with the ordinary forms of business courtesy. I have deduced this from my own experience with the department, from many people who came in touch with the aircraft order department and from the way the Wittemanns were received and treated.

It seemed at the time of these interviews that the officers having charge of letting contracts had set views regarding the Wittemann-Lewis Co. which they had probably formulated months or a year before, and that nothing new could move them to reconsider the Wittemann-Lewis aircraft situation which when presented by us had an entirely different aspect than when presented months earlier.

As a matter of fact, the situation of the Wittemann-Lewis is a simple one. Prior to November, 1917, they came before the Production Board with what at that time seemed to be a small plant with a small organization, conducted by known expert engineers—for no one can say that the Wittemann brothers are not versed in the science of airplane design and construction. During that period it is my contention, and that they should have gotten some sort of order, no matter how small—enough to give these men incentive to make their ingenuity useful in the future development of this field, for if the Production Board has ever contended that they were not production men, there was something out of the hundreds of millions of dollars of work that the Production Board had for this purpose that the Wittemann-Lewis people could have done in order to benefit both the country and themselves.

But they have not received anything, though they were offered something verbally, which evidence proves it would have been impossible for them to accept, inasmuch as it was tied up with conditions brought about by the connection with the Curtiss Co., which no sane manufacturer of airplanes would undertake.

But let us forget the fact that they have been neglected prior to November, 1917, for a period of 10 months, during which time many people who have never built airplanes, nor knew a thing about airplanes, have received contracts—and go to the period after November, when we were called in by certain bankers of New York to investigate the Wittemann-Lewis Aircraft Co. and pass upon their ability to handle a Government contract.

We found them so far as plant and equipment are concerned quite small, not warranting a large contract, but we did find them well-versed men in the understanding of what an airplane should be. We were therefore retained as production and managing engineers and we subsequently wrote a report covering production planning for an enlargement of the Wittemann-Lewis Aircraft Co. through capital to be provided by the bankers in question and where the Wittemanns would act as aircraft engineer with out concern as production engineers and managers. This was repeatedly brought to the attention of those in operation of the procurement department. As a matter of fact a similar report to that which had been submitted to the bankers was left with this department of the Aircraft Board. But nothing seems to have availed. Two things were discovered months thereafter: One that the report was left in the hands of a new man who just happened to come into the department for a few weeks, and is out belief that that report has never been read by anyone else excepting that new man; second, we were told only recently that the report was lost in transit between Washington and Cleveland and we were requested for another one.

With a situation of that sort there is naturally a feeling of great disappointment. The small manufacturer is used to expecting the least for the greatest amount of effort, but it is not so with those who like ourselves are investigating and managing engineers where we come in contact with difficult industrial problems and where always a solution is found if the problem is studied, analyzed, and planned in advance

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carefully. I wish to convey to you this point, when we were brought into the Wittemann-Lewis Aircraft Co. we never expected to be a party to the getting of a contract, but we became interested only after we saw what little chance people of the type of Wittemann-Lewis have in obtaining proper treatment.

It has come to our attention at various times that the contract or production department of the Aircraft Board contended—

(1) That the Wittemann-Lewis Aircraft Co. were offered contracts but they have not responded.

(2) That they were too small and were not production engineers.

We will answer for the benefit of the Production Board that in regard to the first we are witnesses that persistent effort has been made to receive attention and that it must be denied that any offers were made to them where they have not responded, excepting in the case of the original verbal offer which they refused on account of the Curtiss interference, as explained to you in the letter to Mr. Bezner, and it was fully and repeatedly explained to the same people who have power to let contracts, but without avail.

In regard to the second, we have already agreed that they are small, and while they are expert designers of airplanes, they have taken the proper course when they engaged us to cooperate with them in the problem of large production. As a matter of fact, the Government in other departments that I know has considered very seriously that it is not really a question of plant or equipment in producing war devices, but it is the knowledge of the art, and organization.

It will take very little investigation to find out how many concerns have been financed by the Government because of knowledge and organization, and it is my firm belief that the Aircraft Production Board would have made no mistake if the Wittemann-Lewis Aircraft Co. had not only been given a contract, but had been also financed.

For five months they offered everything that the Government could wish, but nothing has come of all this. So that when a situation like this arises, it is my belief that it is no longer up to those having charge of the letting of contracts to handle the matter, but it surely comes up to the man at the head of the Aircraft Board. The Wittemann-Lewis situation has been aired so much that I am surprised that it has not reached you earlier than this.

All this goes to prove that this concern has not been treated right. However, at no time did we come out to say that such was our view, nor have the Wittemann-Lewis people openly expressed their feelings in the matter. All that has been said or heard regarding the Wittemann-Lewis Co. has come from the indignation of many outside disinterested people, who say things as they are, and not from talking. However, when reviewing this whole history of the Wittemann-Lewis Aircraft Co., which should have been the one to receive an order, one can not remain quiet nor at peace. Our attitude up to this time was rather one of disappointment and silence, for the reason that we did not believe in embarrassing so tremendous an undertaking as the one which you are the chairman.

Very truly,

The CHAIRMAN. Mr. Wittemann, were you originally requested and did you originally consent to identify yourself with the organization of what is called the Aircraft Manufacturing Association?

Mr. WITTEMANN. We were put on the list. We originally consented; yes, sir. We were put on the list subject to the terms and conditions and other requirements that may eventually be made upon the member.

The CHAIRMAN. Did you continue to occupy that position or did you withdraw from the original list?

Mr. WITTEMAN. We occupied that position until the by-laws had been drawn. There is one clause which states that any eligible member must have had either $100,000 of business in the past year or have that amount of business at the present time. I believe those are approximately the terms of it.

The CHAIRMAN. You could not comply with that provision?

Mr. WITTEMANN. No, sir. The question was asked as to whether or not we would still be eligible. They stated that we were not.

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The CHAIRMAN. In other words, the little fellows were to be excluded?

Mr. WITTEMAN. At that time we were one of the big fellows.

The CHAIRMAN. At that time was any reference made to this letter of Mr. Avram's by Mr. Potter in April, when you called upon him?

Mr. WITTEMANN. Mr. Potter just had it on his desk. Col. Horner said that letters such as these might better remain unwritten.

The CHAIRMAN. Did he exhibit any feeling over that?

Mr. WITTEMANN. He was very much disturbed at our attitude, and made that statement.

The CHAIRMAN. What reply did you make to that?

Mr. WITTEMANN. After each man had argued it, I said, "If you leave the sarcastic part out and take the facts as they are, they are correct, are they not?" He said, "Yes, sir."

The CHAIRMAN. At any rate, Mr. Potter did not use or refer to that letter as any reason why you should not have a contract?

Mr. WITTEMANN. No, sir.

The CHAIRMAN. I think that is all.

(Thereupon, at 4 o'clock p. m., the committee adjourned subject to the call of the chairman.)

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AIRCRAFT PRODUCTION.

SATURDAY, JULY 20, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met, pursuant to adjournment, at 10.30 o'clock a. m., in the committee room, Capitol Building, Hon. Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, and New.

STATEMENT OF MAJ. GEN. WILLIAM L. KENLY.

The CHAIRMAN. Gen. Kenly, as you know, we have been appointed by the Committee on Military Affairs to inquire into the conditions regarding aviation, principally as regards production. We have heard a great many gentlemen, and we have traveled some and had first view of some factories and have seen with our own eyes some of the facilities for production, and we are just about through. Our program contemplated the completion of our investigation and then the making of a report in crude form, and before submitting it to the committee we thought we would submit it to you and Mr. Ryan for the purpose of getting such information from you as we could regarding the changed conditions since you have taken hold, as that would materially affect the report. Only yesterday we learned that both you and Mr. Ryan are going away and were to be gone for something like three weeks, which explains the reason for our asking you to attend to-day and on account of which we are not ready to present any report, because we have not formulated one as yet. We would like to get from you before you go away a statement as to what has been done with regard to matters of inspection, changed conditions in training, if any, and other changes that have been instituted since you were put in charge of the Bureau of Military Aeronautics. We think that you may have anticipated, and probably have set in force, changes and made recommendations, and it would give our committee pleasure to say that these things have already been done. I think that is a brief outline of the reasons we had for asking you to attend this meeting.

Gen. KENLY. First of all, sir, I found the organization turned over to me in Washington rather messed up, and there was really very little real organization. I think we are beginning to see a little daylight now. I have changed some of the heads of my bureaus and have gotten hold of some additional men who are now with me.

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There is one man in particular, who was sent to Europe and whom I have since had sent back, Col. Kenney, who has been of a tremendous amount of service in bringing about a systematic organization within my own office. That was extremely necessary. Even now we have not got things going quite the way we wish.

Up to the time I took hold there seemed to be an idea that each department was more or less independent. They were acting upon that supposition. There was much overlapping, and naturally much ignorance in one department about what another department was doing. There was considerable authority exercised by subordinates who signed important documents by authority of the Chief Signal Officer. Of course it takes some time to discover that many of these things have been going on, because you would hardly suspect them until you run into them. That seemed to be one of the most necessary things to do when I started out.

When I first came back I took a look around through the Texas schools before I had any real idea what they wanted to do with me.

The CHAIRMAN. Do you mean preliminary schools, like the Princeton School?

Gen. KENLY. That type, including flying schools. I saw all the preliminary, primary training, and pursuit schools and the gunnery schools. I saw the command of the British cooperative training at Fort Worth, the observers' school at Fort Sill, the balloon school at Omaha, and I also saw the Belleville school. In that inspection I also saw the ground school at Austin. So I got some idea of how things were going on.

I was quite impressed by the excellent work that was being done along certain lines. The primary training and the advanced training, so far as facilities were afforded, were being very well done, I thought.

The construction work at these schools, one and two unit schools—the actual plant costing something like from $2,000,000 to $5,000,000—impressed me as having been especially well done, especially in view of the fact that so much had been accomplished in a comparatively short time. However, there was quite a lack of coordination.

One school would be accentuating one thing and another another thing. After they put me in charge I attempted to standardize training and to cut down excessive flying for some schools, and to do everything possible to impress on everybody the necessity of so handling training that accidents would be cut down to a minimum.

That is a practice which I have tried to follow consistently. Several weeks ago, when I felt that it could be done, I directed that all standard training planes, so called, with the four-cylinder Hall-Scott motor be put out of commission. From my own personal knowledge, from what I saw at these schools and from inquiry, I considered this not only an extremely dangerous plane to fly, but also an extremely uneconomical plane.

The CHAIRMAN. How many were there?

Gen. KENLY. That, sir, I would have to look up. I know the value of those was reported to be about $6.000,000.

The CHAIRMAN. I think it was stated by Col. Arnold that there were about 1,200.

Gen. KENLY. Yes.

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Senator REED. Was that the value of the planes with the engine or without the engine?

Gen. KENLY. That is the total. I happen to know the money value, because that was a feature that I felt that some day might invite criticism. I felt that the sudden discontinuance of the use of about $6,000,000 worth of Government property might be considered a cause for criticism. There has been a necessity for the use of the planes up to that time, as I saw it, because we did not have the Curtiss plane of a more reliable and more satisfactory type to really do the work, so we had to use this plane.

Senator REED. Will you please state the reasons why you considered that plane dangerous and undesirable?

Gen. KENLY. I considered it dangerous, sir, because we had not only quite a number of accidents, actual crashes and deaths, but it had developed imperfections.

Senator REED. Were the accidents and deaths due to the imperfections of the machine or the imperfections of the motor?

Gen. KENLY. Due, sir, to the unreliability of the motor, I should say. The motor was found to be most uncertain. They were always breaking down. They were considered by every flyer with whom I discussed this matter to be so uncertain that in their training and in their so-called cross-country flights they usually flew round and round the field, expecting the motor to go bad, and desiring to be in a position where they could make a safe landing.

The thing that particularly forced the issue was that the day before we reached a decision, as I remember it, there were two deaths from burning in the air. Altogether, as I remember it, there were seven casualties by burning in the air from this type of plane. The one thing that an aviator dreads is fire in the air. If they have no confidence in a plane, that, in itself, is a sort of reason for accidents. So I took this rather important step by wire. I wired everybody that they should discontinue the use of those planes. I felt I could do it, because, due to the slowing down of production according to the original program, it occurred to me that we could begin slowing down on training, and while I held it up for a while we could secure more training planes and more advanced planes, so that the possibility of sending pilots overseas would not be interfered with.

Senator REED. When did this change occur which resulted in the slowing down of production?

Gen. KENLY. That had all happened in the very beginning, you might say, of our entry into the war. The French contract practically fell down, as you know. We expected to supply a certain number of planes to our troops in France from contracts with the French. I was in France when those contracts were materially altered, if not entirely changed. I think the original idea was to accept about one-fourth of the contract rather than the total number. It was due to what I consider two reasons. In the first place, the contracts with the French were dependent upon a certain amount of raw material that was to be furnished by us, and we did not live up to our side of the agreement. In the second place, the increase in German activities in the air caused a change of program in French aviation construction, desirable from their point of view. In other words, they had an increased need for planes which they had not contemplated when the contracts were made. Due to this,

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and perhaps to other and political reasons of which I am ignorant, our French contracts fell down so that we became more or less dependent upon what could be done on this side. When I came here I found the situation as I have set it forth.

The CHAIRMAN. Coming back to the question of training planes, do you know whether it would be possible to equip them with some more satisfactory type of engine?

Gen. KENLY. That is a question which is being carefully investigated at this time. I have an idea that the four-cylinder Hall Scott motor can be modified so that it can be used with safety.

The CHAIRMAN. Or you can use another engine?

Gen. KENLY. I am positive that one or the other of these things can be done, so that I consider that a suspension.

The CHAIRMAN. Have you noticed whether the discarding of that type of planes has had any effect upon the average number of accidents?

Gen KENLY. I can not say that it has. Accidents are due primarily to one thing, and that is the carelessness of the flyer. You hear practically every day of tail spins, nose dives, and side slips. Those things are usually due to the stalling of the machine. They are usually due to the stalling of the machine in an attempt to climb at too steep an angle, or gliding down at too flat an angle, or making a turn at too flat a slope without sufficient power. All of those things are rubbed into the men in training from the very beginning. The moment a man puts himself into the cockpit he knows all these things, and they have been impressed upon him before he is turned loose, and is dependent upon himself. If a man is careless and does not watch the climbing speed of the propeller, it is a very easy matter to stall his machine. If that stall occurs within three or four hundred feet of the ground it is apt to prove dangerous. When the engine stalls flying speed is lost and the plane drops by gravity. When it drops it goes into some variety of spin. It is almost sure not to drop straight. If you get into a spin it takes a certain amount of speed and distance in order to enable you to make the machine respond to control again. Within several hundred feet of the ground that is practically impossible. Most of our deaths are due to the causes I have mentioned.

The CHAIRMAN. The most frequent fires in the air, resulting in the burning of the aviators, resulted in that type of machine which you have discarded?

Gen. KENLY. Yes, sir. I do not think we have had any fires in the air since that, to the best of my recollection, although there are so-called fires because after the machine crashes it is very likely to catch on fire, just as an automobile is.

The CHAIRMAN. That is generally where it strikes the ground?

Gen. KENLY. Yes, sir; where it strikes the ground. We have had a number of fires of that kind, due to the crash itself.

Senator NEW. You spoke a while ago of the failure of the French to supply the number of machines that we had expected to get from them, or that they had promised. You said that was because we did not live up to our side of the contract.

Gen. KENLY. That was one of the contributing factors, sir.

Senator NEW. That was one of the contributing factors?

Gen. KENLY. Yes, sir.

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Senator NEW. Just what do you mean by that? Do you mean that we did not supply the raw materials with which the French expected to make the planes?

Gen. KENLY. Yes, sir. That was my understanding. That is purely my opinion, because at the time this thing occurred I was no longer connected with the air service. I picked it up from Col. Bolling, who was intimately associated with that phase of it in connection with the contracts themselves.

Senator NEW. Much has been said to the effect that we were to supply quantities of raw materials to the French and that they were to supply our needs with the finished planes out of the material we were sending, and with the aid of the mechanics whom we were sending over there.

Gen. KENLY. Yes, sir.

Senator NEW. In view of that, your statement that they had failed in their program because we did not live up to our side of the contract interested me.

Gen. KENLY. If you will allow me to interrupt you, sir, I think that is one of the contributing factors. Here is another factor which I did not mention, and on which they laid the greatest weight. They said we have good pilots to fly the planes and we need them, and you have not got the pilots; therefore, why should we not be permitted to cancel these contracts? I do not know whether they were canceled or whether they were just redrawn for a much lower number of planes than the original contracts called for.

Senator NEW. In answer to that, it has been testified by officers of your department in the course of our examinations here that we have pilots far in excess of our supply of machines.

Gen. KENLY. We have now, sir.

Senator NEW. We started with a program of pilots that called for 23,000 machines, that number being about the number originally promised for this particular time, July, 1918. Now, the testimony given us is that the Army made ready the number of pilots all right, but the supply of machines was not forthcoming, and that is the reason we have now so many more pilots than can be equipped with flying apparatus.

Gen. KENLY. But you must remember that many of those pilots still are only partially trained. They are trained in primary work only, because to do advanced work requires advanced machines, which even now we are not getting.

Senator NEW. The fact that they have not finished their courses is due to the additional fact that we have not had machines with which to finish them?

Gen. KENLY. Absolutely; yes, sir.

Senator NEW. In other words, they have been taken as far as they could be taken with the outfit that we have available for their training?

Gen. KENLY. Yes, sir.

The CHAIRMAN. What, if any, changes have been made, or what, if any, improvements have been made in the matter of inspection of these camps; I mean the inspection of machines, etc.?

Gen. KENLY. Do you mean so far as production goes?

The CHAIRMAN. No.

Gen. KENLY. You mean so far as training goes?

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The CHAIRMAN. My question has reference exclusively to the camps, keeping them in order, and so on.

Gen. KENLY. We have attempted, sir, to improve the engineering section at all camps. That has been a matter that I have given special attention to with a view to coordination, which will make the camps standard so far as possible.

Instructions have always been issued to the effect that no plane shall go into the air that has not been carefully gone over by its crew and tested and O. K.'d by the engineering people who handle that before it is brought out of the shed to fly in the morning. In addition to that, every time a man flies a machine he himself is required to make a careful inspection. Of course, it is superficial, but it is a careful inspection. He must inspect every joint, every turnbuckle, see that the control works, and that the nuts and bolts are in proper shape, and all that sort of thing. That is a part of the regular routine. That has been insisted upon ever since I have known about the Aviation Service. Ours, by the way, is the only one that does that. Abroad they trust entirely to the mechanics.

The CHAIRMAN. You mean our Government?

Gen. KENLY. I mean this: Take a Frenchman, for instance, he will have a mechanic who stays with him. Take Guynimer, he had a mechanic in whom he had absolute confidence. If the mechanic said that the ship was all right, he would get in it without looking at it. On the other hand, our men are required to inspect the planes themselves.

The CHAIRMAN. Are these requirements carried out?

Gen. KENLY. They are rigidly carried out. I do not think there is any accident that can be attributed to failure of inspection.

Senator NEW. I would like now to take up another line. General, you are at the head of the Aviation Department, I know, but you are also a practical flyer, are you not?

Gen. KENLY. A very modest one. I have done some flying. I was at the school at San Diego, Cal., for six months. I was flying all the time, but was only under instructions about three weeks before I came away from there, officially.

I have been flying from that time to this every time I get an opportunity.

Senator NEW. You have given particular thought and attention to the matter of aviation for some time before you were made head of the department; that is true, is it not?

Gen. KENLY. Yes, sir; that is true.

Senator NEW. I want to ask you what types of airplanes we should have made in this country; what type should we now put in production?

The CHAIRMAN. Just a moment, Senator. You mean fighting or training planes, or both?

Senator NEW. I am speaking of combat planes.

Gen. KENLY. I think that is a very difficult thing to answer, Senator, because I do not believe two men in the world would agree on that. We are putting, or we started to put into production, what I thought were, theoretically, if they had come up to the performance of the type they were supposed to represent, as good planes as you could find. The DH 4 of that type, due to its performance abroad, seemed to be an excellent machine in every respect, and the head of

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that type. The Bristol fighter the same way. The same applies to the SE 5. The DH 4 is coming along, sir, but it is not yet up to the performance of the British DeHaviland 4, in speed or in various other points. As to the SE 5, we have not started to get it into production at all, but it should be and is, theoretically, an excellent type of machine.

Senator NEW. Now, you are speaking of the DeHaviland 4. Do you regard it, as produced in this country, as a first-class plane?

Gen. KENLY. Right at this minute, no, sir; I do not, but I think it will be. I think we will make it so.

Senator NEW. You think we will make it so?

Gen. KENLY. I think it is gradually getting so, and it will be gradually getting so without really slowing up production, which is an important point to consider.

Senator NEW. To what particular purpose is the De Haviland 4 best adapted?

Gen. KENLY. It is best adapted to day bombing and reconnoissance work.

Senator NEW. Does it carry as high a load of bombs and explosives as other machines of similar type which are now in general use?

Gen. KENLY. I should say so; yes, sir.

Senator NEW. How is it as an observation plane?

Gen. KENLY. As an observation plant I think it has more power, and therefore it is more expensive than is really necessary. It can be used, however, for that purpose.

Senator NEW. General, it has come to the notice of this committee that a short time ago Gen. Pershing sent a cablegram requesting that no more De Haviland 4's be sent over until they had been inspected in this country, or, rather, had been tested in this country.

Gen. KENLY. Yes, sir.

Senator NEW. Is that correct?

Gen. KENLY. I remember that cable; yes, sir.

Senator NEW. There was such a cable?

Gen. KENLY. Yes, sir.

Senator NEW. Will you give the committee a description of the general character of the cable message?

Gen. KENLY. I do not think, sir, that I could give you the details. I do not remember whether that was the cable that had a long list of defects found in the De Haviland 4. If that is the one you refer to, I remember that, in a general way, it went through the De Haviland 4 plane from top to bottom, finding a great many faults. Many of these, however, had already been corrected, or were being corrected, and many of them were really more or less trifling. The cable produced the impression of there being a much more serious condition found than really existed, in my mind. There were one or two important things and many very unimportant things. Attempts had been made before that to correct all these things, or most of them, which had been called to the attention of the production department by our department, and they had begun to make alterations along the lines suggested long before this cable came.

The CHAIRMAN. Is it not a fact that your department preferred to withhold for the time first 75 or 100 De Havilands produced for the purpose of testing them out here, in order to discover whatever de-

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fects might be revealed, but that, due to the insistence of the authorities across the seas, they were sent over as soon as they were built?

Gen. KENLY. That is my understanding of it; yes, sir.

The CHAIRMAN. So that the plan which you wanted to follow here would probably have revealed these defects if you had been permitted to carry it out?

Gen. KENLY. Yes, sir.

Senator NEW. Have we built any airplanes in this country for service at the front other than the De Haviland 4?

Gen. KENLY. I believe, sir, that I can say safely that none have been shipped overseas, if they have been built, but I think none have been built. The Bristol fighter, of which they have built quite a number, has not been shipped overseas.

Senator NEW. The United States Government did adopt the Bristol fighter as one of its machines for production, I believe?

Gen. KENLY. Yes, sir.

Senator NEW. That was being made at the Curtiss plant in Buffalo; isn't that the fact?

Gen. KENLY. Yes, sir.

Senator NEW. General, is it true that a board of officers from the Signal Corps went by official direction to Buffalo within the last week to inspect and report on the conditions with reference to the Bristol fighter?

Gen. KENLY. That is true. There was a board sent by me, at the request of Mr. Ryan, and they have been back a week.

Senator NEW. Did it make such a report?

Gen. KENLY. I have never seen an official report, but Maj. Jones, who was a member of that board, told me upon his return that the board had recommended the discontinuance of the production of the Bristol fighter.

Mr. Potter, I think it was, told me that he had informed the Secretary of War, and I believe yesterday, due to the report of this board, they had decided absolutely to discontinue further production of the Bristol fighter.

Senator NEW. To what do you attribute our lack of success in copying the Bristol fighter?

Gen. KENLY. I think, sir, that it is the result of the desire of the production people to turn out something which they thought would fly, without consulting experienced aeronautical engineers who could have told them that it was an impossible situation.

Senator NEW. In other words, the designers of that machine and those who were familiar with it were not consulted about the changes that were made at the factories; is that the truth?

Gen. KENLY. That would be the only reasonable deduction I could make, sir.

Senator NEW. I will say here that the testimony of other officers of the department has been to the effect that the weight of that machine was so increased at the factory that whereas it had been originally designed to carry a wing load of 7.1, it had been forced to carry a wing load of 9.2, which was entirely too heavy a load and rendered the machine unsuitable, unstable, and dangerous. You confirm that opinion?

Gen. KENLY. That is my understanding, purely from hearsay, however.

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Senator REED. That is the result of your investigation?

Gen. KENLY. Yes, sir; without having seen the report of the board, except being told by Col. Jones that the board had said it was unsuited to do anything with, even if you stripped it; that it was not fitted to be used as a training plane because it had too great weight per square foot of wing surface.

Senator NEW. Then the Bristol fighter is to be entirely abandoned?

Gen. KENLY. That is my understanding; that it had been recommended to the Secretary of War to entirely abandon it.

Senator NEW. Can you tell us how many planes had been completed?

Gen. KENLY. I do not know that.

Senator REED. Can you tell us from your records the amount of money which has been expended in producing the Bristol fighter, not only the completed machines, but including the whole Bristol fighter program. I mean to include in that any money that has been employed for any purpose in order to produce these machines. Include the number of machines completed, the number of uncompleted machines, and the amount of material that may have been so used as to not be available for other work. In other words, I want the loss incident to this transaction.

The CHAIRMAN. May I suggest that as Gen. Kenly is going away to-night, I can probably get that information from the department?

Gen. KENLY. If you will allow me to say so, I can get that, but that is a question of production. Mr. Ryan has all that data. He is responsible for all these things.

Senator NEW. Have we developed or copied a successful single-seater machine for fighting?

Gen. KENLY. I do not believe we have, sir.

Senator NEW. How about the Spad? What is your estimate of that machine?

Gen. KENLY. The Spad, so far as I know, is still one of the best single-seater fighters on the western front.

Senator NEW. It is still in use by the French?

Gen. KENLY. Yes, sir. We have one squadron using it. The old Lafayette squadron had the Spad when I came back.

Senator NEW. We, at one time, had the Spad on our program for production, I believe?

Gen. KENLY. Yes, sir.

Senator NEW. Afterwards its manufacture was ordered discontinued, and it was discontinued?

Gen. KENLY. Yes, sir.

Senator NEW. Do you know why?

Gen. KENLY. All I know is, sir, that the cable records show that Gen. Pershing asked that that program be cut out; that the building of the Spad be discontinued.

Senator NEW. I was going to ask you, General, especially about that cable. Do you know whether there is, in fact, a record of the cable having been received by the department from Gen. Pershing in which the Spad is specifically mentioned?

Gen. KENLY. Yes, sir.

Senator NEW. In which he asks that it be cut out?

Gen. KENLY. Yes, sir. I do not know whether we have got it yet or not, but we will furnish you a copy of that cable.

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Senator REED. How do you account for that? You say it is a good machine for use on the front?

Gen. KENLY. I do not know exactly how to account for it, unless it is a question of engine production—the particular type for it. I have also understood, without being specifically so informed, or positively assured of it, that it was the idea that we should build rather a big bombing type—a two-seater type—in this country, and be furnished a one seater from overseas, from the French and British, and, possibly, the Italians. I speak with more or less uncertainty. For two months before I came back I had not been near the air service, and many things have transpired during that time that I picked up by hearsay or by digging it out myself, and this Spad situation is one of them.

Senator REED. Hove you gone back to making them again?

Gen. KENLY. No, sir.

Senator REED. Are we not making the equivalent of it in the SE5?

Gen. KENLY. Yes, sir. It is practically a two-seater Spad.

Senator REED. We were furnished by the French with a Spad machine—the single-seater machine?

Gen. KENLY. They have equipped more than 1 squadron over there. We have 13 squadrons on the front.

Senator REED. How many men would be in a squadron?

Gen. KENLY. They run from 18 to 21. There are about 3 extra men.

Senator REED. That would mean 21 machines.

Gen. KENLY. The replacement is considerable, you know.

Senator NEW. The replacement of machines or pilots?

Gen. KENLY. It is really pilots. The replacement of machines is an uncertain thing. You may have no replacements and you may have to replace them all in two or three days. It depends upon luck.

Senator REED. That number of machines is, of course, a bagatelle compared with the actual demand?

Gen. KENLY. Yes, sir.

Senator REED. And that does not fill the demand in any way.

Gen. KENLY. No, sir.

Senator REED. Do you know whether we have been promised a large number of these Spad machines?

Gen. KENLY. I could not say.

Senator REED. General, without wanting to press the point importunately, it seems to me a very peculiar thing that there were 2,000 Spads ordered in this country from, I think, one factory, and work had progressed to some extent upon them, if the French had been ready and willing all the time to furnish us those 2,000 machines; secondly, it is very strange that that work was absolutely stopped unless the French had promised us at that time the necessary number of Spads or similar machines; third, it is strange that we find ourselves to-day not making any Spads and not being furnished with any Spads to speak of, and then going over to the SE-5, which is a two-seater instead of a one-seater machine, thus leaving us almost without a one-seater plane.

Gen. KENLY. This other machine has the performance practically of a two-seater Spad.

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Senator REED. There ought to be some reason for that situation. I wonder how it is possible to get at it. It seems to me that it is a matter of vital importance.

Senator NEW. General, who should determine the type and character of machines that we are to make and use in our warfare?

Gen. KENLY. It is agreed, sir, that Gen. Pershing shall tell us what he wants. Then I agree with him or disagree with him, and we settle it between us, and then I tell the production division to put such and such a thing into production.

Senator REED. That has only happened since you came in?

Gen. KENLY. Before that I do not know what happened. It has taken quite a lot of talking to agree on that.

Senator NEW. That is a recent development, as Senator Reed has suggested.

Gen. KENLY. Mr. Ryan and I signed that agreement to that effect.

Senator NEW. You said a moment ago that we had 13 squadrons on the front.

Gen. KENLY. The cable advices give that.

Senator NEW. And there are 18 men to the squadron?

Gen. KENLY. That is the normal number, but they usually have 21 flyers.

Senator NEW. That would mean 273 pilots, American pilots, that are on duty on the various fronts?

Gen. KENLY. Yes, sir; approximately that, because there may be 21 in some squadrons, while others may have 20. Eighteen is the minimum.

Senator NEW. That is approximately the figure?

Gen. KENLY. Yes, sir.

Senator REED. How many machines have they got that were made in America?

Gen. KENLY. That have been shipped over?

Senator REED. I mean that they have got.

Gen. KENLY. American flying machines?

Senator REED. Yes.

Gen. KENLY. We have not any advice that they are flying any.

Senator NEW. Has our Army designed service machines, to your knowledge?

Gen. KENLY. To my knowledge, no, sir. There have been training planes designed, but as to the others, I believe not. I can not say absolutely authoritatively about that.

Senator NEW. Now, General, I have one or two more questions to ask. You are the head of the military air service?

Gen. KENLY. Yes, sir.

Senator NEW. What, in your opinion, has been wrong with our system that we have failed to produce more successful service machines?

Gen. KENLY. I think it has been a matter of proper organization and proper direction of that organization by the military head of aviation. I think they would have been further advanced than they now are, although I think the production of airplanes up to the present time, so far as quantity goes, has been very creditable, considering that it has been done within practically one year, if there had been proper organization.

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Senator REED. General, what does quantity amount to when you take $6,000,000 worth of planes of one type and throw them out of use because a lot of gallant fellows have been killed in them? That kind of quantity production is no good.

Gen. KENLY. No.

Senator REED. Take a plane like the Bristol. Many millions of dollars have been lost, and that has been thrown out. That kind of quantity production counts for nothing.

Gen. KENLY. It is worse than nothing.

Senator REED. Yes; it is worse than nothing. Now, as a matter of fact, speaking of quantity, we have not produced in this country yet and put on the front one single-seater fighting plane, have we?

Gen. KENLY. We have not, sir.

Senator REED. We have none under way, so far as you know?

Gen. KENLY. We have not.

Senator REED. And yet that character of plane is used extensively by all of the nations on the battle front?

Gen. KENLY. Yes, sir.

Senator REED. We have not produced in this country a single night bombing machine which is in operation, have we? I mean by that one of the large, heavy type of machines.

Gen. KENLY. There have been two turned out; one was the Handley-Page and the other the Caproni.

Senator REED. They have been recently developed?

Gen. KENLY. Quite recently.

Senator REED. And can hardly be said to be thoroughly tried out in this country?

Gen. KENLY. They are not thoroughly tested; no, sir.

Senator REED. Of course, they have not been to the battle front?

Gen. KENLY. No, sir.

Senator REED. We have not produced a single two-seater fighter that is upon the battle front at this time, have we?

Gen. KENLY. We have not.

Senator REED. The only machine that we have produced and that is upon the battle front, or, I mean, has gotten over there and is at work, is the DeHaviland 4; that is correct, is it not?

Gen. KENLY. That is correct.

Senator REED. And the number of those that have gone across is very small, and their advent upon the western front is very recent; that is correct, is it not?

Gen. KENLY. Yes, sir; that is correct?

Senator REED. In the meantime we have expended all of the Government's $640,000,000 appropriation which was made in one lump, have we not?

Gen. KENLY. From my recollection of some testimony that I heard on that subject by production before the Military Committee of the House, I should say that we were overobligated for that amount, but as the results of the contracts about two-thirds have been received; that is, they paid out something like $200,000,000, and the balance would come along in time.

Senator REED. Yes; but in addition to the obligation of the $640,000,000, you understand, do you not, that there are about $250,000,000 more of obligations outstanding?

Gen. KENLY. Yes; I understand that.

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Senator REED. So that the amount expended or obligated approximates $1,000,000,000?

Gen. KENLY. That is my understanding.

Senator REED. Now, let us see; we have under way in production, if the Bristol fighter is thrown out, a single two-seater fighting machine, have we?

Gen. KENLY. That is true, sir.

Senator REED. How about the SE 5's? Do you call that a fighting machine?

Gen. KENLY. That would be a fighting machine.

Senator REED. Have they been started in production?

Gen. KENLY. I believe they expect them in October.

Senator REED. So that we may say that is on the way. I want to get it as it is. I do not want to overstate it.

Gen. KENLY. Yes.

Senator REED. Now, General, isn't a great deal of this trouble due to the fact that they have been trying to force one engine into different types of machines, and that that engine itself has been undergoing a process of development and that kind of experiment which must go with every new piece of machinery? Isn't that largely the cause of this situation?

Gen. KENLY. I absolutely believe that is the reason for it.

Senator REED. I want to ask you now your opinion as an expert about this. Should we or not, at the beginning of this war, have selected one or more of each of the most approved types of machines employed by the French, English, or Italians, and have entered upon that production in this country, making as nearly exact copies as possible, and have done that without waiting to develop engines and planes for ourselves, thus making our whole program dependent upon an engine which we might develop?

Gen. KENLY. I believe, sir, if that had been done we would have been very much further forward than we are now.

Senator REED. Is it not known to you—and I ask this, thinking that you may possibly have heard of it—that when Italy entered this war, not being much of an aeroplane-producing country at that time, it did substantially the thing I have suggested in my previous question; that is, sent to France and obtained French experts, French machines, and French drawings, and proceeded at once to the making of machines of that type, and then at about the same time allowed her own engineers to begin the development of Italian machines, carrying along the two programs, one of copying a successful machine abroad and the other of trying to produce one themselves? Do you know about that?

Gen. KENLY. I have understood that was the case.

Senator REED. And the result has been, has it not, that Italy had got herself pretty well supplied with planes pretty early in the contest?

Gen. KENLY. Yes, sir.

Senator REED. You think that should have been done here, do you not? You think that program should have been followed?

Gen. KENLY. I will say I believe if it had been done we would be very much further forward. Of course, there are many considerations entering into these things.

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Senator REED. Oh, certainly. There was in this country a factory at the time we entered this war that was engaged in making the Hispano-Suiza engine, was there not?

Gen. KENLY. I can not answer that question.

Senator REED. You can not answer that question?

Gen. KENLY. No, sir; I do not know that, sir.

Senator REED. Is it not a fact that now, after having occupied all these months in the method that they have been described as having been occupied, we are now substantially beginning on the program that has been suggested by my two or three previous questions; that is to say, are we not now beginning to adopt machines, and machines that are to be equipped with other engines than the Liberty engines?

Gen. KENLY. Yes, sir. We are making arrangements to build the Hispano-Suiza motor that you have just spoken of.

Senator REED. What is the arrangement we are entering into with reference to the Hispano-Suiza motor?

Gen. KENLY. I really could not give you definite information on that.

Senator REED. I do not mean the details.

Gen. KENLY. We are building the 150 and the 300 horsepower Hispano-Suiza motors.

Senator REED. In quantity?

Gen. KENLY. In considerable quantity. I do not know to what extent, but it is quite large.

Senator REED. And we are going to put them into what character of machines?

Gen. KENLY. We are using a great many of them, sir, in our J. N. 4 H, so called, which is one of the advanced types of training machines. We are using those very largely.

Senator REED. The 300-horsepower Hispano-Suiza is going to be used in the machine that is expected to fly over the lines, is it not?

Gen. KENLY. That is my understanding.

Senator REED. It would be very well adapted for that, would it not?

Gen. KENLY. It is a very excellent engine, the Hispano-Suiza. I know that myself.

Senator REED. There are some other engines, are there not, that we are now getting ready to produce? Are we not getting ready to produce some of the English engines?

Gen. KENLY. That I am really unable to answer.

The CHAIRMAN. The Le Rhone is in production.

Gen. KENLY. Oh, the Le Rhone is in production. Some of the rotary engines, I know. Some of those rotary engines we have already produced considerable numbers of.

Senator NEW. Can you tell us anything about the character of the contracts under which those engines—the Hispano-Suiza, the Liberties, and the Le Rhones—are to be made? Let me explain that question. We know, of course, the number of Liberty engines that had been contracted for originally. We will say now the same thing with reference to the Hispano-Suizas and the Le Rhones. Now, I understand that orders have been issued for an additional number of engines of each of those types and that contracts for them, while not yet made, are under consideration; and in our investigations it has been developed here that the profits to the manufacturers making

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the Liberty motors are in the neighborhood of $1,100 per motor, and that the profits to the makers of the Le Rhone engines are in excess of $1,600 per motor. I think I am right in those figures. It is not less than $1,600 on the Le Rhone motor. Do you know whether anything is being done to make the award of the next contracts at a less cost to the Government than the first one?

Gen. KENLY. I can give you those figures, but I regard this as highly confidential.

(Informal discussion followed, which the reporter was directed not to record.)

Senator NEW. As I remember it, my last question was one in which I asked you what was wrong with our system; that we had failed to produce more successful service machines, and you said, in general terms, you thought it was defective organization. Now, I will ask you, General, if it is not true that under that system of organization or lack of organization, just as you prefer, there has not been much confusion at times that has resulted in misunderstanding and delays?

Gen. KENLY. I am sure of that, sir.

Senator NEW. Has not this occurred also—and I think you made a slight reference to this in your earlier testimony—that cablegrams from Gen. Pershing intended for your department had been received by the production department?

The CHAIRMAN. Senator, all those cables go to the Secretary of War.

Senator NEW. Well, have been referred to the production department and answered by it without reference to your department, resulting in confusion or wrong answers, or answers that were at least unsatisfactory to your department, and generally calculated to mislead both here and abroad?

Gen. KENLY. There have been instances of that, sir. Right now all cables that come that have anything to do with either the production or my department, I see. I also see all copies that go out.

Senator NEW. That, also, is a matter of recent correction, is it not?

Gen. KENLY. Yes, sir. I believe it is comparatively recent.

Senator NEW. Now, to get down to bedrock: This committee, of course, is more interested in building up for the future than it is in criticism of what has passed, or in tearing down just for the sake of tearing down. With that in view, we would like to have any suggestions you may have that you think might be acted upon that would result in bettering our system.

Gen. KENLY. I will tell you, sir, exactly what the relations between Mr. Ryan and myself have been up to date. It became evident at first to me that with an independent head of production and an independent head of operations, which I am—I have no power to direct Mr. Ryan to do anything, nor can he give me any directions—the success of our work would be dependent upon the closest sort of cooperation. To parallel each other we would have to be very, very close, and if we really succeeded, it would be because we were so thoroughly in touch with each other and sincerely desired to cooperate.

The CHAIRMAN. Thoroughly of one mind?

Gen. KENLY. Yes; thoroughly of one mind. Then we might succeed. It is a difficult question. First of all, we came to an agreement. It seemed to be necessary that something of the sort should be done.

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The agreement was put in writing, and a copy was sent to the Chief of Staff. The substance of it was that I would tell Mr. Ryan what we wanted in the way of production and he would produce it. We would test it and O. K. it, or suggest modifications, and, finally, we would approve it, and then it would be put into production. When produced it would be turned over to me. In a general way, that was the original agreement. Quite recently, due to all sorts of friction that we found growing up, and a lack of cooperation on the part of subordinates, particularly along technical and engineering lines, we have just agreed to a certain arrangement, and I turned in to the Chief of Staff this morning a document signed by Mr. Ryan and myself to this effect: That we would combine our engineering sections—my technical section and his so-called engineering section—and they would be stationed at Dayton, Ohio, for the present and work together; that a head of that combined section, selected by Mr. Ryan and agreeable to me, would take charge of that combined section, working for both of us, however; that my technical section would report to a liaison technical officer in my office who was closely associated to a similar man in Mr. Ryan's office, so that I would get the operation's point of view from my own man weekly, but everything that came to me was also laid on the table for Mr. Ryan. His man did the same thing with him, and I saw that, and all our communications with the engineering section were sent to Mr. Ryan, and his to me, so that our cards are on the table.

I have instructed my own technical men that they have got to get along harmoniously out there; that it just has to be done. It would seem unnecessary, perhaps, to have to say that, but engineers and men of that type are very hard to get along with.

The CHAIRMAN. And they have a hard time getting along with each other?

Gen. KENLY. Yes, sir. They think their view is right. They are regular prima donnas. In addition to this, we agreed that I should establish a testing section, and that would be exclusively under my control.

The CHAIRMAN. Just one testing section?

Gen. KENLY. Just one testing section, and that is under me. We test and O. K. what he produces. This testing section also is trying to improve production all the time. It was agreed also that we would organize under me an information section, and we would establish agents overseas from whom we would get all the information we possibly could along the lines desired, for our mutual benefit. The Chief of Staff approved the list which I turned in to-day, which will be the beginning of that information process. These things have been agreed to by Mr. Ryan and me and put in writing. We put it in writing so that the Chief of Staff would have something for his files.

The CHAIRMAN. The purpose of the last agreement is to harmonize by unifying the production engineering section and the military engineering section?

Gen. KENLY. Yes, sir.

The CHAIRMAN. Presided over by one man to be selected by Mr. Ryan with your approval?

Gen. KENLY. Yes, sir.

The CHAIRMAN. About how many men constitute that engineering staff, General?

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Gen. KENLY. We have about 10 men, and I presume Mr. Ryan has about that many. That, however, is a growing organization, and it may be and will be much larger than that. Of course, that does not include the office forces, draftsmen, and men like that.

The CHAIRMAN. How have you arranged for the increase of this engineering force?

Gen. KENLY. There has been nothing said about that, sir. It is now arranged that anything proposed that Mr. Ryan and I agree to will be automatically done.

The CHAIRMAN. You anticipate no trouble?

Gen. KENLY. I will say that so far as Mr. Ryan and Mr. Potter are concerned, those two men have not shown the slightest indication of anything except a general desire to cooperate.

The CHAIRMAN. I am quite sure of that. Is there any other matter which, in your judgment, can be recommended that will still further improve conditions?

Gen. KENLY. I think, sir, under existing circumstances, that if this plan that we have under way works out all right there will be nothing more to be said right now.

The CHAIRMAN. And if it does not work out all right——

Gen. KENLY. Then something should be done. I have distinct views as to what might have been done to begin with, but I think we may get along all right this way.

The CHAIRMAN. In that connection, I would like to get your opinion of the policy or expediency of the establishment of a separate department of aeronautics, distinct from, and yet cooperating with, the Navy and War Departments.

Gen. KENLY. I believe, sir, it would be a very wise thing to do. It is a specialized arm of growing importance. I think the biggest thing in aviation that has been done has been the point of view taken by Great Britain.

The CHAIRMAN. That would contemplate an additional Cabinet officer representing the air service. I think the British call him the air minister.

Gen. KENLY. Yes, sir; it requires specialized study, because a man can not think of it casually and make the most of it. I think the British are on the right track.

The CHAIRMAN. While we are on this subject, please tell the committee whether there is any conflict or friction between the War Division of Aeronautics and the Navy Division of Aeronautics.

Gen. KENLY. There is no real friction, but there is a very strong feeling that the Navy is sometimes getting more than its share. They naturally want to get all they can. Before we met I mentioned, for instance, North Island, at San Diego.

Senator NEW. The Navy not only wants to get all they can, but they succeed in getting it, do they not?

Gen. KENLY. I feel rather keenly about it, because I went through the school out there when the Army had it alone. The Army had developed this alone under great difficulties. It was a question of acquiring that land from Mr. Spreckels when I was out there, and it was going to cost a lot of money. We had not entered the war. It was very desirable to have the Army own this and not be dependent upon the benevolence, so to speak, of Mr. Spreckels, because up to that time the Government had never paid a cent for it, nor had

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the Government paid taxes on the land. In the desire to acquire it, somebody proposed the cooperation of the Navy, and the Army and Navy combined—I assume this, because I left there and went overseas—and they finally acquired the land, and now the Navy is gradually shoving the Army out. They have all the land and buildings put up by the Army, and the Army is being pushed on the other side of the island. The Navy has all the water front, the sea front, and there is no doubt that it should be exclusively handled by the Army or the Navy. When I come back I shall have a definite recommendation to make as to whether one or the other shall have it. That is one thing that could be settled if one man had to handle it. The Secretary of the Navy now will say, "We should have it." And the Secretary of War will say, "We should have it." Who is going to decide without friction?

(Informal discussion.)

Senator REED. You were speaking a while ago of the different types of engines that are now being made, and the fact that we are finally coming to the point of making foreign planes and foreign engines and putting them together and proceeding to make some of them in this country. We have been speaking also of our failure up to date to get any real fighting planes. What is your program, General, in order to get these planes in quantity and of the character that we desire and need?

Gen. KENLY. We are following now, sir, absolutely the over-seas program; that is, Gen. Pershing's request of an O. K. by the Chief of Staff and the production of the De Haviland 4. The Bristol fighter has been discontinued, as I have said, and we have already referred to the S. E. 5. That is all they are contemplating at the present time.

Senator REED. In the meantime what becomes of these immense factories that have been devoted to the airplane business?

Gen. KENLY. They are still building a certain number of training planes, and they are supposed to switch to the other planes that are approved and that will be in production.

Senator REED. Those are the ones just mentioned—the De Haviland 4, the S. E. 5, and what other machines?

Gen. KENLY. There are various advanced training machines that have to be, as the program goes along, constantly replaced, and there are the bombing, observation, pursuit, and M defense machines.

Senator REED. Those are advanced training planes?

Gen. KENLY. Yes, sir; those are advanced training planes. Just at the present time we have a very small number, an insufficient number.

Senator REED. At the present time?

Gen. KENLY. At the present time; yes, sir.

Senator REED. As a matter of fact, while they may not be sufficient to complete the program, the necessity for them is not anything like as great as it is for the fighting planes on the front?

Gen. KENLY. No.

Senator REED. Now, what I am trying to get at is, What is the program with reference to the fighting planes on the front? As I understand it, nothing besides the S. E. 5 and the D. H. 4 have been determined upon?

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Gen. KENLY. And the Handley-Page and the Caproni.

Senator REED. The Handley-Page and the Caproni have been ordered in some quantities?

Gen. KENLY. Yes, sir.

Senator REED. They have?

Gen. KENLY. Yes. Then there is the D. H. 9 and also the D. H. 10, which may be modified without holding up production.

Senator REED. What will we have to take the place of the discontinued Bristol fighter?

Gen. KENLY. That is a thing to be determined at once, sir. We have not been officially notified beyond what I told you is my unofficial notification. That has got to be replaced very quickly by something that is satisfactory to Gen. Pershing. The program of production over here so far has been one that he has had a guiding hand in, the supposition being, or the claim being, that they want quantity production over here of things that can not be produced satisfactorily over there. We want two-seater machines. They say they can furnish us with one-seaters. As a matter of fact, we can not have too many of them.

Senator REED. As a matter of fact, they have not been furnished.

Gen. KENLY. No, sir.

Senator REED. As a matter of fact, as was testified the other day by a young officer sent over there on the business of inspecting and finding out these things, the planes we are using over there of English and French make are an inferior class of machine?

Gen. KENLY. They are, except a few Spads.

Senator REED. Why isn't it a proper thing to make those Spad machines and get them out in quantity?

Gen. KENLY. If I were chief of the Air Service in both France and here, I would decide that matter myself; but as it is, Gen. Pershing asks for something, and it is approved by the General Staff. That is the program that is being pursued up to the present time.

Senator REED. The fact of the matter is it is all a mixed-up jumble?

Gen. KENLY. Yes, sir. If you could look over the cables that I have, you would find a cable from overseas asks for one thing one day and the next day countermands the order, and then the next day asks for it again, and a week later again countermands it. It is entirely a jumble.

Senator REED. A thing that should be gotten at.

Gen. KENLY. Yes, sir; if we are going to get out of it. They have recently appointed a chief of air service. It is expected that he will do something. He is Gen. Patrick.

Senator REED. As a matter of fact, we have spoken of 273 planes with flyers on the front with the Army. We now have an Army of 1,200,000 men. How many planes should we have?

Gen. KENLY. I would have to figure that up. The program calls for 350 squadrons by next year. The original project contemplated two armies by next summer. We have one there now. We ought to have about 175 squadrons instead of 13. That is what we would like to have.

Senator REED. I am talking about the proper equipment.

Gen. KENLY. Yes.

Senator REED. That would be about 175 times 20?

Gen. KENLY. Yes.

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Senator REED. So that we ought to have about 3,500 instead of 273?

Gen. KENLY. We have got men there.

Senator REED. You are up on the man program, but back on the machine program?

Gen. KENLY. Yes. We are really ahead on the man program. We have about that many pilots on the other side now—over 3,000 pilots now.

Senator REED. I want to ask you about this: You seemed to agree to the proposition that the right thing to do was to take a good English machine and reproduce it, or a good French machine and reproduce it, or a good Italian machine and reproduce it, and in the meantime carry along our own efforts to make our own engines and, perhaps, our own planes. Now, we have started into the manufacture of the Caproni. Why is it that the experts sent here from Italy are not given charge of the production of the very machine that they were sent here to teach us how to make?

Gen. KENLY. I understand that they are supervising it, just as the English are supervising the production of the Handley-Page, but the labor and all that sort of thing is American.

Senator REED. I want to draw a distinction between your statement, if I can, and what I understand is the case. I am going to put it in just as a plain statement of facts. I understand that representatives of the American Government saw Mr. Caproni and expressed the desire that he should furnish or help put this Government in a way to produce a Caproni machine. He sent the superintendent of his factory and a great number of his finest experts over here in order to help us get these machines and get them very promptly. These men have been sent from place to place, and they are now practically marooned out here on Long Island. The production of their machine is going on, but instead of their being put in charge of the work they are at best used in some sort of a minor capacity. I am suggesting this, not by way of criticism, but with the thought that it seems to me to be a bad arrangement, and I know that it is very disappointing to those officers, even heartbreaking to them.

Gen. KENLY. The men that I have seen at Long Island have apparently been more interested in flying the Caproni they had up there than anything else. They were interested in that side of it. The men were pilots.

Senator REED. I am speaking of such men as Capt. D'Annunzio. He expressed the sentiment to me that I have just expressed to you.

Gen. KENLY. That is a thing, being purely production, that I never had presented to me before, and therefore I have really never given it consideration, but I will give it consideration.

(Informal discussion occurred.)

Senator REED. There have been complaints of improper inspection at the factories. There has been some claim that the factories, in some instances, are trying to put off inferior work, and that the inspectors of the Government have not caught it. Do you have charge of that work?

Gen. KENLY. No, sir. We inspect the finished product, but not any part of the production.

Senator REED. Mr. Chairman, if you will permit me to make a suggestion, I think we should send Gen. Kenly all of this evidence, and particularly a marked copy of this testimony with reference to im-

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proper inspection, so that he can have it before him when it is sent for revision.

The CHAIRMAN. Is it not a fact, General, that you and Mr. Ryan have arranged for a thorough revolution in the methods of inspection to be put into operation as fast as possible, which has for its fundamental basis the employment of only such inspectors as are sufficiently well acquainted with the things they inspect to make them themselves?

Gen. KENLY. That is absolutely the fact.

The CHAIRMAN. Or are so thoroughly posted in the character and quality of material as to be able to detect anything that was wrong?

Gen. KENLY. I was assured by Mr. Ryan that every inspector would be an expert at the thing he inspected.

(Informal discussion occurred.)

Senator REED. I want to ask a question along this same line. Do you think that a proper inspection of the merits of a machine is likely to result when one of the makers of that machine is in charge of production and another one of the makers of that machine is in charge of the final test?

Gen. KENLY. Do you mean maker or designer?

Senator REED. Designer. Do you think that is the best way to get good results?

Gen. KENLY. No, sir; I do not think so.

Senator REED. I call your attention to the fact that Col. Hall and Col. Vincent are credited with having designed the Liberty motor. I apprehend that, like all other machines, the designs of many other men are wrought into it, but they, together, chiefly designed the Liberty motor as we know it. As I understand the situation, Col. Hall has been placed largely in charge of the production of the motor; that is, the inspection of the motor and the installation of the motors in the planes. That, then, when the plane is completed, it goes to the McCook testing field, and when it goes there, it is tested by Col. Vincent, so that the two men who designed the Liberty motor produce it and inspect it.

Gen. KENLY. That does not exist now.

Senator REED. When did that cease?

Gen. KENLY. When they get through producing it they turn it over to me and I test it.

Senator REED. That is very recent, is it not?

Gen. KENLY. I thought that was so axiomatic that there would be no opposition to it, but I found it was not being done. It was being done the way you have stated, and there was considerable opposition to changing it.

Senator REED. When did you change that—about how long ago?

Gen. KENLY. This first agreement in writing between Mr. Ryan and myself is a matter of record.

Senator REED. I do not ask you to be accurate about the exact date.

Gen. KENLY. I should say it has been six or eight weeks ago when we made this agreement, and it has been, possibly, four weeks since we really got the thing going.

Senator REED. As a matter of fact, is Vincent now out of the position that I have referred to over there at McCook field?

Gen. KENLY. I do not know just exactly what kind of testing they do on their own hook, but I test them before they are accepted.

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Senator REED. Do you mean that they are individually tested by you?

Gen. KENLY. Oh, no, sir.

Senator REED. Is Hall one of the staff that makes inspections now?

Gen. KENLY. No.

The CHAIRMAN. Is Commander Barry?

Gen. KENLY. The man who is doing that specifically is directly under Col. Bane. Col. Bane is going to be with the rest of the technical men in Dayton, right where the thing is going on. We are interested from the standpoint of the men who are going to use it and fly it, and, therefore, in association with the production engineers Col. Bane and the other men who are particularly interested in my point of view will go right through the factories and satisfy themselves that the factory inspection and production inspection are as they should be. Although that is really under the control of production, we will assure ourselves that the thing is going right, and if it is not going right, Mr. Ryan and I will have to take it up and settle it.

Senator REED. You say you found there was some opposition to changing the conditions that I spoke of. Does that opposition come from any of the manufacturers?

Gen. KENLY. No, sir; it was the opposition of some of Mr. Ryan's subordinates here who had been doing the thing, and therefore they did not like to give it up.

Senator REED. Were they men who formerly had been connected with automobile concerns?

Gen. KENLY. I think not.

Senator REED. Were they Regular Army officers?

Gen. KENLY. No.

Senator REED. Were they dollar-a-year men?

Gen. KENLY. The man I am thinking about is Col. Horner. He is a belligerent sort of man, who does not like to give up anything he has. I do not attribute it to anything more than that. I do not see at present that there is anything to be apprehensive about.

Senator REED. Very well. I think that is one of the chief difficulties.

(Informal discussion occurred.)

Senator REED. Do the flying fields come under you?

Gen. KENLY. Yes, sir.

Senator REED. Are you preparing to locate some new flying fields?

Gen. KENLY. We have no need for them at present. We have a great many tentative sites that are admirably suited, if we have occasion to use them.

Senator NEW. In what parts of the country?

Gen. KENLY. I could not say, except in a general way that they cover all parts of the country.

Senator REED. Do you propose to change the character of the work done at the Wilbur Wright Field so that it will become a testing field?

Gen. KENLY. Yes, sir.

Senator REED. Is that because McCook Field has been found to be inadequate?

Gen. KENLY. No. It was simply so that I could have a place for a testing squadron near enough to one of our big production plants. like

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the Dayton Wright people, where, when they turn anything over, we can fly right over there and test it. The field is already in excellent condition.

Senator REED. Why not use McCook Field for that?

Gen. KENLY. There is a certain amount of testing which production has to have. It is preliminary testing with relation to production. That has been under their control. We did not want both. We want one, so we permitted them to hold onto McCook Field with out any question at all.

Senator REED. Who wants that—the producers?

Gen. KENLY. The producers.

Senator REED. McCook Field is too small a field for real testing, is it not?

Gen. KENLY. Yes, sir; it is too small a field for real testing. It is too small where you want about 2 miles straight away. The McCook Field will be used by this joint engineering section, from which my men will get equal benefit. They will be located at that field with an experimental laboratory, etc., right at the McCook Field.

Senator REED. What are you going to do if there comes a flood on that Wilbur Wright Field?

Gen. KENLY. In the first place, it will be properly ditched. I understand there has been some expression of doubt about the accuracy of some surveys that I had made by the "floods engineers"—I think they are called out there. I looked into that thing when I was out there. The question of the flooded hangars and all that was looked into. I went down to that office, and I subsequently got a contour map of that field. According to that map, the very lowest point on any part of the Government holding in the swamp and down there in one corner is something like 10 feet above the main creek bottom. I was told by Maj. Wilburn, commander of the field, that there were many portions of the field that were as low as the creek bottom, and very little higher. This contour map did not show that. It ran from 10 to 25 or 30 feet. But, in the event of flood, the way it is now, sir, the whole thing would be under water in an ordinary rain, or a heavy rain. A portion is under flood now because it is not drained properly. However, if this contour map is accurate, the very simplest kind of engineering is involved in properly draining the field.

The CHAIRMAN. It is, however, hardly a field that you would have selected if the selection had been left to you?

Gen. KENLY. No, sir.

Senator REED. I think you had better examine that map. I think it is a perfect maze of swamp.

Gen. KENLY. It is perfectly easy to find out. It can be done in half an hour.

Senator NEW. Gen. Kenly spoke of these contracts which were up before the board the other day. I suggest that we get somebody from up there who can give us the figures on which they are proposing to let the contracts.

Gen. KENLY. Mr. Potter can do that. He can give you every detail. He can give you not only the details in regard to that, but about all matters connected with contracts in connection with production.

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Senator NEW. If you can furnish those figures I see no reason why we should summon any other witnesses.

Gen. KENLY. I can not give them to you, sir.

Senator NEW. If you can not, I would like to have those figures from that board.

Gen. KENLY. Contracts and various things of that kind that are proposed are brought before the Aircraft Board for approval. I am a member of that board. They are discussed in a general way, but as to going into them in detail, I have not seen that done.

Senator NEW. Mr. Potter could do it?

Gen. KENLY. Yes, sir.

The CHAIRMAN. I received this morning from Col. Arnold a statement in response to an inquiry which I addressed to him of the number of planes and the types of planes which have been furnished to our squadrons on the front up to this time, making a total of 271. If you do not object, General, I will have this put in the record as a part of your statement.

Gen. KENLY. All right, sir.

(The statement referred to is in the words and figures following, to wit:)

WAR DEPARTMENT,
OFFICE OF THE DIRECTOR OF MILITARY AERONAUTICS,
Washington, July 19, 1918.

From: Department of Military Aeronautics.
To: Hon. Charles S. Thomas, Committee on Coast Defense, United States Senate.
Subject: Equipment of American air squadrons at the front.

1. Answering your inquiry regarding the above subject, addressed to Maj. Gen. William L. Kenly, the following is submitted for your information:

From the latest reports from the American Expeditionary Forces, there are at present 13 squadrons at the front, equipped with 271 planes purchased from foreign governments of the following types:

Name.	Type.	Engine.	Delivered.
Breguet XIV B2	Bomber	Renault, 300 horsepower	20
Breguet XIV A2	Observation	do	23
Sopwith A2	do	Le Rhone, 120 horsepower	71
Sopwith B2	Bomber	Clerget, 120 horsepower	35
Spad XI	Pursuit	Hispano, 220 horsepower	22
Spad A2	Observation	Gnome, 150 horsepower	
Spad 6147	Pursuit	Hispano, 220 horsepower	26
Nieuport 28	do	Le Rhone, 120 horsepower	9
Voisin VIII	Night bomber	Pregiot, 220 horsepower	6
Italian manufacture:			
Caproni	Bomber	Isotta, 265 horsepower	15
S. I. A	Day bomber	Fiat, 290 horsepower	44
Total			271

2. Regarding the second paragraph of your letter, a cable has been sent asking for the information regarding the number and performance of American-made machines at the front, which information will be forwarded to you as soon as received.

By direction of Maj. Gen. Kenly.

H. H. ARNOLD,
Colonel, Signal Corps,
Assistant Director of Military Aeronautics.

(Thereupon, at 4.30 o'clock p. m., the committee adjourned.)

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REPORT OF SENATOR FRELINGHUYSEN ON THE AERO-MARINE PLANE AND MOTOR CO. (INC.), KEYPORT, N. J.

I visited this plant on Saturday, July 6, 1918.

This is a small plant, manufacturing single pontoon hydroplanes of the advanced training type, equipped with the Curtiss OWX engines. They are building them under contract No. 3252 for the United States Navy; contract dated October 27, 1917. The order is for 200 machines and 50 sets of spares, to be completed in one year.

The capital of the company is $50,000; the president is Englis M. Uppercu, the agent for the Cadillac Automobile Co. in New York City; J. S. German is vice president and E. D. Newman, secretary. They employ 975 hands, mostly all Americans, many of them being boat builders and carpenters from along the Jersey coast.

The plant is the outgrowth of eight years' experience in aircraft experiment and was formerly located at Nutley, N. J., under the same name. The morale of the workmen is excellent; the efficiency of high standard. The plant is protected by a company of police under an ex-New York detective, who is chief of watchmen. They produce a hydroplane for the United States Navy at an estimated cost of $7,770.

Inasmuch as the contract is limited, as above, they stated to me a continuation of the production would probably reduce the cost, no machines having been rejected, and they state they are ahead of their orders. They have been having considerable trouble with the Dupont dope, stating that it would not hold.

They have had no difficulty in getting their spruce until recently, but are now splicing and using laminated spruce.

The plant is managed by Hinsdale Smith, a young man formerly president of the Springfield Metal Body Co., of Springfield, Mass.

The plant is an excellent one, shows good housekeeping, and the workmanship seems to be excellent.

Inasmuch as this plant is utilized at the present time by the United States Navy, it is expected that their full capacity will be needed. My inspection has no particular significance on this investigation except to show that in the event of enlargement of the plant they would have a capacity for building airplanes which might be utilized with the experience and organization they now have.

JOSEPH S. FRELINGHUYSEN.

BUREAU OF AIRCRAFT PRODUCTION—CAUSES OF DELAY.

[For Senator Thomas, May 31, 1918. Exhibit C.]

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I. General Cause of Delay.

Senator Thomas's letter dated May 27 requests "Reasons and excuses, if any, assigned for failure to produce all or insufficient production."

1. The delays in aircraft production are, for the most part, those incident to the creation, under strenuous conditions, of a new, highly technical industry. In this the experience of the United States closely follows that of the allies.

Submitted herewith is a copy of the British War Board's report, which, after three years of war, very accurately describes our first year's experience and might well serve as an answer to your inquiry.

2. At the time the United States entered the war there did not exist in this country specialists trained in the design, manufacture, and use of airplanes, engines, and their accessories suitable to combat work in Europe.

Our experience and such facilities as we had were limited to the simplest forms of flying machines, and up to that time no airplane had been built here that carried a machine gun, or bombs, or other kindred war paraphernalia. The few planes used in the Mexican campaign were flying machines only, and not combat machines.

Two European engines, developed under war conditions for airplane use, had been put into production here, the 100-horsepower Gnome and the 150-horsepower Hispano, but by the time our manufacturers had translated the European drawings so as to meet American conditions of manufacture and had made tools, bought raw materials, educated workmen, inspectors, etc., and obtained production, so much time had elapsed that these motors had been superseded on the front by others.

Up to the beginning of 1917 only 118 airplanes of all types had been delivered to the Army, 64 of these being delivered during 1916 and 54 during the eight years prior to 1916. Not only was there no industry for either combat planes or engines but there was no knowledge of what should be built or where to begin. There was no adequate organization in the Signal Corps, no Aircraft Board, and no program to work to.

The Aircraft Production Board was created in May, and a mission made up of Army and Navy officers and civilians, under Maj. Bolling, was sent to Europe in June to investigate in England, France, and Italy and to recommend types of engines, planes, and accessories, to negotiate for rights to manufacture such as were selected, and to ship sample planes, engines, instruments, accessories, and all necesary drawings, bills of material, specifications, and other data to facilitate production in this country.

Right here is where delay in the production of combat planes commenced. Samples of planes recommended for manufacture were not received in this country until five months after we declared war, and these samples were without engines, except the Spad, and such drawings as accompanied them were totally inadequate for duplication according to American methods of quantity production.

During the five months before samples were received, and while their redesign was being accomplished, all possible speed was put into the building of training planes and engines, so as not only to meet our training needs but to assist in the education of additional sources of supply available for the building of combat planes.

3. Detailed engineering information was not supplied promptly, stating what and how instruments, accessories, and ordnance should be placed on the combat planes.

4. Lack of sufficiently skilled instrument mechanics capable of interpreting and producing delicate instruments required for combat planes.

5. Lack of engineers skilled in the design and production difficulties of a combat airplane. This lack of proper engineering ability, which had not been developed in this country, was due to the fact that previous to the declaration of war there had not been a demand from the Government for the development and production of combat airplanes. This resulted in designs not being correctly made and the failures not being determined until tests could be made of the airplanes in the air.

6. Another most serious difficulty was the fact that after accessories, ordnance, and instrument equipment had been determined in December, 1917, and January, 1918, changes were directed by orders from the American Expeditionary Forces, dated January 10 and delivered in this country about February 16 to the Production Engineering Department. These changes involved serious

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complications, as the placing of two instead of one machine gun firing through the propeller. This change involved a redesign of the fuselage, cowl, and the arrangement of connections between the engine and the various instruments, due to additional space required for the cartridge boxes and the chutes for taking away the empty shells and the disintegrating links from the machine guns in such a way as to avoid interfering with the connections to the other apparatus, and also involved changes in the support of machine guns and other parts.

7. These difficulties were largely due to the distance of the United States from the front, and to the lack of capable trained technical personnal in both Europe and the United States. Furthermore there has not been organized up to this time an effective, continual weekly liaison between the technical departments in Europe, England, Italy, and the United States.

8. It must be further recognized that this country was called upon not only to educate the engineers, but to develop the manufacturing facilities for quantity production of combat engines, airplanes, and the many accessories, instruments and ordnance with which an airplane must be equipped. The difficulties can not be conceived or described. Experience only can enable the most capable engineering mind to interpret the requirements and performance of a combat plane; and, furthermore, the United States did not have a proper comprehension of a combat plane completely equipped, so vitally needed to guide the engineer and manufacturer before his design and manufacturing methods could be fully developed.

II. Specific Causes of Delay.

1. *Liberty engines.*—The first Liberty engine was of eight cylinders. The order to build it experimentally was given June 4, 1917, and the first sample was delivered and running in Washington about July 25. During August it became apparent, through cable advices from our mission in Europe, that the airplane art was progressing so rapidly that this eight-cylinder motor would in all probabilities be obsolete for combat work on the front by the time it was possible to produce it in quantities. Our mission in Europe urgently wished us to concentrate our energies upon the 12-cylinder Liberty instead. As the result of this our effort was transferred to the 12-cylinder, and tentative arrangements for the manufacture of the 8 cancelled in favor of the 12.

It is impossible, in a report as brief as this must be, to cover thoroughly all of the reasons for delays in the production of Liberty engines, and only a few will be mentioned.

The 12-cylinder Liberty was designed on the basis of developing 330 horsepower. Continual experiment developed improvements from time to time in such matters as carburetor, intake headers, cam shapes, etc., which gradually increased the power obtainable to over 400 horsepower. Each improvement as it came up was considered on its merits and decision reached as to whether its introduction was worth the delay and scrappage of material that might result from its adoption. When the Liberty engine was originally designed and rated at 330 horsepower it was believed that it would be possible to obtain much higher horsepower out of it, but it was not expected that this would be accomplished so soon.

Increasing the horsepower of the engine made necessary changes in parts which showed weakness under this increased power. Several important elements had to be strengthened, requiring the making of new dies, tools, and fixtures, and entailing a delay in production.

When the manufacturers began to produce parts for Liberty engines and to assemble these parts they made application for many changes to facilitate their own manufacturing operations.

When the engine was finally through its experimental and early manufacturing stages and being more generally used in airplanes in cross-country work, altitude tests, etc., difficulties with radiation, carburetion, and lubrication were encountered and had to be overcome.

In addition to these point, having to do more particularly with the original design and its transition through the stages of early experimentation, increase of horsepower, flying tests, and standardization for manufacture, there were many unlooked for difficulties to be overcome in the securing of the raw materials, equipping factories with machinery, tools and fixtures, and the training of skilled workmen under the strenuous conditions that have existed during the past six months. The making of the Liberty steel cylinder by the Ford Co.

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from tubing instead of from a solid forging, as was done with each of the experimental engines and with quite a number of the first deliveries, was in itself one of the real achievements in this part of our air program.

2. *Bristol fighter.*—This plane was received from England minus an engine, but designed to use either the Hispano-Suiza 200-horsepower or the Rolls-Royce 190-horsepower. This country was informed that engines of greater horsepower would be required, so as to get more speed and better performance. This Bristol fighter was therefore redesigned at the Smithsonian Institute so as to use a Liberty engine of increased length, weight, and power.

The design and sample plane were submitted to the Curtiss Co. in November, 1917, and when the first sample was assembled it was found that for manufacturing reasons changes had to be made. Almost coincident with these changes instructions were given by the American Expeditionary Forces to the production engineering department, under date of February 16, that two instead of one fixed machine gun, firing through the propeller, and other changes in instruments and accessories were to be made in equipping this plane. These changes and the lack of experience on the part of the manufacturer of this type of combat plane caused delays of at least six weeks.

When the first planes were built and tested it was found that the sample plane did not meet expectations as to the maneuverability. British fliers experienced in flying this Bristol fighter stated this to be their opinion, and changes necessary to obtain an improved performance are now being made. Official tests will be conducted as soon as these changes are completed in order to determine to what use this plane will be put by our forces in Europe.

The development of this American Bristol fighter is a particularly good illustration of the lack of airplane engineering talent and the necessity for the greatest caution in attempting to adapt an airplane to a particular engine.

(*a*) The principal difficulties causing delay in the production of this plane were due to a failure to determine what ordnance, accessories, and instruments would be used and where they would be placed.

(*b*) Lack of detailed engineering information concerning the radiator. Tests were made with this machine flying from the early part of November, during cold weather, during which tests the radiator was apparently satisfactory, but when tested under summer conditions the radiator was found unsatisfactory at low altitudes. The art of designing and manufacturing airplane radiators is still in the state of imperfect development in the United States, and much difficulty continues to be encountered in satisfactorily producing them in quantity.

(*c*) The changes in the number of machine guns and in the arrangement of the accessory apparatus were responsible for many weeks of delay in the production of the first planes, these changes being ordered by the American Expeditionary Forces' instructions to the production engineering department February 16. With better airplane engineering talent and with experience these delays would not have occurred.

4. *Oxygen apparatus.*—(*a*) A sample of dryer oxygen apparatus was brought to this country by an engineer, Monsieur Jacques de Lestang, and later the designer, Col. Dryer, came over himself to assist us in many difficulties which our manufacturers experienced in reproducing this delicate, complicated design.

(*b*) The French had undoubtedly been able to make a success of the comparatively small number which they had produced through the fact that they had a larger number of skilled workmen accustomed to this kind of delicate work. We did not have such skilled help, and consequently it took us 8 to 10 weeks to develop the necessary personnel and manufacturing facilities to produce this apparatus in quantity.

5. *Tel and Jaeger speed indicators.*—This apparatus consisted of a delicate watch mechanism, made by hand, in Europe, and of an extremely complicated nature. We have developed the necessary mechanics and engineering knowledge to produce this apparatus satisfactorily, but we were delayed 10 to 12 weeks on account of these conditions.

6. *Cameras.*—(*a*) We experienced the greatest difficulty in finding out from Europe what focal length and kind of cameras were suitable to use for the very complicated condition of taking photographs from an airplane at heights varying from 2,000 to 15,000 feet, the focal lengths of the cameras varying, according to reports which were received, from 10 inches to 54 inches, and there being two different schools of camera experts in France and England.

(*b*) We were also confronted by the impossibility of securing in this country dense barium crown glass necessary for the lenses to use in these cameras, and

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the lack of ability and knowledge of our glass experts to produce a glass which would even approximate dense barium crown. This condition delayed our ability to design a camera properly, or even copy one from Europe and be able to give the necessary data to the plane designer as to the space to allow in the fuselage for the camera mounting, the kind of control, and the location of the cntrols for the operation of the camera on the plane. We advertised for leuses and secured quite a few. Our scientists actively pushed the experiments on the necessary glass, and we have at last secured what looks to be a promising substitute, although not in any way equal to the dense barium crown glass produced principally in France in a small way.

7. *Aldis unit sights for machine guns.*—(*a*) These sights, in order to be efficient, require dense barium crown glass for the lenses, on which the difficulty in securing the same was similar to that of cameras.

(*b*) We tried an American made glass with the result that the Aldis sights were about 60 per cent as effective as those abroad. There was a delay of at least 16 weeks in developing a sight of this kind.

8. *Airplane compass.*—Most serious difficulty was experienced in developing and producing a satisfactory compass, which is exceedingly complicated when used on an airplane. Samples were brought from Europe in September, and immediately the design and production were turned over to the Sperry Gyroscope Co., who had the most experienced skilled personnel on this kind of apparatus. They failed to produce a satisfactory instrument or to meet even a small percentage of their estimated production. It was therefore necessary to develop an entirely new source, which fortunately was accomplished through the patriotism and appreciation of the necessity on the part of the director of meter production of the General Electric Co., at West Lynn, Mass. This company developed and put into large production a compass which, while not yet completely tested, has every promise of meeting the requirements, but deliveries could not be obtained until the early part of April.

9. *Synchronizing device for fixed machine guns firing through propeller.*—Satisfactory output of production on this complicated device was delayed due to a lack of knowledge and experience. As a result of engineering study and ability of the men engaged in reproducing the same there should be no further difficulty in meeting the requirements.

10. *Radio equipment.*—No difficulty was experienced in reproducing the ordinary raidotelegraph equipment, but this country has developed and given a great contribution in the form of a satisfactory radiotelephone set which can be used from plane to plane or between plane and ground, at distances up to 5 miles or more. Manufacturing facilities were developed along with the design and sufficient production will be available.

11. *Dope for airplane wings.*—An enormous shortage existed of the special dope required to treat the wings of planes. This dope is derived from the acetate of lime, acetone, and their chemical by-products. The allies also required large tonnage for their planes and for explosives. New chemical methods of producing this dope have been developed and plants have been and are being constructed which will produce an output by 1919 about sufficient for needs expected. The output of present wood chemical plants was entirely commandeered and is now being distributed for war and industrial needs by the Government.

12. *Cotton for airplane wings and balloons.*—Shortage of Irish linen and the delay and cost of bringing it from England became very serious in the fall of 1917. The cotton experts designed a strong, light cotton cloth, then developed and obtained sufficient manufacturing facilities to supply not only the United States but also the allies to a large extent. As soon as the shortage of linen became evident more than 10,000 bales of long staple sea-island cotton was purchased without inflating the market, and is now available for use in this airplane cotton. A prominent executive of the British war mission has cabled his Government that in his opinion this airplane cotton is the "greatest contribution of the United States to the allies of a material necessary to airplane production."

13. *Castor oil—Lubrication of rotary and possibly fixed type engines.*—A serious shortage was foreseen and a large per cent of the available stock of castor oil in this and other countries was purchased and stored. It being recognized that the amount obtained would not be sufficient, an organization was developed and a campaign through the various States was launched through which farmers were persuaded to plant more than 100,000 acres in castor-oil plants. The beans from these crops will be purchased by the Government at a fixed

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price and shipped to crushers to extract and refine the oil. If the yield is average the requirements now known to exist for castor oil should be met by this accomplishment.

14. *Spruce.*—Spruce is the strongest wood obtainable, for its weight. Next to spruce comes fir. In ordinary times there is no wide demand for spruce of the first class. Therefore, a shortage of this wood soon made itself felt. The largest supply of first-class spruce comes from Oregon and Washington. Large scale operations in these States met with serious organized opposition by the I. W. W. In addition to this further delay was increased by natural shortage of labor and lack of facilities to meet this emergency. It was necessary to organize regiments of experienced woodsmen selected from the cantonments of the National Army, and by voluntary enlistments from civilian life. The introduction of these men into the logging camps gradually overcame opposition to Government spruce production. However, in order to obtain the necessary amount of spruce it was, and still is, necessary to build railway extensions and logging roads, and in addition it became necessary to construct dry kilns and special cut-up plants to secure the quality of straight grain, clear material required. The demands of our allies still are greatly in excess of the present production, and large development of spruce timber and special sawmills will be necessary. The cut-up plants and dry kilns have made a large comparative reduction in the tonnage of spruce moved from the Pacific coast to the manufacturing plants and eastern seaports. This has been accomplished by eliminating shipment of green wood and confining shipments solely to selected and carefully inspected lumber of proper size and quality wherever used.

15. *Tool makers—Skilled mechanics.*—Other serious causes of delay were general shortage of tool makers and skilled mechanics due to the demands of other Government plants not engaged on airplane production.

16. *Transportation.*—The extreme severity of the winter caused serious trouble with transportation, delaying the delivery of raw materials and manufactured parts to airplane manufacturers. Certainly 30 days' delay on certain vital parts can be attributed to this cause.

17. On other ordnance, instruments, and materials minor delays, mistakes, and difficulties in manufacture were experienced, but not to an extent to delay seriously the output of combat planes.

L. S. HORNER,
Lieutenant Colonel, Signal Corps.

[Open letter.]

Mr. JOHN D. RYAN,
Chief Aeroplane Production, Washington, D. C.

DEAR SIR: The Senate bill 4686, authorizing the director of aircraft production to form a $100,000,000 corporation for the purpose of expediting the production of aerial apparatus, brings up the question of the policies to be pursued, and if the plans contemplate any improvement in the present primeval and inefficient Government system for the scientific development and perfection of motors and aerial apparatus.

When you accepted the directorship of aircraft production you undertook the most difficult and important job in the whole United States war program. The building of ships is, by comparison, an office boy's job, for the reason that ships are a commercialized product and a developed art, and it is only necessary to increase output. Ships are essential to carrying on war, but superior aerial apparatus and supremacy of the air will win the war. Hence the importance of your job.

Washington is still asleep in conception and plans for a most efficient aerial program.

The failures and investigations of the aerial program have been brought on by fundamental errors in policies and patents, industrial and professional monopolies.

To what extent the situation has been complicated by monopoly systems is something the investigations should determine, so that the country may be relieved from such menace from now on.

One point I particularly wish to impress you with is that the success of the aerial program and the war against Germany is most seriously jeopardized by failure of authorities to realize that the present art of aerial warfare is not 10 per cent developed.

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In the course of, say, a five-year war, ships, guns, etc., will undergo some improvements which may amount to 5 per cent or, in some things, 25 per cent. Aerial apparatus, however, can be improved several hundred per cent as an efficient and aggressive art of war.

The United States may build hundreds of millions of dollars' worth of aerial apparatus; but if we allow the enemy to excel us in the art, our men and aerial equipment will suffer needless sacrifices—even defeat could result.

If Germany's experts had foreseen the unlimited opportunities in aerial warfare and directed her efficiency and resources to this end instead of concentrating on submarines and dirigibles, and in addition had turned 30 per cent or 50 per cent of her sacrifices of shells, guns, and men toward the perfection and building of improved aerial equipment, Germany, with a small part of the losses already made, could have paralyzed the munition and transportation organizations of France and Italy and also carried such warfare into England.

Germany is doubtless awakening to the opportunities and advantages of aerial warfare, but our Government methods for the scientific development of inventions and aerial apparatus, I repeat, are not 10 per cent efficient. Our aerial program has been more or less of a patents, industrial, and professional monopoly, which has brought on failures and investigations, with lasting discredit to men who may be found responsible or incapable.

The indications are that a system of press propaganda has been carried on designed to deceive the people and administration. There apparently has been a program of secrecy, which could not deceive the enemy, but would operate to shut out valuable suggestions and cooperative work by the genius of invention and industry of the United States.

I would also call attention to the trend and danger of newspaper publicity and monopoly propaganda which inspires the people with the impression that the Liberty motors are the last word in motor perfection, and that, because some motors and planes are now being manufactured, the aerial program is on the high road to the peak of success.

I have never criticized the Liberty motor, because this would amount simply to an expression of opinion about things which can only be proven by actual performances and war service.

My criticisms have been constructive and refer to matters of principles and policies, which are supported by self-evident facts. My pamphlet, The Men Who Can Win the War, or Things That Should be Known at the Capitol, pointed out in advance wherein the aerial program could not escape serious failures. No adequate steps have yet been taken to meet these deficiencies.

The status of our aerial program to-day is: A captain of industry, heretofore charged with the management of extensive corporations, has undertaken the direction of aircraft production for the Government, assuming the duty of safeguarding public welfare in all respects. In other words, a man whose ambitions and associations lay with big business is now confronted with the task of deciding plans and carrying out policies which, in some instances, can not be agreeable to the schemes of powerful industrial organizations.

As a matter of self-protection and a guaranty to the administration and the people, and in order to secure cooperation and efficiency, definite policies should be announced.

The President of the United States is dependent on captains of industry, and men holding positions of responsibility and trust must reason that the public know that big business, under the direction of captains of industry, is more or less dominated by monopoly and "profiteering" systems; hence harmony and efficiency can only be obtained by open, clean-cut, patriotic policies.

Under the proposed bill the Government may be engaged extensively in the manufacture of aerial apparatus.

The first basic policy, which should apply to all war business, is that peacetime industries are national assets which establish the rank and power of nations among the civilized countries of the world.

The people and country as a whole are entitled to all the benefits to be derived from their billions of dollars spent for war equipment. If the billions so spent, first, purchase needed war equipment, and, second, build up the manufacturing industries, then the people and country have profited in two ways.

Now, if the Government takes over the manufacture of aerial apparatus, at the end of the war we shall have no manufacturing organizations ready to carry on a commercial business in aircraft or other industries, but, instead, the country will have a great Government organization which will suddenly go to pieces like a private corporation going into bankruptcy.

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A second indefensible argument against the Government going into the manufacture of aerial apparatus is that it is the principle of private enterprise, operating on a legitimate competitive basis, which has made the United States, and only on this principle can we mobilize inventive and industrial genius and win wars and compete with the world. One reason for this is that Government ownership and centralized control direct all things into one narrow channel and shut out the inventive and creative engineering genius which has perfected the automobile and all of our industries. If motors and aerial apparatus were now perfect, and conditions did not change, then centralized Government ownership and control might be ideal.

The directors of the aerial program have fallen down because they ignored sound business policies. Instead of calling upon the industrial genius of the United States to produce the best motors and planes that could be turned out in competition, a few men have assumed the superhuman task of dictating all the intricacies of invention, design, and manufacture, when the industrial genius of the whole country can not do it too well.

The New York Times of June 27, quoting the British secretary to the air ministry, says: "The new policy of intrusting pure design to the industry itself has been very successful." If this means that the directors of the British aerial program have finally learned a principle which is so obvious from the analysis of commercial industries, then they have made one of the biggest steps toward supremacy of the air and are a long way in advance of the United States.

Referring again to the bill proposing $100,000,000 for furthering the production of aerial apparatus, the people should know if the policy will be to favor a few large corporations monopolizing the business or if care will be given to the creation of a healthy, independent, and competitive industry. The difference between these two plans means success or failure, and the reasons are extremely simple.

If monopoly corporations are "handed" the business, there is no incentive on their part to improve aerial apparatus, because improvements cost money and changes curtail their output and profits. The grade of output will drop as low as Government inspectors can be induced to pass. On the other hand, if the Government policy encourages competitive manufacturers and awards products and also inventions of merit the Government will not only save money in the first cost, but get a superior manufactured product and at the same time be constantly improving the art, and at a minimum expense to the Government.

The monopoly plan means deterioration, graft, and defeat, and loading the industry with a gouty, corpulent monopoly system.

As a man who can point to some successes in business, manufacturing, and invention, my opinion of the cost-plus plan is that it leads to demoralization of both the manufacturer and his workmen. I also believe that investigation will show that in many cases this plan has resulted in the prodigal employment of men at a time when their services should be used more advantageously.

The manufacture of new products in war times at contract prices involves some risk on the part of the manufacturer, and it would be much better to let him make at the outset even what might be called a profiteering profit, because much of such profits will go back into the expansion of the industry or taxes on war profits. The point is to run the industry on a competitive basis, which operates to regulate profits and create the best conditions throughout.

The policies of the directors of the aerial program, including the National Advisory Committee for Aeronautics, show favoritism toward monopolies in patents and the industry, and the number of men and dollars which have been and will be needlessly sacrificed because of the blunders of the first year's aerial program can never be estimated for the reason that the direct and indirect losses affect the whole war program, and the end is not yet.

The enemy may succeed in taking Paris, whereas a few thousand airplanes might disorganize their transportation and save the situation and, if at the beginning, orders had been placed on a competitive basis, allowing manufacturers to copy foreign motors and planes or produce their own improved designs, the Government would have the choice of many manufacturers and the advantage of the cooperation of the best genius in the country.

All the Government engineers had to do was to limit purchases to a few simple specifications which covered a useful apparatus and, as the product began to exceed the demand, a system of competition and elimination would gradually bring about standardization as the art was perfected.

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Instead of this a coterie of engineers and experts having a professional monopoly and on the theory that the aerial art in point of perfection had about arrived at the present stage of automobile production, they began at the wrong end of the program by a system of standardization and the stipulation of thousands of theoretical specifications which absolutely prohibit any improvements and even the economical production of useful apparatus.

It would be a pitiable example, indeed, if the Liberty motor did not prove a good motor, because never before in the history of the world did men have the unlimited backing of a national treasury and the Government stamp of priority which commandeered the facilities of the United States for experimental work. Withal, the Liberty motor is substantially an enlarged edition of a type of motors in use, and the problem is still unsettled if it is the best all-round type suitable for the various types of planes or even if it is the best type for any particular kind of plane. Competition only can prove this and develop the best motors, and the policies of the aerial program taboo competition.

If six post planes, equipped with Liberty motors, could each make three successful round trips between New York and Chicago, this would be more convincing to the public than press propaganda and afford some proof that a trans-Atlantic voyage is feasible.

The evil of it all is that the Liberty motor has been "starred" and paraded in the interest of individuals and monopolies. The scheme of fostering and press agenting it as a national progeny and calling it a Liberty baby instead of a Packard or something else was obviously to monopolize the field. Such press propaganda as heralded the designing of the Liberty motor in five days behind locked doors in Washington, etc., is too cheap and insidious for a serious country to tolerate and especially in war times. Such misrepresentation and nationalizing of one particular product is not fair to other manufacturers of motors and it also operates to prevent inventors and manufacturers producing improved types of motors. To use Senator Thomas's words in characterizing the cross-license agreement, "It is un-American; it is undemocratic; it is wrong. In my judgment it should be annulled without further delay."

Inventions and patents.—Senator Thomas's interpretation of the cross-license agreement, as described in the Senate Chamber and printed in the Congressional Record of May 9, goes to show that the policies pursued thus far have resulted in fattening the wallets of millionaire promoters and conferring rights of monopoly to an industry, on the one hand, and shutting the doors to the inventors and independent manufacturers of the United States, on the other hand.

The annual reports of the National Advisory Committee for Aeronautics are written evidence that this representative body of scientific men, charged by law with the supervision and direction of the scientific study of the problem of flight, with a view to their practical solution, are in part accountable for policies and transactions which have thus shackled the Government and the industry and mean the sacrifice of the people's resources in men and money through failure to encourage and even permit the mobilization and cooperation of our national genius which has perfected all of our industries.

When the history of the war and aerial art are reviewed years hence by the critical student, I surmise that the story of the National Advisory Committee will be pointed out as an example of the decades in which soaring professionalism so often failed because theoretical science lacked the balance of practical science.

I have no personal and individual criticism to make of men who have risen to the top of their respective professions. On the other hand, I hold in contempt the halo of professionalism which so often bars criticism, and especially when men's lives and the causes of our country are jeopardized by policies which are not thoroughly constructive and right.

According to the records of the National Advisory Committee for Aeronautics, a request from the War Department brought the response from the executives of said committee that in their opinion all parties and Government agencies connected with the development of the air service were cooperating in an efficient manner, and that nothing would be gained by the establishment of a department of aeronautics. A British expert says that our advance in research and experimental work during the first year of our aerial program has not closed the gap that existed at the time of our entering the war and that we are now further behind than ever. This may be taken as a testimonial showing the impracticability and extremely narrow field of usefulness of the present system of technical advisory committees.

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The writer, in an interview with a chairman of the National Advisory Committee for Aeronautics, long ago sought to impress the fact that the plans and system of such committee could not, under the most favorable circumstances, prove anything like even 10 per cent efficient; whereupon said gentleman was shocked and explained in surprise that they had laboratories, etc., and were doing everything they could toward the development of motors and aerial apparatus.

When any dozen men think that they have more brains and genius than all the inventors, creative engineers, and manufacturers in the United States, and this eminent body controls the situation and is the technical and expert adviser of the War and Navy Departments in an embryonic art of war, on which our success depends, we are a long way from defeating our enemy.

Now, the Director of Aircraft Production is undertaking to provide the Government with aerial apparatus, and this equipment must be the last word in the art to be of service and win a war of invention and science. To express the present aerial program in plain words, the United States is furnishing the money and doing the manufacturing and we are going to depend on Germany and our allies to make inventions and discoveries, supply the intellect, and show us what to build, so that we shall be up to date. This is what our program amounts to.

Here we are, a Nation that has blazed the way and led the world in invention and the commercializing of many important industries, yet the men responsible for our aerial program, our best weapon in defeating Germany, have closed their eyes and ears to all the lessons and experiences of industries and science.

It beggars words to picture the situation, but the fact is that we have reveled so long in commercial debauchery, professional egotism, and deceitful propaganda that we need war to purify and regenerate our national systems.

The motor is the mainspring of the airplane and the key to supremacy and victory in aerial warfare. I have pointed out that the Liberty and all aeroplane motors have serious inherent faults which make them extremely short-lived, and that the short, uncertain hours of service necessarily result in the sacrifice of most valuable men and apparatus.

The life of aeroplane motors may be increased—doubled, trebled, and even multiplied by 10. Doubling the life of motors would substantially mean doubling the size of an aerial fleet, all things being considered. There is great opportunity for discovery and improvements in aeroplane motors which will reduce weight, decrease fuel consumption, and add to the mileage and carrying power. It is possible to make radical improvements which will cut complication of motor construction in half, and simplicity is the first essential to reliability.

I have sounded the forewarning that with German efficiency and American methods which do not mobilize anything like 10 per cent of our creative genius in invention and industry there is grave danger and probability of the enemy producing such superior aeroplane motors and other improvements as to cost us terrible losses.

As a practical example of this danger and the consequences, suppose Germany perfects combat planes which have, say, even 10 per cent more speed than our machines, and at the same time, through improvements in motors and apparatus, these machines are able to carry armor protecting the operator and vital parts of motors against machine-gun bullets or any guns carried by aircraft. Now, take the case of a score of our bombing planes, heavily loaded and slower in speed, on an expedition perhaps several hundred miles into the enemy's territory. Our combat planes guarding the fleet are outmatched in speed and armored protection, and at a further disadvantage in having to carry a greater fuel supply, whereas the enemy, being over home territory, could fly light and replenish their fuel tanks at convenience. The enemy would have great advantages in being able to take the higher altitude, follow, and attack at will, picking off our machines with certainty and little risk.

Admiral Fiske has been a strong advocate of aerial torpedoes. While I have no knowledge of his inventions, at the beginning of the European war I endeavored to inspire British experts with the importance of developing high-powered motors and types of airplanes which would carry and launch the standard torpedoes used by submarines and also be adaptable to aerial-torpedo and bomb work.

The field for aerial-torpedo and bomb apparatus is one of the most important in aerial warfare, and millions of dollars could be spent judiciously in its perfection. This science is capable of such development that troop ships and war

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vessels of all kinds can be made to suffer a heavy percentage of losses. By the risk of one man's life a ship can be sunk with something like 50 per cent certainty, and a whole fleet might easily be caught with less than a minute's warning. It behooves us to make progress and forestall the enemy.

I have used the automobile industry so often for comparison, that readers may gain the impression that the work of developing aerial-warfare apparatus parallels the automobile art, whereas this would be underestimating the job before us many times over.

We should look at it in this way, viz, that the aerial art, as a science in invention, intricate engineering, and multiplicity of problems, is infinitely more difficult than the automobile which, by comparison, may be regarded as in the primer class.

It will be a grave error in policies if the United States aerial program is not planned to meet the emergencies of a long war; and, in this respect, we have already lost one year of precious time for which the Nation stands to be penalized heavily.

I fear we mistake by counting too quickly on victory in the air. Some say 10,000 machines, 50,000 machines, etc. The solution is to keep building machines, keep improving, and keep fighting, and the probabilities are that it will take us anyhow three to five years to gain supremacy in aerial apparatus and finish the job—except the enemy disintegrates.

Upon the question of fundamental policies, the directors of aircraft production and of aerial warfare are naturally dependent upon the opinions of experts and engineers. I would wager that if 12 of the country's distinguished professional engineers and experts were selected to determine the policies in respect to invention and the scientific development of aerial apparatus, that the majority of them would vote to assume the responsibility themselves, instead of for a system which would mobilize the genius of the whole country. Here we have an example of "professional egotism," which would willingly risk the lives of fellowmen so that they might be starred and honored by the glare of the spotlight, when 10,000 men ought to be on the job.

I make the suggestion to the gentlemen charged with the investigation of the aerial program and its policies, that this element of professional egotism, if it can be discovered, should be uprooted, as it is a blight which affects all Governments and most seriously retards inventions and industry in the present age.

On account of the business connected with the designing and manufacture of warships and of big guns being, by the nature of it, Government work, a very general and erroneous impression prevails that the engineering and designing problems in aerial apparatus should also be handled by Government experts and by Government departments. According to the recent words of the British secretary to the aerial departments, costly experience has finally taught the British the very thing I have been trying to impress upon the aeronautical clubs and upon the Government authorities at Washington for more than one year.

CONSTRUCTIVE POLICIES.

A résumé formulating the principles I have advocated into policies necessarily considers the aerial program as composed of two stages: First, development policies, which cover invention, design, experiment, competition, awards, and patents; second, production policies, including all processes in connection with the manufacture.

DEVELOPMENT POLICIES.

First. The Government must depend on and mobilize the genius of the inventors, the creative engineers, the designers, and the manufacturers of the whole United States if we are to excell our enemies in the perfection and supremacy of motors and aerial apparatus. This means the elimination of the present petty system of a theoretical sanctum sanctorum in which a few professional high priests presumptiously refine the genius of a whole Nation.

Second. Government engineers, departments, laboratories, etc., must be organized for the purpose of furthering most advantageously the scientific work of the Nation's practical inventors, creative engineers, designers, and manufacturers, such as furnishing data, technical information, making tests and trials of apparatus, and experting official trials and competitions.

Under the present régime our Government laboratory organizations are a part of the sanctum-sanctorum system and more or less a professional monopoly.

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Instead of our laboratories being used to further the work of the country's industries genius and the most advantageous advancement of the arts and sciences the ideas and work of men of genius are appropriated and the laboratories grind chiefly to the honor of the professional high priests. (I have knowledge of cases.)

Third. It is essential that the Government establish a department of inventions, which may be known by this or any suitable name, the purpose of such department being to handle the business of the Government in all matters pertaining to the scientific development of aerial apparatus as generally indicated by policies 1 and 2.

As a matter of efficiency the personnel of said department should be permanent and competent salaried officials and employees, and such personnel should be prohibited from taking out patents for inventions or taking credit for ideas, designs, and suggestions, thereby removing as far as possible every incentive and opportunity for conflict with their natural duties.

Fourth. The department of inventions should comprise an award and competition system whereby trials and competitions would be held as often as practical and for the purpose of developing improved types and construction in aeroplane motors, combat planes, torpedo planes, post planes, torpedo and bomb apparatus, and every kind of essential equipment.

Awards of suitable amounts of money sufficient to cover cost of exhibition apparatus and reasonable preliminary experimental work plus a profit on such work should be paid to winners of contests showing advance in the art.

The awards in this class would not be intended to cover valuable features of invention, but primarily as competition and performance awards, thereby stimulating refinements in design and construction which contribute to perfection. In other words, the awards in this class would correspond to the "premium money" paid on the showing of a fast horse, a draft horse, or for a new grade of wheat, with the advantages in this case that the Government could adopt valuable features in design and construction not covered by United States patent rights, which would be provided for under policy 6. Naturally a manufacturer or builder exhibiting prize-winning apparatus should receive some extra consideration in the placing of Government contracts, governed, of course, by usual commercial qualifications.

This award system also has a great advantage in discovering and bringing out new men of genius as inventors, designers, engineers, and manufacturers.

The principle of this award system is highly progressive and advantageous to the Government, the people, and the industry. It benefits everyone except the monopolist, and because of this the plan may meet with strong opposition.

Fifth. The department of inventions would require a patents and inventions board, the personnel of which should be made up of men capable as judges and experts and competent to arbitrate all questions pertaining to inventions and patents, so that the development of the art would not be retarded and stifled, as at present, through the loss of years and the waste of money in a system of litigation which is favorable to monopoly and death to the expansion of industrial genius.

Sixth. A system of specific awards should be provided for the purpose of encouraging the discovery and perfection of valuable inventions, and particularly radical improvements in motors and all types of planes and apparatus and any inventions which add to our supremacy in the air.

Recognizing the fact that our present system of depending on advisory committees and experts to judge the merits of inventions in the "paper stage" is nine-tenths impractical and a prodigal waste of opportunity and time, the proposed award system would ordinarily apply only to inventions which had been reduced to practice or such state as to demonstrate certain and valuable results.

The announcement of specific awards of adequate amounts for the Government rights to valuable inventions in motors, combat planes, torpedo planes, etc., would lead manufacturers to concentrate on and develop such inventions. It would not only cause inventors to specialize on these things, but the announcement of such awards would materially assist inventors and manufacturers in financing the experimental and introduction work.

Seventh. Since our success in this war and our security and national preparedness hereafter will depend on our supremacy in the air, and inasmuch as aerial navigation and the industries in connection therewith will have much to do with establishing our standing as a leading nation of the world, the policy of the United States Government should be to purchase and throw open to public use all patents covering basic and fundamental inventions essential to the perfection of aerial apparatus and navigation of the air.

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Respecting any useful inventions pertaining solely to aerial warfare, whether such inventions be fundamental or not, the Government should acquire the rights to Government use for war purpose by purchase or a part payment in cash and royalties, so that practical inventors and builders may be promptly assisted in carrying on such work.

PRODUCTION POLICIES.

First. The aircraft manufacturing business must be carried on by industrial organizations instead of Government owned and operated factories.

Fundamental principles which I have explained show that this is the only plan whereby we can excel in the art and also build up American industries.

As an exception to this principle there may for a time be some advantages in operating a Government factory where men and manufacturers can go to be trained in the work, it being understood that such factory would be highly specialized and combine the best practice and experience to be gained from the whole industry and scientific study of the business.

Second. The Government should encourage progressive independent builders and manufacturers and discourage monopolies and local concentration and congestion of the industry.

The policy of the Government in placing contracts should be to rid the industry of the vampire breed of business men, which schemes control by means of secret agreements and organizations, vicious patent monopoly systems, intriguing lobbies, and insidious press and trade propaganda, all of which operates to throttle and retard a national progressive development of the art and industry and thereby causes the sacrifice of the country's resources in men and money. These "systems" are conspiracy and treason, fully as dangerous as German propaganda, and the United States aerial program, to be efficient, must recognize and adopt policies which will eliminate such "systems."

Third. Government war-contract qualifications.

Definition of building and manufacturing. In the recasting of the aerial program it is very important to fully comprehend the term "building" and what it means to the industry in the present stage.

The term "manufacturing" applies to a plant, tooled and jigged for a rapid duplication of parts or all of a complete machine, whereas the term "building" means a plant equipped with standard woodworking or metal-working machinery but not tooled and jigged for most profitable quantity production.

Government authorities, automobile men, and many engineers now consider aerial apparatus as wholly a manufacturing proposition, and policies dealing with it as such are not progressive and will not make us leaders in the art. The reasons are simple, and because aerial apparatus is not 10 per cent perfected.

It was the builders of bicycles and the builders of automobiles who, more than the manufacturers, first combined and forced the commercialization of new and valuable features of invention, design, and construction. These new and valuable features constituted the successful builder's selling advantages and offset his increased cost of production until the builder became a manufacturer.

The moral of this is that if the United States Government is to produce superior aerial apparatus the Government must supply the incentives which the commercial industry normally provides, therefore the policies of our aerial program must foster invention and the builder of aerial apparatus.

The competition prize and award system and the inventions award system are the first steps in this direction, but it is equally necessary that producers of improved apparatus be encouraged as builders by awarding them such contracts as they can successfully turn out.

The present aerial program is marked for a heavy score of failures and partly because the idea of standardization is being too broadly applied, and years in advance of the perfection of the art.

To-day our great munition factories, cities, and railways are virtually unprotected because we have not superior types and equipment of the fastest machines or men skilled in fighting with them.

My proposition would be to consider the production of aerial apparatus as divided into two classes, viz. Foreign apparatus and domestic apparatus. Under this plan, generally speaking, standardized and manufactured apparatus would be sent to the European war field.

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With the inauguration of the competition and award system the builders of aerial apparatus would find great incentive for the production of improved types of combat planes and aerial fighting and defense apparatus of all kinds, and the competitions of such apparatus would serve not only to perfect the best apparatus but, at the same time, would be highly advantageous in training men and making them skillful in the science of defense and warfare.

It is obvious that this plan would result in many makers of combat planes, each with its particular advantages, but that, as domestic fleets were built up, the progress of competition and elimination would constantly lead toward a perfected and standardized product.

It is my judgment, based on various sound reasons, that, if the enormous sum of $1,000,000,000 could be spent, even semi-judiciously, on the domestic aerial program alone, commencing the first year now, the developments and results would be such as to save the country many men and a large war debt.

Successful invention and scientific work always means an immediate waste of anywhere up to 90 or even 99 per cent, but a 10 per cent, or 1 per cent gain, in the aerial art would be of inestimable value.

The system proposed, however, is extremely simple and the Government takes little risk because the inventor and the builder substantially make good before they receive Government recognition or the people's money. Under this plan it is only the men who finance a failure and bad judgment who lose.

Under the present "systems" everyone loses except the monopoly wolves.

As a further example of the fallacy of the present "systems," Government experts now dictate the technical limitations of postplanes when, in truth, it is only a simple business proposition governed by cost and performance.

Under the award and competition plan, the builder of a postplane which demonstrated superiority would not only gain the competition award but would be entitled to an order for machines which could be used on such route or some other route. In fact, the planepost service might be operated and perfected most advantageously on the competition basis.

The Government, in placing contracts with a builder or manufacturer, should consider as qualifications: First, the standard of applicant's product in points of advanced art and grade of construction; and second, ordinary business qualifications, such as manufacturing facilities, promptness of deliveries, etc.

Fourth: Policy of prices on Government work.

The matter of fixing prices should be determined by Government authority based on good business principles. Under the present war conditions, it is absolutely essential that builders and manufacturers make a fair margin of profit because no industry can thrive and be progressive on starvation rations.

Capital can not finance manufacturing without profit, and schemes ignoring this fundamental business principle means that the Government and people are either going to suffer through want of such product or of being grafted indirectly.

A system of competition bids based on a minimum profit and record factory costs might be worked out to give the bidder certain points of advantage in the size of the contract to be allotted or in respect to a whole contract, but, since the qualifications named in policy 3 are essenial features of any such contract, the various features should govern in relation to their respective merits.

Fifth: Government financing of the industry.

Our Government policies in any financing of the industry must be carefully planned and guarded against the creation of monopolies.

If "systems" and men, through influence, are allowed special privileges in the financing of their business or in obtaining contracts, it means that other manufacturers and builders are deprived and that the industry and country will suffer through degrading the standards of qualifications and the superiority of output.

Referring to the announcement just published that the plan of a Federal corporation to build aircraft has been adopted, I am not prepared to say that this plan is another misstep at the present moment, but facts and logical arguments show that it is, at best, a side step which, if temporarily necessary, is due to the missteps made at the outset in pursuing dangerous policies.

If the new Director of Aircraft Production has found that the commercial industries of the United States to-day are not sufficiently organized and equipped

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to produce the required amount of aerial apparatus, it is prudent to analyze the reasons and also weigh the advantages and disadvantages of a Government-operated industry. No doubt this has been attempted, but the history of the war shows that the administration is confronted and surrounded with such complications that it is extremely difficult to know the truth.

One of the first steps taken, supposedly in the interests of the aerial warfare, was the act of authorizing a patents and industrial "monopoly system," and the adoption of policies which prohibited the investment of free capital, either in the development of inventions and the manufacture of improved apparatus, or the organization of manufacturing plants for turning out standardized apparatus. Every shrewd investor of money knows that when a state of affairs exists in which the business is controlled by a "monopoly system," that the investment of independent capital in such business is hazardous, and he further knows that, while he might become a licensee and a part of the "system," that his venture would be handicapped by royalty and other one-sided taxes, and that the men dominating the system would always have power to manipulate desirable contracts in their own favor.

It would be difficult to conceive a more successful scheme of indirectly curtailing the scientific development of the aerial art and the free expansion of the industry than the so-called cross-license monopoly cooperated with by Government policies.

If the principles and purposes of the United States patent laws are right, then the cross-license "monopoly system" is wrong and a crime in this war, because it defeats the objects of our patent laws and sacrifices the lives of men to greed.

Supporting the plan of a Federal corporation for the manufacture of aerial apparatus, an editorial in the New York Times of July 12 says: "The Shipping Board began to make headway with its elaborate program when the Emergency Fleet Corporation was established." I have given logical and indisputable arguments showing why the aircraft industry can not be most successfully managed along the lines pursued in the ship-building program.

Now, calling attention to the fact that the writer began in April, 1917, the writing and publishing of papers directed to impress men responsible for the aerial program that efficiency and marked success could only be attained along certain practical lines, it would seem that the time had come when such suggestions warranted fair consideration. If these suggestions were mere theories and opinions and without the backing of logical arguments, parallel examples and practical experience, then they might, with some excuse, be ignored, but when the author has been more or less instrumental in the exposure of dangerous policies and the workings of a "monopoly system," which can do as much harm as the most vicious German propaganda, these things are, in a measure, further claims to recognition.

If Government operation, by some miracle, could make skillful workmen out of pebbles by the roadside, this would be a strong argument, but on the contrary, Government employment has the reputation of decreasing the output of industrial labor; this, however, is a very insignificant reason compared with the arguments heretofore given.

Whether the proposed program means that the Government is going directly into the manufacture of aerial apparatus or plans to finance corporations already having a monopoly of the business, it amounts to an attempt to win the war by a spurt and a bet that with sheer weight of numbers we will outmatch any advance Germany may make in the art plus her peculiar natural advantages which amount to quite a handicap to us. We are pushing an unbalanced program in which the scientific side is sadly neglected.

I would further call attention of Government authorities to the fact that any plans for the extensive invasion of the enemy's territory means that we must have not only superior types and equipment in combat planes sufficient to match the enemy, but at the same time a large equipment in bombing planes and apparatus, whereas Germany, on a defensive plan, can get along without the big, expensive bombing planes and their equipment and concentrate her skill and production on combat planes, and by excelling us in this one direction, defeat our aerial program.

I am told that Schwab says that the trouble with Americans is that they so often figure as though the Germans were standing still; that they forget that this war is at present a more serious thing to them than it is to most Americans. This logic will apply to the aerial program; it might be all right if the Germans will stand still.

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The United States war program to-day, so far as the Army and Navy are concerned, is on progressive lines, but the examples of the German offensive operations must be taken as an indication that the allied armies will find the road to Berlin just as difficult as the enemy has found it to Paris and London. The Germans have fallen down thus far for want of cooperation of an aggressive aerial program. German experts and officials from the start have underestimated the importance and opportunities of aerial warfare.

Therefore, the logical conclusions are that if the United States is compelled to defeat Germany it can only be accomplished by the gradual and scientific building up of an aerial fleet which in every respect is superior to the enemy. Our policies are plunging and gambling and not progressive.

What about after the war? Some men work hard, abuse their health, get their fortune and then die. If, at the end of the war, bad policies have demoralized and killed our industries, whereas our allies, enemy, and the rest of the world are organized for going on with business, the administration will be held responsible even by men who have profited by giving bad counsel that they might fleece the people with their "systems."

I believe that the country is so saddled with "systems" and the press so twisted with various kinds of "systems" propaganda that the war will be prolonged with great sacrifices and dangers of domestic disorganization unless big business and our national industries are carried on with more respect to the golden rule principles than prewar business is credited with.

At this moment the welfare of the Nation is largely in the hands of the captains of industry; the President can not do it alone.

Respectfully,

W. H. FAUBER.
55 Hicks Street, Brooklyn, N. Y.

JULY 14, 1918.

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AIRCRAFT PRODUCTION.

TUESDAY, JULY 23, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at 2.30 o'clock p. m. in the committee room, Capitol Building, Hon. Charles S. Thomas presiding.

Present, Senators Thomas (chairman), Reed, and New.

STATEMENT OF MR. JOHN A. JORDAN.

The CHAIRMAN. Mr. Jordan, at the time of the last adjournment your statement was postponed pending the receipt of certain correspondence from the Liberty Iron Works of Sacramento, Cal.

Mr. JORDAN. Yes.

The CHAIRMAN. The committee is in receipt of a telegram from Mr. J. M. Henderson, of the Liberty Iron Works, which I will read into the record:

There is no correspondence or telegrams in my possession or in the hands of Liberty Iron Works or its officers between any of parties mentioned in your letter of July 17 or any other parties connected with us regarding contract for 300 aeroplanes awarded to our company.

Mr. Henderson had previously written or wired me that he would, at his earliest convenience, send the correspondence which we requested in a telegram of July 15.

I wish you would tell the committee whether you know of any correspondence or telegram passing between the Liberty Iron Works and the Aircraft Production Board or any of its members in Washington regarding that contract?

Mr. JORDAN. Yes, sir. There is voluminous correspondence. There must be hundreds of letters that relate to the contract and its fulfillment.

The CHAIRMAN. Do you know why Mr. Henderson should have sent the committee such a telegram?

Mr. JORDAN. No, sir; I do not.

The CHAIRMAN. Inasmuch as we will have to proceed without that correspondence, at least for the present, I wish you would take up your statement to the committee where you left off and give such other information as you have in your possession regarding that contract.

Mr. JORDON. Now, if the committee will bear with me, I think the best way to get at the matter will be to read this written statement.

The CHAIRMAN. As supplementary to what you have already said?

Mr. JORDON. Yes, sir. While it repeats what I have already sadi in some places, I have enlarged on my original statement and made it much clearer, perhaps.

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I arrived in Washington about July 27, 1917, and called upon the Aircraft Board, which was then in session at the War and Navy Building. I saw Messrs. Deeds and Waldon, who told me that they could speak authoritatively for the Aircraft Board. Mr. Deeds said very emphatically that my offer to construct aeroplanes for the Government could not be considered, for the reason that all the manufacturers had been selected who would do the work, and that this list would not be enlarged under any circumstances. I persevered, however, and insisted that here was an urgent necessity of a factory for the production of aircraft for the Government on the Pacific coast, and I finally secured the attention of Gen. Squier, who promised me consideration. Shortly afterwards I met a Mr. Farwell, who told me he was the confidential representative of Mr. Deeds. Mr. Farwell suggested that I visit the Curtiss plant at Buffalo, and he gave me a letter of introduction to his cousin, who was employed at the Curtiss plant, in charge of one of the departments.

I went to Buffalo and met Mr. Farwell's cousin. He took me through his department. I had several talks with him as to sources of supply for metal parts. He made no reference to the cross-license association.

I saw Glen Curtiss. I asked Curtiss if, in the event of our receiving a contract, he could furnish us enough of metal parts, stampings, and forgings to get a start and enable us to make connections with other manufacturers of parts. He said, "We will help you out in any way we can. Some parts we may be short on, but we will do all we can for you." He then sent me through the shops under the guidance of an engineer who was very courteous and who showed me all the machinery and the parts their machines were producing. This guide told me that some of the parts could be turned out in excess of their own requirements, while in order to keep up the supply other parts were made outside of their own shops. He took me through all departments and showed me everything that was of interest to me.

I returned to Washington. I made frequent calls upon Mr. Coffin and Gen. Squier, appeared several times before the Aircraft Board while the board was in session. I had another interview with Mr. Waldon, who said again very emphatically that I could not get a contract.

Finally, about September 25, 1917, the Aircraft Board awarded me a contract for 300 machines. I went at once to Shepler, production engineer of the board, and asked him for a set of blue prints and specifications. He said that the department did not own a set. I asked him if he was familiar with the plans and specifications of the JN4D, and he said he was not; that the blue prints and specifications had never been given to him. I asked him who checked the blue prints and specifications for the Government, and he said he did not know. I asked him if anyone in authority had approved of the blue prints and specifications for the Government and he again said he did not know. I remarked that it was an extraordinary proceeding to undertake to construct something for the Government on blue prints and specifications which had never been checked or approved of by any official, and he said I would have to work out my own salvation.

I had been engaged in construction work for the War and Navy Department before for many years, but I had never before seen or

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heard of a contractor accepting a straight priced contract without the privilege of examining and checking the blue prints and specifications, which had previously been approved of by some Government authority. I had never before heard of the Government obligating itself for a million and a half dollars without first knowing what they were going to get for it, and I never heard of a contractor obligating himself to do something while he had no conception of the details of the work.

Shepler finally said, "Well, I can't help you any. See Col. Montgomery, and he will get you the blue prints and specifications." I saw Col. Montgomery, and he said that the price fixed for the machines was the same in every contract, and that there was a good margin of profit in the work; that Col. Deeds had told him that the machines would not cost the manufacturers to exceed $3,000 each, and that I need not be afraid to go ahead. He told me then that I would have to go to Buffalo to the Curtiss plant to get the blue prints and specifications. I asked him if he would not get them so I could go over them with Shepler, and if there was anything that was not clear to clear it up while I was in Washington. He said, "No, you will have to go to Curtiss in Buffalo to get them." He then handed me an order signed by Col. Waldon, addressed to the Curtiss Co., requesting them to give me the blue prints and specifications. I went to Buffalo and the blue prints and specifications were delivered to me at a desk in the engineer's office of the Curtiss plant. I spent two days checking the blue prints. There were approximately 600 of them. These were sadly mixed up. There was no continuity of the planes.

For instance, No. 160 showed a clip in the fuselage, and No. 161 showed a mast on the aerolon, the extremes of the machine. I was handicapped in the checking, because I had no general assembly plan; that is, the master or key plan. However, I satisfied myself that I had all, or nearly all (it was not possible to determine exactly), except the nose plate and general assembly prints. These I was assured by Mr. Mueller, Curtiss's chief engineer, had not been released. I asked him when I could have these two most important prints. I could not build a machine without them. He said he would forward them to me within a week. As a matter of fact, I did not get them until late in December and early in January, respectively.

After checking the prints, I had them tied into a bundle, and then a clerk from Mr. Morgan's office came to me and said Mr. Morgan wished to see me. I went to Mr. Morgan's office and there found Mr. Morgan. I asked Mr. Morgan if he could furnish me some of the metal stampings and drop forgings to give me a start, and he said he thought they could. I then said, "Can you give me at least one of each of the parts as a sample, from which I can get the angles and bends," and he said, "Yes; I can promise you that anyway."

Then came in Mr. Guy with the chief engineer and another of the company's officials. I was introduced all around, and they were all very cordial. Then Guy asked if I had found all the blue prints and specifications, and I said they were not complete and not very well drawn, and in many places were badly printed. I told him I was short the two very important prints—nose plate and general assembly. He said, "Yes; we will release those to you in a week or so." He then told me that I would have to enter into the cross licensing agree-

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ment and agree to pay 1 per cent of the contract price for the use of the blue prints and specifications, 10 per cent of this sum to be paid in advance of the delivery of the blue prints and the balance when I returned home; also that I would have to pay $200 on each machine I built. This $200 was to be paid to the Curtiss Co. for and on account of cross licensing the Aircraft Association, and by them distributed to the Wright and Curtiss Cos. This was the so-called cross-license agreement. I declined to pay either of these amounts, or any other amount, and Guy refused to give me the prints which I had checked and bundled up.

I returned to Washington and took the matter up with Mr. Coffin, who assured me that I would not be required to pay anything to anybody. He referred me to Col. Montgomery. I saw Col. Montgomery, who told me that he would send his brother, W. W. Montgomery, to Buffalo to straighten the matter out. I returned to Buffalo, and there met W. W. Montgomery. He had seemingly seen Guy, of the Curtiss Co., and had arranged matters. He told me that I could get the prints from the Curtiss Co. without further question. I did get the prints and went to Sacramento and started the work of securing materials.

A few weeks later a young man named Cook came to the Sacramento plant and introduced himself as representing the Aircraft Production Board, as the Pacific Coast production engineer. He gave me a list of manufacturers who, he said, had all the facilities to produce the metal parts. I at once got in touch with these manufacturers (see correspondence which the Senatorial Committee has requisitioned from the Liberty Iron Works).

About this time the department inspectors arrived at the plant, headed by a Mr. Wetzel. We were then manufacturing wire parts, aluminum parts and wood parts. The inspectors, with the exception of Wetzel, had no knowledge or experience in aeroplane construction or in the materials, either metal or wood, which entered into the construction. They rejected a large quantity of materials which were perfectly good and passed some materials which I would not allow to be used. We started the manufacture of the nose plates, and the first several of these cracked in the bending. I would not allow these to be used and they were put in a scrap pile. We made many small parts which I rejected because I did not consider them up to the standard. The inspectors rejected many parts and they were scrapped. Shipments of parts ordered from Cook's list of manufacturers began to arrive, from Barcalo & Co., of Buffalo, and some others. In the first lot there was a quantity of clevises, which had already been rejected by the inspectors at the Curtiss plant but notwithstanding such rejection were shipped to us. I sent them back.

Then came bolts from the Erie Specialty Co., of Erie, Pa. These did not conform to the specifications, and I sent them back. I had great difficulty in securing the metal clips. I had offers from several eastern manufacturers, and placed orders which were accepted, but not filled. (See correspondence in Liberty Iron Works files.) I ordered a large quantity of bolts and rods from the Harvey Machine Works, Los Angeles, who accepted the order and promised delivery. They had the steel on hand and were then engaged in making the bolts and rods.

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When the deliveries failed I went to Los Angeles and took the matter up with Harvey. He told me that Remington, who at that time had a contract from the Aircraft Board for landing gear parts, had a prior call upon his product, although Remington could not use these parts as fast as Harvey could make them. Harvey assured me of this, but said he was powerless to give me even the excess parts without Remington's consent. I saw Remington, who said he expected to open up his production to a point where he would use all the Harvey output. As a matter of fact, he never did so, and Harvey afterwards furnished bolts and rods and filled the order, but this delayed us a full month.

Howell, who was in charge of the inspection bureau of the Pacific Coast, advised me that the American Coin Register Co., of Oakland, Cal., could turn out certain parts; it afterwards transpired that Howell was a stockholder in this concern.

I placed a large order with the American Cash Register Co., but they failed in delivery. I canceled the order and had a hot controversy with Pattison, who succeeded Howell in the office of the Chief Inspection Bureau. Pattison insisted that I must not cancel the A. C. R. order.

He was very closely associated with Howell at that time. Shortly afterwards Pattison was relieved from his duties on the coast and was sent to Detroit.

Howell was formerly in the Navy and had no experience in airplane construction when appointed chief inspector. He selected his subordinates, and with a few exceptions, out of the 20 or 30 men whom he selected as inspectors at the plant, none had any experience in construction and in handling either wood or metals. Pattison was formerly a maker of automobile trailers in New York, and was without experience in airplane construction. He made a few changes in subordinates and those he selected were of the same quality as the rest. They were all young men, some of whom frankly admitted that they joined this inspection bureau to avoid the draft.

About February 1 we were at a point of production. We were lacking only some of the clips and forgings. My directors began to complain of the large expenditures, and that we were not producing machines. They admitted that it was impossible to secure the small stamped parts and attributed this to me. The president expressed the idea that I was persona non grata to the eastern crowd, because of my opposition to the attempted hold-up by the Curtiss crowd and that they had influence enough to have our orders sidetracked. So it was decided that I should resign the active management of the plant, which I did.

The new manager was wholly inexperienced in shop management and in aeroplane construction, and two days after the change was made our contract was canceled. I learned afterwards that the department at Washington had been advised by their Pacific coast representative of the change of management just on the event of production, and seemingly did not approve of the plan. A week later the new management had employed Wetzel, the Government's chief inspector at the plant as superintendent at a salary of $500 a month. He had been paid $150 a month as an inspector. There was at once a radical change in the methods of inspection at the plant, and materials which had been rejected by the inspectors were brought

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from the scrap heap and from the salvage rooms and incorporated into the machines. Among other things were several nose plates that were cracked in the making, which were scrapped by myself. These were welded up and used.

The department at Washington had sent us a sample machine from which to check our work. This machine was of little value, it being of a different type from the machine we were building. Some of the parts, however, were similar, and these parts were taken from the Government-owned machine with the full knowledge of the Government inspectors and incorporated in the first machine sold to the Government. In other words, the Government bought over again its own property, with the full knowledge of its representatives.

I objected to this proceeding because I did not know whether the parts were standard or strong enough, and they might be a serious menace to the safety of the machine, and also that we had no right, morally or legally, to sell the Government's property, that the Government had already paid Curtiss & Co. for and still owned. I also learned from the mechanics that the parts I had rejected myself were being used, and I was seriously alarmed. I went to Mather Field and called the attention of Maj. Emmons, commandant at the field, to the inadequate inspection by the Government inspectors, and Maj. Emmons said he knew the inspection was "rotten" and could not be depended upon, and for that reason he was having the machines carefully gone over by his own men, who were removing the bad parts and reenforcing and strengthening other parts in order to make the machines safe.

The CHAIRMAN. You have said nothing there about Fowler or United States aircraft machines.

Mr. JORDAN. No; but the same statement applies to all three.

The CHAIRMAN. You have stated that he sent back four or five of those machines.

Mr. JORDAN. Yes; I was so informed. That order came from Washington, I believe. I did not go into the details of it.

Another thing that I took up with Emmons was the steel in the small metal parts, on which great strain comes.

The specifications require a tensile strength of from 60,000 to 80,000 pounds. They never once tested it out to see what kind of steel was in them; that is, no chemical analysis has ever been made by the Aircraft Board to the steel to my knowledge.

In conclusion I beg to say, and I say this advisedly, that if we had had the full support of the Aircraft Board in the matter of securing blue prints and materials that we would have delivered the airship without any delay as the undertaking was entirely practical.

Preferred stock—list of stockholders of the Engel Aircraft Co.

	Number of shares.		Number of shares.
Arter, Frank	100	Beeman, B. O	5
Andrews, W. H	5	Barricelli, G. A	5
Atwater, A. L	3	Byron, F. E	5
Allen, S. W	2	Brown, Samuel	20
Bill, Dr. A. H	100	Baird, H. M	1
Bender, C. W	10	Brown, Harry C	2
Baker, E. H	50	Bause, George J	6
Barnes, H	50	Butler, J. G	100
Bentley, A. J	50	Case, F. C	25

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Preferred stock—list of stockholders of the Engel Aircraft Co.—Continued.

	Number of shares.		Number of shares.
Coffinberry, J. B.	35	Johnson, W. T.	25
Chamberlain, W. W.	56	Jones, Clinton	5
Chapin, George W.	5	Keim, C. R.	2
Culbertson, H. E.	15	Klanowski, Stanley	5
Clayton, H. W.	10	Lang, E. J.	1
Clayton, W. B.	10	Lyon, W. F.	50
Campbell, Thomas B.	6	LeFevre, W. N.	5
Crabbs, H. W.	5	Lininger, J. M.	15
Capper, C. C.	10	Lucish, M.	2
Coburn, Mrs. J. M.	2	Lininger, J. A.	5
Cottrell, Gertrude	1	Ingersoll, A. F.	10
Dewey, F. L.	1	Lally, R. B.	10
Doubler, Edw.	5	Leitch, Rebecca J.	5
Doyle, J. E.	10	Lininger, L. D.	2
Davis, J. R.	5	Lezius, Carl F.	10
Drake, George W.	2	McConnell, F. C.	5
Deming, T. H.	5	McCorkle, R. L.	25
Donaldson, A. G.	1	McKinstry, J. S.	3
Durkin, James F.	1	McLaughlin, J. R.	10
Dolon, Charles A.	50	Morris, Isaac	2
Ewald, J. S.	2	Munson, Julia LaV.	5
Engel, William	10	Merrill, George B.	5
Eagan, M. L.	3	Madden, Thomas	15
Fairchild, E. M.	50	Moffett, H. E.	1
Firestone, H. S.	100	Manley, Dr. O. T.	2
Fuller, Joel H.	50	Miller, T. U.	2
Fairchild, ——	50	Moore, Gertrude K.	1
Finney, D. J.	35	Miller, Cloyd W.	10
Fisher, M. F.	50	Mueller, Carl H.	8
Frostbauer, H. L.	10	Moore, Ross L.	1
Fowler, Harold	10	Niles Car & Manfacturing Co.	2250
Foward, C. B.	2	Noll, Edward A.	150
Flynn, J. P.	5	Nicola, B. D.	5
Fritzsche, H. E.	10	Ott, A. L.	10
Frantz, Edward L.	50	Offeldt, B. F.	1
Graver, C. Lee	10	Pacx, Dr. A.	50
Green, J. S.	10	Pierce, F. L.	50
Griffin, Mrs. P. E.	4	Paisley, J. A.	25
Grady, Patrick	10	Prentiss, F. F.	100
Geib, George P.	5	Patterson, Robert W.	2
Gilbert, W. R.	10	Peabody, O. E.	5
Gilbert, G. R.	5	Pendergast, F. A.	10
Gimmil, W. D.	10	Pendleberry, T. F.	5
Gates, Mrs. Etta L.	5	Price, A. M.	10
Graver, A. M.	5	Randall, J. E.	50
Gilliam, Charles B.	5	Ruby, O.	10
Gill, K. F.	50	Robinson, Allen J.	5
Hyde, Edward P.	24	Ruth, Mrs. H. R.	2
Hawley, D. R.	15	Sayle, W. D.	50
Henry, A. S.	10	Sanchetta, Bianco	25
Huntington, John	20	Sanchetta, Nelly	1
Huffman, L. F.	10	Schaedel, H. F.	5
Harman, F. W.	2	Shirley, O. M.	5
Hager, W. M.	20	Soukup, Joseph	5
Horn, C. A.	5	Strong, J. M.	10
Hope, Frank G.	5	Strong, L. P.	10
Hurlburt, W. G.	15	Svobody, F. J.	10
Heil, Thomas, jr.	1	Salmon, Joseph	10
Harris, F. W.	5	Strong, E. E.	20
Hart, S. W.	20	Smith, G. W.	1
Herrigan, E. M.	1	Sagar, B. F.	3
Ingersoll, Charles B.	20	Sutherland, Marg.	3
Jennings, J. G.	25	Spahn, Thomas	5
Jennings, I. L.	20	Tobin, R. L.	5

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Preferred stock—list of stockholders of the Engel Aircraft Co.—Continued.

	Number of sharess.		Number of shares.
Tower, George E.	5	Wilcox, H. P.	5
Tillinghast, E. P.	10	Ward, C. W.	20
Thomas, Charles S.	100	Weinger, W.	2
Tubman, Dr. T. H.	5	Woodward, A. H.	4
Thomas, T. E.	50	Watkins, John	5
Thomas, W. A.	50	Wilson, P. P.	25
Vande Boe, Mary S.	20	Wiltsie, C. H.	5
Vams, R.	1	Wilson, Mrs. A. P.	2
Vogel, Henry	8	Zillmer, A. F.	3
Woodford, W. R.	75		
Wilson, W. G.	50	Total	5,160
Wurth, William	2		

STATEMENT OF MR. WALTER D. SAYLE.

The CHAIRMAN. What is your business?

Mr. SAYLE. Manufacturer.

The CHAIRMAN. Where are you located?

Mr. SAYLE. My personal office is at Cleveland, Ohio.

The CHAIRMAN. What is the name of the company with which you are associated?

Mr. SAYLE. In this particular transaction?

The CHAIRMAN. Yes.

Mr. SAYLE. The Englo Aircraft Co., of Niles, Ohio.

The CHAIRMAN. Where are the factories of the Engle Aircraft Co.?

Mr. SAYLE. Niles, Ohio.

The CHAIRMAN. What position do you occupy in that company?

Mr. SAYLE. President and general manager.

The CHAIRMAN. How long have you occupied that position?

Mr. SAYLE. Since January 21.

The CHAIRMAN. Of this year?

Mr. SAYLE. Yes, sir.

The CHAIRMAN. Are you manufacturing aircraft on account of the Aircraft Production Board?

Mr. SAYLE. Yes, sir.

The CHAIRMAN. You have been doing so for about how long?

Mr. SAYLE. That is a pretty hard question to answer. Do you mean when we commenced to ship?

The CHAIRMAN. No. When did you begin negotiations with the Aircraft Production Board looking to the manufacture of aircraft?

Mr. SAYLE. Negotiations were begun, according to my recollection, early in 1917.

The CHAIRMAN. When was your first contract made?

Mr. SAYLE. The contract was given us—I do not want to answer that question because I can not answer it accurately.

The CHAIRMAN. These questions are just approximate.

Mr. SAYLE. I should say it was about July or August.

Senator NEW. Of 1917?

Mr. SAYLE. 1917. I want to reserve the right to change that, because I did not come prepared to answer that.

The CHAIRMAN. When was your company organized?

Mr. SAYLE. The organization was started in October, 1916—Engel, Patterson & Baker, a copartnership.

The CHAIRMAN. For the manufacture of aeroplanes?

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Mr. SAYLE. For the manufacture of aeroplanes; yes, sir.

The CHAIRMAN. That was the Mr. Baker to whom you referred some time ago?

Mr. SAYLE. H. D. Baker was the brother of the Secretary of war.

The CHAIRMAN. What are his initials?

Mr. SAYLE. H. D. B.

The CHAIRMAN. Will you state, in a general way, what contracts, if any, subsequent to the beginning of negotiations with the Aircraft Board here have been made out to the Engel Aircraft Co.?

Mr. SAYLE. Up to the present time, you mean?

The CHAIRMAN. Yes.

Mr. SAYLE. Our first contract was for 100 sets of J. N.-4-D's.

The CHAIRMAN. Spares?

Mr. SAYLE. Yes, sir; spares. That was increased from time to time until we finally had 1,200 sets. Those 1,200 sets have been shipped. They were shipped in March, April, May, and June.

The CHAIRMAN. Of this year?

Mr. SAYLE. Of this year; yes, sir.

The CHAIRMAN. When?

Mr. SALYE. March, April, May and June.

Mr. Walden was the negotiator. He gave us a preliminary contract for 1,000 De Havilands. The contract was not completed. It was what they call a supplementary contract for 1,000 De Havilands.

The CHAIRMAN. When you say "De Havilands" do you mean spare parts?

Mr. SAYLE. Spare parts. Then this trouble came up on account of the relationship between H. D. Baker and the Secretary of War, and it was canceled.

The CHAIRMAN. Just one moment. You had the contracts which you have just mentioned at the time of the trouble which you say arose on account of Mr. Baker's connection with the company. What was that trouble to which you referred?

Mr. SAYLE. There was a relationship between H. D. Baker and the Secretary of War, they being brothers.

The CHAIRMAN. You say, in other words, that this contract for 1,000 De Haviland spares was canceled?

Mr. SAYLE. All contracts were canceled.

The CHAIRMAN. Those completed and uncompleted?

Mr. SAYLE. There were no completed contracts at that time.

The CHAIRMAN. You have given us the date when business was commenced at Niles, Ohio. The copartnership, if I understood you rightly, consisted of three men—or was it a corporation?

Mr. SAYLE. The copartnership was organized in October, 1916. The organization of the Engel Aircraft Co. was started about January or February of 1917. It was incorporated in August, 1917.

The CHAIRMAN. To succeed the partnership?

Mr. SAYLE. To succeed the partnership; yes, sir.

The CHAIRMAN. What was the capital stock of that company?

Mr. SAYLE. The capitalization, the final capitalization, was to be $1,000,000 of the preferred stock and $2,000,000 of the common stock.

The CHAIRMAN. How much was issued at that time?

Mr. SAYLE. None was issued at that time.

The CHAIRMAN. None was issued?

Mr. SAYLE. No, sir.

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The CHAIRMAN. Was Mr. Baker one of the stockholders of the company when the change was made?

Mr. SAYLE. Mr. Baker was to be a stockholder of the company and have his pro rata third interest in the partnership in the common stock it was to get.

The CHAIRMAN. Was it after the corporation was organized that this contract for 1,000 De Havilands was obtained?

Mr. SAYLE. Yes, sir. The J. N.-4-D's were the first contracts.

The CHAIRMAN. That was for the corporation?

Mr. SAYLE. Yes, sir.

The CHAIRMAN. You spoke of trouble regarding Mr. H. D. Baker. Do you mean by that that because the Secretary of War was informed of the existence of the contract between the Government and this company in which his brother was interested he ordered the contract canceled?

Mr. SAYLE. I have no knowledge of why it was done, or, at least, how it was called to his attention. I only know what happened.

The CHAIRMAN. What you refer to as the trouble was the relationship coupled with the fact that the contract, as you understood it, because of that, was canceled?

Mr. SAYLE. That is what I understood; yes, sir.

Senator REED. Do you mean by that that there was public criticism?

Mr. SAYLE. Public criticism in Washington and in the press all over the country.

The CHAIRMAN. What became of Mr. Baker's interest in the concern about the time of the cancellation of the contract?

Mr. SAYLE. We received notice of the cancellation of the contract on January 8. On January 22 we called a meeting of the directors. Mr. H. D. Baker realized that his position as president of the organization was embarrassing the Government in their aircraft production, or in the pursuit of the war, so he tendered his resignation as president and general manager and director, and he was paid $15,000 by the company for the surrender of all his interests in the organization, stock and everything, without profit to him.

The CHAIRMAN. Did that represent what he had put into it?

Mr. SAYLE. That represented what he had put into it in cash and services.

The CHAIRMAN. And for that consideration, you say, he retired from this position and also transferred all of his interests in the company to his associates?

Mr. SAYLE. Everything.

The CHAIRMAN. Absolutely?

Mr. SAYLE. Absolutely.

Senator NEW. You say that $15,000 represented what he put in in cash and services. Can you tell how that was divided; how much of it was cash?

Mr. SAYLE. I do not know that, sir. I do not suppose anybody would know, except as a general estimate. Engel himself had started the aeroplane company. I think it was at Depew. It was near Buffalo. Anyway, he had failed. They went down there and purchased his entire assets.

Senator REED. Whom do you mean by "they?"

Mr. SAYLE. Engel, Patterson, and Baker.

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Senator REED. Who was it that failed?

Mr. SAYLE. Engel failed.

Senator REED. He could not purchase out very much, then,

Mr. SAYLE. Patterson and Baker did that. They took Engel along with them as the technical brains of the organization to complete it.

The CHAIRMAN. That was before?

Mr. SAYLE. That was in October, 1916; yes, sir.

The CHAIRMAN. Now, since that time, what contracts have been made with your company by the Aircraft Production Board?

Mr. SAYLE. In April of this year we had a contract executed for 500 De Havilands.

The CHAIRMAN. Spares?

Mr. SAYLE. Spares; yes, sir.

The CHAIRMAN. Anything else?

Mr. SAYLE. That is all.

The CHAIRMAN. Do those contracts include——

Mr. SAYLE (interrupting). Pardon me; I did not understand what you meant by "anything else." Later we received a contract for 10 complete JN-4-D planes and, I think, about two sets of spares.

Senator NEW. Completed planes?

Mr. SAYLE. Completed planes, not including power plant.

The CHAIRMAN. Have you a contract for landing gears?

Mr. SAYLE. Yes, sir.

The CHAIRMAN. What is the date of this contract?

Mr. SAYLE. Landing gears have been included in all our contracts.

The CHAIRMAN. They constitute a part of the spares. Have you any contracts for landing gears independent of the spares, or, extras, I should say?

Mr. SAYLE. No, sir; we have not received a contract for landing gears only.

The CHAIRMAN. You manufacture at your plant the wheels for the landing gears?

Mr. SAYLE. No, sir; we buy the wheels.

The CHAIRMAN. Do you buy any from any concern in Geneva, N. Y.?

Mr. SAYLE. I think so; yes, sir.

The CHAIRMAN. You do not manufacture those in competition with the Geneva firm, or other firms?

Mr. SAYLE. No, sir.

The CHAIRMAN. Now, tell the committee whether Mr. H. D. Baker, directly or indirectly, had an interest in or was connected with the Engel Co. or any of its contracts since the purchase by the company of his interest and his retirement.

Mr. SAYLE. Mr. Baker has absolutely no financial interest, and the only interest that he has taken in it is the interest that he took about February 1. At that time I was called down to Washington. The proposition was entirely new to me, and I asked him to come along with me to guide me. I explained to Mr. Montgomery, with whom we were dealing at that time, that Mr. Baker was down here as an adviser to get me started on the airplane work, and that was the last time that Mr. Baker or his name has been connected with any of our negotiations.

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The CHAIRMAN. Does he own over his own name, or in the name of anybody for him, any shares of the stock of the Engel Co. or any of the other concerns with which the Engel Co. is identified?

Mr. SAYLE. Absolutely nothing, not a single share of stock or in any other way whatsoever.

The CHAIRMAN. Were either of the contracts renewed which were canceled at the time that this question first presented itself?

Mr. SAYLE. The contract for the 1,200 JN 4 D's was renewed approximately the middle of February, or along there. I could get you those exact dates.

The CHAIRMAN. About the middle of February?

Mr. SAYLE. About the middle of February; yes, sir.

The CHAIRMAN. Were they renewed for 1,200 or for 500?

Mr. SAYLE. 1,200 JN 4 D's.

The CHAIRMAN. Were they renewed at the same price?

Mr. SAYLE. They were renewed at the same price. The contracts were just reinstated, so to speak. To tell the truth, the Government could not cancel it. It was a bona fide contract with the Government, just as bona fide a contract as if it were between you and me.

The CHAIRMAN. As a matter of fact, they were canceled, apart from the legal authority?

Mr. SAYLE. Yes, sir; they were canceled.

The CHAIRMAN. And it required your presence down here after Mr. Baker retired, to obtain a renewal of that contract?

Mr. SAYLE. Yes, sir.

The CHAIRMAN. And the renewal was made in the shape of another contract or another paper?

Mr. SAYLE. I think only a telegram.

The CHAIRMAN. Nothing but a telegram?

Mr. SAYLE. Yes, sir.

The CHAIRMAN. Then the contract, as a matter of fact, was suspended, and after Mr. Baker's retirement you went on with it by the authority of the Government?

Mr. SAYLE. Yes, sir; we went on.

The CHAIRMAN. Have you completed your deliveries of the 500 De Haviland spares?

Mr. SAYLE. No, sir; we have not started on delivery yet.

The CHAIRMAN. You have started on production?

Mr. SAYLE. Oh, yes, sir.

The CHAIRMAN. Have you more than one factory engaged in this work?

Mr. SAYLE. No, sir; just one factory.

The CHAIRMAN. At Niles, Ohio?

Mr. SAYLES. Niles, Ohio.

The CHAIRMAN. What was this concern in Depew, N. Y.?

Mr. SAYLE. That was a concern that Engel, who was a flyer for Curtiss, started up to build a flying boat.

The CHAIRMAN. Is he still connected with your company?

Mr. SAYLE. Yes, sir.

The CHAIRMAN. Where is Mr. Baker now?

Mr. SAYLE. In Cleveland, Ohio.

The CHAIRMAN. What is his business?

Mr. SAYLE. Well, I really do not know. Baker has held a great many responsible positions, in Cleveland, Lorain, and New York City.

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The CHAIRMAN. I did not know but what he was a lawyer.

Mr. SAYLE. No.

Senator REED. What kind of positions?

Mr. SAYLE. He was at one time purchasing agent for the city of Cleveland. He was in Lorain at one time. As I understand it, he was a sort of manager for Tom Johnson down there. Just what his business was in New York City, I am not in a position to tell you.

Senator REED. It was some official position?

Mr. SAYLE. Yes, sir. He is a very bright man.

Senator REED. There are one or two questions that I would like to ask. Do you think that Mr. Baker, in his withdrawal from this corporation, received any more than the actual value of his contribution in money or time?

Mr. SAYLES. Not a penny.

Senator REED. Did he receive a fair equivalent for his contribution in money and time?

Mr. SAYLE. If it had been my own, I would have said no; I would not have sold for that value.

Senator REED. What would you have sold out for, if you had been going to get out, as Mr. Baker was?

Mr. SAYLE. Senator, that is a pretty hard question to answer.

Senator REED. What would you have sold out for if you had no Government contract?

Mr. SAYLE. If I had been called upon to get out of my own volition, $50,000 would not have taken it.

Senator REED. But suppose you had no Government contract; what would it have been worth?

Mr. SAYLE. A concern without contracts at all is not worth anything.

Senator REED. How much money was actually paid into the corporation at the time it was organized?

Mr. SAYLE. The corporation?

Senator REED. Yes.

Mr. SAYLE. No money was paid at the time it was organized.

Senator REED. Was any money paid in afterwards? I mean before Mr. Baker went out.

Mr. SAYLE. Just how much was paid in before Mr. Baker went out, I could not say, but I will guarantee it was $400,000.

Senator REED. That was paid in from the sale of preferred stock?

Mr. SAYLE. Yes, sir.

Senator REED. Was there anything paid for the common stock?

Mr. SAYLE. The common stock was paid out to take over the interest of the trio, Engel, Patterson, and Baker.

Senator REED. Were those interests considered as equal?

Mr. SAYLE. I think they were.

Senator REED. So that at most there was $45,000 contributed in money. That is, there was $45,000 invested in money and in services, which included the value of these contracts, and for that $2,000,000 of common stock was to be issued to three men. That is the situation, is it not?

Mr. SAYLE. If you want to figure it that way, yes.

Senator REED. There is no other way to figure it, is there?

Mr. SAYLE. Yes, sir.

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Senator REED. Now, let us see. These men went into a partnership. They organized a corporation. This corporation got some Government contracts, and after they had the Government contracts one of the partners, who owned a one-third interest, sold his interest for $15,000. Estimating the other two at equal amounts, that would make a total of $45,000. That is correct so far, is it not?

Mr. SAYLE. I think your basis of reasoning is corect; yes, sir.

Senator REED. Yes. Well, I am trying to get the correct basis. Now, it was proposed to capitalize this corporation by issuing common stock in the amount of $2,000,000 and preferred stock in the amount of $1,000,000; is that right?

Mr. SAYLE. That is right.

Senator REED. And the common stock was to be turned over to these three incorporators, each of them to get the same amount; in other words, each got one-third.

Mr. SAYLE. Yes, sir; that is right.

Senator REED. Then you proposed to sell the preferred stock and in that way get capital with it to carry on the enterprise: that is right?

Mr. SAYLE. That is right.

Senator REED. Now, as a matter of fact, what physical properties did the corporation have transferred to it at the time of the organization?

Mr. SAYLE. Is that question addressed to me?

Senator REED. Yes.

Mr. SAYLE. I can not give that information, but there was this flying boat that I have spoken of.

Senator REED. Did it own real estate?

Mr. SAYLE. Oh, no, sir.

Senator REED. It owned no real estate?

Mr. SAYLE. No.

Senator REED. Was any cash put into the corporation by the three incorporators at the time it was incorporated?

Mr. SAYLE. No, sir.

Senator REED. Did it have leasehold interests?

Mr. SAYLE. No, sir.

Senator REED. What did it have?

Mr. SAYLE. The three men had the flying boat and the machinery that they brought with them.

Senator REED. What was that machinery, and it was brought from where?

Mr. SAYLE. From Depew, N. Y.

Senator REED. How much did they pay for that machinery from Depew?

Mr. SAYLE. I do not know.

Senator REED. What machinery was it?

Mr. SAYLE. Machinery for the flying boat—machinery for manufacturing.

Senator REED. Lathes and things of that kind?

Mr. SAYLE. Yes, sir.

Senator REED. Do you know what it cost?

Mr. SAYLE. No, sir.

Senator REED. Do you know what they paid for it?

Mr. SAYLE. No, sir.

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Senator REED. Was this flying boat a completed thing?
Mr. SAYLE. It was a completed thing.
Senator REED. Who had created this boat?
Mr. SAYLE. Engel.
Senator REED. He was to get a one-third interest for that flying boat?
Mr. SAYLE. Yes, sir.
Senator REED. And the patents?
Mr. SAYLE. Yes, sir.
Senator REED. That was Engle's contribution?
Mr. SAYLE. All those things were owned by the three. I do not understand that Engel or Patterson had an individual interest.
Senator REED. When Engel, Baker, and Patterson formed the copartnership, what did Engel put into the partnership? He put in this boat, did he not? It was his invention, was it not?
Mr. SAYLE. Yes, sir; but they bought this boat from the Engel receiver down at Depew, N. Y.
Senator REED. How much did they pay for it?
Mr. SAYLE. I do not know
Senator REED. Did you ever hear?
Mr. SAYLE. I never heard and never asked.
Senator REED. You have no idea?
Mr. SAYLE. Absolutely not.
Senator REED. Engel had made this boat. He had gone into the hands of a receiver. Then a copartnership was organized and he was one of the partners, and they purchased from him the boat and the patents?
Mr. SAYLE. I do not know about the patents.
Senator REED. Do you know whether your concern has patents on the thing?
Mr. SAYLE. They have no patents. I do not think these things can be patented. The Government allows a certain amount for a model boat. I think it is $40,000 or $50,000.
Senator REED. If the Government is making it, that is true, but this boat was made before the Government was in that business.
Mr. SAYLE. Yes, sir.
Senator REED. Your answer does not seem to get us any place. There were patents that had been issued upon at least parts of the aeroplane. Do you know whether any such patents as those had been issued on this flying boat which Engel and these other gentlemen owned?
Mr. SAYLE. I do not know of patents issued on any of it, because——
Senator REED. So far as you know, what was paid in by Mr. Engel was an unpatented, unprotected flying boat, which had been built by Mr. Engel when he was a member of a corporation and had then been sold by a receiver of that corporation and had been bought by Mr. Baker, Mr. Engel, and Mr. Patterson. Now, that was put in as a part of the assets of the corporation. Do you know what value they put it in at?
Mr. SAYLE. I do not know that.
Senator REED. What else did they have to put in and did they put in, in fact, I mean?
Mr. SAYLE. I do not know that there was anything else put in.

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Senator REED. But that boat?

Mr. SAYLE. Except the contract that they had with the Niesl Car Manufacturing Co. for the purchase of the property down there.

Senator REED. What property was that?

Mr. SAYLE. At Niles, Ohio.

Senator REED. What was this property?

Mr. SAYLE. The Niles Car Manufacturing Co.

Senator REED. They had an option on the property?

Mr. SAYLE. They had an option on the property.

Senator REED. Do you know how much that was for?

Mr. SAYLE. That was for $450,000—$225,000 of preferred stock and $225,000 of common stock.

Senator REED. That is to say, this Niles Car Manufacturing property was to be taken over by the Aircraft Corporation and was to be paid for with $225,000 of the preferred stock of the Aircraft Corporation and $225,000 of the common stock. Now, in view of the fact that that was all to be paid for out of the stock of the Aircraft Corporation, of course it was not a contribution to the capital stock. That property was not there to turn into the corporation as original capital. It was something that the corporation purchased after it had been incorporated, and paid for by the issuance of its capital stock. That is how that comes out, is it not?

Mr. SAYLE. I do not know that I will agree with you there, Senator.

Senator REED. All they had was a contract for the purchase of this property, and they did not pay for it in money, but paid for it in the manner you have stated, by the issuance of capital stock—common and preferred; that is correct, is it not?

Mr. SAYLE. Yes, sir.

Senator REED. Now, what else did they have at the time they organized this corporation?

Mr. SAYLE. I guess you have stated it all, except brains and energy.

Senator REED. Did they have at that time any Government contracts?

Mr. SAYLE. No, sir.

Senator REED. Well, the brains and energy were tolerably well capitalized, were they not, in the shape of $2,000,000 of common stock?

Mr. SAYLE. No, sir; they were not.

Senator REED. Was this an Ohio corporation?

Mr. SAYLE. Yes, sir.

Senator REED. Is there any law in Ohio that provides for the payment of stock in brains and energy, or does the law require it to be paid for in money?

Mr. SAYLE. Well, the organization passed the blue-sky law; that is the only way I can answer that question.

Senator REED. With all due respect, I think your law would have to reach the blue sky. That is all I have to ask.

The CHAIRMAN. Let me ask you a question that I overlooked. Were you requested by any of the representatives of the Government to enter into what is called the cross-license agreement?

Mr. SAYLE. No, sir. May I explain that?

The CHAIRMAN. Certainly.

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Mr. SAYLE. It has been explained to me, because I had nothing to do with it at that time. Mr. Baker carried it on. As I stated to you, personally, if you remember, Mr. Baker tried to get a contract at Washington through Col. Waldon, who paid no attention to him at all. That was the time that he started in on the Niles Car Manufacturing plant. It was intimated to him down here that he could not get a contract with the Government unless he showed ability to produce. That is the time that he got the Niles Car plant, and then when he got that he found out that he could not get the drawings, so he went down to the Curtiss Co.

Senator REED. This Niles contract for the Niles Car Manufacturing Co., or whatever you call it, was not obtained at all until after the corporation had been organized?

Mr. SAYLE. Yes, sir; it was obtained before it was organized. Baker had a contract with them before the company was organized, and tried to get a contract with the Government before the company was organized, and the Aircraft Corporation would not listen to him, and then he had to organize a company to take over the Niles plant, and show the Aircraft Production Board that he had the physical property in which to complete his contract.

The CHAIRMAN. He had an option, and he transferred it into the arrangement that you have made, and got possession?

Mr. SAYLE. I will be glad to bring those papers. They are very voluminous, however.

Going back to your question, Senator Thomas, Mr. Baker saw that he could not make any headway, because he did not have drawings, so he went down to the Curtiss plant and laid down $2,500 for these drawings, and he got them. Well, the minute he got his Government contract he was entitled to these drawings, so that he demanded from the Curtiss Co., and received from them, $2,000 of the $2,500, so that it cost the Engel Co. only $500 for the complete drawings of the JN4D.

The CHAIRMAN. Why was he required to leave $500 with the Curtiss Co.?

Mr. SAYLE. I can not answer that question. It is something pertaining to the matter of——

The CHAIRMAN. The planes?

Mr. SAYLE. I wondered why he was asked to leave $2,500 there, but there was something pertaining to the aircraft organization that made him pay that amount of money.

The CHAIRMAN. Is there any cross license agreement now existing between the Engel Aircraft Corporation and the Aircraft Manufacturing Association?

Mr. SAYLE. Not that I know of.

The CHAIRMAN. What about the $2,500 deposit?

Mr. SAYLE. I understood that was canceled when we received the contract.

The CHAIRMAN. To the extent of $2,000?

Mr. SAYLE. Yes.

Senator NEW. You say that Mr. Baker came down to Washington with you?

Mr. SAYLE. Yes, sir.

Senator NEW. When was that?

Mr. SAYLE. May I explain the whole situation?

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Senator NEW. Yes.

Mr. SAYLE. Before I was connected with the airplane plant they received from Mr. Gee a tentative contract for 1,000 De Havilands, which was signed about January 8. Then they called us down here to Washington to reopen the De Haviland contract.

Senator NEW. You say they called "us."

Mr. SAYLE. I mean the Engel Aircraft Co. I, as president of the company, had to come down, but I knew nothing about the former negotiations, so that I requested Mr. Baker to come down with me. I took him up to the Aircraft Production Board and explained to Mr. Montgomery, the lawyer there, with whom we did business, that Mr. Baker was here as my adviser, and this would be his last trip, as I hoped to get in complete touch with the situation on that trip; and it was his last trip. That was early in February.

Senator NEW. Of this year?

Mr. BAKER. Yes, sir; of this year.

The CHAIRMAN. Mr. Sayle, will you attach to the record, when it is sent to you for correction, a list of the shareholders of the Engel Aircraft Co.?

Mr. SAYLE. A complete list?

The CHAIRMAN. Yes, sir.

Mr. SAYLE. Yes.

Senator REED. To whom was Mr. Baker's stock transferred?

Mr. SAYLE. To the company.

Senator REED. It was transferred back to the company?

Mr. SAYLE. To the company; yes, sir. It stands now in the name of the company.

The CHAIRMAN. I think that is all.

(Whereupon, at 4 o'clock p. m., the committee adjourned, subject to the call of the chairman.)

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AIRCRAFT PRODUCTION.

FRIDAY, JULY 26, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at 3 o'clock p. m., pursuant to the call of the chairman in the committee room, Capitol Building, Senator New presiding.

Present: Senators New and Reed.

STATEMENT OF CAPT. RILEY SCOTT.

Senator NEW. Captain, state your name and address to the stenographer.

Capt. SCOTT. Riley Scott, technical section, office of the Director of Military Aeronautics, Washington, D. C.

Senator REED. What is your rank?

Capt. SCOTT. I am a civilian. I am a West Point graduate and have been in the service. I am now an aeronautical mechanical engineer.

Senator NEW. You were formerly in the Army and a graduate of the Military Academy?

Capt. SCOTT. Yes, sir.

Senator NEW. Of what year?

Capt. SCOTT. 1904.

Senator NEW. You served in the Army how long?

Capt. SCOTT. Four years.

Senator NEW. What rank did you have when you left?

Capt. SCOTT. First lieutenant.

Senator NEW. How did you happen to leave the Army?

Capt. SCOTT. Lieut. Selfridge, who was the first man killed in mechanical flight, was my chum, and he interested me at that time in aviation.

Senator NEW. You resigned from the service when?

Capt. SCOTT. At the ti ne that Orville Wright was flying at Fort Myer.

Senator NEW. Did you become associated with the Wrights?

Capt. SCOTT. I was an aide to Wilbur Wright for a time during the Hudson-Fulton Exposition and have known both of the Wright brothers since that time.

Senator NEW. What has been your business since that time?

Capt. SCOTT. I have specialized on the airplane as an instrument of war, especially its rôle as a bombing machine.

Senator NEW. You say that you have specialized on those subjects. In what connection and capacity?

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Capt. SCOTT. I happen to have invented the first bomb sight and to have dropped the first bomb in the history of aviation. Then I went to France in 1911 and won all of the Micheli prizes for bombing. I then went to Germany in 1912 and dropped bombs there, which were probably about the first which were dropped in Germany.

Senator REED. Were you operating there under the German Government?

Capt. SCOTT. By invitation of the German Government.

Senator REED. And in France under the French Government?

Capt. SCOTT. I was competing for a prize offered by Monsieur Micheli.

Senator REED. Of course both of these occurrences you have spoken of occurred before the European war?

Capt. SCOTT. In 1911 and 1912.

Senator REED. Was this Micheli prize which was offered in France open to the world?

Capt. SCOTT. Yes, sir.

Senator REED. What was the prize for?

Capt. SCOTT. Accuracy in bomb dropping and the most scientific instruments for bomb dropping.

Senator REED. Are you an aviator yourself?

Capt. SCOTT. I learned to fly in France, but do not fly at present.

Senator REED. Were you running the machine as aviator when these bombs were dropped on these two occasions you have spoken of—that is, in France and Germany?

Capt. SCOTT. No, sir; I was then a passenger operating the bombing instrument.

Senator NEW. Since the European war broke out have you been abroad?

Capt. SCOTT. Yes, sir; I have. When the war broke out I cabled my services to both France and England. Neither country accepted the services, on account of my not being on the ground. I then went abroad on my own responsibility for the purpose of seeing and learning as much as I could about the rôle that the airplane was playing in the great war, especially in the field of bombing. By good luck I was able to get into 14 European countries, 9 of which were belligerents on both sides of the conflict.

Senator NEW. Did you get into Germany?

Capt. SCOTT. Germany, Austria, Hungary, Serbia, Bulgaria, Turkey and Asia Minor, France, England, Italy, and Belgium.

Senator NEW. With what opportunity for observation?

Capt. SCOTT. They happened to be most excellent on account of my knowing most of the old aviators of those various countries, having met them at various times in Europe.

Senator NEW. Captain, you have been back here about how long?

Capt. SCOTT. About two years.

Senator NEW. Have you recently discharged any commissions or had any connection with the aviation section here of the Signal Corps?

Capt. SCOTT. For over a year I have been employed as an aeronautical mechanical engineer, and my work has been wholly concerned with aeroplane bombing.

Senator REED. Who were you employed by?

Capt. SCOTT. The air division of the Signal Corps.

Senator REED. Who was at the head of it?

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Capt. SCOTT. Gen. Squier was then the head.

Senator REED. Where were you located?

Capt. SCOTT. My headquarters have been at Langley field, Hampton, Va., but I have been traveling a great deal to various fields and factories.

Senator REED. Under the directions of your employers?

Capt. SCOTT. Under official orders.

Senator NEW. Have you recently made a trip to Dayton under official orders?

Capt. SCOTT. I was and was there two weeks for the purpose of studying and reporting on the D. H. 4 airplane as a bombing machine.

Senator NEW. Have you made such a report?

Capt. SCOTT. I have but it has not yet been submitted. I have written it.

Senator NEW. Without asking you to define the character of the report which has not yet been submitted to the department, I will ask you what has been the result in your own mind of the inspection of the De Haviland?

Capt. SCOTT. I came to the conclusion after a cursory inspection that there was something radically wrong with the machine, and after making a minute inspection I am of the firm opinion that the machine is totally unfit for the purpose for which it was designed.

Senator REED. Namely, what?

Capt. SCOTT. As a bomber and as a combat machine.

Senator NEW. Why?

Capt. SCOTT. For the reason because the design and workmanship of this machine are so faulty I consider it unsafe for bombing, especially when the bombs are carried suspended from the rings, as at present.

Senator REED. Well, that is a conclusion, but tell us why.

Capt. SCOTT. A few of the defects are indicated on the photographs which are herewith submitted.

Senator REED. What are those defects? Can you not put your criticism in the kind of language which anybody who understands anything about the technical nature of airplane manufacture or operation can understand?

Capt. SCOTT. The longerons, a most vital part of the machine, are entirely of spruce and are scarcely larger in cross section than the ash longerons of other lighter machines.

Senator REED. What conclusion do you draw from that?

Capt. SCOTT. That they should use a stronger wood than spruce, especially in such a heavy machine.

Senator NEW. For that particular structural part?

Captain Scott. For that particular structural part.

Senator REED. You say that the machine as now made with spruce is inefficient in strength at the part you spoke of, the longerons?

Capt. SCOTT. Decidedly so.

Senator REED. What are the longerons? Can you describe them so that the layman will understand what it is?

Capt. SCOTT. The "longeron" may be described as the backbone of the machine. There are usually four longerons running from the engine section to the tail, about which are formed the body of the machine. These longerons perform the same function in the airplane that the back bone of a man performs in his anatomy. In other

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words, the various fittings and attachments for the motor, for the wings, and for the rudders are attached and depend upon these longerons.

Senator REED. They form the chief strengthening supports for what is called the fuselage——

Capt. SCOTT. Yes, sir.

Senator REED. Or body of the plane?

Capt. SCOTT. Yes, sir.

Senator REED. You say they are deficient in strength. Now, why do you say they are deficient in strength?

Capt. SCOTT. In the first place, the wood itself is not that usually used for these parts. If, taken in connection with the fact that all fittings without exception are attached to the longerons with bolts passing through the wood of the longeron—these bolts are awfully closely spaced and pass through both laterally and vertically, thereby destroying the strength of the wood.

Senator REED. Now, if I understand you, you say, first, that the spruce, being the material of which these longerons are made, is a wood that is too weak considering the size of the pieces. It is too weak in itself, and, second, that it has been further weakened by boring holes of bolts through it and putting bolts through at close intervals?

Capt. SCOTT. Yes, sir.

Senator REED. So that as a result of the two elements, you say that the longerons are too weak a part of the machine?

Capt. SCOTT. Yes, sir.

Senator REED. That is a conclusion. Let me follow it a minute. You said a minute ago that the longerons were made of spruce, whereas the material generally employed was ash.

Capt. SCOTT. Yes; there are other stronger woods.

Senator REED. Now where is ash or other stronger wood employed; in what factories or countries?

Capt. SCOTT. I think in every other type of machine in this country and generally abroad.

Senator REED. You think then that these De Haviland 4's are the only machines that are built that are to do practical flying and work on the war front—I suppose of course you would include that limitation you would not include every kind of machine that has ever been constructed?

Capt. SCOTT. I referred to two machines in production.

Senator REED. This is the only machine you know of that does not employ ash or some equally strong wood some wood that is stronger than spruce in these parts which are called the longerons?

Capt. SCOTT. Yes sir; not only in this country but abroad as well.

Senator REED. I want to come to the second element of weakness. You spoke about the bolts these longerons having been bored through and bolts inserted and the borings and of course the bolts being sometimes close together.

Capt. SCOTT. Closely spaced, both laterally and vertically, the holes alternating sometimes.

Senator REED. Is that kind of construction peculiar to the De Haviland 4 as made here in this country?

Capt. SCOTT. It is and I have seen no other machine where the longerons were perforated by these holes.

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Senator REED Other machines fasten their bolts how? If they do not make bolt holes how do they fasten them?

Capt. SCOTT. The fittings are called clips and are placed around the wood instead of being fastened by bolts.

Senator REED. How are they attached to the wood so as to make them firm?

Capt. SCOTT. By being placed entirely around the wood and gripping instead of being fastened by bolts.

Senator REED. What is the process of making them grip; by a set screw, or by heating them and putting them on hot?

Capt. SCOTT. They are put on cold and are held in place by bolts through metal but not through wood.

Senator REED. These bolts then press against the wood, do they not? I understand you to mean from the illustration you have made that this clip or metal is placed against the wood, and then it is drawn tightly against the wood by means of a screw going through the metal parts and drawing them together, grasping the wood, but not penetrating the wood?

Capt. SCOTT. Yes, sir.

Senator REED. You say that is the only kind of construction?

Capt. SCOTT. That is the standard construction?

Senator REED. Are there other planes, however, in common and general use in this country where they bore through the parts?

Capt. SCOTT. Not to my knowledge, unless it be the Bristol, which I have not closely examined.

Senator REED. The Bristol fighter. That is a machine we understand has been condemned.

Capt. SCOTT. Yes, sir.

Senator REED. You say these parts are weak, and you have given us your reasons for saying that they are weak. Have you ever seen them tested under a load when they gave way?

Capt. SCOTT. That is being done at present, but I was not able to see the test.

Senator REED. Your conclusions that you have given us are deductions from the conditions which you find, and not from the actual breaking of the planes?

Capt. SCOTT. The conclusions are based on a general fundamental knowledge of airplane construction, and from an examination of the records of several machines which have fallen with fatal results.

Senator REED. Do you know that any of these machines, or have you good reason to assume and conclude that any of these machines fell because of breakage, which was the result of these particular weaknesses which you have described?

Capt. SCOTT. In one case in particular into which I inquired, the wings were seen to leave the plane in midair, first one wing and then the other, which was apparently due to the fact that the fittings which held the wings to the fuselage gave way. The records show that the longeron broke in practically every instance at the bolt holes, which one would naturally expect.

Senator REED. You say that the wings left the body. Do you connect that fact up with the weaknesses in the longerons which you have described?

Capt. SCOTT. An examination afterwards showed that the fittings attached to the longerons, by means of bolts, had given away.

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Senator REED. You mean the fittings that united the fittings to the longerons?

Capt. SCOTT. They had given away.

Senator REED. Had the bolts given away or the longerons broken?

Capt. SCOTT. The longerons had broken at the bolt holes.

Senator REED. Have you other reasons than those that you have just given to sustain the question of the weaknesses? I want to stick to this particular weakness we are now discussing. Are there any other tests that you have known that have indicated the weakness of the longerons?

Capt. SCOTT. In another instance into which I inquired, the machine was compelled to make a forced landing in rough ground, receiving a considerable jolt upon touching the earth. The whole motor section, including the motor and the propeller, broke off and turned at right angles to the axis of the machine. All four longerons broke at a place where there were a number of bolt holes.

Senator REED. At substantially the same point in the longeron?

Capt. SCOTT. At exactly the same cross section of the fuselage.

Senator REED. Do you know of other instances than these two?

Capt. SCOTT. Not personally.

Senator REED. Have you heard of other cases of a similar nature?

Capt. SCOTT. I was told at the Wilbur Wright field that in every case where there had been a serious fall the aviator had been killed, and that the fuselage was usually crushed like an egg shell, I examined, however, the wreckage of only two machines, of which I have spoken.

Senator REED. Who gave you this information you have just imparted?

Capt. SCOTT. The principal flying officers at the Wilbur Wright field.

Senator REED. Can you tell me who they were?

Capt. SCOTT. Maj. Muhlenberg, chief of the testing department; Capt. Schroeder, in charge of flying in the testing department; Lieut. Foote, one of the best De Haviland 4 fliers at the field, and Lieut. Tabuteau, an old experienced French flyier now stationed at this field as a technical expert.

Senator REED. When did these gentlemen give you this information?

Capt. SCOTT. While I was at the field inspecting the machines and dropping bombs for them.

Senator REED. Approximately when?

Capt. SCOTT. About two weeks ago.

Senator REED. When did this first machine fall that you described a little while ago in which there was a fatality.?

Capt. SCOTT. At the Wilbur Wright field.

Senator REED. Who was flying it at the time?

Capt. SCOTT. Lieut. Patterson, a nephew of the National Cash Register Co.'s president.

Senator REED. Do you remember when that fell?

Capt. SCOTT. About a month and a half or two months ago.

Senator REED. When was the second accident that you described?

Capt. SCOTT. About a month ago.

Senator REED. Who fell in that?

Capt. SCOTT. Maj. Ocker, an old experienced flyer.

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Senator NEW. Was Maj. Ocker killed?

Capt. SCOTT. No; he was not hurt, except that he is swearing yet about it.

Senator REED. Where is Maj. Ocker?

Capt. SCOTT. At present he is at Wilbur Wright field.

Senator REED. You spoke about the strength of these longerons in connection with the load. Do you know whether the De Haviland 4 was originally planned to carry the weight that is now put upon it?

Capt. SCOTT. The machine was copied from the English De Haviland, which was designed to carry a much lighter motor than the present Liberty motor. Instead of strengthening the machine it is common comment among the flyers that the American De Haviland is considerably weaker than its prototype, the English machine.

Senator REED. And it has to carry a much heavier motor?

Capt. SCOTT. And has to carry a very much heavier motor.

Senator REED. Well, does it not also carry a more powerful motor than the one it was originally planned for?

Capt. SCOTT. It does, and, of course, the high speed of the machine—about 120 miles per hour—adds very considerably to the strains imposed upon the structure.

Senator REED. That is to say, a machine carrying a motor weighing, for illustration, 500 pounds, and going at a rate of 100 miles an hour, does not have anything like the same strain on its parts as the same machine would have if you put in a motor that weighed 800 pounds and ran the machine at 120 miles an hour. Is that right?

Capt. SCOTT. That expresses it exactly.

Senator REED. Have you ever figured out the difference in the strain upon the wings of these planes which you say is due, first, to the increase in the weight of the motor, and, secondly, to the increase in speed?

Capt. SCOTT. I have not personally, but it is common aeronautical knowledge, several authorities having figured all those things out.

Senator REED. What is the rule as to pressure? Is there a rule? I do not know but want to make my question plain. Sometimes the momentum of a body can be ascertained by multiplying the speed of the square of the weight with the square of the speed, if I remember the old rule right. Is there any such rule as that which would tell the pressure on the parts of the machine, or have you not advanced far enough to develop a rule?

Capt. SCOTT. We have. This has been figured out by Dr. Zahm, an eminent American scientist, who has computed tables showing these various strains at various speeds and at various diving angles.

Senator REED. Those tables, of course, you do not carry in your mind?

Capt. SCOTT. No, sir.

Senator REED. But the pressure is very much greater?

Capt. SCOTT. Very much greater. It increased rapidly and is very much greater.

Senator REED. You have spoken of the difference in the load occasioned by the motor. What other load has been put on the De Haviland since it has been sdopted by our people?

Capt. SCOTT. The American De Haviland carries approximately the same load in machine guns and bombs that the present English De Haviland carries.

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Senator REED. How does the present English De Haviland compare in strength of structure with the American De Haviland?

Capt. SCOTT. It is said to be much stronger. I have not seen the English De Haviland personally.

Senator REED. Do you understand that they have increased the strength of their plane as they have increased the load?

Capt. SCOTT. I have been told so.

Senator REED. Now, if I understand you right, you say that the English De Haviland from which we copied the American De Haviland was planned to carry a lighter load than the American De Haviland, and was a stronger machine than the American De Haviland? Was it also planned at the time it was made to carry a load of bombs? I am speaking now of this type that we copied ours from.

Capt. SCOTT. The later ones were. I am not sure about the first De Havilands.

Senator NEW. Captain, you spoke of the custom here of perforating the longerons for the use of bolts. You showed me a photograph, one of a longeron showing the frequency with which those bolts were put in. Have you a copy of it with you?

Capt. SCOTT. I have a copy in which nine quarter-inch bolts pass through the spruce longeron in a length of 10 inches, which naturally destroys the strength of the longeron at that point.

Senator NEW. Will you submit that copy of the photograph for the records of this committee?

Capt. SCOTT. I will. And also I have with me a section of the longeron showing the manner in which the bolts go through the wood.

Senator NEW. Will you let us also have the section of the longeron?

Capt. SCOTT. Yes, sir.

Senator REED. The photograph that you show; does it contain the same section of the longeron that you are handing us?

Capt. SCOTT. No, sir; the section which I am giving you has only four bolts through the wood.

Senator REED. Exactly, but it is broken off, and I do not know what there was in the broken-off portion. What I am interested in is the size of the longeron at the point where these bolts go through it.

Capt. SCOTT. It is practically of the same cross section as the sample submitted.

Senator REED. Give us the size of this piece of longeron which you say is substantially the size of the longeron shown in the photograph marked E, through which nine quarter-inch bolts pass in the space of 10 inches.

Capt. SCOTT. The cross section of the longeron is about 1½ inches square. It may be that the section shown in the photograph is slightly greater in cross section.

Senator REED. When you say slightly greater, that, of course, is indefinite. Can you state the limits?

Capt. SCOTT. Not over 1¾ inches square.

Senator REED. You are perfectly clear that there is no such construction as this which you have criticized in the English and French machines that are in general use in those parts of the machines where there is the same character of strain that comes upon the De Haviland 4 at the points you have been speaking about?

Capt. SCOTT. In all the foreign machines that I have seen, as a general rule, clips were used instead of bolts. Occasionally I have

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seen bolts used, but always singly, and never in great number or closely spaced.

Senator NEW. You have some other photographs illustrative of structural parts of the De Haviland 4 machine?

Capt. SCOTT. I have a photograph of the machine in which the motor broke away from the fuselage, showing the points at which it broke.

Senator NEW. Will you please submit it?

Capt. SCOTT. Yes, sir.

Senator REED. That is the one you referred to a while ago in your testimony?

Capt. SCOTT. Yes, sir. In this picture it will be noted that the longerons broke at the bolt holes, and that the veneer, which takes the place of the diagonal wires in other machines, was jointed at this weakest point of the longerons.

Senator REED. You have spoken of the defect, if it be a defect, incident to using veneer instead of wires. Is that another element of weakness?

Capt. SCOTT. It seems to be in this particular machine. There are other machines, notably those manufactured by the L. W. F. Airplane Co., in which veneer is used, but in a different and much more substantial manner.

Senator REED. Do you, then, regard it as an element of weakness that they have in these machines placed as a substitute for a wire support this veneer?

Capt. SCOTT. Decidedly so, considering their manner of attaching the veneer to the fuselage.

Senator REED. The photograph witness has been testifying about is marked "C" and is filed herewith.

Senator REED. You have handed us photograph "B" in connection with photograph "C." What is the purpose of that? Is that to show the section which broke off?

Capt. SCOTT. Yes, sir.

Senator REED. Was the whole of section C in the section which is marked "motor section weak here"?

Capt. SCOTT. The motor and the whole section broke off along the dotted lines shown in photograph marked "B."

Senator REED. In connection with this photograph I find the mark "See D. Weak fittings here." What does that indicate?

Capt. SCOTT. In order that the motor could break away the supporting cables leading to the front struts of the motor section had to give away. The fittings to which these cables are attached are quite weak.

Senator REED. The metallic fittings?

Capt. SCOTT. The metallic fittings to which these cables are attached are quite weak an gave away when the machine struck the ground.

Senator REED. You have then photograph D which is intended to illustrate these fittings that you have referred to.

Capt. SCOTT. Yes, sir.

Senator REED. You have marked one of them, "Double and strong." Does that indicate that that thing is all right?

Capt. SCOTT. That fitting is relatively unimportant, but it has been doubled and made strong.

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Senator REED. Now, there is another arrow indicating a fitting which is at the point where the wires are attached to the strut.

Capt. SCOTT. To the upper portion of the strut.

Senator REED. And you have marked that "single and weak." Do you mean by that that particular metallic fitting is weak?

Capt. SCOTT. It is not sufficiently strong for the purpose for which it is intended, namely, that of largely supporting the weight of the Liberty motor.

Senator REED. Is it as strong as the one which is marked "double and strong," and which you say is relatively unimportant?

Capt. SCOTT. It is nothing like as strong and consists of a single piece of metal instead of a double piece as in the other fitting.

Senator REED. That photograph is marked "D."

Capt. SCOTT. I was told by an engineer connected with the manufacture of the D. H. 4 machine that these fittings referred to are not according to specifications, but were made by mistake, and that they are using them up, before employing other and better fittings.

Senator REED. Who told you that?

Capt. SCOTT. A Mr. Zimmerman, formerly engineer for the Curtiss Co. and recently connected with the Engle Aircraft Co., of Niles, Ohio.

Senator REED. Do you think he is there yet?

Capt. SCOTT. I saw him in Washington yesterday, and we talked over the De Haviland and its weaknesses, and I have a particularly high regard for his ability, and he agreed with me that the machine was, to express it vulgarly, rotten.

Senator REED. Do you know Mr. Zimmerman's initials, and where he is stopping?

Capt. SCOTT. He is now designing a machine on his own responsibility and can be reached through the Curtiss Engineering Co. at Hempstead, Long Island.

Senator REED. Do you know his initials?

Capt. SCOTT. I do not.

Senator REED. What hotel was he stopping at here?

Capt. SCOTT. He was here only during the day, and I asked him where he was stopping, and he said that he was not registered at a hotel.

Senator REED. Have you any better address than the one you have given us?

Capt. SCOTT. No, sir.

Senator REED. Photograph D will be introduced. Now, photograph D has on it an arrow, pointing, as I have said, to this metallic fastening and marked "single and weak. See B." Have you a photograph marked "B" to further illustrate that fact?

Capt. SCOTT. That photograph has already been introduced and shows a distance view of the parts which are shown closely in photograph "D."

Senator REED. Have you further photographs illustrating what you regard as weak points in this machine?

Capt. SCOTT. Photograph A gives a general view of the fuselage of the machine and merely shows the location of parts referred to in the other photographs.

Senator REED. These photographs, where they say, "See E," or "See B," etc., are cross references to the other photographs?

Capt. SCOTT. Yes, sir.

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Senator REED. Are there other defects in this machine?

Capt. SCOTT. There are minor defects of workmanship which show to a trained eye evidences of carelessness and lack of proper inspection in the manufacture of the machines.

Senator REED. Do you care to call attention to them, or are they of such a nature that you can not?

Capt. SCOTT. An example might be given in which upon stripping a machine of its fabric it was found that three alerons were made of spruce and the fourth one of ash for some unknown reason.

Senator REED. What would be the effect of that?

Capt. SCOTT. It shows merely carelessness on someone's part and probably would not affect the operation of the machine, except that it would have been much better if all four had been made of the stronger wood which is usually employed in the alerons.

Senator NEW. Captain, you have given us the names of some of the aviation officers out there at the Dayton testing field; Maj. Muhlenberg and Capt. Schroeder and Lieut. Foote. You conferred with them frequently and fully while you were making these inspections?

Capt. SCOTT. We talked over the machine day after day and these officers, especially the two latter, seemed to consider the machine not only weak, but actually dangerous.

Senator NEW. They concurred with your views as to the efficiency of the De Haviland 4.

Capt. SCOTT. Every officer at the field regularly flying the De Haviland 4 expresses the same views that I have expressed in this hearing.

Senator NEW. Captain, is it true that this is the only field at which the De Haviland 4 is tested?

Capt. SCOTT. There are a few De Haviland 4's at other fields, but this is the official testing field for these machines.

Senator REED. These officers that you say have concurred in your opinion are official testers, or flyers, or both?

Capt. SCOTT. They are flyers in the testing department.

Senator REED. Are they the officers who report on the machines?

Capt. SCOTT. They are officers who originate the reports which are submitted from that field by the chief of the testing department.

Senator NEW. Have you any reason to think that they have submitted reports to the department that are in accord with the evidence you have given this afternoon to this committee?

Capt. SCOTT. I know that they have, and while I was there a commission was sent by the War Department from Washington to report on certain features of weakness which the testing department has submitted to the War Department.

Senator NEW. Was that a commission of officers?

Capt. SCOTT. A commission of civilian experts sent there from the production department.

Senator NEW. Who comprised that commission, do you know?

Capt. SCOTT. I do not remember their names. I can get that for you.

Senator NEW. Do you know whether it made a report?

Capt. SCOTT. They undoubtedly did, because they came right back to Washington and were sent there for that purpose.

Senator NEW. You have no knowledge as to the character of that report?

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Capt. SCOTT. I have not; except that they seemed to be impressed by what was shown to them.

Senator NEW. Shown by whom?

Capt. SCOTT. By the officials of the testing department.

Senator NEW. If you can, I would like you to get the names of that commission and supply them to the committee.

Capt. SCOTT. Yes, sir.

Senator NEW. Captain, I want to ask you a further question. Do you know whether any of these Dehaviland 4 planes have been recently delivered to the Navy or the Marine Corps?

Capt. SCOTT. I have been told by an officer of the technical section of the Army Air Service that a large order had been placed by the Marine Corps for De Haviland 4's.

Senator NEW. You say that a large order was placed for the aviation branch of the Marine Corps. Is that what I understand?

Capt. SCOTT. Yes; the aviation branch of the Marine Corps. A few of these have been delivered, and just to-day Naval Constructor Hunsacker, who is the technical authority in the Navy is reported to me to have said that the flying officers of the Marine Corps testing these machines have sent in a protest against using them as at present constructed.

Senator NEW. As a matter of fact, then, I glean from your testimony that you regard the De Haviland 4 as in about the same class as the Bristol fighter as an unsafe machine. Is that correct?

Capt. SCOTT. Yes, sir; I consider it totally unfitted for bombing and almost equally unfitted as a combat machine.

Senator NEW. In the course of your testimony you told us of the accident out there in which Lieut. Patterson was killed. I wish you would tell the committee the purpose for which he was sent out and give a description of that accident just as briefly as you can.

Capt. SCOTT. I was told that he was ordered to go about 3 miles high and then dive vertically toward the earth for the purpose of testing a machine gun synchronizer, the gun firing through the arc of the propellor. The officers observing this flight through glasses first saw one wing leave the machine.

Senator NEW. At the height of approximately 3 miles?

Capt. SCOTT. At approximately the height of 3 miles. An instant later the other wing left the machine so that the pilot and the observer shot toward the earth on the bare fuselage, and, of course, the machine was a complete wreck upon striking. The observer leaped from the machine upon nearing the earth apparently in order to avoid being mangled. The pilot in the De Haviland sits between the Liberty motor and a 75-gallon gas tank and I am told that in no case of a serious fall has the pilot been able to escape.

Senator REED. Do you regard that as bad construction also?

Capt. SCOTT. Decidedly so.

Senator REED. Where ought the gas tank to be located in reference to the pilot?

Capt. SCOTT. In other machines, notably the Curtiss, the gas tank is in front of the pilot and also under his seat.

Senator REED. Does that interfere with his ability to see?

Capt. SCOTT. No; it does not.

(Whereupon, at 4.30 o'clock p. m., the subcommittee adjourned subject to the call of the chairman.)

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AIRCRAFT PRODUCTION.

SATURDAY, JULY 27, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The committee met at 2 o'clock p. m., pursuant to adjournment in the committee room, Capitol Building, Hon. Harry S. New presiding.

STATEMENT OF NAVAL CONSTRUCTOR J. C. HUNSAKER.

Senator NEW. Give your name and rank to the stenographer, please.

Constructor HUNSAKER. J. C. Hunsaker, naval constructor, U. S. N.

Senator NEW. Are you a graduate of the Annapolis Academy?

Constructor HUNSAKER. Yes, sir.

Senator NEW. How long have you been in the Navy?

Constructor HUNSAKER. I graduated from the Naval Academy in 1908 and from the Massachusetts Institute of Technology in 1912.

Senator NEW. How long have you had the rank of naval constructor?

Constructor HUNSAKER. I have had the rank of assistant naval constructor since 1909; of naval constructor, the past year. We lose the "assistant" after eight years.

Senator NEW. In your capacity as constructor and assistant constructor, have you anything to do specially with aircraft for the Navy?

Constructor HUNSAKER. Yes; nothing else.

Senator NEW. Your time is devoted entirely to that?

Constructor HUNSAKER. Yes; and it has been for a number of years.

Senator NEW. In this connection I would ask you what type of American-made aircraft have been delivered to the Navy for its use within the last few months?

Constructor HUNSAKER. The Navy has adopted as standard in the interests of production and in maintenance of spare parts and of supplies abroad, for any submarine patrol, two types of flying boat, a large boat equipped with two Liberty engines, and a smaller type equipped with one Liberty engine, and we have been shipping those for the past few months to France and England, where they are now in operation, and we ship nothing else.

Senator NEW. Are they giving satisfactory service?

Constructor HUNSAKER. They have not been in operation long enough on the other side to determine what changes may be advantageous. We have them operating on our own coast and they are giving satisfactory service.

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Senator NEW. Where you have opportunity for trial they appeared to be giving satisfactory service?

Constructor HUNSAKER. Yes.

Senator NEW. That applies to the motor, of course, as well as to the plane?

Constructor HUNSAKER. Yes, sir.

Senator NEW. What about the De Haviland 4, so called? Have any of those machines been delivered to the Navy lately?

Constructor HUNSAKER. Yes, sir.

Senator NEW. How many?

Constructor HUNSAKER. We had an inquiry from our Marines for land machines. We do not consider that land machines are our business, and instead of going to the manufacturer we went to the then Signal Corps to buy some De Havilands for the Marines, and the necessities were urgent and they shared with us their first deliveries from the Dayton Wright factory.

Senator NEW. How many of those machines were turned over to the Marines?

Constructor HUNSAKER. There have been shipped overseas 50. There are now awaiting shipment or loading 100. We diverted four of these to the Marine training squadron in Florida to try them out and get some experience with them.

Senator NEW. At the naval testing station?

Constructor HUNSAKER. At Miami, Fla.

Senator NEW. Have the four that you delivered there been subjected to tests?

Constructor HUNSAKER. Yes; they have been flying them.

Senator NEW. Have you any reports as to the results of those tests?

Constructor HUNSAKER. There is no report as to their flying, but a great many detailed reports as to structural matters, and details of construction in the nature of instruction; minor defects that have developed from their flying.

Senator NEW. Defects, you say, which they developed from their flying?

Constructor HUNSAKER. Yes.

Senator NEW. Then they have been flown?

Constructor HUNSAKER. Oh, yes.

Senator NEW. And the defects as you say, have developed as the result of that flying?

Constructor HUNSAKER. Yes.

Senator NEW. I wish you would state just what the character of that report is.

Constructor HUNSAKER. The report has to do largely, I should say, with the quality of workmanship, and the defects, so-called, that have been found are not fundamental, and can be and will be corrected.

Senator NEW. What are those defects?

Constructor HUNSAKER. Cases of wire terminals pulling out. That was a lack of workmanship only; a matter of the soldering; cases of aileron sheaves not working freely or being properly faired up. Weaknesses in the tail structure, insufficient bracing for it, bad work in applying the fabric to the planes. It has been necessary to refit the fabric to the ribs. An improvement is required in the

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method of bracing the wings against folding to the rear. A certain fitting that anchors the forward drag wires is not satisfactory. There is no use detailing such matters. There are 15 or 20 small things, any one of which is annoying to a pilot and can be corrected and will be corrected by the Bureau of Aircraft Production, and we have requested them to send experts to Florida and they have offered to supply new wings for those wings which we do not like.

Senator NEW. Then, the defects reported are such that new wings have been requested for those machines that were sent to the Florida field?

Constructor HUNSAKER. Yes.

Senator NEW. An airplane without wings is more or less useless, is it not?

Constructor HUNSAKER. It would not fly very well, sir. These planes are flying and they do fly pretty well.

Senator NEW. Are you a flyer?

Constructor HUNSAKER. No, sir; an engineer.

Senator NEW. You have never flown?

Constructor HUNSAKER. No.

Senator NEW. Still you may have an opinion as a naval constructor, anyhow, as to whether or not you would regard it safe for an aviator to take the air with a machine on which the wing fabric has not been properly stitched?

Constructor HUNSAKER. It is not safe as a general thing for an airplane to take the air with any defects in it whatsoever, but in war time a certain amount of risk is willingly taken by the flyers, but we should minimize the risk that they have to take. This can be minimized in this case by instructing the flyers to do no acrobatics with these machines until corrections have been made.

Senator NEW. Of course, we all understand that any man who goes into the military or naval service does so with the full knowledge that he must take all reasonable chances that come to a man in war, but is it not true that in the military service, as elsewhere, a man has a right to expect that every reasonable precaution will be taken to provide him with a safe appliance in which he is required to risk his life? The risk is great enough at all times without the care and attention that can be given to machines of various kinds.

Constructor HUNSAKER. Yes.

Senator NEW. You speak of a report having been made that the fabric is loosely or improperly attached to the ribs. Are there any specific details given in that report, or is that just a general statement?

Constructor HUNSAKER. It is general in that they do not say which wing or which rib. It appears to be a general condition on all the machines that the fabric is not well stitched or well stretched, and that they have had trouble from the fabric lifting away from the ribs and the stitches pulling out.

Senator NEW. When that is done does that not render the machine extremely unsafe?

Constructor HUNSAKER. Yes; and our marines have repaired that themselves. They are a pretty competent lot of fellows down there.

Senator NEW. But those machines that have been delivered have been delivered with that defect?

Constructor HUNSAKER. Yes.

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Senator NEW. What knowledge have you, if any, as to the conditions in which the machines that have been sent abroad were delivered?

Constructor HUNSAKER. I have no knowledge. They have not been taken out of their crates.

Senator NEW. How many of those machines were shipped?

Constructor HUNSAKER. Fifty of them have already gone. We will make arrangements to take care of them on the other side and send new parts and alterations to be installed on them.

Senator NEW. Before they are flown?

Constructor HUNSAKER. Yes, sir.

Senator NEW. Then, you say there are 100 crated here and ready to ship?

Constructor HUNSAKER. We have 100 ready to ship; yes, sir.

Senator NEW. What disposition is to be made of them?

Constructor HUNSAKER. That is worrying us at the present time, whether to uncrate them and make changes or to ship them and make changes on the other side, and that has not yet been decided.

Senator NEW. But before they can be used they will be examined?

Constructor HUNSAKER. They will; yes, sir.

Senator NEW. And tested?

Constructor HUNSAKER. Yes.

Senator NEW. And if found to have the same defects in the wing structure of which you have already spoken, that must be corrected before naval aviators are permitted to use them. That is correct, is it?

Constructor HUNSAKER. I doubt whether naval aviators will be refused permission to use them. They will be warned to fly them with caution. Our naval station theory is that these stations shall be largely self-supporting. They have skilled mechanics of all trades as part of the organization and they are able, if they take the time to do it, to rebuild any plane sent to them, if necessary. We have our assembly and repair base in France, which no doubt is able to make any necessary repairs of any machines we send over.

Senator NEW. But it is the business of the concern at Dayton, the Dayton Wright Co., to turn that machine over to you in good shape, is it not?

Constructor HUNSAKER. Yes, sir.

Senator NEW. The machine is supposed to be inspected before it leaves that factory, is it not?

Constructor HUNSAKER. Yes.

Senator NEW. And by whom?

Constructor HUNSAKER. By the inspectors of the Bureau of Aircraft Production.

Senator NEW. Do you regard it as a serious omission that a machine should pass inspection and be delivered to you bearing those defects?

Constructor HUNSAKER. It is poor inspection or inexperienced inspection, probably. These machines we got were the first of the output.

Senator NEW. Do you not regard that as inexcusable?

Constructor HUNSAKER. I would not say inexcusable, because I am not familiar with the exact conditions there. There may be some good excuses.

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Senator NEW. I have no doubt there will be so-called good excuses. As a constructor, have you had occasion to make personal examination or consideration of the structural parts of the De Haviland 4, as made at the Dayton Wright factory?

Constructor HUNSAKER. No; I have not had any reason to believe that special examination was necessary. I made a trip to Dayton and went through the factory last month while these machines were coming along, and since have received from the Bureau of Aircraft Production engineering data which indicate that the structural design affords an ample factor of safety.

Senator NEW. You, of course, know what the longerons of a machine are?

Constructor HUNSAKER. Yes, sir.

Senator NEW. It has been reported to this committee that the longerons of the D H. 4, as made at the Dayton Wright factory, are of spruce, whereas other and stronger woods are used in the same construction in the original machine as made in England. Do you know anything as to the accuracy of that statement?

Constructor HUNSAKER. No; I would not know. I am not familiar with these military machines in detail, but I would consider it no defect to make longerons of spruce rather than ash if they were of proper size. We use it.

Senator NEW. They are 1½ inches square, I believe. It has also been reported to this committee that within a space of 10 inches there are nine quarter-inch bolts set through these longerons. Would you regard that as structurally weakening the machine, to do that?

Senator NEW. Nine quarter-inch bolts through a piece of spruce timber 1½ inches square within a longitudinal space of 10 inches?

Constructor HUNSAKER. It sounds ridiculous. I do not know where that would be done.

Senator NEW. There is a photograph of it and I call your attention to that photograph.

Constructor HUNSAKER. Is that meant to be a splice?

Senator NEW. No.

Constructor HUNSAKER. That is a butt joint. The longeron is in two parts. It comes here in the middle of the fuselage and these fish plates of steel run, one on the bottom of it and one on the top. There are three bolts to the right of the joint and three to the left, so that this may be taken down and the fuselage will come apart. That seems to be a quick demountable fitting perhaps to facilitate shipment. The longeron there is strengthened by these steel planes top and bottom.

Senator REED. Of course, to strengthen the splice it is necessary to have plates above and below in order to make a splice at all, if it is a splice.

Constructor HUNSAKER. Yes.

Senator REED. What would be the occasion for a splice there?

Constructor HUNSAKER. In order to take the after part of the fuselage off so it will be shipped in a smaller package. I recall having seen one of those in Dayton, so that the fuselage can be broken into two parts for shipment.

Senator NEW. I show you photograph "A" and call your attention to this point where the arrow strikes the fuselage and the legend "See E" is opposite the end of it. Is that the point on the machine at

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which the bolts are shown in the photograph marked "E" which you have just seen?

Constructor HUNSAKER. I should presume so. That is the logical place to put the joint.

Senator NEW. I call your attention to a photograph marked "C." There appears here a section of the longeron of the machine with bolts marked as penetrating that.

Constructor HUNSAKER. Is this taken at the same section as photographs A and E?

Senator NEW. I presume so.

Constructor HUNSAKER. This is after some wreck?

Senator NEW. That is on a wrecked machine, yes. Do you see anything in that that indicates a structural weakness on that machine?

Constructor HUNSAKER. It appears to be broken, but we do not know the conditions under which it was wrecked. If that blade had been stronger, it would, no doubt, have broken in another place. The matter of the design of a take-down fuselage is a technical matter. You might use bolts and make up for the bolt holes by the use of steel straps. It seems to be within any ordinary engineer's province to make a joint which will not weaken the general structure of the fuselage. I can not tell by looking at these fuselages whether that joint is a good one or not. There is nothing unreasonable about it, however.

Senator NEW. Airplanes are like other machines; they are likely to break at the weakest point.

Constructor HUNSAKER. Yes, sir.

Senator NEW. Who are the officers who have made these reports, officers or cadets, or whoever they were?

Constructor HUNSAKER. The commanding officer of the first marine aviation force, Miami, Fla.

Senator NEW. Is his name given?

Constructor HUNSAKER. We have them from Capt. Walter E. McCaughtry, captain in the United States Marine Corps, who is commanding officer at Miami.

Senator NEW. From the reports that you have seen and your own experience with the De Haviland 4, I ask you directly if you regard it in its present condition as a safe airplane?

Constructor HUNSAKER. I do not know what its present condition is. Of course, the Bureau of Aircraft Production is fully informed as to the troubles that have been had to date, and they are doing everything possible to correct them. In its condition as first delivered to us I can answer the question by saying that it was not safe, but there is nothing about the difficulties found that can not be corrected, and the machines can be made safe.

Senator NEW. Did you have any experience with the Bristol machine?

Constructor HUNSAKER. No, sir; I went to Buffalo and looked at one once.

Senator NEW. What was your impression of the Bristol?

Constructor HUNSAKER. I had been told that it was overpowered and structurally weak, and it looked it.

Senator NEW. You know that a board of Army officers did make an adverse report upon it, and that pursuant to that report it was condemned?

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Constructor HUNSAKER. Yes.

Senator NEW. Do you know whether the changes recommended by the Navy Department have been made in the De Haviland 4 or is it still being turned out like the four on which this report is based?

Constructor HUNSAKER. I have no knowledge based on my own inspection, but I have been assured that all changes are being taken care of at the present time.

Senator NEW. Whence comes that assurance?

Constructor HUNSAKER. From a conference between Naval Constructor Ream, in our office, and officers attached to Mr. Potter. I do not know with whom Mr. Ream had his conference, but he has made several trips to the bureau to press the matter of disposing of these planes that we now have on our hands, and he reports that he reached a satisfactory agreement with them.

Senator NEW. As I understand you, then, it is true that the 150 De Haviland 4 planes which have either been shipped or delivered for shipment must be gone over and these reported defects rmeedied before you regard them as safe and efficient machines?

Constructor HUNSAKER. Yes, sir.

Senator NEW. And this will be done before they are released for use?

Constructor HUNSAKER. Yes, sir.

Senator NEW. Have you any idea how much time that will require?

Constructor HUNSAKER. No; I have not. We are working on that now.

Senator NEW. You do not know whether that will be done on this or the other side of the water?

Constructor HUNSAKER. No decision has been reached yet.

Senator NEW. I guess that is all.

(Whereupon, at 3 o'clock p. m., the committee adjourned subject to the call of the chairman.

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AIRCRAFT PRODUCTION.

TUESDAY, JULY 30, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at 2 o'clock p. m. pursuant to adjournment in the committee room, Capitol Building, Hon. Harry S. New presiding.

Present: Senators New and Reed.

STATEMENT OF MAJ. H. C. K. MUHLENBERG.

Senator NEW. Maj. Muhlenberg, you are now stationed at Dayton?

Maj. MUHLENBERG. At the Wilbur Wright Field; yes, sir.

Senator NEW. At the Wilbur Wright Field?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. In what capacity?

Maj. MUHLENBERG. Commanding officer, testing department.

Senator NEW. How long have you been there?

Maj. MUHLENBERG. I have been there since about the 12th of May—May 10 or 12.

Senator NEW. How long have you been in the United States Army, Maj. Muhlenberg?

Maj. MUHLENBERG. I entered West Point in 1904, graduating in 1908.

Senator NEW. You are a graduate of the Military Academy?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Are you an engineer?

Maj. MUHLENBERG. No, sir.

Senator NEW. You are not an engineer?

Maj. MUHLENBERG. No. I was assigned to the Infantry and served in the Infantry three years, and then four years in the Ordnance Department, then two years in the Infantry, and then I was assigned to the Signal Corps in October of last year.

Senator NEW. What machine is undergoing inspection and observation at your field?

Maj. MUHLENBERG. We have completed the standard performance test of the De Haviland 4 and are now working on the standard performance test of the Standard M. Defense single seater and the English-built Bristol fighter with the 300-horsepower Hispano-Suiza motor in it.

Senator NEW. It is with special reference to the De Haviland 4 that I wish to examine you at this time. What is the De Haviland 4 machine?

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Maj. MUHLENBERG. It is a two-seater machine for three purposes: A day bomber, a fighter, and a reconnoisance machine, showing a different load for each of these three duties.

Senator NEW. Originally it was an English machine, was it not?

Maj. MUHLENBERG. It was an English machine originally; yes, sir.

Senator NEW. What changes, if any, have been made in that machine by the Americans, as compared with the English model?

Maj. MUHLENBERG. I have a report on the English De Haviland here. While I have not gone into it at length, it appears to be very much the same machine that we had. There seem to be some changes, of course, to adapt it to the Liberty motor. The motor there, I believe, is the Rolls Royce. There have necessarily been some changes to adapt it to the Liberty motor, but otherwise, in general, the appearance is exactly the same.

Senator NEW. In making these changes, has it been necessary to add much, comparatively speaking, to the weight of the machine?

Maj. MUHLENBERG. The weight given here for the English is 1,630 kilograms, and the weight of the American De Haviland is given as 3,700 pounds. I can not now translate that English weight into pounds. The results are given in French, in kilograms. I have the results here in pounds. I can translate them subsequently, but I have no means at the present time of doing that.

Senator NEW. I wish you would make that translation and supply it when this evidence is sent to you for revision.

Maj. MUHLENBERG. Yes, sir; I will do that; 2.1 pounds equal 1 kilogram.

Senator NEW. Major, a great deal has been said lately about the character and qualities of the De Haviland 4 machine. I want to ask you some pretty direct questions concerning it. Are you satisfied from your observations with the present condition of the De Haviland 4 machine?

Maj. MUHLENBERG. No, sir. It is by no means the machine we want for a fighter nor the machine we want for a bomber. As a reconnaissance machine, and, possibly, as an artillery observation machine, it would be all right, but certainly not as a fighter nor as a bombing machine. It will not fill the bill of either one. Of course it is the only plane that approaches a fighter plane now in full production, and necessarily I would not advocate stopping its production at all, but the minute a better fighter can be produced, or a better bomber can be produced, that plane should take the place of the De Haviland for those purposes.

Senator NEW. Then, what are its defects as a bomber?

Maj. MUHLENBERG. As a bomber, it has a ceiling of 15,800 feet. That is the maximum ceiling. The service ceiling is very close to 15,000 feet. That means the ciling at which the rate of climb is less than 100 feet per minute. That is about 15,000 feet. Now, as a day bomber, the ceiling should be better than 15,000 feet. It should be considerably better than that, because hits have been known to have been made by antiaircraft batteries at 15,000 feet altitude. The best ceiling, as I say, of the De Haviland 4 is 15,800 feet. In addition to that, the De Haviland carries at the present time 75 gallons of gasoline. Its consumption, at full throttle, is 37 gallons per hour, so it carries about two hours' fuel at full throttle, which is a

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very limited capacity for a bomber, unless that bomber is to be employed immediately around the airdrome from whence it comes.

In addition to that, in the trials which were recently made at the Wilbur-Wright field, in dropping bombs, there was considerable difficulty experienced in maintaining communication. The proper kind of communication between the pilot and the observer was difficult. The pilot is so far from the observer that they have to communicate by interphone, and that is not the best means of communication. The best means of communication would be by touch, where the pilot would be immediately in front of the observer, and the observer could point him in the right direction, so as to enable him to drop his bombs.

Another thing is this: The pilot is so situated in between the wings that he can not see the object at the proper time, just before the observer picks it up. The pilot should first pick it up, and he should follow it until the observer can pick it up, and the observer should pick it up far enough in advance to set the bomb right at the proper time. As the target comes under the leading edge of the lower wing, the pilot loses sight of it and the observer does not pick it up until it is too late to set the sight from the end seat.

Senator NEW. Isn't that a very serious defect in a day bomber?

Maj. Muhlenberg. A very serious defect, yes, sir. We overcame it to some extent by putting a negative lens immediately in the rear of the pilot's right foot, so that he could see something, but that was only an expedient, and I believe it panned out fairly well.

Senator NEW. In other words, the vision of the pilot is so interfered with by the structure of the machine that it impairs its efficiency as a day bomber?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Is there any other defect that detracts from its efficiency as a bomber?

Maj. MUHLENBERG. Structural defects only that show that it is not constructed strongly enough for the load that it carries. It may be built to carry it without accident, but there are certain structural defects in it that should be remedied, even for use as a fighter, and more so for use as a bomber, where it carries that heavy load.

Senator NEW. You spoke of structural defects there that impai- its strength. Do I understand you to mean that you think the mar chine is not strongly enough built?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. To answer the purpose for which it is designed to be used by our forces?

Maj. MUHLENBERG. There are three or four points in which it is not strong enough.

Senator NEW. What are those points—the structural points?

Maj. MUHLENBERG. I have a photograph here showing the nose of the machine without the motor. You can see it here. [Indicating on photograph.]

Senator NEW. You have handed me a card bearing two photographs, numbered 521 and 522.

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Please tell us just what these photographs represent.

Maj. MUHLENBERG. The photograph numbered 522 is a picture of the nose of the De Haviland 4 with the motor out. I wish to draw your attention here to the two nose drift wires. These two wires

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[indicating] both run to the same fitting, this fitting here [indicating], and that fitting is held in place by a tie-rod, which runs through the lower longeron and through the fuselage to the longeron on the other or opposite side of the machine. You can not see it in the picture, but on the other side of the fuselage is a corresponding fitting, and to that the two nose drift wires run.

Now, going back to these nose drift wires, these two wires run to the top and bottom, respectively, of the first strut, and are the only effective means of preventing the wings sweeping back in a dive.

Senator NEW. Can you identify these wires of which you speak on the photograph which I will now hand you and which is marked "B"?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. That is a photograph which was made a part of the evidence given by Mr. Riley Scott, formerly of the Army, who testified before this committee as a witness a few days ago. I will ask you if you can identify these wires so as to make these photographs correspond?

Maj. MUHLENBERG. The wires spoken of are those which run from the top and bottom of the first strut out from the fuselage.

Senator NEW. As shown on photograph "B"?

Maj. MUHLENBERG. As shown on photograph "B"; yes, sir. They run to the fitting at the lower portion of the nose near the radiator. These are the only wires, as I said, that effectively prevent the wings from sweeping back in a dive. We had just such an accident at the Wilbur Wright field on the 19th day of June.

Senator NEW. Was that the accident in which Lieut. Patterson was killed?

Maj. MUHLENBERG. Yes, sir. As far as we could tell from the examination of the wreckage, that tie rod, which ties in the two fittings spoken of on either side of the fuselage, sheared off, or pulled out, due to the pressure exerted on the wings in the dive, allowing the wings to sweep back and leave the fuselage. I have pictures of the wreck.

Senator NEW. I infer from that that this accident was probably due to a structural weakness of this machine?

Maj. MUHLENBERG. Yes, sir. That is my opinion. That opinion has been expressed in a report rendered by my office to the Director of Military Aeronautics.

Senator NEW. Will you please tell me the date of that report?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Have you a copy of it?

Maj. MUHLENBERG. I have only the photograph, but not the report itself.

Senator NEW. Can you give us the date of that report?

Maj. MUHLENBERG. I find that I have it here after all. It was dated June 26. [Handing report to Senator New.]

Senator NEW. Will you state what the gist or the substance of this report is?

Maj. MUHLENBERG. The gist of the report was that this tie rod spoken of failed, allowing the nose drift wires to become loose, which allowed the wings to sweep back. Of course, the plane being at 15,000 feet altitude, it was impossible for anyone to tell exactly what did occur, but the examination of those fittings and that rod leads

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to the conclusion that was reached by my office. There has been nothing to even reasonably disprove that theory. In a sand test the De Haviland has failed at that point.

Senator NEW. Just what do you call a sand test?

Maj. MUHLENBERG. It is a static load test, where the machine is turned upside down and the sand is placed on the wings until they fail. The wings are at an angle of 14 degrees from the horizontal, so as to bring the strain on the drift wires as well as on the——

Senator NEW. The machine is called upon to stand a test equivalent to that which it would have to stand from air pressure in the air?

Maj. MUHLENBERG. Yes, sir. The De Haviland failed at that point, as I remember it, in two sand tests made at the McCook field, at a factor of failure of from 4½ to 5 or 6, which means that the wing was loaded with approximately six times the maximum load that the ship would be expected to carry before breaking. The French consider that the proper factor of safety is seven.

Senator NEW. Do you know what the English regard as the proper factor of safety?

Maj. MUHLENBERG. I do not know; no, sir.

Senator NEW. If there are other structural defects which you have in mind, will you state what they are? I wish to ask you at this point to supply copies of any photographs to which you testified before this committee, because without them your testimony will not mean much.

Maj. MUHLENBERG. Yes, sir; I will do that.

Photograph No. 524 shows a part of the wreck of June 19.

Senator NEW. Which, for the purpose of identification, we will call the Patterson machine.

Maj. MUHLENBERG. Yes, sir.

This fitting shown is the fitting which joins one of the main wing spars to the fuselage, or to the center section. That fitting is shown with a single bolt through it. We believe that that fitting should be stronger, and should have two bolts through it instead of one; also that the end of the spar should be capped with a metal fitting, so as to tie the wing bolt to the spar by something other than the small piece of wood contained in the end of the spar. The hole for the bolt is simply driven through the end of the spar. There is little or nothing but that piece of wood in the end to hold that bolt to the wing spar. Now, either a fitting should go around that spar, a metal sleeve, so to speak, or the internal drift wires shown at this point should be tied to the bolt, so that the bolt can not separate from the wing.

Senator NEW. You are now indicating a point marked "A B" on the margin?

Maj. MUHLENBERG. Yes, sir. I have another photograph, showing how the ends of the spars were simply pulled out.

Senator NEW. That is photograph No. 525?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. They appear to have been pulled right out?

Maj. MUHLENBERG. Yes, sir. Of course, it might have been the failure of those wing spars that caused the accident, but that is hardly probable, because they would give as soon as the nose drift wires gave. The failure of the nose drift wires would necessarily

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cause the main spars to give, as shown in the photograph, because the wings were swept absolutely clean from the fuselage.

Photograph 519 is a picture of one of the fittings of the Patterson machine fastening the nose drift wires to the fuselage and shows the fittings, wires, and turnbuckles in good condition, showing that the rod, the tie-rod connecting one fitting to the other through the fuselage, was the thing that failed. These fittings stayed with the wings and the tie-rod went with the fuselage, which landed about 1,000 to 1,500 yards away from the wings, so that the tie-rod must have been sheared or pulled apart in the air.

Senator NEW. You may proceed, Major, if there are other structural defects which occur to your mind.

Maj. MUHLENBERG. The principal structural defect over and above those I have mentioned is the fabric which covers the wings. The fabric over the entire wing in nearly all De Havilands is much looser than the fabric in our training planes. By tapping it with the fingers you get a different sound from that which you get when you try this on the training planes.

Senator NEW. Should that be the case?

Maj. MUHLENBERG. It is believed by everyone to whom I have spoken on the ground that the fabric should be tight.

Senator NEW. Is the fact that it is looser on the De Haviland than it is on the training planes due to design or is it the result of bad workmanship, or to what is that to be attributed?

Maj. MUHLENBERG It may be any one of four or five different things. It may be caused by the dope; it may be caused by the paint; it may be caused by lack of initial tension in putting on the fabric; it may be due to a combination of all these. The chances are it is due to a lack of initial tension in putting the cloth over the wing. Acetate dope is now used for doping battle planes, whereas nitrate dope is used in training planes.

Senator NEW. But whatever the cause of the weakness, it is a structural defect which should not be there; is that the case?

Maj. MUHLENBERG. Yes, sir. It should be tight, just as tight on the battle plane as it is on the training plane.

In addition to this looseness all over, we have what is believed to be a new problem in aviation that of keeping the wing fabric attached to the ribs of the wing, in the slip stream. That is where the wind strikes the ship in the rear of the propeller. In all high-powered Liberty motor planes that we have had we have had trouble with that very thing. The vibration from the propeller in the slip stream sends ripples down the cloth that tear it loose from the ribs in time, and that problem has not been properly appreciated up to the present time because it was brand new. I doubt if it has been met in Europe at all.

Senator NEW. By reason of the fact that the high-powered Liberty motor is not in use?

Maj. MUHLENBERG. Yes, sir. That is the fact.

Senator NEW. Is that your conclusion?

Maj. MUHLENBERG. Yes, sir. The Navy, I understand, is having the same trouble.

Senator NEW. With its boats?

Maj. MUHLENBERG. Yes, sir. The difficulty of keeping the fabric attached to the ribs is what I refer to.

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Senator NEW. I asked you if they are experiencing that trouble with the boats for the reason that I know of a report which was made last week of a trial and inspection by the Navy Department of De Haviland 4 machines which had been submitted to it for test, and I wondered if you had reference to that particular report?

Maj. MUHLENBERG. No, sir. My knowledge of what troubles the Navy has had is only hearsay. I have heard that they are having the same trouble with their Liberty motor planes as we are. They attribute it to a little different cause, but naturally we think we are right. We think it is caused by the vibration of the motor or of the propeller in the slip stream.

Senator NEW. That is your theory?

Maj. MUHLENBERG. That is my theory and the theory of the office.

Senator NEW. It is the theory of the officers in charge of the test field at Dayton, Ohio?

Maj. MUHLENBERG. Yes, sir. The increased number of ribs and the improved methods of sewing on material to the ribs and tighter fabric on the wings will probably eliminate this. If it does not—and we are going to find out by experiments at the Wilbur Wright field—experiments will have to be made with a stronger and coarser cloth, or with veneer. We are trying veneer, also, in our experiments. That is not a structural defect peculiar to the De Haviland. We have seen it on the LePere machine and on the Bristol. I believe it was that trouble that caused the death of Philip Rader at Buffalo, especially as the upper wing of that American-built Bristol is much more in the slip stream than is the upper wing of the De Haviland. The gap, that is, the distance between the upper and lower wings on the De Haviland, is greater than that on the Bristol. Both wings are lower on the Bristol than on the De Haviland, so it brings the upper wing more in the slip stream than is the case with the De Haviland, so that you get a condition of affairs in the Bristol that you do not get in the De Haviland. That is why, in the Bristol, the upper surface of the upper wing comes loose, just as I have described. In the De Haviland we have only the under surface of the upper wing and both surfaces of the lower wing come loose from the ribs.

Senator NEW. The committee has heard some evidence to the effect that the tail of the De Haviland 4 is weak.

Maj. MUHLENBERG. The stabilizer is certainly not fastened to the machine in the strongest manner possible. It looks frail and feels frail in the air. We have not had an accident to date from that cause that we know of, but we received a communication from the Director of Military Aeronautics shortly after the Patterson accident suggesting that that might possibly have been the cause of that accident, because such accidents—that is, the failure of the stabilizer—had happened in England; but we could not find anything to substantiate the assumption that the stabilizer failed in that accident. However, that stabilizer is not fastened to the machine as strongly as the stabilizer of the Le Pere machine is fastened. A man can jump on the stabilizer of the Le Pere machine without apparent injury to the machine, whereas if he were to do that on the De Haviland he would probably injure it. It looks to frail for that.

Senator NEW. I would like to ask you, Major, to point out what, in your opinion, should be done to remedy the defect shown in the photograph numbered 522.

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Maj. MUHLENBERG. The two nose drift wires, instead of running to one fitting, should run to two different fittings on each side of the fuselage. The upper fitting should be located, preferably, on the engine bed, or at the forward end of the upper longeron, and each pair of the fittings should be tied in by an alloy steel rod.

Senator NEW. Now, I would like to call your attention to a photograph marked "E," which was submitted by Capt. Scott, a recent witness before this committee. I call your attention to the fact that in this photograph it is shown that a number of quarter-inch bolts are run through the longeron of the machine. In your opinion, should that construction be followed there?

Maj. MUHLENBERG. No, sir. I believe that it is possible to get the same or greater strength without so many holes in the longeron.

Senator NEW. In your judgment, does the presence of those bolts and the necessary holes through the longeron to receive the bolts weaken the structure?

Maj. MUHLENBERG. Yes, sir; I believe so.

Senator REED. Is that a dangerous weakness?

Maj. MUHLENBERG. I would not call it highly dangerous. We have known of the existence of those bolts, as you say, at the field. Our pilots are in the habit of making fast landings, to avoid putting a strain on the fuselage at that point. By a fast landing, I mean putting the landing wheels on the ground in landing, with the tail high.

Senator REED. In other words, these men must regard it as a place likely to be broken, or they would not be landing in this way to protect it?

Maj. MUHLENBERG. Exactly, yes, sir. It has failed at that point in the sand tests.

Senator REED. It has also failed at that point in a number of accidents; that is, you have found the longerons broken at that point?

Maj. MUHLENBERG. We have only had one accident with the DH4 at the Wilber Wright Field. Of course, that machine failed everywhere after it struck.

Senator REED. You said that it "failed everywhere." You mean by that that it struck so hard and smashed into so many small pieces that you could not tell where the original break was?

Maj. MUHLENBERG. Yes. We could not tell definitely; no, sir.

Senator REED. But in the sand test the De Haviland 4 has broken. The longeron has broken noticeably at the point where the longeron is pierced by these bolts, as is shown in these photographs?

Maj. MUHLENBERG. I believe so. That statement can be verified by reference to the record of sand tests at McCook Field, but I believe it has failed there. I know that in a sand test which I witnessed on the fuselage of the De Haviland, they expected it to break at that splice.

Senator REED. If, instead of boring these nine holes through the longeron and then putting these bolts through, a steel clasp was put around the fuselage, that would do the same work as the bolts, would it not? You could employ that in lieu of a bolt, could you not?

Maj. MUHLENBERG. Probably. I would like to experiment with it before taking the ship into the air if it was treated in that way.

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Senator REED. You know, as a mechanical proposition, that a steel clasp can be put around it?

Maj. MUHLENBERG. Yes, sir. At all events, those bolts could be so spaced that they would not weaken the longeron as they do.

Senator REED. You mean as much as they do?

Maj. MUHLENBERG. Yes, sir; as much as they do.

Senator REED. What do you say about the supports of the engine? Is not the engine support itself weak in this machine?

Maj. MUHLENBERG. Well, from one accident which we had, or rather, one forced landing, it would appear that the engine support is not what it should be in that photograph of the fuselage (indicating), which is marked "C." In that accident, or forced landing, which was made by Maj. Ocker, at Bridgewater, Va., due to a leak in the gasoline tank, which was a landing in bad terrain, he smashed everything on the machine below the lower longerons, and also the lower longerons. In addition to that, the engine bed sagged, as shown in the photograph. I can hardly see, though, that that proves that that particular portion is any weaker than the rest of the fuselage. In order to get lightness and corresponding of performance in the air, a battle plane fuselage can not be made to resist a possible forced landing the way a training plane can be made to resist it. It must be weaker in order to make it light. If we had the De Haviland fuselage as strong as the JN-4 fuselage, correspondingly, it would be too heavy to manipulate in the air. So, while that failure occurred in that particular landing, I would hate to say that it shows any great structural weakness in the machine, because it was a bad landing—it was a good landing in a bad territory—and we all know that a bad landing in that plane is liable to result in serious injury to the pilot, and possibly to the observer, because so much depends on the veneer that is on the fuselage. It is not braced with wood and wire the way the training plane is braced.

Senator REED. Why isn't it braced with wood and wire?

Maj. MUHLENBERG. Because to do that would make it heavy.

Senator REED. How much would it really add?

Maj. MUHLENBERG. A few pounds, not a great many, but the cry is all through, "cut out the weight."

Senator REED. And have we not cut it out in this country in our construction until to-day we have got our machines very dangerous? Have we not cut more, I will add, than any other country, in that respect?

Maj. MUHLENBERG. Really, I am not familiar enough with foreign planes to say.

Senator REED. Very well. The load of the machine has a great deal to do with the wing pressure, does it not?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Do you know the weight of the engine that the English De Haviland carries, the plane from which this was copied?

Maj. MUHLENBERG. About 600 pounds, I think. It is six or seven hundred pounds.

Senator NEW. If you have any figures, let me have them. I think you are away up.

Maj. MUHLENBERG. This will give it in kilograms. It does not give the weight of the engine. It gives the weight of the machine.

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Senator REED. Do you know of any engine that was used in the De Haviland 4 in Europe that had the equivalent in horsepower of the Liberty motor?

Maj. MUHLENBERG. The nearest thing was the Rolles Royce, a 375-horsepower motor.

Senator REED. The others were considerably below that?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Now, the horsepower of the engine and the weight of the engine and the weight of the load driven by great horsepower vastly increases the pressure upon the wings?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And upon the whole machine?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Could this Liberty motor be cut down to an eight-cylinder machine, let us say, and yet be powerful enough to handle that De Haviland?

Maj. MUHLENBERG. I have heard it said that the English De Haviland handled better with a lower powered English motor than with the Liberty motor. I have heard that said by an Englishman. I have never flown it myself, of course, so that I can not say it at first hand. We are trying now the English-built Bristol fighter to act as a fighter, and that plane is equipped with a 300-horsepower Hispano-Suiza. The chances are that that machine will give a better performance as a fighter, or at least as good a performance, as the De Haviland; that is, with the 300-horsepower motor instead of the Liberty. That is largely because the ship is lighter.

Senator REED. That is to say, the experiments thus far seem to indicate, without being conclusive, that if you were to put a 300-horsepower Hispano-Suiza into this Bristol machine which we have been building in this country, and which we understand has been practically discarded, that that might perform a better service?

Maj. MUHLENBERG. I am talking about the English-built Bristol machine.

Senator REED. So that you would not want to say that about the American-built Bristol machine?

Maj. MUHLENBERG. No, sir.

Senator NEW. You have just spoken of the Bristol and have said that you are experimenting with the English plane of that name at the Wilbur Wright field?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. In what respect does that plane differ from the so-called Bristol, which we have been making in this country at the Curtiss factory, and which has recently been discarded?

Maj. MUHLENBERG. It differs principally in weight. I do not know what the weight of the American Bristol is, but the weight of English-built Bristol, loaded as a fighter, is 2,910 pounds, full fuel and oil, just 900 pounds less than the weight of the De Haviland loaded as a fighter. That plane gives promise of being a very satisfactory fighter. So far we have been compelled to experiment with an old motor and an old plane, but when we get the new motor and the new plane, as we will do before very long, the performance will undoubtedly show a great improvement.

Senator NEW. You approve of the rejection, do you, of the American-built Bristol machine?

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Maj. MUHLENBERG. Yes, sir.
Senator NEW. You do not think it should be used?
Maj. MUHLENBERG. No, sir.
Senator NEW. You do not think it is a fit machine as made in this country?
Maj. MUHLENBERG. No, sir.
Senator REED. I believe you gave some testimony somewhat along that line long before this plane was condemned, did you not?
Maj. MUHLENBERG. Yes, sir.
Senator Reed. To this committee?
Maj. MUHLENBERG. Yes, sir.
Senator REED. Will you state, briefly, what, in your judgment, were the material defects in the American Bristol?
Maj. MUHLENBERG. The ribs are too far apart in the wings. In some cases, the spars were misplaced. The upper spars were where the lower spars should have been, or vice versa. The internal drift wires in the wings were not properly arranged. The flying wires were where the landing wires should have been, and vice versa; and it looks very much as though the covering for the wings in the center section, in the slips stream, should have been made of radically different material. Those wings get a much greater whip from the slip stream by their location than even the wings of the De Haviland do, especially the upper wings, and the chances are that material should be of heavy, coarse linen, or veneer.

In addition to that, the overhang of the motor bed is all right for a lighter motor, but for the heavy Liberty motor it is of faulty construction. It is what is known as cantilever construction. The motor hangs out in the front with a very poor support. The weight is not carried properly back to the fusilage or to the landing gear for that heavy motor.

Senator REED. In other words, you think it is a botched affair?
Maj. MUHLENBERG. I have seen samples of that kind.
Senator REED. Doesn't that indicate the grossest kind of carelessness in the assembling of the machine?
Maj. MUHLENBERG. It looks that way.
Senator REED. Isn't that inexcusable in a shop that pretends to turn out machines of this character?
Maj. MUHLENBERG. Yes, sir.
Senator REED. That would be inexcusable in a wagon maker, would it not?
Maj. MUHLENBERG. Yes, sir.
Senator REED. Where did these machines come from that were built in this way?
Maj. MUHLENBERG. They were built at the Curtiss plant.
Senator REED. Were those defects that you have spoken of largely visible to the eye or were they hidden?
Maj. MUHLENBERG. Oh, you would have to take off the wing covering to find them.
Senator REED. So that the poor fellow who had to go up in the machine went up without knowledge of the character of construction?
Maj. MUHLENBERG. Yes, sir.
Senator REED. In other words it was covered up?
Maj. MUHLENBERG. Yes, sir.

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Senator REED. And a proper inspection of the machine as it was being built would have discovered all those defects, would it not?

Maj. MUHLENBERG. Not all I have mentioned; but those wing defects, internal wing defects, should have been discovered on inspection.

Senator REED. What ones would not have been discovered on inspection?

Maj. MUHLENBERG. Well, the improper spacing of the ribs could be seen by anyone by casually looking at the machine, provided he knew the problem that he was up against.

Senator REED. That, then, was another defect that could have been observed upon proper inspection?

Maj. MUHLENBERG. If the inspector had had the proper knowledge of the problem.

Senator REED. Exactly. Well, proper inspection, of course, implies a proper knowledge, does it not?

Maj. MUHLENBERG. Yes, sir; but what I want to point out is that the question of keeping the fabric on the ribs seems to be a problem new to everybody in aviation.

Senator REED. That is to say, this is the first time that we have put a motor into a machine, the motor being so powerful as to tear the machine to pieces?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And this is the first time anybody has built a motor and put it into a machine without experimenting to find out whether the machine was strong enough to stand it, so far as you know?

Maj. MUHLENBERG. That is a pretty general question.

Senator REED. You need not answer that question. It is hardly a proper one.

Maj. MUHLENBERG. I do not know

Senator REED. As a matter of fact, the history of aviation is that the great trouble they had in the early days of aviation was to get a motor strong enough to drive the machine?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And, accordingly, the machine generally was strong enough to stand any motor that they put into it?

Maj. MUHLENBERG. Yes, sir.

Senator REED. But now we have produced a motor of about 525 horsepower in the Liberty motor?

Maj. MUHLENBERG. Approximately 400.

Senator REED. Four hundred to four hundred and twenty-five horsepower?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And that has been put into these machines that have not been theretofore tried with either so heavy or so powerful a motor?

Maj. MUHLENBERG. That is the point.

Senator REED. And when you put that to the test the covering of the wings began to give away?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And those other defects of construction that you have been speaking of were defects as a result of not properly following

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the design, or defects that resulted from not doing the work according to the design?

Maj. MUHLENBERG. All except the engine bed overhand. That was a defect in design.

Senator REED. Of course, you have not torn open all the Bristols that have been manufactured?

Maj. MUHLENBERG. No.

Senator REED. A very small percentage?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Now, in what percentage of those that you did have opportunity to go through and examine, inside and outside, did you find those defects that you have spoken of?

Maj. MUHLENBERG. We have not tested the Bristol at all in my department. We have simply seen and had our attention called to samples of the work which was improperly done in ships that were owned by the production engineer department. It is a very small number and not to be expressed in percentages. We know these faults do exist. We know that these drift wires are improperly placed, that the spars are improperly placed, and that the ribs are too far apart.

Senator REED. Are you familiar with the way the inspection is done at the Curtiss plant?

Maj. MUHLENBERG. I know approximately what is done at the Dayton-Wright plant.

Senator REED. There are two sets of inspectors, one set for the factory and one set for the Government?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And as the work progresses, these men have opportunity to see each step that is taken in the machine from the time it is laid out until it is completed? They have every opportunity to see; they have a chance to see the machine, inside and out, do they not, before it is covered up?

Maj. MUHLENBERG. Before it is covered up; yes, sir.

Senator REED. There is a factory inspector and a Government inspector, both of whom have that opportunity; that is right, is it not?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Yet you found these machines in that shape with that double inspection upon them?

Maj. MUHLENBERG. Yes, sir.

Senator REED. That either indicates the grossest kind of carelessness or else it indicates conspiracy?

Maj. MUHLENBERG. One or the other.

Senator NEW. Maj. Muhlenberg, you spoke some time ago of the gasoline supply carried by the De Haviland 4 as being insufficient for its use as a day bomber.

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Seventy-five gallons, I think it was, you said it carried?

Maj. MUHLENBERG. Yes,sir.

Senator NEW. Which would give it approximately two hours' radius?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. How much gasoline should a day bomber carry; that is, what radius should be afforded to a day bombing machine to make it acceptable for that purpose?

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Maj. MUHLENBERG. As I understand it, in Europe the aerodromes are, speaking aeronautical distances, fairly close to the lines, and if a ship were not to go too high before going over the lines, an hour's fuel out and an hour's fuel back, would probably be sufficient for day bombing, but it takes the De Haviland 48 minutes, approximately, to get to its ceiling. Its ceiling as a bomber is 15,800 feet. It ought to get to that ceiling before it goes to the lines to function as a day bomber. Therefore, there is over three-quarters of an hour's fuel that is gone before it can function at a proper altitude. It then has an hour and 13 or 14 minutes of fuel left. That is at full throttle. It has, in fact, an hour and about 12 minutes to go and come.

Senator NEW. About an hour and 12 minutes?

Maj. MUHLENBERG. Yes, sir. You would consume 48 minutes' worth of gasoline in getting your altitude before the day's work could be started at all. That would leave only about an hour and 10 or 12 minutes, approximately, of gasoline to do the work with.

Senator REED. Is this not true, also, that in seeking this altitude, or achieving this altitude, air currents and air conditions generally might compel you to use a great deal more gas to get up on some occasions than on others?

Maj. MUHLENBERG. No, sir; that would not make any great difference. No; I do not think it would make any particular difference.

Senator REED. Suppose you were required to go up with an adverse wind blowing. I mean to say that you might desire to go east when there was a wind from the east blowing at the rate of 45 miles an hour. You have to hold yourself against the wind and at the same time you are making your climb.

Maj. MUHLENBERG. That would not make any difference on a time climb to a given altitude. You might stand still over the same spot on the earth. If the speed of the ship was 120 miles an hour and the wind was blowing at the rate of 120 miles an hour, you might stand still, as far as the earth was concerned, but you would get altitude just the same. It would not make any difference in the time as far as getting the altitude is concerned.

Senator NEW. You have spoken of some of the defects which, in some measure, disqualify the De Haviland 4 as a bombing plane. Do you know of any defects which tend to disqualify it as a fighter?

Maj. MUHLENBERG. I believe those that disqualify it as a fighter are really more serious than those that disqualify it as a bomber. The location of the pilot seat is immeasurably bad.

Senator NEW. That is, the De Haviland 4?

Maj. MUHLENBERG. Yes, sir. I see from the French report we have on the De Haviland that the English De Haviland had a pilot seat in approximately the same place; that is, between the wings and very far in front of the observer's seat. That is unquestionably wrong. I have never sat in a machine in which a pilot could see less than in the De Haviland 4. I have sat in the United States D9, as it is called, which is an alteration of the DH9.

Senator REED. Is that the De Haviland 9? Is that what they call the De Haviland 9?

Maj. MUHLENBERG. It is the United States De Haviland 9 that I am speaking of. It is an alteration of the De Haviland 9. In that ship the gas tank, the main gas tank, and pilot seat, are just inter-

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changed. That places the pilot's seat right close to the observer's seat, and it is really a luxury to get into that seat, because you can see so very much from it. A pilot can see very little from the pilot seat of the De Haviland 4.

Senator REED. Is not a pilot whose vision is obstructed as you say it is in the De Haviland 4, at a tremendous disadvantage because of that fact?

Maj. MUHLENBERG. It certainly looks that way to me. I have never done any fighting, but I would certainly hate to be in that position in a fight. The pilot has wings above and below him, and a tremendous motor in front of him. The only way he can see is by bending to the right or to the left, and looking out of the dip that comes in the fuselage expressly for that purpose. It is hard even to land the ship because the vision is so restricted. I have flown a De Haviland a little, and I would not compare its range of vision at all with even the training plane. A training plane is so much better, at least from the rear seat.

Senator REED. What training plane?

Maj. MUHLENBERG. The JN-4 plane. In addition to that, the gasoline tank is located aft of the center of gravity of the machine, and a change in the amount of gasoline produces a change in the center of pressure.

Senator REED. In the balance?

Maj. MUHLENBERG. In the balance, yes, sir, whereas, if you had the gasoline tank forward where the pilot sits now, it would be over the center of balance, and the change in the gasoline contents would not induce a corresponding change in the balance of the ship.

Senator NEW. Do you regard that as a serious matter?

Maj. MUHLENBERG. I regard that as very serious. The only way the pilot and the observer can communicate is by interphone. It is considered vital to have the pilot and the observer close together, so that the observer can stand up and fire his gun and communicate with the pilot at the same time by touch or, if necessary, by word of mouth. Of course, it is hard to communicate by word of mouth, but he could communicate by touch, and should be able to do that.

Senator NEW. Is that all?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Can that tank be changed and the opportunity of the observer to see be improved and these other defects be remedied in that machine? Is it possible to do it in the machine?

Maj. MUHLENBERG. It would take an expert designer to state accurately whether that could be done without doing any harm. It looks on the face of it very feasible in future production, but it would take a designer to say positively whether it could be done. It is being done in the United States D9, and, I believe, in what they call the United States D4, which is an alteration of the De Haviland 4. We have two experimental planes now—the United States D4 and the United States D9, the one being an alteration of the De Haviland 4 and the other being an alteration of the De Haviland 9. In the United States D4, and in the United States D9, both the pilot and the observer are close together, with the gasoline tank in front. Of course, another advantage of the gasoline tank in front is that the pilot in a crash is not then between two millstones as is the case at present, when he is between the motor and gasoline tank, and has practically no chance whatever to come out of the crash alive.

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Senator NEW. The longerons of the De Haviland 4 are made of spruce, and objection has been made to this committee that a stronger wood than spruce should be used for this purpose. What is your opinion concerning that?

Maj. MUHLENBERG. Probably ash would be stronger. I am not absolutely certain as to that. I do not think that that is vital enough or dangerous enough to be considered as anything highly important, because that fuselage has stood up in a fuselage test at a factor of about six.

Senator NEW. I call your attention to photograph marked "B," with a dotted line showing the forward end of the fuselage, in which the motor of the DH 4 is located. I would like to ask you if you think this section of the machine is properly supported [indicating on photograph], and if it is strong enough?

Maj. MUHLENBERG. As I have said, the only evidence we have to the contrary is that one forced landing that was made, which caused the motor section to drop forward, but I do not consider that that shows any particular weakness in that section, because the whole fuselage is, to put it tersely, a cigar-box affair, and it is not built to stand a crash. It is built for lightness, and probably has a maximum strength consistent with a certain weight that can be given. In a crash or a bad landing I would expect that fuselage to break almost anywhere. In a heavy pancake landing, for instance, it would not be surprising at all to see the motor drop forward just the way that motor did.

Senator NEW. Don't you think that is equally true of machines of other patterns?

Maj. MUHLENBERG. It would be true, probably, of the American Bristol, but not of other machines; no, sir.

Senator NEW. It is true of the American Bristol and true of the De Haviland 4?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. But not of other machines?

Maj. MUHLENBERG. No, sir.

Senator NEW. In other words, they are more fragile than most?

Maj. MUHLENBERG. It would seem so, although we have only one bad landing to prove it.

Senator NEW. Earlier in the examination you said, in reply to a question I asked, that you did not regard the De Haviland 4 machine as it is at present made as a satisfactory machine?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Just how unsatisfactory is it? Just what is the measure of your disapproval of the De Haviland 4 machine?

Maj. MUHLENBERG. It should not be used as anything but a reconnaissance machine in its present design; that is, the minute any machine of proper, or anywhere near proper, design and capability can be turned out, that machine should be substituted. It (the DH4) is the only ship which has reached production which can even come anywhere near being used for those three purposes, and necessarily its production should not be stopped simply because it is not the top notch in those three lines; that is, as a bomber, fighter, and reconnaissance machine. However, its real use is as a reconnaissance machine.

Senator NEW. In its present condition, is not that its only use?

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Maj. MUHLENBERG. It is the only proper use; yes, sir.

Senator NEW. Don't you think that its defects as a fighter are sufficient to warrant its being kept out of that service?

Maj. MUHLENBERG. Not unless we can get something better; no, sir. It should be used as a fighter until we can get something better. In the meantime, something better should be manufactured and developed with all possible speed. There are three styles of fighters being developed, and one is now on the way to the Wilbur Wright field from the Thomas-Morse factory.

Senator NEW. What is that?

Maj. MUHLENBERG. It is the Thomas-Morse design for the Liberty motor. I have not seen it yet. There is another kind that is probably better than that for a fighter. That is the Lepere machine, of which we have two samples.

Senator NEW. Where is that made?

Maj. MUHLENBERG. At the Packard plant in Detroit. That is probably the best fighter.

Senator NEW. That is a two-seater fighter?

Maj. MUHLENBERG. Yes, sir. As soon as that can be brought into production, the De Haviland 4 should be withdrawn from the fighting line.

Senator REED. When you say that this machine should be used in the absence of anything better, you mean that if you had nothing but bows and arrows you had better use them until you could get guns?

Maj. MUHLENBERG. That is the idea exactly.

Senator NEW. This committee has been told that many changes have been recommended in the De Haviland 4, both from Gen. Pershing's headquarters and from other official sources in this country. Are steps being taken to adopt those suggestions?

Maj. MUHLENBERG. I do not know to what extent those changes have been corrected. I do know that I received some time ago a letter from the director of Military Aeronautics embodying all the criticisms and suggestions of Gen. Pershing, with the direction that I submit a list of recommendations and criticisms on his criticisms, and I have that here.

Senator REED. Does that contain the criticisms of Pershing?

Maj. MUHLENBERG. Yes, sir. Undoubtedly, the director of Military Aeronautics has taken steps to see that those changes, or as many of them as possible, shall be made. For instance, Gen. Pershing suggests that the CC gears be abandoned entirely. Gen. Pershing says those gears shipped over there are entirley useless. We have no other synchronizing gear in production at the present time and it would not be possible to get him any other until the Nelson gear, for instance, is put into production.

Senator NEW. What is this gear?

Maj. MUHLENBERG. It is a means of arranging the fixed machine guns so that they will shoot through the propeller.

Senator NEW. It is a part of the synchronizing apparatus?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Gen. Pershing says that it is worthless?

Maj. MUHLENBERG. Paragraph 4, subparagraph c, says:

No spare parts or special tools for synchronizing gears. These gears absolutely useless and can not be repaired here.

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He is referring to the CC gears.

Senator REED. Will you now let us have the criticisms of Gen. Pershing?

Maj. MUHLENBERG. Yes, sir. These are the original records of the office, and the letter on top contains the criticisms of my office.

(The papers referred to are in the words and figures following, to wit:)

JULY 17, 1918.

From: Commanding Officer, Testing Department.
To: Director of Military Aeronautics, Technical Section, Washington, D. C.
Subject: Improvements and defects in latest type De Haviland Four plane.

1. De Haviland Four plane No. 32477 flown to this post from Dayton Wright factory June 28, 1918, showed some changes as compared with plane No. 32098, received at this post May 16, 1918, also certain defects not yet corrected.

2. At the factory as it was turned over to the testing department pilot to be flown over here there were certain defects in the plane as assembled, due simply to assembling. These were defects due solely to assembling of the plane which would not show in planes shipped to Europe. Such defects were the omission of cotter keys and the omission of the nut fastening a control pulley on.

3. As delivered here, after having flown over, the propeller was five-eighths inch out of line, causing the motor to vibrate; there was a leak in radiator around top bracket which holds the radiator to top longeron; the lever on the distributor was too long and would not advance all the way; the adjustment screws of the carburetor synchronizer rod were loose, not being fastened with a lock wire; the preaker points adjusting screws, came loose on the right distributor; the ignition wire on the switch for the right distributor came loose, causing the motor to run on the left distributor only; two exhaust manifolds nuts were not cotter keyed and came loose.

4. The fabric covering the wings was so loose as to completely change the aerofoil in some cases. This may have been due either to the inferior quality of dope used or insufficient initial tension on the fabric before doping. Acetate dope as used on the present product can not be expected to produce as great a shrinking effect as the old nitrate dope, hence if the same tautness is to be affected in the final product, the initial tension on the fabric must be greater than would be used with the old dope. This is known to be the exact opposite of the facts in at least the Dayton-Wright factory, as their employees have not been putting very much tension on the cloth on streching it over the frame. In addition to the change produced in the aerofoil by the looseness of the fabric, there is a real danger in this condition, i. e., a danger of the cloth tearing loose from the ribs in the slip stream, as has occurred so frequently at this post. Tight or loose, the fabric is very apt to come loose from the ribs in the slip stream fo the Liberty motor, due to the tremendous vibration caused by the propellor; but looseness of the fabric probably increases that tendency, hence it is believed that it is necessary to have fabric at least as taut as the fabric in the training planes.

5. There has been no change in the spacing of the ribs in the slip stream, as it is believed there should be, to provide additional support to the fabric in the slip stream; but the interval between stitches fastening the fabric to the slip stream has been reduced to about 2 inches, which is considered good practice. It is a serious question as to whether fabric of any description is the proper material to use for wing covering in the slip stream of a Liberty motor. This office has found numerous instances of the fabric coming loose in the ribs in the slip streams on three different types of machines, the Le Pere, De Haviland, and American Bristol, all of them having varying degrees of tautness of the fabric. It is possible that decreasing the spacing of the ribs in the slip stream and use of the proper kind of stitching at 2-inch intervals between stitches will solve the problem. This office is about to conduct experiments, using the fabric furnished as a wing covering for the D. H. 4 against a covering composed of coarser linen and a covering of thin wood veneer. The test will consist of running a Liberty motor on the ground in a plane whose surfaces exposed to the slip stream are one-half one kind of material and one-half another. This is being done in connection with somewhat similar experiments being carried on at Dayton-Wright factory and in collaboration with the materials department of the Bureau of Aircraft Production.

6. The nose drift wires still run to the same fitting on each side of the fuselage, without any additional reinforcements to the tie-rods which runs through the bottom longeron and ties in these two fittings, one on either side of the fuselage near the nose. This office has run each of these wires to separate fittings, one at the lower longeron and one at the upper longeron, with tie-rods connecting each pair of fittings through the fuselage.

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The factory has substituted ⅞-inch chrome nickel steel rod for the ⅞-inch cold-rolled steel rod which tie the fittings of the left wing spars to those of the right wing spars. The factory is also substituting a chrome nickel-steel rod for the cold-rolled steel tie rod, as mentioned in first sentence.

7. This office is also strengthening the wing fittings by increasing their size sufficiently to allow putting two bolts of chrome nickel-steel through each spar instead of one bolt

H. C. K. MUHLENBERG,
Major, Signal Corps.

[Second indorsement.]

DEPARTMENT OF M. A., TECHNICAL SECTION, TESTING DEPARTMENT,
Wilbur Wright Field, Fairfield, Ohio, July 23, 1918.

To: Director of Military Aeronautics, Technical Section, Washington, D. C.
(Through C. O., S. C. A. S., Fairfield, Ohio.)

1. Inclosed herewith is a memorandum report from Capt. R. W. Schroeder, A. S. Sig. R. C., in charge of flying for the testing department at this post, consisting of a series of comments on the faults of the De Haviland Four, as reported in cablegram from Gen. Pershing, No. 1361.

2. The remarks on the Liberty motor made by Maj. Geo. E. A. Hallett, S. C., in charge of the motor test section of this department.

3. So little work has been done at this post with the machine guns on the D. H. 4 plane that very little can be said about Gen. Pershing's comments except in isolated instances. Paragraph 3, subparagraph A, is concurred in heartily by this office. Paragraph 4, a Nelson synchronizer gear recently tested at this post will probably replace the G. C. gear entirely.

4. In addition to the faults mentioned by Gen. Pershing, this office has found the following:

(*a*) The wing covering is too loose in many cases and in all cases is either not properly fastened to the ribs in the slip stream or is not the right kind of material to use for wing covering in the slip stream. Experiments are now being conducted at this post to determine the serviceability of cloth versus veneer for wing covering in the slip stream. Several cases have occurred of the linen fabric as now used coming loose from the ribs, this always occurring in the slip stream. The probabilities are that wood veneer is the proper covering to use in the slip stream.

(*b*) Leading edge should be veneered in order to preserve the shape of the aerofoil at this very important portion of the wing. Present practice maintains the proper shape of the aerofoil only at the points where the cap strips support the fabric.

(*c*) The nose drift wires should run on from bottom of the front of the first strut from the fuselage front to wing, the forward end of the lower longeron and the other from the top of the first strut rear to the fore and of the upper longeron with a compression member in the upper wing between the first struts front and rear. Steel rods such as the tie rods connecting wing spars and the tie rods connecting the nose drift wires through forward end of the fuselage should be of alloy steel instead of cold-rolled steel. This is being done in the new ships.

(*d*) Wing fittings connecting the wing spars to the fuselage should be stronger and the ends of the spars should be metal capped.

(*e*) Holes through wing spars should be metal bushed.

(*f*) There are too many holes in the longerons.

(*g*) The fitting holding the drift wire which runs from the top of the center section to the longeron is attached only to the top longeron, and should have a wire member distributing this load elsewhere preferably the landing gear.

(*h*) The fitting attaching the ailerons, rudder, and elevators is not the best. It should have the double fitting instead of the single as the cotter pins take the strains.

(*i*) Splicing the cables would probably be better than soldering.

(*j*) A double cable to the elevator instead of a single would be safer.

(*k*) Aileron pulleys should be inside of the wings and inspection openings provided. The pulleys in their present location offer considerable head resistance and are difficult of inspection.

(*l*) The pilot's seat and the main gas tank should be interchanged for several reasons, viz: Consumption of gasoline means change of balance of the machine in the present situation, and the pilot can see practically nothing from the pilot's seat as located at present; also communication between the pilot and observer is hampered by the distance separating the two.

(*m*) The control stick should be of nonmagnetic material to prevent influencing the compass.

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(*n*) The gasoline-control valve should operate with one handle connecting the pressure tank with the engine, the gravity tank with the engine, or shutting off all three. The present arrangement of three valves, all of them hard to operate and not labeled, is crude in the extreme and might very easily lead to fire where the pilot, while on the ground, would inadvertently connect the pressure tank with the gravity tank. This has occurred at this post, fortunately without any conflagration resulting.

H. C. K. MUHLENBERG,
Major, Signal Corps, Commanding Department.

WAR DEPARTMENT,
TECHNICAL SECTION,
OFFICE OF THE DIRECTOR OF MILITARY AERONAUTICS,
June 28, 1918.

From: Office Director of Military Aeronautics.
To: Commanding officer, Testing Squadron, Wilbur Wright Field
(Through commanding officer, Wilbur Wright Field, Fairfield, Ohio).
Subject: Cable No. 1361, from Gen. Pershing.

1. Forwarded herewith is a copy of Gen. Pershing's cable, No. 1361, for remark and recommendation.
2. Early action is requested.
By direction of Maj. Gen. Kenly.

THURMAN H. BANE,
Lieutenant Colonel, Signal Corps.

[First indorsement]

HEADQUARTERS, S. C. A. S.,
Fairfield, Ohio, July 2, 1918.

To: Maj. H. C. K. Muhlenberg, S. C., Test Department, Fairfield, Ohio.

1. Forwarded for remark and recommendation.
By order of Lieut. Col. Duncan.

C. H. REEVES, Jr.,
Captain, A. S. Sig. R. C., Adjutant.

TECHNICAL SECTION FOR INFORMATION,
June 24, 1918.

(Received June 26, 1918.)
(For Director, Military Aeronautics.)

Paragraph 1, copy to Chief of Ordnance.—D. H. 4 plane has been carefully examined. Plane structure has been found defective as follows:

Subparagraph A. Rubber cords for shock absorbers incorrectly made; rubber strands not put under sufficient tension before covering with braiding. Result is that estimated weights too much for under load.

Subparagraph B. No check cables have been applied to check axles from forceful striking threats of running gear V. — struts which are permitted to strike ground, crashing machines in landing.

Subparagraph C. Tail plane is of old type and should be braced with stream line tubes extending from leading edges to lower longeron of fuselage. Possibly this old type tail plane should be replaced by new type made of all spruce and having no joints near curves in leading edges. With new type tail plane stream line tubes will not be necessary.

Subparagraph D. Wood screws have been used in various places instead of bolts, notably on washer plates at points where tail advancing without tubes passes through fuselage and on wing skid fastening.

Subparagraph E. Nuts have been omitted in securing bolts.

Subparagraph F. Bolts, shackles, and cotter pins throughout the machines are in many cases loosely and badly fitted.

Subparagraph G. Cotter pins have been substituted for buffers.

Subparagraph H. Wing skids badly fitted and ash packing blocks omitted.

Subparagraph J. Main compression ribs in the main plane are of hollowed out type with 3-ply web. These should be solid spruce to prevent flange from bulging up.

Subparagraph K. No fairing placed between double fly wire. All these wires should be of stream line type and not of cable.

Subparagraph L. Washers under fixing bolts of ailerons pulleys wheels omitted, allowing aluminum packing to penetrate into ribs at leading edges.

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Subparagraph M. Tail skid shock absorber wound so tight that skid throws great strain on cross members of fuselage. Rubbish plate for this skid extends only about 6 inches compared with 18 inches extension fitted in England.

Subparagraph N. There is one-eighth inch extension fitted in England.

Subparagraph O. There is one-eighth inch play in hinge of tail plane. This fitting should be made snug to take all play away.

Subparagraph P. Cotters and split pins were used in adjustment of tail hinge instead of bolts and nuts.

Subparagraph Q. Stream-line covers were omitted from fin and empennage.

Subparagraph R. In center section main plane fixing bolts are a very loose fit in spar.

Subparagraph T. Wrapping of wire terminals in some cases bad.

Subparagraph U. Pilot's wheel on tail planes should be bolted and not secured with lag screws.

Subparagraph V. Ashes temporarily have been omitted from axles, which break.

Subparagraph W. Air speed indicator heads are heavy and glassy and this instrument is virtually worse as at present fitted.

Subparagraph X. Cables and pulleys should be thoroughly greased, and not come dry.

Subparagraph Y. Such thing as jammed pulley wheels and joints in landing gear structure show faulty inspections.

Paragraph 2. Liberty motor is defective, indicating shop inspection not satisfactory. Lincoln apparently better than Packard.

Subparagraph A. Open carbureter inlet not safe and neither British nor French will use them. Imperative arrange gasoline tightly piped to carbureter and drain it outside fuselage.

Subparagraph B. Flight tests in England supervised by Capt. Munford indicate Zenith 52 carbureters not satisfactory and cheaply made but better results from Claudel.

Subparagraph C. Water pipe from bottom radiator to pump should be moved to starboard to clear oil strainers.

Subparagraph D. Copper tube vents for oil tanks should be $\frac{5}{16}$ inch. Oil tanks burst in service because this tube too small.

Subparagraph E. Vent for radiators must have a tube leading water where it can not blow on spark plug or pilot and vent should not be in radiator caps.

Subparagraph F. Oil tubes from tanks to pumps must be 1 inch or larger and plug for draining oil tanks should be 1 inch. The present sizes will not work in cold weather.

Subparagraph G. Gasoline tube to carburetors not secure against vibration and hose connections to carburetors not secure against detachment. Small pieces of rubber have been found in gasoline tubes and have caused forced landing. There should be strainers in carburetors.

Subparagraph H. Priming tubes and thermometer tubes over manifold should be placed so as to leave carburetors accessible.

Subparagraph J. Oil tubes between cylinders should be secured to crank case.

Subparagraph K. Interchanging positions of switches and all high speed indicators so that switch operates with left hand and close to control lever.

Subparagraph L. Engine control lever and mounting not rigid enough.

Subparagraph M. Battery boxes does not protect against short circuit.

Subparagraph N. Present system main gasoline tank under air pressure should be changed because of danger from fire and because if punctured above liquid level by rifle bullet pressure is lost. Suggest enlarging needle valve on carburetor and altitude adjustments and use of gravity feed tanks in upper wing or pumps between tanks and carburetors. Overflow for gasoline from upper tanks should be conducted to point at least 6 feet from exhaust and visible by pilot. One plane destroyed by fire due to this defect.

Paragraph 3. Following defects have been found in armaments.

Subparagraph A. Scarf mounts for Lewis guns badly designed, vertical release should not operate until after horizontal release. Regarding arrangements necessitates gunner supporting entire weight of magazine and gun when turning mounts.

Subparagraph B. Quadrant scarf mounts entirely too light; guns jump badly when fired.

Subparagraph C. Fixed gun mount fastenings inaccessible and not properly locked in place. Removal and replacement of fixed gun destroys alignments of barrels. Gun can not be adjusted so that barrels are parallel to line of flight and still permit line of sight to clear radiator.

Subparagraph D. Sight mountings for fixed guns light enough and * * * require special tools to attach. Aldis ring sight mountings inconveniently placed, can not be used by pilots.

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Subparagraph E. Oil cover Aldis sight does not stay open.
Subparagraph F. No side doors in ammunition boxes for arrangement of ammunition.
Subparagraph G. Fastenings of ammunition boxes not secure.
Subparagraph H. Front-sight brackets Lewis gun will not stay in place.
Paragraph 4. Synchronizing gears entirely useless.
Subparagraph A. Reservoir badly made; must all be replaced. Low-pressure valves in very bad condition. High pressure cylinder cuts cup leathers due to bad machining. Several high pressure springs have broken, apparently defective. High pressure pipe connections broke in several cases, badly designed.
Subparagraph B. Gear arrived filled with grit, with cup leathers dried up and useless, and with all three-way valves leaking.
Subparagraph C. No spare parts or special tools for synchronizing gear. These gears absolutely useless and can not be repaired here.
Paragraph 5. Bomb carriers not sent with planes. We understand that these are in transit.
Subparagraph A. Sample bomb carrier sent by courier has no release mechanism or device to steady bombs.
Paragraph 6. Marlin guns not in good condition; require a careful inspection and overhauling.
Subparagraph A. Many Marlin guns have defective gear springs. Great variation in length of action spring Marlin guns cause variation in rate of fire.
Subparagraph B. No spare parts for armaments received.
Paragraph 7. None of the above planes can be used until some of above changes are made, causing vital delay in program.
Subparagraph A. Planes sent here must be inspected and thoroughly tested before being shipped.
Subparagraph B. Appropriate spares, too, must accompany them.
Subparagraph C. When operating this far from base of supply it is essential that defects which are discovered by inspection in the United States be corrected there.

PERSHING.

Senator NEW. Do you regard the work at the factory making the De Haviland four planes as satisfactory?

Maj. MUHLENBERG. Improving, I should say, but not wholly satisfactory. It is improving rapidly. They show themselves willing on every hand to come around and improve their methods where they are faulty.

Senator REED. That is, if you catch them they do not do it again right away?

Maj. MUHLENBERG. That is a terse way of putting it; yes, sir.

Senator NEW. Improving that would certainly indicate that it has not been all that it should have been.

Maj. MUHLENBERG. No, sir. For instance, I submitted to the Director of Military Aeronautics a letter which I am afraid I have not with me, describing a fault that we found in the old plane. There were three holes drilled through one wing spar. There should have been only one. Evidently the first one did not fit, so they drilled another. That did not work satisfactorily, so still another was drilled. That was an old ship. We have since seen no signs of that. They may be there, but we have not discovered a repetition of that particular defect. That is why I say they are improving.

Another trouble, I should say, is in the slip stream. We have trouble keeping the fabric on the ribs. The factory has not changed the stitches; that is, they have changed the interval between the stitches. You can probably see that in photograph "C." It was originally about 4 inches. The factories voluntarily reduced that to 2 inches, which makes more work, but it is safer. They have since changed the method of stitching and have put a binding strip on the fabric before they stitch it, and then another binding

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strip is put over the stitches. They have done that. While I do not know whether it is the result of observation of our work at Wilbur Wright Field, or what has been the reason for it, they have done it.

Senator REED. Subparagraph V says: "Ashes temporarily have been omitted from axles which break." Just what does that mean?

Maj. MUHLENBERG. I can not say.

Capt. SCHROEDER. That is hollow tubing. They are probably using spruce instead of ash. Ash is now being used.

Senator NEW. Is it not true that Gen. Pershing in his report enumerated changes which should be made in the De Haviland four machine and recommended that it be not used until after that list of changes had been made?

Maj. MUHLENBERG. He did; yes, sir. In paragraph 7 he says:

None of the above planes can be used until some of the above changes are made, causing vital delay in program.

Senator NEW. Do you agree with that?

Maj. MUHLENBERG. Yes, sir; especially as there are some changes which should be made which he has not mentioned at all in his report.

Senator NEW. You say there are some changes which he has not mentioned?

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Which are substantial in character?

Maj. MUHLENBERG. Yes, sir; they are every bit as necessary as those mentioned in his report. For instance, the nose-drift wires and the fabric. Those changes should be made immediately.

Senator NEW. Before the machine is used at all?

Maj. MUHLENBERG. Yes, sir. We are making those changes at the Wilbur Wright Field as fast as we can make the changes before we fly the machines.

Senator NEW. How many machines were sent abroad before these changes were reported or recommended?

Maj. MUHLENBERG. That I do not know. All I know is that the Dayton-Wright factory alone is now producing in the neighborhood of 20 ships a day.

Senator NEW. Were those changes made?

Maj. MUHLENBERG. Some of them, possibly. How many I do not know. There are some that are not being made. I know that those nose-drift wires have not been changed.

Senator NEW. And yet you regard that as one of the most important changes that has been recommended?

Maj. MUHLENBERG. Yes, sir. I reported to Washington, after receiving hearsay evidence on the subject, that the change was being made in production. I was told so by one of the factory employees, I believe, but I have since been told, without any accounting for the failure to make the changes, that they have not been made. I have not had an opportunity to investigate that at all because I simply heard it yesterday or the day before.

Senator NEW. You have not yet seen a copy of the report filed by Capt. McCorcker?

Maj. MUHLENBERG. No, sir.

Senator NEW. Who conducted the tests at Miami, Fla.?

Maj. MUHLENBERG. No, sir.

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Senator REED. Maj. Muhlenberg, you have, at the command of the committee, furnished us with a paper dated June 24, 1918, and marked "Received June 26, 1918," purporting to be a copy of a cable from Gen. Pershing; that is correct, is it not?

Maj. MUHLENBERG. Yes, sir.

Senator REED. That was transmitted to you in the letter which is attached, and which is dated June 28, 1918, and is signed by Lieut. Col. Thurman H. Bane?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And, then, attached to these documents is your own reply, is it not?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Your reports are contained in the two documents?

Maj. MUHLENBERG. That is all the same document. There are two copies of the last page.

Senator REED. Your report is contained in the document which bears the date of July 23?

Maj. MUHLENBERG. Yes, sir.

Senator REED. These documents, you have stated, you desire to keep. The committee will have to keep them overnight in order to copy them and return them to you.

Maj. MUHLENBERG. Yes.

Senator REED. Have you any other reports or have you written any other letters?

Maj. MUHLENBERG. I have also a letter dated July 17, 1918, from myself to the Director of Military Aeronautics, on the subject of defects noted in the De Haviland 4 planes received at the Wilbur Wright field.

Senator REED. What suggestions have you to make with reference to a way out of these difficulties?

Maj. MUHLENBERG. The relegation of the D. H. 4 to use as a reconnoisance machine solely, the speeding up of the production of the LePere machine, and the adoption of that, probably, as a fighter, and the development of the U. S. D–9 to the point where it can be used as a day bomber.

Senator NEW. That means practically discarding the De Haviland 4 as a day bomber and as a fighter?

Maj. MUHLENBERG. Yes, sir; it means discarding it as a day bomber and as a fighter. It is possible that the U. S. C. B.—Curtiss battler—may be a good fighter. I have not seen it. I have only seen the drawings, but I do know that the LePere is giving promise of being an excellent fighter.

Senator REED. It has been suggested that there should be created a division of aeronautics separate from the rest of the Army or Navy, as the Army is separate from the Navy to-day.

Maj. MUHLENBERG. Yes, sir.

Senator REED. And that at its head should be placed an officer who would have a corps of men under him or with him, so that he will have a complete organization, not so large as but similar to that of the Army or Navy?

Maj. MUHLENBERG. Yes, sir.

Senator REED. And the men in this Aviation Service then would progress along the lines in this separate department and they would not be subject to the control of men sent into the service, who are

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atterly unfamiliar with it. That suggestion has been made. What do you think of it?

Maj. MUHLENBERG. There is only one possible way to feel about it, and that is to be in favor of it. Knowing as little about the subject as we do in this country, we can but take the advice and profit by the experience of our foreign allies. France and England have found that system preferable to anything else, and the chances are that we will later have to adopt it, so why not adopt it immediately. The sooner we adopt some air-service system and get down to that organization the better off we will be.

Senator REED. You have spoken of two or three types of machines that we should get into production on as soon as possible. Why should we not adopt and begin to manufacture at once some of the approved European machines that have been tested, such machines as the Spad and the Nieuport and the Briguet, and other types of planes that have been successful?

Maj. MUHLENBERG. You can not use those with the Liberty motor, of course. We have got to create a plane for the Liberty motor.

Senator REED. Then why not create some motor for some plane and get at this thing? We have spent a year and a half nearly on the Liberty motor. There is a place in this country where they make the Hispano-Suiza engine, as I understand it.

Maj. MUHLENBERG. It is a good motor, too.

Senator REED. Why not get those machines as fast as we can and begin to give our men something that will work?

Maj. MUHLENBERG. We, at the Wilbur Wright Field, are endeavoring to rush as fast as we can the testing of the English Bristol, using the 300-horsepower Hispano-Suiza motor. We think that will be a good fighter. I would not be surprised at all if that ultimately proved the possible solution; that is, the English ship and the Hispano-Suiza motor. The motor is a known motor, but there is no production of those machines. It will take some months to get production on those machines. There are only about 10 in the country.

Senator REED. If we had started a few days after we declared war we would have them in production by this time.

Maj. MUHLENBERG. I should say so; but the motor, until very recently, was more or less experimental.

Senator REED. You mean the 300-horsepower motor was experimental?

Maj. MUHLENBERG. Yes, sir.

Senator REED. But the 175 and the 200 horsepower motors were not experimental?

Maj. MUHLENBERG. No, sir.

Senator REED. They had been used by the French with great success in fighting over the lines in the Spad machines, had they not?

Maj. MUHLENBERG. Yes, sir.

Senator REED. Could they not have been procured?

Maj. MUHLENBERG. I do not know, sir.

Senator REED. If we had put some of the energy on them that we put on the Liberty motor, we could have got them.

Maj. MUHLENBERG. I think so. If we get a plane that will take the Liberty motor, there is not anything to beat it, because it is

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turned out in such production as the Hispano-Suiza motor never dreamed of.

Senator REED. Did anybody ever try to produce the Hispano-Suiza motor in this country? What is there about it that makes it impossible to produce it in quantity? I have looked at that side of the question, but I can not understand that. They are fundamentally the same in principle, are they not?

Maj. MUHLENBERG. If you do not design a motor for production, you will never arrive at the same production you would if you designed with that end in view. The Hispano-Suiza has not been designed with that end in view, because the French are much more prone to put handwork on their machinees than we are.

Senator REED. But they have got some of that French handwork flying on the lines and we have not an American-made machine, have we?

Maj. MUHLENBERG. No, sir; not unless they are De Havilands.

Senator REED. I want to go back to the question of reducing the size or the number of cylinders in the Liberty motor. Has that been given real consideration?

Maj. MUHLENBERG. At McCook field an experiment is now being conducted with a brand-new English-built Bristol with a Liberty 8 motor in it. That is going to be tried out. They are going to try out the same ship with the Hispano-Suiza 300-horsepower motor. The Liberty 8 developed something like 250 to 300 horsepower. That is being tested. One is to be tested against the other. The Liberty 8-cylinder motor would, of course, have the advantage of much greater production than the Hispano-Suiza motor.

Senator NEW. One final question: Do you, of your own knowledge, know how many American combat planes are in use to-day on the battle front?

Maj. MUHLENBERG. No, sir.

Senator REED. He said that he did not know of any there.

Senator NEW. I did not understand him to say so. Major, you spoke of the De Haviland 4 as a reconnoissance machine.

Maj. MUHLENBERG. Yes, sir.

Senator NEW. Just what character of work is done by a reconnoissance machine?

Maj. MUHLENBERG. Principally aerial photography.

STATEMENT OF CAPT. R. W. SCHROEDER.

Senator NEW. State your full name.

Capt. SCHROEDER. Capt. R. W. Schroeder.

Senator NEW. You are connected with the Signal Corps?

Capt. SCHROEDER. Yes, sir; Aviation Section.

Senator NEW. Where are you located now?

Capt. SCHROEDER. At the Wilbur Wright field.

Senator NEW. How long have you been in the service, and how did you happen to come into the Army?

Capt. SCHROEDER. Through previous experience in aviation.

Senator NEW. You were an aviator before you joined the Army?

Capt. SCHROEDER. An aeroplane mechanician.

Senator NEW. What experience had you had and where?

Capt. SCHROEDER. In 1910, and up to the fall of 1915, I had experience along this line.

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Senator NEW. Where were you employed?

Capt. SCHROEDER. Two years at the Franco-American Aviation Co.

Senator NEW. Where is that?

Capt. SCHROEDER. Chicago, Ill. We conducted a school there and built planes with the help of the students, and occasionally we gave exhibition dates.

Senator NEW. You are a flyer?

Capt. SCHROEDER. Yes, sir.

Senator NEW. Have you a pilot's license?

Capt. SCHROEDER. No, sir.

Senator NEW. Or did you have?

Capt. SCHROEDER. No, sir.

Senator NEW. You are a practical flyer?

Capt. SCHROEDER. Yes, sir.

Senator NEW. How long have you been connected with the Army?

Capt. SCHROEDER. Since the fall of 1916—October, 1916.

Senator NEW. You have heard the evidence that has just been given by Major Muhlenberg, have you not?

Capt. SCHROEDER. Yes, sir.

Senator NEW. Do you agree with that in the main, and if you disagree with it in any point, please state where and in what respects you differ?

Capt. SCHROEDER. I agree with everything and can add something, probably, with reference to the inspection that is being made at the factories.

Senator NEW. You have handed the committee two photographs, one marked 559. Please state what this represents and what it reveals.

Capt. SCHROEDER. That is the condition that we found in checking a machine.

Senator REED. What kind of a machine?

Capt. SCHROEDER. A D H 4. To verify Gen. Pershing's criticism, on pulling off one of the strips of one covering to examine the box which Gen. Pershing speaks of, we found that the rib was cracked. It is subparagraph J. This crack is revealed here in that photograph. It would show more plainly here [indicating on photograph]. There is a strip that was torn off. The cloth is under tension, and it now shows the rib pulled right open. That is the rib there [indicating]. This is the first condition after the strip was removed.

Senator REED. You are now referring to the photograph that you have just spoken of?

Capt. SCHROEDER. Yes, sir.

Senator REED. You mean to say that it shows the condition of the crack when the covering was first removed from the wing cover; that is, the binder strip was first removed from the wing cover over the box rib?

Capt. SCHROEDER. Yes, sir.

Senator REED. Does that show the very weakness that was pointed out by Gen. Pershing?

Capt. SCHROEDER. Yes, sir.

Senator REED. You found it in the first machine you opened?

Capt. SCHROEDER. Yes, sir.

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Senator REED. The crack was there and was covered up so that a man could not see it except by taking the cover up?

Capt. SCHROEDER. The only way he could see it was to remove the cover.

Sentator NEW. Were any other machines inspected for the same defect?

Capt. SCHROEDER. Yes, sir; but we found no other machine in such condition.

Senator NEW. You found no other machine in such condition? You found it in the first one only?

Capt. SCHROEDER. Yes, sir; but none in the rest. On removing this cover, we found the crack closed up. It shows that the tension of the cloth is splitting the rib open. The cloth does not go across the rib as shown in the photograph. One edge of the cloth is tacked on one edge of the rib and the other edge of the cloth is tacked on the other edge of the rib.

Senator REED. It should go over?

Capt. SCHROEDER. Yes, sir.

Senator REED. If it went over it would tend to hold the wood back instead of pulling apart?

Capt. SCHRODER. Yes, sir.

Senator NEW. In connection with photograph No. 559 you have also submitted others, one numbered 557 and another 558, showing the same part of the machine after the cloth is removed?

Capt. SCHROEDER. Yes, sir.

Senator NEW. And the comparisons of which you are speaking are made between 558 and 559?

Capt. SCHROEDER. Yes, sir.

Senator NEW. And also photograph 557?

Capt. SCHROEDER. Yes, sir. From photograph 559 it is quite evident that the inspectors on this particular job did not observe that tacks were being used to attach the wing covering to the rib. In no place on the wing are tacks used on ribs.

Senator REED. You mean they should not be used?

Capt. SCHROEDER. Yes, sir.

Senator NEW. You mean they should not be used in any place?

Capt. SCHROEDER. No, sir.

Senator NEW. Why not?

Capt. SCHROEDER. These tacks that were placed on this job caused the rib to crack as the cloth shrunk.

Senator NEW. The tension caused by the shrinking of the cloth and the perforation made by the tacks caused the rib to split?

Capt. SCHROEDER. Yes, sir. As this binder strip was pulled off the cloth let go the ribs in a number of places, as indicated in this photograph. The tacks fell out on the floor. In photograph 557 you can see the opposite side of the wing of this De Haviland 4 plane, which shows——

Senator NEW. The opposite of that shown in photograph 559, you mean?

Capt. SCHROEDER. Yes, sir. These photographs show practically the same condition, only that the wood in the rib has not shown any signs of splitting as yet. However, it does indicate that the cloth is not attached, but it is tacked on two individual edges. This condition has never existed in any other ship on our field.

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Senator REED. Could that ship have passed out of the factory in that condition if there had been proper inspection?

Capt. SCHROEDER. No, sir.

Senator REED. Do you agree with the statement made by Maj. Muhlenberg that there are two inspectors, or should be two inspectors in these plants, one representing the Government and the other representing the factory, each of them having opportunity, under proper inspection, to see the entire construction of the machine before any part of it is covered up?

Capt. SCHROEDER. Yes, sir.

Senator REED. What else have you to say about the defects in these machines?

Capt. SCHROEDER. They have all been brought out by Maj. Muhlenberg very much along the same line. This one particular instance was in addition to his.

Senator REED. You agree with all that he said in regard to the defects of this machine?

Capt. SCHROEDER. Yes, sir.

Senator REED. Is it your opinion that the machine at the present time is of such character that you can say it is a proper machine in which to send our boys up to do battle?

Capt. SCHROEDER. No, sir.

Senator REED. You do not think it is?

Capt. SCHROEDER. It is not.

Senator REED. You think if a man goes up in the air and risks getting killed by another man, or being shot down, that he ought not to take the additional risk of having an accident because of a bad machine of his own, if it can be avoided?

Capt. SCHROEDER. If it can be avoided we will stay away from it.

Senator REED. It has been stated to me that the woodwork of the machines ought to be built by men who are skilled cabinetmakers, and that the construction of these machines is of such character as to indicate that they had been put together by rough woodworkers. What do you think of that?

Capt. SCHROEDER. From all indications the workmanship in the plane is being done by rough mechanics. I dare say that it is being done by men who know little, if anything, about woodwork.

Senator REED. Have you observed that kind of workmanship in planes that have been turned out in other factories than the Dayton-Wright factory?

Capt. SCHROEDER. I noticed very poor workmanship in connection with the American built Bristol, especially in the woodwork.

Senator REED. That was turned out from where?

Capt. SCHROEDER. The Curtiss factory.

Senator Reed. Are the flyers at the field, speaking of them generally, satisfied that these machines are safe, or do they dread using them?

Capt. SCHROEDER. In carrying out our orders on the field they carry them out in a way that would lead me to say they were glad when it was over with. On each test I have noticed that when we send them up to find out something that will probably take about 20 minutes, if we tell them that at the end of 15 minutes if they do not find what we want they can come down, they generally come down at that time.

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Senator REED. And you tell them because you do not like to send these boys up in the air with these machines?

Capt. SCHROEDER. They will do our work.

Senator REED. I say the reason that you tell them to come down as soon as they discover what you want is that you yourself regard it as a dangerous thing to send these young men up in these machines?

Capt. SCHROEDER. Yes, sir.

Senator REED. I will ask Maj. Muhlenberg if he agreed to that statement.

Maj. MUHLENBERG. Absolutely; yes, sir.

Senator REED. Now, Lieut. Foote, I would like to have an expression of opinion from you while you are here, so that I may cover this question completely. Is that your judgment about these machines?

Lieut. FOOTE. I think I would be very safe in saying that every pilot at our field, without exception, is very leary of these machines.

Senator NEW. Leary of them because of experiences with them; is that right?

Lieut. FOOTE. No, sir; but more because of the facts that have been laid before them.

Senator NEW. That is what I mean. To put it another way, they would not be in the same frame of mind and entertain the same distrust with respect to other machines of other types; is that true?

Lieut. FOOTE. Yes, sir.

Senator REED. That is what you mean? They are not afraid to go into the air, and they are not afraid to make tests if they are given a good machine; is that what you mean, Lieutenant?

Lieut. FOOTE. Yes, sir. They have seen so many faulty things in the construction and performances of the De Haviland machine that they have become more than leary of it. It shows it when you fly it. When you hold it on a straight away course for 20 minutes you can feel the strain it is under. Of course, there are a lot of things that are covered up. If the men could see them, maybe they would not stay up that long.

STATEMENT OF LIEUT. JOHN M. FOOTE.

Senator NEW. Lieutenant, will you give your full name and state the position you occupy?

Lieut. FOOTE. First lieutenant, A. S. S. O. R. C.

Senator NEW. How long have you been connected with the Army?

Lieut. FOOTE. I made application in 1916 and started flying in 1917, in January and February.

Senator NEW. Are you a graduate of one of the Government schools?

Lieut. FOOTE. Yes, sir; a graduate of the Memphis school. That was the Billings field and fairground in 1917.

Senator NEW. You have been a practical flyer?

Lieut. FOOTE. Yes, sir.

Senator REED. What was your occupation before you took up aviation?

Lieut. FOOTE. I was in the automobile business.

Senator REED. Were you a mechanic?

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Lieut. FOOTE. Yes, sir. I could not say that I was an aeroplane mechanic. But I was thoroughly familiar with the gas engine, and with automobiles.

Senator NEW. With what machines have you had experience as a flyer during and since your period of training?

Lieut. FOOTE. I have flown the Curtiss training planes, the De Haviland, the L. W. F., the Curtiss R-4, the Wright-Martin, the Standard, the Sturtevant. In scouts I have flown the Robbins-Schaeefer the Standard M Defense scout, the Ordnance scout and the L. W. F. Liberty battle plane.

Senator NEW. Do you share the feeling of distrust of the De Haviland 4 that is spoken of as being entertained by the pilots at the Dayton-Wright field?

Lieut. FOOTE. Yes, sir.

Senator NEW. You feel that same distrust with reference to any of these other planes that you have spoken of as having had experience with?

Lieut. FOOTE. I have felt it in one scout that is improperly built, but that was never put into production. I never felt that way about a production ship.

Senator REED. What was the one that you felt that way about that was never put into production?

Lieut. FOOTE. The Robbins-Schaeefer scout, made in San Diego, Cal. They only built one of them.

Senator REED. You have heard the testimony given by Maj. Muhlenberg and Capt. Schroeder?

Lieut. FOOTE. Yes, sir.

Senator REED. Do you agree with that?

Lieut. FOOTE. Yes, sir.

Senator REED. Do you disagree with it at any point?

Lieut. FOOTE. I might say that with regard to a number of things I think they are quite modest in their criticisms.

Senator REED. In what, for instance? Do you mean that they understated the criticisms of the machine?

Lieut. FOOTE. No, sir; not that they understated them, but that they gave it the benefit of the doubt. They give the machine the benefit of the doubt at every turn.

Senator REED. That is what I mean.

Lieut. FOOTE. Yes, sir.

Senator REED. Tell us what you think about the machine, in your own way?

Lieut. FOOTE. Personally, I think that the machine is wrong in design as well as production. It is not designed for a bombing machine, which is one of the missions it is supposed to fulfill.

Maj. MUHLENBERG. Lieut. Foote flew it in a bombing test that Capt. Riley Scott conducted. Lieut. Foote was the pilot.

Senator NEW. Let me ask you if you have flown the machine in a bombing test?

Lieut. FOOTE. Yes, sir.

Senator NEW. On what occasion and with whom as a bomb dropper?

Lieut. FOOTE. I conducted a bombing test of the De Haviland 4 with Mr. Scott at the Wilbur Wright field in the middle of July, 1918.

Senator NEW. The middle of the current month?

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Lieut. FOOTE. Yes, sir.

Senator NEW. What seemed to be the objection to it?

Lieut. FOOTE. In the first place, the machine is constructed so that the pilot has absolutely no way of accurately sighting the target. This is due to the construction of the fuselage, in that you are not able to cut the holes needed in the fuselage because of weakening it.

Senator NEW. And the result of that is that the pilot can not see?

Lieut. FOOTE. Yes, sir. The pilot has no vision of the object that they are bombing, and he can not follow the object and pass it up to the observer. This is due to the limited scope of the pilot's vision, which is very poor in this machine. The view of the pilot is limited in this machine. There are so many blind angles. A second reason is the distance between your observer and your pilot. The third reason is the unfavorableness of the machine with reference to placing the bombing sight on things; that is, there is no suitable place for the bombing sights.

Senator REED. What are your criticisms of this machine for other purposes than bombing? What is your criticism of it as a fighter, for instance?

Lieut. FOOTE. Owing to the weaknesses shown by Maj. Muhlenberg, it would be absolutely unsafe to do any maneuvering with it. For that reason alone it would be unfit for a fighter.

Senator NEW. The machine is not stable enough?

Lieut. FOOTE. Yes; on account of such things as the fittings on the drift wires, the weakened construction of your wings and your faulty wing spars. I have seen one wing spar that was spliced in two places—one main wing spar.

Senator NEW. Was that the fault of design or the fault of manufacture?

Lieut. FOOTE. Well, the double spliced wing spar was the fault of production.

Senator NEW. It was not design?

Lieut. FOOTE. No, sir. It just has a specified wing spar of such and such dimensions, but it is generally the rule in production that the wing spar shall not be spliced in two or three places. It makes it weak.

Senator NEW. Is the machine sufficiently speedy to make it a first-class fighter?

Lieut. FOOTE. At a high altitude, in my opinion, it is not.

Senator NEW. Do you know what its accredited speed is at different heights?

Lieut. FOOTE. If I am not mistaken it has a speed of somewhere around 83 miles an hour at 15,000 feet. As a fighter the D H 4 has a speed, an indicated air speed, of 117 miles an hour at 2,460 feet. It has an indicated air speed of 105 miles an hour at 7,770 feet, and an indicated air speed of 96 miles an hour at 10,780 feet. Now, I will give you the true air speed. The true air speed for 2,460 feet is 120 miles an hour; for 7,770 feet it is 117 miles an hour; for 10,780 feet it is 113 miles an hour, and for 15,740 feet it is 106. That is the true air speed.

Senator REED. Then its true air speed is better than the indicated air speed?

Lieut. FOOTE. That is the real speed.

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Senator REED. I say it is better than the indicated speed; its performance is better?

Senator NEW. What is the report from which you are reading?

Lieut. FOOTE. This is the performance of the De Haviland 4 plane numbered 32098.

Senator NEW. By whom was that test made?

Lieut. FOOTE. It was conducted by Rader.

Senator NEW. Philip Rader?

Lieut. FOOTE. Yes, sir.

Senator REED. What is the ceiling?

Lieut. FOOTE. The ceiling for the fighter was 19,773 feet in 66 minutes and 23 seconds.

Senator NEW. Is that the De Haviland?

Lieut. FOOTE. As a fighter.

Senator REED. Is not that slow climbing?

Lieut. FOOTE. It is quite slow, in my opinion.

Senator REED. In modern fighting, is it not true that the fighter has to get this great altitude of even 19,000 feet and higher?

Lieut. FOOTE. 19,000 feet is a pretty good altitude. My idea is that 19,000 feet is about the maximum altitude for a battle plane. It is seldom as high as that, as I understand it. I have never been over there, so I do not know much about it. I would not like to state positively.

Maj. MUHLENBERG. They are getting a theoretical ceiling of 25,000 feet with the English Bristol.

Senator REED. What do you say of this machine for reconnoisance work?

Lieut. FOOTE. I know very little about reconnoisance work, so I would not care to state my views on that. I have done absolutely none of it. I would like to state, in regard to the battle planes, that I think with the mounting of the guns on the De Haviland 4 at the present time they will be absolutely useless.

I tried to use the fixed guns that are on the synchronizing device. From the pilot's seat it is impossible to pull back your charging handle in order to cock these guns; also, the present situation of the range sight is very unfavorable.

Senator NEW. It has been stated before this committee that the compass of this machine is absolutely useless. Do you know anything about that?

Maj. MUHLENBERG. I just rendered a report to the Director of Military Aeronautics stating that I thought we were splitting hairs on the question of the compass; that properly compensated, as it stands, and with the ship properly swung, and with a nonmagnetic joy stick, the compass, right where it is, can probably be used for any trip that the De Haviland 4 can make. We have made cross-country trips with it in just this way. We have done it with the compass at the pilot's left knee, which has been found to be the position most free from outside influence. If you take a day when there is very little wind a pilot can make his destination in a 250-mile flight. Maj. Ocker tried to fly from Washington to Dayton and found himself, when he was forced to land, about 40 miles out of his course. He had flown approximately 250 miles without going by anything but his compass and subject to the winds that prevailed, so that was

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a pretty fair test. I have summarized the situation by saying that we can use the compass at the pilot's left knee probably absolutely free from outside influences, or for as long a trip as the De Haviland 4 can make with the compass in its present position. The problem is not so much to get a perfect compass as it is to get a pilot who will use the compass. The pilots from France say that the pilots there do not use them under any circumstances except when they get into a fog. They do not even use them at night. I dare say that Capt Schroeder and Lieut. Foote prefer not to use them. We have difficulty in geting them to use the compass, simply because they are prejudiced against the compass. They do not want to use it. They do not want to use any instrument if they can avoid it. They fly by the terrain and the ship rather than by instrument.

(Informal discussion followed which the reporter was directed not to record.)

Senator NEW. Lieut. Foote, I would like to ask you, as a final question, whether your approval of what Maj. Muhlenberg and Capt. Schroeder have said or testified to, extends to their belief that the De Haviland 4 ought to be relegated for all purposes except that of reconnaissance.

Lieut. FOOTE. I would say for all purposes that I am familiar with. I am not familiar with reconnaissance work, so I can not say with regard to that, but for any purpose connected with fighting or bombing, I should say it should.

Senator NEW. That is, that it should not be used.

Lieut. FOOTE. Yes, sir; it should not be used.

Senator NEW. I think that is all.

(Whereupon, at 5.30 o'clock p. m., the committee adjourned until Thursday, August 1, 1918, at 10.30 o'clock a. m.)

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AIRCRAFT PRODUCTION.

THURSDAY, AUGUST 1, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at 10.30 o'clock a. m. pursuant to adjournament, in the committee room, Capitol Building, Hon. Harry S. New presiding.

Present: Senators New and Reed.

STATEMENT OF MAJ. C. K. REINHART.

Senator NEW. Please state your name and rank.

Maj. REINHART. Maj. C. K. Reinhart, Aviation Section of the Signal Corps.

Senator NEW. At the present time?

Maj. REINHART. Commanding officer of the first provisional squadron, headquarters, Hazelhurst Field, Mineola, Long Island.

Senator NEW. How long have you been in the Army?

Maj. REINHART. Thirteen year.

Senator NEW. Are you a graduate of the academy?

Maj. REINHART. No, sir.

Senator NEW. How long have you been connected with the Aviation Service?

Maj. REINHART. Since December 12, 1916.

Senator NEW. You are a practical flyer?

Maj. REINHART. Yes, sir.

Senator NEW. I believe you came down yesterday from Mineola by airplane?

Maj. REINHART. Yes, sir.

Senator NEW. And are going back by that means as soon as you have testified here? Is that correct?

Maj. REINHART. Yes, sir.

Senator NEW. Major, with what machines have you had practical experience since you have been in the service? Describe the list as nearly as possible.

Maj. REINHART. I have flown the Curtiss J N 4A, J N 4B, and J N 4D, probably all three 500 hours. I have flown the L. W. F., the Standard, the Martin T T, all landing machines. I have flown the D H 4, the Thomas-Morse scouts, equipped both with the Gnome and the Le Rhone engines. I have also flown seaplanes.

Senator NEW. The committee desires to question you at this time more particularly in reference to the De Haviland 4. What particular opportunity have you had to observe this machine?

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Maj. REINHART. When the DH 4's were first made in this country for over-sea service, eight of these were diverted. About 70, I am informed, had been made at that time and shipped to France. Eight were diverted to my station at Mineola, Long Island, to be used in connection with the aerial defense of New York.

Senator NEW. You tested them out there, did you?

Maj. REINHART. These machines were lined up and tested by me there in this service.

Senator NEW. What kind of tests?

Maj. REINHART. They were lined up and put in commission on a flying status. They were equipped with machine guns and bombs. and were used for, or attempted to be used for a certain number of hours,—two or three hours—in patrol work over New York City and over Long Island and the Jersey coast and the Sound.

Senator REED. Giving them a test somewhat similar to that which they would be put through on the front?

Maj. REINHART. As far as I am able to say, it would be the same test.

Senator REED. That is, you mean in the patrol work.

Maj. REINHART. In the patrol work.

Senator REED. Of course, it would be a test where you would not be pestered with any enemy machines, but you were trying to cover about the same tests as over there?

Maj. REINHART. Of course, you would not have had an enemy diving, etc., over you.

Senator REED. You put it through other tests, did you not?

Maj. REINHART. We gave it an official flight and tested its climb and speed.

Senator NEW. What was the general result of that test? I mean its result in regard to the De Haviland 4 machine?

Maj. REINHART. It revealed certain defects in the mechanical construction of the machine which made the machine for the purpose of patrolling at regular hours, or when the machine was actually needed, unsatisfactory on account of its unreliability.

Senator NEW. You say these were structural defects?

Maj. REINHART. Yes, sir.

Senator NEW. That were thus revealed?

Maj. REINHART. Yes, sir.

Senator NEW. Can you enumerate some of them?

Maj. REINHART. On the first eight machines the radiators sprung leaks and went out of commission after the first two hours' flight, on the average.

Senator REED. That happened to every machine you had in service?

Maj. REINHART. Yes, sir; as far as I know. I think I can safely state that every machine—it was reported to me that every machine after two hours' flight the radiators went out of commission, and I personally saw at least five radiators being taken off; but I did not inspect every machine. The landing gears were weak and the machines had to be reinforced in our repair depot before they were put into service.

Senator REED. Did you discover that before you started to use them?

Maj. REINHART. No, sir. One machine broke while being lined up on a concrete floor in a hangar from its own weight. Two machines

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nosed over in attempting to get them out of the airdrome. The landing gears were then examined and it was found that the little braces above the axle or trunnion around which is wound the shock absorber were hollow and of very thin metal construction, and on examining different machines it was found the thickness of these trunnions was variable, so on some it was bigger than on others, so this trunnion had to be reinforced before the machines were safe to fly.

Senator NEW. Is there anything else of which you think now?

Maj. REINHART. Nothing else on these machines was revealed at that time except from examination of the machine, as a practical flyer, there were certain structural defects on them which, in my opinion, made them unsafe to fly. I mean I felt uneasy flying them myself.

Senator REED. What were those defects?

Maj. REINHART. The stabilizer was not fastened securely enough to the fuselage. It being an adjustable stabilizer, operated from the pilot's seat, only the support that it had in front from the connection to these controls was all that it was fastened to in order to hold it to the fuselage, so that when the stabilizer was shaken or tested out before flight it appeared to be very loose and very loosely fitted to the fuselage.

Senator REED. A bad piece of work, in other words?

Maj. REINHART. Yes, sir; not enough security to the fuselage.

Senator REED. Not enough strength.

Senator NEW. Did that make the machine dangerous?

Maj. REINHART. In my opinion it made the machine dangerous if you got into a bad position in the air. For instance, a steep nose dive, or if a bad wind turned you over, coming out of this the stabilizer is very liable, in my opinion, to come off while the ship is in flight.

Senator NEW. Should the stabilizer come off what would be the inevitable result?

Maj. REINHART. Fatal. The elevator controls the stabilizer, it being the most vital of all the controls.

Senator NEW. Major, have you since had further opportunities to observe this machine?

Maj. REINHART. I have.

Senator NEW. If there were any further defects that came to your notice, will you please state them?

Maj. REINHART. After a very few hours' flight—six hours average—on these eight machines, I personally examined these eight machines and found that the canvas had come loose from the wing structure, the ribs, and spars and wing beams. I first noticed this by its flapping on the ship while it was in flight, and in examining other machines afterwards I found that the canvas near the fuselage on the bottom of the lower wings had come loose and sagged out from 1 to 3 inches. The canvas on the upper wings near the center section had also come loose on the balance and sagged out to the same extent. On all ships—there were about five of these eight we found in this condition and they were put out of commission until the canvas could be replaced on the wings by our repair shop.

Senator NEW. Just how serious a matter was this loosening of the canvas on the wings?

Maj. REINHART. It would allow the canvas to sag while in flight, and probably puncture the fabric, in which case with a heavy load

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like the De Haviland carries it would rip the fabric from the wings; the speed of the machine and the weight would rip the fabric from the wing immediately.

Senator NEW. What would be the result?

Maj. REINHART. Causing you to lose the lift or the effect of one wing, and put you probably into a spin and a crash. It might not happen, but it is certainly unsafe to take a chance in flying.

Senator NEW. You do regard it as highly dangerous?

Maj. REINHART. Absolutely. I do not believe any flyer would care to fly these machines with the canvas loose on the wings.

Senator NEW. Is there anything else which was revealed at that particular time which you think of now?

Maj. REINHART. Nothing else, sir.

Senator NEW. Then, I will ask you if you have had any subsequent experience with other machines of the same type?

Maj. REINHART. I have.

Senator NEW. Will you please state what that was?

Maj. REINHART. About 30 additional machines have since been sent to our field.

Senator NEW. That is, De Haviland 4's?

Maj. REINHART. Yes, sir. In the assembly of these ships, and during their first few flights, the flying wires and landing wires supporting the wings were found to be in very poor condition, necessitating the replacing of these wires, and the ships were put out of commission for that time.

Senator REED. Did you discover those on an inspection?

Maj. REINHART. Before each flight a qualified man inspects every ship, and the pilot who flies the ship also inspects it before every flight.

Senator REED. If you could discover this defect by an inspection after the machine came to your field, of course the defect could have been discovered by a proper inspection before the machine left the factory, could it not?

Maj. REINHART. Well, this particular defect, no sir. If the workmanship itself was not discovered to be faulty, the defect occurred after the ship had been put into flight. The defect was this: That the flying wires and landing wires where they support the wings and connect between the struts, they connect to safety devices and to the turnbuckles, and the wire itself is brought to the turnbuckle over a metal thimble and bent back, and a fine copper wire is then wound around the bent end to the extent of about 2 or 3 inches. Then it is soldered over so as to make it solid. After the first two or three flights this solder and these wires pulled out and broke away. It was wound up close together and the threads split away, and in one instance I saw the wire completely pulled out, so the whole wing gave way.

Senator REED. Then, this was a defect in construction that was revealed under the tension and strains of flight.

Maj. REINHART. Yes. Apparently, when the wires were put on, to the eye they were very well done.

Senator REED. What proportion of your machines did this weakness develop in?

Maj. REINHART. We had about 20 lines up when I left, and in practically every machine.

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Senator REED. If it was true of those 20, and if they were not constructed as other machines had been constructed, a proper inspection would have developed it, would it not?

Maj. REINHART. I should think so, if they inspected at the time this work was being done.

Senator REED. That is what I am talking about.

Maj. REINHART. Yes.

Senator REED. So, if they were different from the other machines, that would have been discovered by a proper inspection. Now, if they were like the other machines, then a proper test of the other machines would have revealed a defect and weakness in that construction, would it not?

Maj. REINHART. Yes, sir.

Senator REED. So that it must follow that either this bunch of machines which were sent to you was in some way different from the ordinary machine, or else these defects which you found shortly after you got the machines were known or ought to have been known to the factory before the machine ever started out? That pretty nearly follows as an inevitable consequence, does it not?

Maj. REINHART. Yes.

Senator REED. How soon would these defects develop after you put the machine in flight? How many hours of flight did it require to develop that?

Maj. REINHART. Two or three hours. In some machines, I believe, after a flight or two.

Senator REED. A short flight?

Maj. REINHART. Yes, sir. May I state further? When these wires began to give away my engineer officer took them to the shops and put these wires under test, and every wire that was put under test—he took them right off the machines which were still lined up—they went slightly over the required test for the Government construction, which is a straight tension test. Then we tried taking them and beating them with a hammer at the time to cause the vibration that the machine has in flight, to see if that caused the giving away, but as to the result of that test I have not heard yet.

Senator REED. But the machine is supposed—this type of machine is supposed to be thoroughly tested in the air before these machines were sent out, and any weaknesses which developed in your case in all these machines should have developed in the other tests which were made at the shops; that is true, is it not?

Maj. REINHART. Yes, sir.

Senator REED. As a matter of fact, are not those wires, regardless of what the Government rule may be—is it not manifest that those wires are too weak and that the rule ought to be changed, if the rule is such that the wires conform to it?

Maj. REINHART. The wires are not strong enough to support the machine in flight.

Senator REED. Regardless of any rule, that fact having been developed, these wires must be strengthened, even if you have to change an Army rule?

Maj. REINHART. Yes, sir; they must be before the ships are safe to fly.

Senator NEW. Have you now enumerated all the structural defects of the machines which occur to your mind?

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Maj. REINHART. Do you ask me for my opinion as to the construction of the machine?

Senator NEW. No; I was going to ask your opinion later. I am speaking now of the structural defects which have been clearly revealed by actual test and experience?

Maj. REINHART. Those are the only parts that gave way under flying tests.

Senator NEW. But the giving away of any of those parts would have resulted fatally to the pilot and in the wreck of the machine, would they not?

Maj. REINHART. Yes, sir; more in favor of it than not. Except in the landing. Now, if the landing gear gave away, the machine would be wrecked certainly, but the pilot might not be killed.

Senator NEW. But the machine certainly would have been wrecked?

Maj. REINHART. Yes, sir.

Senator NEW. I will ask you to state your opinion as an expert flyer, based also upon your experience with the machine, as to the De Haviland 4.

Maj. REINHART. I believe that the De Haviland 4 as it is at the present time constructed is not strong enough to stand service tests, for the reasons that I have before enumerated, and, additionally, the weight of the wings supported by the nose wires from the front part of the longeron under the engine puts too much stress or strain on the front part of the fuselage. In a steep dive or under heavy strain that is liable to give away. The elevator control has only a metal fitting about 8 or 10 inches long on the front part, to which are attached the elevator and control wires. That is the only connection the elevator has with the control wires. This construction is too weak, in my opinion, to stand hard service. Additional support is necessary.

Senator NEW. Have you made any reports to the department of these observations of yours?

Maj. REINHART. I have made reports of defects as they occurred through the proper channels in Washington.

Senator NEW. Do you know what action, if any, has been taken on them?

Maj. REINHART. I do not. I have been told, though not officially, that the radiators had been strengthened and that the ships now coming out would have the fabric attached to the wings in a more secure manner.

Senator REED. Since you have spoken of the new machines, will you tell us when it was that you received the eight machines that you first described and then when it was that you received and tested the 30 machines, approximately?

Maj. REINHART. About the 1st of June we received the 8 and about the 15th of July we received 32, to the best of my recollection.

Senator REED. Do these defects which you spoke of as having been developed by the trying out of the 32 machines—did the wires show these weaknesses in all of these machines which were tried out in the air?

Maj. REINHART. I did not personally inspect every machine.

Senator REED. You were in charge?

Maj. REINHART. Yes, sir.

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Senator REED. You can state your own observation and the reports which were made by the proper officers.

Maj. REINHART. I inspected some of the machines personally and my officers reported to me that there were only about eight machines that they would send in the air—one of my flying officers—on account of those defects.

Senator REED. Only about 8 of the 32?

Maj. REINHART. About 8 of the 20 we had lined up. The others have not yet been flown at all.

Senator REED. When you say "lined up," what do you mean?

Maj. REINHART. Assembled and ready to fly.

Senator REED. And there have been only 20 assembled?

Maj. REINHART. Yes, sir.

Senator REED. And the others have not been assembled?

Maj. REINHART. Yes, sir.

Senator REED. And your officer feels that he can not take any chance on flying the others?

Maj. REINHART. Yes, sir.

Senator NEW. Only the eight?

Maj. REINHART. Yes, sir. And I do not think I will fly those any more.

Senator REED. The eight?

Maj. REINHART. Yes, sir.

Senator REED. And you will not fly them any more because you do not consider them safe?

Maj. REINHART. That is it.

Senator REED. You do not want to order a man to fly a machine that you would not care to fly yourself?

Maj. REINHART. I would not order a man to fly in a machine I would not fly in myself.

Senator NEW. Major, will you please tell us just what type of plane the De Haviland 4 is supposed to be?

Maj. REINHART. My understanding is that the De Haviland plane is to be used for a bombing plane, for a double-seater fighting machine.

Senator NEW. Do you think, with your experience and with your observation of it, that it is fitted for either of those purposes?

Maj. REINHART. I believe that it could be used for either of those purposes, though, in my opinion, it is not as good a machine for either purpose as a straight scout or straight double-seater fighter, or straight bombing plane. I believe that in bombing with this plane against enemy machines that I have read about you would do it at a disadvantage.

Senator REED. When you say it can be used, you mean that it can be used in the absence of better machines.

Maj. REINHART. Yes, sir.

Senator REED. Just like a lumber wagon could be used on the race track in lieu of a sulky if you had no sulky and had to have something; is that the idea?

Maj. REINHART. Yes, sir.

Senator REED. You think that two men who went up in a De Haviland 4 and had to do battle in the air with a German machine would be at a disadvantage?

Maj. REINHART. Yes, sir; most decidedly.

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Senator NEW. Then, Major, would you recommend the continued use of the De Haviland for either of those purposes, either as a bomb dropper or as a fighter?

Maj. REINHART. I have never been abroad to see conditions on the other side, but from what I have learned by reading and talking to officers who have come back from the front, I believe that a better machine for both purposes could be built.

Senator NEW. I think that is all, Major. We are very much obliged to you for your attendance.

STATEMENT OF CAPT. J. H. KELLEY.

Senator NEW. Will you please state your name, rank, and present Army detail?

Capt. KELLEY. John Hubert Kelley, captain Signal Corps Reserve, at present in charge of what we call the fighter flight, including the De Haviland 4's at the testing department, Wilbur Wright field, Fairfield, Ohio.

Senator NEW. How long have you been in the Aviation Service, Captain?

Capt. KELLEY. I went with the R. F. C. in 1915. I am honorary captain in the royal air force at present. I have been with the British a little over two years, and left the British to accept a commission in the United States Air Service January 7, 1918. I returned from overseas July 4, 1918.

Senator NEW. You have had actual experience on the front?

Capt. KELLEY. Yes, sir; quite a number of hours over the lines in British machines, and in battle with some in 1916; also in the Home Defense in London, and I have trained every type of pilot in the British Army; that is, I have had charge of a great number of pilots, and as high as 54 machines. The list is given on this slip of paper.

Training machines.—Maurice Farman long horn F, Maurice Farman short horn F, Curtiss A, Henri Farman F, Avro Gnome E, Avro Mono E.

Service machines.—BE2C, BE2D, BE2E, BE12, FE2B, Vickers Fighter, Bristol Scout, Sopwith Pup, DH No. 1, DH No. 2, DH4 English, Breguet (French), Nieuport.

They are practically all British machines, except the last two, which are Farnams. The Breguet is a two-seated fighting and bombing machine of the French.

Senator REED. You say nearly all these machines are English. Will you indicate the names of those that are French?

Capt. KELLEY. The Maurice Farman long horn and short horn are French, and the Henri Farman is French, and the Curtiss, of course, is American, both Gnome and Mono are English, and all these other machines are English except the Breguet and the Nieuport, which are French.

Senator NEW. Captain, what experience have you had with the De Haviland 4 as built in England?

Capt. KELLEY. The De Haviland 4 is built in England with the A. I. D., that is, the aeronautic inspection department has to my knowledge also proven satisfactory.

Senator NEW. What do they use it for?

Capt. KELLEY. As far as I know it has been used for long or photographic reconnoisance over the lines, and has been used some as a bomber.

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Senator REED. But principally for reconnoisance work?

Capt. KELLEY. As far as I know. They have quite a number of those squadrons on the front and it is pretty hard to say.

Senator REED. You spoke of this inspection department.

Capt. KELLEY. The aeronautic inspection department in the R. F. C. Before any part of a machine is allowed to be put into a machine it has to be examined by the aeronautic inspection department. If a machine is crashed on an airdome after it is assembled, before that machine can be put into the air again it has to be inspected by an A. I. D. inspector, which is the short way of saying it.

Senator REED. In other words, I take it you mean to tell us, Captain, they have a very thorough inspection by real experts?

Capt. KELLEY. Absolutely. Probably as thorough as it is possible to make it, by men who understand what they are doing, and they are the last word. If the A. I. D. say the machine is unsafe to fly a pilot will practically be court-martialed if he takes that machine up.

Senator REED. What opportunity have you had to observe the D. H. as built in this country, and how does it compare with the British machine of the same type?

Capt. KELLEY. The answer to the first part of that is: I arrived for duty July 15 at Wilbur Wright field and inspected for my satisfaction the American-built De Haviland 4's. After seeing the bad structural weaknesses on the machines that had just arrived, or had been there a short time from the factory, and hearing reports on the machines that had been flown, and seeing in the repair shop defects that were taken out of the machine, in my opinion the machine is not safe to fly. I mean to fly. I mean to say it is not an airplane. I do not mean a surface machine. I mean to take it off the ground. Every time a man takes it off the ground he takes his life in his hands.

Senator REED. What are the principal differences between the English De Haviland and the American De Haviland, aside from the mere manner of workmanship?

Capt. KELLEY. That I could not say, because the De Haviland 4 when it was first gotten out had a 220-horsepower Rolls Royce engine in it. The conditions which would exist with a 400-horsepower Liberty would, of course, be quite different, so I do not care to express an opinion. I do not know what they are making over there now, understand.

Senator REED. I am speaking about the English De Haviland that you spoke of which has a 220-horsepower motor?

Capt. KELLEY. That was the only one which I was familiar with at all, and I was familiar with that particular machine only from a little personal experience and only from what other people had said about it.

Senator REED. But the machine you knew had a 220-horsepower Rolls Royce engine?

Capt. KELLEY. Yes; it has since been changed. I think it is a 360 now

Senator REED. And you do not know just what changes have been made in it to strengthen it in order to correspond with the increased power and weight of the larger Rolls Royce engine?

Capt. KELLEY. No, sir; I do not.

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Senator REED. But how does the general structure of the American De Haviland, into which we have put those heavy Liberty motors, correspond with the De Haviland which you were familiar with that carried the 220-horsepower Rolls Royce? I mean to say, has it been materially strengthened, in your judgement, or is it weak in the American machine?

Capt. KELLEY. The way they make them over here, or the way the American-made De Haviland 4—in the first place, the fabric—whether it is the paint which is put on after it is doped—but every fabric that I tested on a wing would not be allowed to be flown, as far as I am concerned. I would condemn it because it is dead. The fabric must sound like a drum. If it leaves an impression of your finger when you put your finger on it and slowly comes back again, that fabric would be condemned and taken off and new fabric put on until it stretched tight.

Senator REED. That is very essential.

Capt. KELLEY. Absolutely; the most important part of the flying machine. That is what you have to keep you in the air. If the fabric bags as you bank up it will finally split and, of course, if the fabric splits you come down and it is all over.

Senator REED. Did you notice other structural defects?

Capt. KELLEY. The tail plane on its leading edge is spliced. You can take hold of the outside of the tail plane and show a play of at least an inch from where it is spliced to the edge. It is spliced about a foot away from the edge. Where the tail plane is attached to the fuselage there is a very decided play. It must be one-eighth of an inch, so that when the machine is in flight there would be constantly a vibration on that which you must get away from.

Senator REED. That would rock your whole machine and make it unsteady and uncertain in the air?

Capt. KELLEY. Not necessarily that, but it would eventually crystallize everything around there and cause it to fall off; and if the machine is put in a bad position, as they often are, the chances are it would break off. In other words, it is not considered safe construction. Where the tail plane is attached to the fuselage on its leading edge are two small wires. The late construction on all heavy machines, and on some light machines, is a metal tube going from the leading edge to your fuselage, making that tail plane solid, as it should be. The aileron, rudder, and elevator fittings have a hinge only on one side, so that the strength of that is only in the cotter pin. A cotter pin is made to lock a bolt and not to take any strain. [Referring to a diagram.] Here is a spar, and there is a bolt through that spar with a hinge on it. The best design is a hinge on this side and on this side, and with the De Haviland as now made the hinge is only on one side. The bolt goes through there, and that is only held in place by a cotter pin, so if you push on that you might get a bolt along there that gave that a side play, and it would tear this out. You can tear those cotter pins out by hand.

Now, that is all in regard to the tail plane. Now, where the main spars are attached to the fuselage, they are held in place by a very light bolt. On inspecting a machine that had done about 60 hours' flying I found that both front bolts had been bent and all eight holes had been enlarged by the constant vibration until there was a play

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in each hole of at least a quarter of an inch; one of them was about half an inch.

Senator REED. Those holes go through what?

Capt. KELLEY. Through the wood. There are four spars on each side, and they take the strain of the wings. The fitting from the fuselage onto these main spars is too short. None of these holes are metal bushed, so that the least play or vibration allows the bolts to chew into the wood, enlarging the hole, and making the machine very dangerous.

Senator NEW. Captain, let us be a little more specific about the danger that would result from the loosening of this bolt hole. Just expand on that a little, will you?

Capt. KELLEY. By these holes becoming enlarged and bending the bolts in ordinary maneuvers the wing is very liable to drop off, which, of course, would kill whoever was in the machine.

Senator NEW. When the wing is off the machine is done.

Capt. KELLEY. Yes; and so are the poor devils who are in it.

Senator NEW. Which is more important. You may proceed, Captain.

Capt. KELLEY. The cables are wrapped and soldered, which is not the accepted European way. All your European cables that I have personally had experience with are spliced. The difference in the two ways is this: By splicing your cable you have in plain view at all times every strand and can see any breakage. By the wrapping and soldering method it is impossible to tell from the outside whether that has been properly soldered on the inside, and my opinion is that it is an unsafe way of attaching cables on an airplane. The three-ply wood which is used on the fuselage on all machines that I looked at had been very badly warped. The splicing of the longerons halfway back on the fuselage seems to me to be a bad design. The inspection of machines that were turned over to us looks very much as if there had not been any. I found one main spar which had a hole drilled through it in the wrong place, and instead of throwing it away they drilled a hole slightly below it running the two holes together. This machine was put together in that condition and sent to us as a serviceable machine.

Senator NEW. What did you do with the machine?

Capt. KELLEY. We took photographs of it, and could not use it.

Senator REED. What would be the effect of those holes in the wood?

Capt. KELLEY. The effect would be that the wings would fall off in the air after 3 to 10 hours, depending upon the strain which would allow that to give. It might be flown for five hours and that particular strain not be put on it.

Senator REED. But that machine was delivered for service?

Capt. KELLEY. Yes, sir. Another main spar had a knot in the center between two bays. I have never seen wood used in an airplane that had knots in it before. The way the drift wires are attached to the longerons is very weak and would on a dive allow those fittings to pull out and detach your wings from the airplane, killing whoever was in it. The guns as at present mounted for the pilot are absolutely inaccessible. The sights placed on one side, of course, is absurd. In other words, in pointing your machine, which is the only way the pilot can sight his guns, the pilot has to lean over this way, and when you have a bead on your enemy machine you have to sit

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still. If you lean to one side to sight your gun you automatically would move your hand on your control, and that would throw you out of line on the machine you are aiming at. In the position your guns are at it would be impossible to clear any jams that may occur without standing up on the seat.

Senator REED. Any jam in the gun?

Capt. KELLEY. Any jam in the mechanism of the gun itself or in the cartridges. Then, the distance between the pilot and the observer is so great that there is no way that they can communicate. If that is to be carried out on any type of machine each machine should be fitted with a telephone. It is very necessary that they should be able to speak to each other because the pilot watches the front and the observer watches the back and the observer, if he saw a Hun coming could not tell the pilot. The ribs and the wings are very weak and not close enough together in the first bay, where the air from the propeller goes through allowing a vibration and loosening of the fabric. On each machine that I have had in my charge I have had to resew the fabric on all of them, as it was very badly done. One wing which I inspected had the fabric sewed only in one place, which might cause that fabric to become loosened and of course crash the machine. The leading edge of the wings is not three-ply wood from the leading edge to the main spar, which construction gives you a bad wing curve, and you lose efficiency. It also is liable to cause the fabric to start to rip and continue down the cord of the wing. I think that just about covers it.

Senator REED. You will have a chance to read the transcript of this testimony and make any corrections or additions you may care to.

Capt. KELLEY. I want to say one thing about the engines. The carbureters being placed in the V is not considered, in my opinion, a safe place. If a back fire occurs it will set fire to your machine, and a back fire is liable to occur at any time. The carbureter should be on the outside and dropped down below the engine.

Senator REED. In its present condition, by which I mean in the condition in which you have found the De Haviland 4, do you regard it as a proper machine to fly?

Capt. KELLEY. The best way I can answer that is that personally I would not send anyone up in it, and I would not fly it myself.

Senator REED. You regard it as unsafe?

Capt. KELLEY. Absolutely.

Senator REED. Assuming that these parts were strengthened, so that you could eliminate the elements of danger incident to this bad construction and bad inspection, for what purposes could this machine then be practically adapted, and when I say that, I mean to be adapted so that it would be a competent machine for service on the front, if it is competent for any purpose.

Capt. KELLEY. If the machine was properly strengthened, I think it could be used for photographic reconnaissance.

Senator REED. Do you believe that the De Haviland 4 can be changed and the defects which you have mentioned eliminated, so that it will become a practical machine for service upon the front as a photographic reconnaissance machine? Do you believe that can be done?

Capt. KELLEY. Yes, sir.

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Senator REED. Even with the machines which have already been built?

Capt. KELLEY. Yes, sir.

Senator REED. It would, however, require taking them back to the shop.

Capt. KELLEY. Most of those changes could be done in the average airdrome.

Senator REED. When that is all done, however, you have not got a fighting machine, as we call it?

Capt. KELLEY. Absolutely not.

Senator REED. Men using that machine on the front and being attacked by the enemy would find themselves at a disadvantage. Is that what you meant to say?

Capt. KELLEY. Yes, sir.

Senator REED. And the flyer would be liable to lose his life or be captured, but he might get away or capture the other man if he had as good a machine as the other man?

Capt. KELLEY. If he was using a photographic machine.

Senator REED. I am speaking about using it as a fighter.

Capt. KELLEY. I do not think it is fit for that.

Senator REED. What are good types of fighting machines which have been thoroughly tested and tried out?

Capt. KELLEY. The Bristol fighter as the English make it, with the Rolls-Royce engine, has been very successful. The French two-seated Briguet has been quite successful. In fact, they all want them at the front.

Senator REED. What type of engine is it?

Capt. KELLEY. 220 Renault.

Senator REED. How is the Spad?

Capt. KELLEY. It is a single-seated machine, and it is very good, and everybody is very keen about it.

Senator REED. Are you familiar with the two-seated Spad?

Capt. KELLEY. No.

Senator REED. Are you familiar with the S. E. 5?

Capt. KELLEY. Yes, sir; I was in the first squadron that had them.

Senator REED. What is your opinion of that machine?

Capt. KELLEY. I think it is a very good machine. The results at the front have been splendid, but it is a scout machine and will not go far from the lines.

Senator REED. Has it as much range as the Spad?

Capt. KELLEY. That I would not care to state, because I do not know enough about the Spad personally. These other two officers here will be able to tell you more about that, because they have had a good deal of Spad work.

Senator REED. Returning to the De Haviland machine, what about its climbing qualities and its range of flight?

Capt. KELLEY. The general opinion is that the climb of the De Haviland 4 is very good, but with the war load and the Liberty engine, as at present made, it will not stay up for its full time.

Senator REED. That is, the flight is very short?

Capt. KELLEY. It is very short, and it has to come down again. The chances are that if you got over the lines you would just get started over there and would have to land in Germany.

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Senator REED. In your opinion, are we sufficiently careful? Would not a large number of these defects which you have spoken of be eliminated if we used more care and time and were not so keen to produce great quantities of airplanes?

Capt. KELLEY. My experience with American mechanics is that they are in too great a hurry to finish whatever job they are on instead of trying to make that job as perfect as they could make it if they took more time.

Senator REED. In other words, the thing we have struggled for in this country largely is quantity more than absolute accuracy?

Capt. KELLEY. The airplane is practically a hand-made machine. Certain parts of it can be turned out by machinery, but the greatest care and exactness must be used in the selection not only of the material but the way in which the work is carried on and in the final assembly. I can put it this way: This is a phrase that I used to use in talking to mechanics: An airplane, in my judgment, every time it is wheeled out of its shed to go in the air must be in the same condition that a race-car driver expects of his machine on any big race that he enters.

Senator NEW. Captain, when did you leave France?

Capt. KELLEY. I sailed from Brest June 27.

Senator NEW. Up to the time you left France, had you seen an American combat plane in used over there?

Capt. KELLEY. No, sir.

Senator NEW. Were there any in use to your knowledge?

Capt. KELLEY. To my knowledge there were none in use. Had there been I would have heard about it.

Senator NEW. You say, then, that there was not an American combat plane in use in France?

Capt. KELLEY. On the front?

Senator NEW. On the front, that is.

Capt. KELLEY. Yes, sir.

Senator NEW. As late as the 27th day of June, is that correct?

Capt. KELLEY. That is correct. About June 22 or 23, when I was in Paris, I met a pilot who had flown the American-built DH-4. What his name is, I can not remember. I asked him his opinion of the machine and he told me it was the poorest job he had ever seen on an airplane, and that he did not like to fly it at all, and would not fly it unless he was ordered to do so.

Senator NEW. In your opinion, Capt. Kelley, what machine or machines would be best adapted for the purposes for which the De Haviland 4 is intended? In other words, if that is, for any reason, to go into the discard, what ought we to build to take its place?

Senator REED. Let me suggest there this question: Is there any machine that will successfully perform all of the things that it has been claimed the De Haviland is made to perform; that is, the functions of a fighting machine, a bombing machine, and a reconnoissance machine?

Capt. KELLEY. No, sir. So far as I know, I can not find out what the De H. is to be used for, so far as the American Army is concerned; but such a combination as a reconnoissance, bombing, and fighting machine—by that, I mean carrying a load of bombs sufficient to go over and do some damage—I do not mean 50 or 60 or 100 pounds of bombs, but enough to do some damage—I do not know of

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such a machine at all. The Breguet make a fighting machine similar to their bombing machine, but they do not send the bombing machine up to do fighting work, because the bomb racks add so much weight to the machine that they slow it up considerably.

Senator NEW. That is all, Captain.

(Whereupon, at 12.15 o'clock p. m., a recess was taken until 2 o'clock p. m. of the same date.)

AFTER RECESS.

STATEMENT OF CAPT. CHARLES C. JOHNSON.

Senator NEW. Captain, state your name and rank?

Capt. JOHNSON. Charles C. Johnson.

Senator NEW. And what is your age?

Capt. JOHNSON. Twenty-eight.

Senator NEW. And your rank?

Capt. JOHNSON. Captain, Wilbur Wright Aviation Field, Fairfield, Ohio. I am officer in charge of scout flight, testing department.

Senator NEW. How long have you been in the Army, Captain?

Capt. JOHNSON. Since May 25, 1918.

Senator NEW. Did you enter from civil life?

Capt. JOHNSON. No, sir; from the French Army.

Senator NEW. From the French Army?

Capt. JOHNSON. Yes, sir.

Senator NEW. You were transferred to the American Expeditionary Forces from the French?

Capt. JOHNSON. Yes, sir; in France I was transferred.

Senator NEW. In France?

Capt. JOHNSON. Yes, sir.

Senator NEW. How did you happen to join the French forces?

Capt. JOHNSON. Well, I——

Senator NEW (interposing). I will change that question. When did you join the French forces?

Capt. JOHNSON. 1915.

Senator NEW. In what capacity?

Capt. JOHNSON. As a soldier in the infantry.

Senator NEW. Were you afterwards transferred to the aircraft forces?

Capt. JOHNSON. I was transferred to the aircraft forces at the end of 1915, and became a pilot in 1916—January 2, 1916.

Senator NEW. How long did your services with the French aviation forces continue?

Capt. JOHNSON. Until May 25, 1918.

Senator NEW. And how did they terminate?

Capt. JOHNSON. By transfer to the American Army.

Senator NEW. That was the date of your transfer to the American Army?

Capt. JOHNSON. Yes, sir.

Senator NEW. You say you were a pilot in France?

Capt. JOHNSON. Yes, sir.

Senator NEW. Did you participate actively in any of the engagements with the French forces?

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Capt. JOHNSON. Yes, sir.

Senator NEW. Where did you serve? Five us a brief outline of your service with them.

Capt. JOHNSON. I served at Verdun; that is, in the offensive of 1916; Alsace; the battle of the Somme; Chemin-de-Dames; Flanders. Well, I have repeated up and down the line. There is no use going over any more, is there, sir?

Senator NEW. No; that is quite sufficient. What machines did you fly while with the French.

Capt. JOHNSON. The Bleriot, the Vosin, Sopwith, Caudron, G-3, Morane-Parasol, Morane 110 horsepower; Rhone-Monocoque, Nieuport type, 23-meter, type 18-meter Nieuport; type 15-meter Nieuport; type 13-meter Nieuport, and the Spad.

Senator NEW. How do you regard the Spad?

Capt. JOHNSON. As a very excellent machine.

Senator NEW. It is a single-seater fighter?

Capt. JOHNSON. Yes; there is a single-seater and a two-seater fighter.

Senator NEW. Are you at all familiar with the De Haviland 4, as it is made in England?

Capt. JOHNSON. Very slightly. At Dunkirk last summer there was a squadron of the Royal Naval Air Service of De H. 4's there—machines all built in England.

Senator NEW. What opportunity have you had to observe the De H. 4 as made in the United States?

Capt. JOHNSON. Very little.

Senator NEW. Where was that?

Capt. JOHNSON. At Wilbur Wright Field, Fairfield, Ohio.

Senator NEW. How long have you been stationed at the Wilbur Wright Field?

Capt. JOHNSON. Since the 17th of July, 1918.

Senator NEW. Since you have been there, have you had any opportunity to examine the D. H. 4 and to form an opinion concerning its merits as an air machine?

Capt. JOHNSON. Well, really very little because, you see, my department is the scouts, and that does not come under my jurisdiction at all, but I have looked into the matter slightly. I have seen some of the weak points.

Senator NEW. You think it has weak points, then?

Capt. JOHNSON. Yes, sir; from never having flown it; from simply inspection on the ground.

Senator NEW. Will you tell us what you think some of those weak points are?

Capt. JOHNSON. Well, the first is the fabric on the wings. The fabric on the wings is apparently dead, due, I think, to the paint which is put over the dope.

Senator NEW. You say "dead"?

Capt. JOHNSON. Yes.

Senator NEW. Just what do you mean by that?

Capt. JOHNSON. It has no life in it. A good canvass, if you hit it with the finger, it sounds more or less like a drum. On the D. H. 4's that I have seen, if you should put your finger on the fabric, it gives and the imprint of your finger stays there. It does not come out the way it should. It is not firm.

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Senator NEW. What does that indicate?

Capt. JOHNSON. It indicates that the fabric has no life.

Senator NEW. Do you think that is due to the material used, or to the manner in which it is put on?

Capt. JOHNSON. In my estimation it is due either to the dope or the paint. The material that I have seen untouched on the D H 4 is good, but after the dope or paint is on there, it seems to be dead.

Senator NEW. What, in your judgment, would be the effect of that on the machine in the air?

Capt. JOHNSON. Well, if the machine were given any bad strains, such as you would have in actual combat, it would tend to split and tear off.

Senator NEW. With what result?

Capt. JOHNSON. With fatal result.

Senator NEW. Fatal to the aviator?

Capt. JOHNSON. Fatal to the occupant and fatal to the machine.

Senator NEW. And fatal to the machine?

Capt. JOHNSON. Yes.

Senator NEW. What other defects have you observed?

Capt. JOHNSON. I have observed the fittings of the main spars to the fuselage. The machine which I saw the wings being taken off of, the holes which held the bolts in the woodwork were considerably enlarged, and the bolts themselves bent. The enlargement of those holes was due to the fact that there was no bushing put in the holes, and that allowed the bolts to have a little play, gradually making the hole larger, from the vibration.

Senator NEW. Capt. Kelley testified to that same defect, I believe?

Capt. JOHNSON. Yes.

Senator NEW. Do you share his opinion that the working of the bolt, caused by the vibration, and tending to enlarge the holes so as to loosen the grip on the bolts, would be productive of a very damaging result?

Capt. JOHNSON. Yes, sir. If there were a strain—a certain strain I might say—put on that point, it would probably result in the wing tearing off, with fatal results to pilot, observer, and machine.

Senator NEW. Now, what might produce such a strain?

Capt. JOHNSON. Well, a dive; suddenly pulling out of a dive or throwing the machine over on that wing suddenly and taking a very quick and steep turn.

Senator NEW. Are not all of those maneuvers absolutely necessary in the manipulation of a machine in the air in combat?

Capt. JOHNSON. In combat they are.

Senator NEW. So that am I to understand that in your opinion this would render the machine liable to collapse as the result of any of those maneuvers during a combat?

Capt. JOHNSON. Yes, sir; it would.

Senator NEW. To just what extent, Captain, do you think that renders that machine unfit for use?

Capt. JOHNSON. I did not quite get that, sir.

Senator NEW. Just change the question, then. In your opinion, does this defect render the machine so liable to damage that it ought not to be used?

Capt. JOHNSON. Yes, sir; it does.

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Senator NEW. Have you observed the construction of the stabilizer?

Capt. JOHNSON. In a casual way; yes. The bolts fitting on to the fuselage are too weak, and at certain points they are only held on by counter-pins, and the entire tail has a play both forward and backward and up and down which produces a certain amount of friction and causes a strain on those points, which weakens the tail.

Senator NEW. Have you ever flown the DH 4 out there?

Capt. JOHNSON. No, I have never flown a DH 4 at any place.

Senator NEW. You heard the evidence given by Capt. Kelley?

Capt. JOHNSON. Yes, sir.

Senator NEW. Do you indorse the opinion he has expressed of the De Haviland 4, from what you know of it?

Capt. JOHNSON. From the points that I have seen—and, of course, I have not looked over the machine as carefully as he has—but those points which he brought out, that I know of, I indorse absolutely.

Senator NEW. Then, is it your judgment that the machine is unsuited for use as a fighting machine?

Capt. JOHNSON. Yes, sir; in my estimation, from what I know of actual war fighting.

Senator NEW. I should think your opinion on that would be entitled to some little consideration now.

Capt. JOHNSON. It is absolutely unfit as a fighting machine.

Senator NEW. Would you care to use it yourself, for your own purposes in combat?

Capt. JOHNSON. I would not. There is one thing I would like to say, sir, if I may.

Senator NEW. You may. We want to get at the absolute truth concerning this machine, and in order that we may do that we have asked you gentlemen of wide experience to come here and tell us what you actually know and what you actually think of that machine from your own direct observation of it.

Capt. JOHNSON. It is a matter of cables. In all my experience over there I have never seen a machine where they used cables that those cables were not spliced instead of being bent over the eye and wrapped and then soldered. The reason that I disapprove of the wrapping and soldering method is that if it is done at all poorly, the solder does not soak through underneath, and then when it is wrapped you cover up a point where there is a great deal of strain on the cable and you can not see whether it is being worn or not, and then the outside covering with solder may or may not be uniform and have gone thoroughly through the wiring.

Senator NEW. And it is the wrapping and soldering method that is employed on the American De Haviland 4?

Capt. JOHNSON. Yes, sir; it is. You can not determine whether that is strong or not, with the naked eye.

Senator NEW. Well, in case that should give what would be the result?

Capt. JOHNSON. It all depends on the cable which gives. If it were on a flying cable, it would give and the wing would be liable to fly off.

Senator NEW. Are there any other defects to which your attention has been directed?

Capt. JOHNSON. No, sir.

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Senator NEW. Then, if you will, I would like for you, in as brief a way as possible, to state to the committee your opinion of the DH 4 as a combat plane—whether it should be employed for that purpose by our forces.

Capt. JOHNSON. Well, in the first place, in my estimation the machine as it stands at present is not a safe machine to fly, and it certainly would not stand the strain of a combat, where one has to dive and whirl and put particularly severe strain on all points of a machine; then, in the second place, it is too large a machine; it does not maneuver quickly enough. That is about all I can say about it. It is too heavy to handle.

Senator NEW. Are we to understand, Captain, then, that you think these structural defects, of which you have spoken, are such that they can not be remedied to the extent of making the machine serviceable?

Capt. JOHNSON. Yes; I think they can be remedied, but never to be a combat machine.

Senator NEW. Just what do you mean by that? That they can be so remedied so as to make it serviceable for reconnaissance purposes?

Capt. JOHNSON. Reconnaissance purposes or photographic purposes.

Senator NEW. But not as a fighter?

Capt. JOHNSON. No.

Senator NEW. Nor as a day bomber?

Capt. JOHNSON. I can not say, because I have never had experience in daylight bombarding.

Senator NEW. As to that you merely do not know?

Capt. JOHNSON. I do not know.

Senator NEW. You do not express any opinion?

Capt. JOHNSON. No; I can not on that.

Senator NEW. I think that is all, Captain.

Capt. JOHNSON. May I just say one thing about the engine?

Senator NEW. Yes; you may add anything you please.

Capt. JOHNSON. The carbureters are placed in the V of the engine.

Senator NEW. You are speaking of the Liberty motor?

Capt. JOHNSON. Yes, of the Liberty motor; and if there is a back-fire—which is constantly occuring—there would be a great and almost sure chance; no, I would say there would be a great chance of the machine catching fire.

Senator NEW. What is the remedy for that?

Capt. JOHNSON. To put the carbureters down below, I should suggest.

Senator NEW. Outside of the V?

Capt. JOHNSON. Outside of the V.

Senator NEW. Has not that been done with the Liberty motors sent to the English?

Capt. JOHNSON. That I could not say. I have not seen one, but on all the DH4's I have seen out there, the carbureters have been in the middle of the V.

Senator NEW. Capt. Johnson, when did you say you left France?

Capt. JOHNSON. When did we sail from France, Frank?

Lieut. WELL. The 24th of June.

Capt. JOHNSON. The 24th of June, 1918.

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Senator NEW. Previous to your leaving there, had you seen any American combat plane in use on the western front?

Capt. JOHNSON. No, sir.

Senator NEW. Do you know of any American combat planes having been used for combat purposes on the western front?

Capt. JOHNSON. No, sir.

Senator NEW. If any such had been used, do you think you would have heard of them?

Capt. JOHNSON. Yes, sir; I think so.

Senator NEW. That is all, Capt. Johnson.

STATEMENT OF MAJ. H. S. MARTIN—Continued.

Senator NEW. Maj. Martin, when you were before the committee a few dags ago, you were asked to submit a table of performances for machines in use in 1919, and types recommended for production in the United States. I now show you a copy of such a table, which has come to the committee since your last appearance. Is this the table that you were asked to present [exhibiting paper to witness]?

Maj. MARTIN. Yes, sir.

Senator NEW. I notice here in next to the left-hand column, under the title, "Best existing types," that the De Haviland 4 is twice mentioned. Does that have reference to the De Haviland 4 as made in England or as made in the United States?

Maj. MARTIN. It refers to the English machines mainly, because our information on the De Haviland 4 as manufactured in the United States is very indefinite. At the time I was in France there were no American De Haviland 4's over there.

Senator NEW. The De Haviland 4, however, was not recommended by the board, of which you were a member, for production in the United States for service in 1919; is that correct?

Maj. MARTIN. It is not recommended for production in 1919.

Senator NEW. This sheet is entitled "Table of performances of machines for use in 1919, and types recommended for production in the United States."

I note, Major, that among the machines recommended for production in 1919 is the Bristol fighter, with 300 horsepower Hispano-Suiza motor. I have also noted that the Liberty 12 was recommended for use in this plan by Col. Clark. Will you explain to the committee the circumstances and the understanding under which that recommendation was made?

Maj. MARTIN. When the question came up as to what engine should be put into the Bristol fighter there really was only one engine available, and that was the Liberty 12. It had been definitely decided that the Liberty 8 would not be produced. Col. Clark was advised that the Liberty 12 would weigh 740 pounds, and a natural assumption would be that the weight of radiator, water, etc., would be the same as any other engine of like horsepower. One of the engines used in the Bristol fighter is the 190 Rolls-Royce, which weighs very nearly 700 pounds. It seemed quite reasonable, then, to assume that the Liberty 12 could be put in the Bristol fighter.

Senator NEW. At the weight reported, of 740 pounds?

Maj. MARTIN. Yes, sir. Actually, the Liberty engine weighs 825 pounds and is quite difficult to cool efficiently. In addition to this,

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everybody, apparently, was able to make suggestions as to improving the Bristol fighter, with the net result that the total weight of the machine was increased nearly 800 pounds. Col. Clark's original figures called for a total weight somewhat greater than 2,900 pounds, whereas the Bristol weighs 3,360 pounds, approximately.

Senator NEW. I will ask you, Major, if you will explain briefly the arrangement of this table which you have submitted and identified.

Maj. MARTIN. The board selected the nine types of machnnes which they thought would be used in 1919 and then listed the best existing types of those machines. Of two of those types no example exists at present, except experimentally. We then decided which of these existing types would be used in 1919; then which of those types it was desirable to product in the United States in 1919. The table also includes the desired performances of machines which it is considered necessaary to approximate in order to have machines which will be satisfactory for the different purposes. It should be understood that not all of the types which have been finally recommende[d] for production in 1919 will give exactly the performance which are desired, but they will all approximate them very closely.

Senator NEW. I think that is all, Major.

STATEMENT OF LIEUT. FRANK W. WELLS.

Senator NEW. State your present rank and station.

Lieut. WELLS. First lieutenant, Aviation Section, Signal Reserve Corps, Wilbur Wright Field, Farfield, Ohio.

Senator NEW. What are your present duties at the Wilbur Wright Field?

Lieut. WELLS. Pilot in the scout flight.

Senator NEW. Have you been connected with the air service of any of the allied forces?

Lieut. WELLS. Yes, sir.

Senator NEW. Before joining those of the United States?

Lieut. WELLS. Yes, sir.

Senator NEW. With which one?

Lieut. WELLS. The French Army.

Senator NEW. How long were you with the French Army, and in what capacity?

Lieut. WELLS. One year, as pilot.

Senator NEW You saw active service on the French front, did you?

Lieut. WELLS. Yes, sir.

Senator NEW. Will you state where that service was just a little more definitely?

Lieut. WELLS. The front on the Verdun sector and the Champagne sector.

Senator NEW. When did you join the United States forces?

Lieut. WELLS. I got my active orders on the 1st of January.

Senator NEW. The 1st of January, 1918?

Lieut. WELLS. Yes, sir.

Senator NEW. By transfer?

Lieut. WELLS. Yes.

Senator NEW. Were you transferred directly from the French to the American forces?

Lieut. WELLS. Yes.

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Senator NEW. When did you come to the United States?

Lieut. WELLS. On July 1, 1918.

Senator NEW. What were you doing with the American forces between the time you joined them and the time of your departure for the United States?

Lieut. WELLS. The first month or six weeks I was officer in charge of R. M. A. work in the second aviation instruction center in France. Then up until the time I left I was officer in charge of the field.

Senator NEW. With what air machines did you have experience, either with the French or American forces abroad?

Lieut. WELLS. With the Bleriot, Caudron, G–3, the Nieuport type 28, 23, 18, 15, 13. On the 15, there was 80, 110, and 120 horsepower. The Spad 140, 180, 200, and 220.

Senator NEW. What is your opinion of the Spad machine?

Lieut. WELLS. I think it is one of the best scout machines there is.

Senator NEW. What machines have you flown since you have been at the Wilbur Wright Field?

Lieut. WELLS. None at all.

Senator NEW. None?

Lieut. WELLS. No, sir.

Senator NEW. How does that happen?

Lieut. WELLS. There have not been any machines to fly in the scout flight, with the exception of one, and I did not think that was fit to fly, so I did not fly that one.

Senator NEW. What was that—what type of machine?

Lieut. WELLS. Standard M defense.

Senator NEW. Just why do you say that, Lieutenant, or on what is that opinion based?

Lieut. WELLS. On my experience with small machines in the French army. There are so many little things, that I did not consider it just the proper machine to fly and do stunts with.

Senator NEW. You thought it an unsafe machine; is that it?

Lieut. WELLS. Yes, sir.

Senator NEW. Well, that introduces a new figure. What seemed to the defects of the M-Defense?

Lieut. WELLS. The stabilizer and the elevator were too small.

Senator NEW. Both too small?

Lieut. WELLS. Yes. The cables were bent around and wired and soldered, instead of being spliced.

Senator NEW. Those are structural weaknesses of which you disapprove?

Lieut. WELLS. Yes, sir.

Senator NEW. And which make you fear to use the machine; is that correct?

Lieut. WELLS. Yes, sir.

Senator NEW. Have you reported this to the department?

Lieut. WELLS. Yes, sir.

Senator NEW. You have sent it up through channels, I suppose?

Lieut. WELLS. Yes, sir.

Senator NEW. Have you had any experience with the De H–4?

Lieut. WELLS. No, sir.

Senator NEW. Have you had any opportunities to observe the machine?

Lieut. WELL. Yes, sir.

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Senator NEW. What sort of an examination have you made of it?
Lieut. WELLS. The first time I saw one was in France.
Senator NEW. Was that an American-made De Haviland?
Lieut. WELLS I presume it was. It was in the hands of Americans.
Senator NEW. Where was this?
Lieut. WELLS. This was at the Second Aviation Instruction Center.
Senator NEW. When was that?
Lieut. WELLS. In May, 1918.
Senator NEW. That was one of the first machines received over there, was it?
Lieut. WELLS. Well, that I could not say. It was the first one I had seen.
Senator NEW. You do not know where it was made?
Lieut. WELLS. No.
Senator NEW. You do not know whether or not it was an American-built machine?
Lieut. WELLS. I could not say positively.
Senator NEW. But your impression is that it was an American-built machine?
Lieut. WELLS. Yes, sir.
Senator NEW. What did you ascertain concerning it on that occasion?
Lieut. WELLS. Well, the stabilizer in the back of the machine was loose; that is, the fittings were loose enough so that you could take the stabilizer and lift it up and down about an inch. The cables were this turned-around affair, wired and soldered. The running gear did not look as strong as it might be.
Senator NEW. Was that machine in use?
Lieut. WELLS. It had been flown from a place called Romorantin.
Senator NEW. That is, it had been flown experimentally, you mean.
Lieut. WELLS. Well, that I could not say.
Capt. KELLEY. Romorantin is the assembly park for the American-built airplanes. The crates are all shipped there and the machines are to be assembled there and then flown to wherever they are wanted—to that point. That is going to be our big assembly plant.
Senator NEW. Did you hear any report made of the performance of that machine on that occasion?
Lieut. WELLS. No. If I remember correctly, this trip was made just to visit the second aviation instruction center. Whether they were trying out anything or not I do not know.
Senator NEW. Was anything said about the character or the quality of the machine on that occasion?
Lieut. WELLS. No, sir.
Senator NEW. Then, what became of it? Was it flown back?
Lieut. WELLS. No; it was taken down and sent back on a truck.
Senator NEW. Taken down and sent back to Romorantin on a truck?
Lieut. WELLS. Yes, sir.
Senator NEW. Why was that?
Lieut. WELLS. The machine met with an accident on landing and could not be flown back.
Senator NEW. Did you hear any opinion expressed by aviators over there, either our own or of the foreign forces, concerning the qualities of the De H-4?

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Lieut. WELLS. At that particular time everybody was of the opinion that it was all right.

Senator NEW. What is the opinion now?

Lieut. WELLS. You mean over there or here?

Senator NEW. Do you know what it is over there now?

Lieut. WELLS. Well, when I left, those that I talked to did not care to do any acrobatics—any stunts with it.

Senator NEW. Why?

Lieut. WELLS. They did not think it was safe.

Senator NEW. Their opinion, then, had undergone a change?

Lieut. WELLS. Yes, sir.

Senator NEW. As a result of observation of the machine; is that it?

Lieut. WELLS. Well, that I do not know. You see, we were located at a different place entirely from where——

Senator NEW (interposing). What was responsible for that change of opinion?

Lieut. WELLS. Men who had visited the place, or met other aviators, or in flying over there, they had landed there, so that kind of talk finally sifted back where we were located, although I never saw any performance of the machine.

Senator NEW. Then, this was was the gossip of that field, which simply drifted back to you through various channels?

Lieut. WELLS. Yes, sir.

Senator NEW. Have you had any opportunity to form any opinion of the machine since you have been out at Wilbur Wright field?

Lieut. WELLS. I have looked the machines over—one in particular—at the Wilbur Wright field.

Senator NEW. Tell us how you happened to make that examination.

Lieut. WELLS. Being more or less interested in the testing department, I looked the machine over with others, and talked it over, and different things were pointed out to me that I had not noticed: so in that way I came to see these many faults that have been pointed out.

Senator NEW. What were some of those things that were pointed out to you?

Lieut. WELLS. These bolts and fittings in the main spar, upper and lower wings.

Senator NEW. You are referring now to the bolts through the spars, which were referred to by Capt. Kelley and Capt. Johnson in their testimony?

Lieut. WELLS. Yes, sir.

Senator NEW. In your opinion, what effect would the wearing of these bolts have upon the machine?

Lieut. WELLS. These bolts moving around, it would cause the hole to get larger, and as the hole got larger, the bolt would bend and, in time, break, and that would cause the wing to go off; and the wing going off, the machine would necessarily have to fall.

Senator NEW. Anything else?

Lieut. WELLS. The aleron, rudder, and elevator fittings do not seem to me strong enough.

Senator NEW. Anything else?

Lieut. WELLS. The location of the guns—the sights.

Senator NEW. You speak now of the machine-guns?

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Lieut. WELLS Yes, sir.

Senator NEW. What is wrong with them?

Lieut. WELLS. I think the machine-guns are placed too high, and, being strapped in, a man could not very well take care of a jam. The sights I can not see through at all. They are way above me. I would have to loosen the straps and raise up in order to see.

Senator NEW. So that renders the gun of no use?

Lieut. WELLS. It would not be of any use to me if I wanted to make a shot at somebody. I could guess at it.

Senator NEW. But the arrangement of that, you think, is structurally wrong; that is, the location of the guns?

Lieut. WELLS. Yes; the location of the guns. There is one sight in particular that is off to one side, and you would have to lean way over this way [demonstrating] in order to see. You have still got to hold the stick in the middle to balance the machine, and the tendency is, in moving this way [demonstrating], to push the other up.

Senator NEW. The tendency is, you mean, in moving to one side, to put too great pressure on the stick you hold in the other hand?

Lieut. WELLS. No, sir.

Senator NEW. You can not lean without putting too much pressure on the stick, is that it?

Lieut. WELLS. That would be it. That would be the tendency. Of course, the machine would never get out of control, or anything like that; but if you got off of balance, it would spoil your shooting.

Senator NEW. While it might not overbalance the machine, it would spoil your shooting?

Lieut. WELLS. Yes, sir.

Senator NEW. Anything else?

Lieut. WELLS. The distance between the pilot and the observer is greater than it should be, making conversation out of the question without the aid of a telephone.

Senator NEW. From your experience, and basing your reply upon that, and upon your observation of the American D'H. 4, do you regard it as a good type of plane for combat purposes?

Lieut. WELLS. As it stands now?

Senator NEW. As it stands now.

Lieut. WELLS. No, sir.

Senator NEW. Have you ever had experience with day-bombing machines?

Lieut. WELLS. No, sir.

Senator NEW. Do you consider yourself qualified to pass judgment upon the D'H. 4 as a day bomber?

Lieut. WELLS. No, sir.

Senator NEW. What, if anything, should be done, or what can be done with the De Haviland 4 to make it an available and acceptable machine for combat purposes?

Lieut. WELLS. From the experience I have had, and from what I have seen of combat machines, I do not think the machine is that kind or type.

Senator NEW. You do not think anything can be done with it to make it an acceptable combat plane?

Lieut. WELLS. No, sir.

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Senator NEW. For what purpose, then, do you think it might be used, if any?

Lieut. WELLS. Photographic work, and possibly regulating artillery fire.

Senator NEW. Do you think it should be used for any purpose until after the structural defects, of which you have spoken, have been remedied?

Lieut. WELLS. No, sir.

Senator NEW. Does that mean that you regard it as unsafe as it stands at present?

Lieut. WELLS. Yes, sir.

Senator NEW. It is one that a pilot should not be asked to use, in your opinion?

Lieut. WELLS. Yes, sir.

Senator NEW. When did you leave France?

Lieut. WELLS. July 24.

Senator NEW. June 24, you mean, do you not?

Lieut. WELLS. Yes, sir; June 24.

Senator NEW. Up to that time, had you ever seen any American planes used on the western front for combat purposes?

Lieut. WELLS. No, sir.

Senator NEW. Do you know whether any of them were being used for such purposes, up to that time?

Lieut. WELLS. Not that I know of.

Senator NEW. You had never heard of any?

Lieut. WELLS. No, sir.

Senator NEW. I guess that is all, lieutenant. Is there anything further you would like to say?

Lieut. WELLS. Why, it is just about the same as Capt. Kelley and Capt. Johnson have said; but there is one thing that I would like to emphasize—these cables. The method of turning the ends of the cable, wiring, and then soldering. That is something I have never seen on a French machine, and the fact that it is wired and soldered makes it difficult to know whether the solder has gone in far enough to make it as strong as it should be. All of the cables over there on the French machines are spliced.

Senator NEW. And you think that the splicing method is the one that should be employed?

Lieut. WELLS. Yes, sir.

Senator NEW. You heard the evidence given by Capt. Kelley and Capt. Johnson?

Lieut. WELLS. Yes, sir.

Senator NEW. Do you agree with that?

Lieut. WELLS. Yes, sir

Senator NEW. If you differ with it, at any point, I would like for you to explain just wherein you differ.

Lieut. WELLS. No. I agree with them in everything they have said.

Senator NEW. I think that is all,

Lieut. WELLS. There is this one more thing. This fabric. In the French Army—well, I will not say "in the French Army," but under French management, both at the front and in the rear, when fabric becomes what they call "dead" or "soft," where you can put your

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finger in it and the dent still remains, either new linen is put on or the old dope is scraped off, and it is redoped.

Senator NEW. And that is something that should be done?

Lieut. WELLS. I think so. When fabric is like that, it is hard to tell whether it is old fabric or not. I think it is the paint.

Senator NEW. That is all, Lieut. Wells.

(Whereupon the committee adjourned, subject to the call of the chairman.)

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AIRCRAFT PRODUCTION.

FRIDAY, AUGUST 2, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The committee met at 2 o'clock p. m., pursuant to adjournment, in the committee room, Capitol Building, Hon. Harry S. New presiding.

Present: Senators New and Reed.

STATEMENT OF NAVAL CONSTRUCTOR J. C. HUNSAKER, UNITED STATES NAVY—Continued.

Senator NEW. Constructor Hunsaker, you were here as a witness a few days ago, and, on that occasion, reference was had to the fact that a number of DeH4 planes had been delivered to the Navy. You recall that?

Constructor HUNSAKER. Yes, sir.

Senator NEW. The test had been conducted on four of the planes selected from that lot which had been sent to the naval testing station at Miami, Fla., I believe?

Constructor HUNSAKER. Yes, sir.

Senator NEW. You said, I believe, that 28 of those machines had been shipped abroad?

Constructor HUNSAKER. Yes, sir. I think I said 28, but the number is 50. After leaving the other day I looked up the shipments within 24 hours, and a few more had got away from us, so substantially 50 are on their way to France, and substantially 100 are on this side.

Senator REED. All of the same type and kind?

Constructor HUNSAKER. Presumably.

Senator REED. You say "presumably." When I say "all of the same type and kind" I do not mean to confine you so that if a piece is changed, or something or other is wrong in the construction, but I want to know if they are the same kind of machine and the same type of machine.

Constructor HUNSAKER. Yes, sir; they are all De Havilands.

Senator REED. De Haviland 4's?

Constructor HUNSAKER. Yes, sir.

Senator REED. And all planned and built in the same factory, were they?

Constructor HUNSAKER. Yes, sir.

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Senator REED. That is, they were built there, anyway, wherever planned.

Constructor HUNSAKER. Yes, sir.

Senator REED. And there is no difference between the machines, so far as the general plan of construction is concerned?

Constructor HUNSAKER. There is not; no, sir.

Senator NEW. We are speaking of a lot of De Haviland 4 planes concerning which you testified on your previous visit.

Constructor HUNSAKER. Yes.

Senator NEW. At that time, Constructor Hunsaker, you said that it had not been definitely determined whether that 100 planes that had not been shipped would be kept on this side or forwarded to France?

Constructor HUNSAKER. Yes, sir.

Senator NEW. Can you tell us now what disposition has been made of those planes?

Constructor HUNSAKER. It has been arranged to return those planes to the Bureau of Aircraft Production; and the Bureau of Aircraft Production of the War Department has agreed to replace them with similar planes of later manufacture, which they can guarantee to be safe.

Senator NEW. The Navy refused to accept those 100 planes; that is correct, is it?

Senator REED. Let me put it this way: Why were they returned?

Constructor HUNSAKER. The planes were returned because of defective workmanship. These planes were the first of the production of a new factory.

Senator REED. What factory?

Constructor HUNSAKER. The Wright-Dayton.

Senator NEW. The Dayton-Wright?

Constructor HUNSAKER. I will correct that statement; the Dayton-Wright Co., at Dayton, Ohio.

Senator REED. What were the defects?

Constructor HUNSAKER. The defects were general workmanship, such as the method of splicing wires, attaching fabric to the planes, the rigidity of the tail structure, certain fittings which anchor the drift wires for the wings, and other items, which I think were mentioned in my testimony at the last hearing.

Senator NEW. They were included in a report made by Capt. McCaughtry, were they not?

Constructor HUNSAKER. Yes, sir.

Senator REED. When was that made?

Constructor HUNSAKER. Those were largely matters of inspection and workmanship.

Senator REED. When was that report made?

Senator NEW. That report was dated July 16, 1918. That is all I wanted to ask on that subject, Senator Reed. If you have anything further you wish to ask——

Senator REED. I want to get a little more detail in regard to the different defects. You say the splicing of the wires was defective?

Constructor HUNSAKER. Yes.

Senator REED. What is that splicing you refer to? Do you refer to the place where the wires are doubled back on themselves and then wound and soldered?

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Constructor HUNSAKER. I think so. I did not see the defective splicing myself, but I recall from the report of the inspection that certain of the wire terminals, which presumably had an eye splice in the end, were not well made.

Senator REED. Do you know whether or not that defect was visible to the naked eye after the wrapping had been completed and solder had been put over it—whether it then was in such shape that it could have been discerned—the weakness of it or the improper construction?

Constructor HUNSAKER. I doubt it.

Senator REED. But it could have been discerned by proper inspection while the work was in progress, could it not?

Construction HUNSAKER. It is extremely difficult even then. The security of the wire splice which involves solder can only be tested by breaking certain of them at random.

Senator REED. Well, you could tell whether the work was being done right, could you not?

Constructor HUNSAKER. If you stood over the men.

Senator REED. Yes. Well, I am talking about proper inspection, and I take it that means to stand over the work enough to see how the work is being done, does it not?

Constructor HUNSAKER. No, sir. In a large factory it is impossible. There are too many thousand workmen and there are too few inspectors to make that possible.

Senator REED. I am still talking about a competent inspection. I am not talking about the kind of inspection we are giving now, but whether, if a man saw the work being done—and I grant you that is impossible in each instance—if he then could see whether these defects existed or whether the defect was in the method of fastening the wires? Which was it?

Constructor HUNSAKER. I do not know which it was.

Senator REED. You do not know which?

Constructor HUNSAKER. No, sir.

Senator NEW. Is not that, as a matter of fact, a structural defect, rather than a defect of workmanship?

Constructor HUNSAKER. No, sir; I think it is workmanship.

Senator NEW. What I mean is, should not that be a splice rather than to have one end of the wire doubled back on another end and soldered to it, as it is in the case to which you refer?

Constructor HUNSAKER. If the job is properly done, there should be no choice between the two ways of making the wire terminal.

Senator REED. Well, you found these splices weak, at any rate, did you?

Constructor HUNSAKER. The commanding officer at Miami found them so; yes, sir.

Senator REED. Would that make the plane dangerous to the man who flew it?

Constructor HUNSAKER. Yes, sir.

Senator REED. Those splices were liable to give way while the machine was in the air, were they?

Constructor HUNSAKER. Yes, sir.

Senator REED. You spoke of the improper attaching of the fabric to the wings?

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Constructor HUNSAKER. Yes, sir.

Senator REED. Do you know whether that was a proper method of applying the fabric, or whether it was the arch of the wings, or whether it was the weight of the load that occasioned the fabric to give way, or was it all of these things combined?

Constructor HUNSAKER. All things enter into it, but the fabric was not well stitched to the framework of the wings.

Senator REED. Was that a thing that could have been discovered by proper inspection?

Constructor HUNSAKER. Yes, sir.

Senator REED. There ought to be enough inspectors at a factory to see that, anyway, ought there not?

Constructor HUNSAKER. Yes, sir.

Senator REED. What I understand you to mean, when you say it was improper stitching, is that it was unsafe stitching, and of such character that the fabric might give way?

Constructor HUNSAKER. Yes, sir.

Senator REED. Then, of course, we know what would happen if that occurred in the air. Now, you spoke of certain fittings which were employed to attach the wings to the—was it to attach the wings to the fuselage?

Constructor HUNSAKER. No, sir. There are certain fittings on the forward end of the fuselage to which wires are anchored. These wires are called drift wires, and lead back toward the wings, and serve to brace the wings against folding to the rear. Those fittings were not so strong as the wires which were anchored to them, and are being changed in all new machines.

Senator REED. The fittings were too weak, so that the wings were liable to give way?

Constructor HUNSAKER. Either the fitting or its method of attachment to the wooden part.

Senator REED. Now, which was it? Could you tell us?

Constructor HUNSAKER. Possibly both.

Senator REED. Both?

Constructor HUNSAKER. I know that the Army proposes now to put a tie-bolt at that place.

Senator REED. Were not nearly all of these defects of which you have spoken either structural, so that they ought to have been discovered by competent aeronautical engineers, or the result of bad workmanship, which ought to have been discovered by a proper inspection as the work progressed?

Constructor HUNSAKER. I suppose the majority of them might have been detected.

Senator NEW. Do you not think they should have been detected?

Constructor HUNSAKER. Yes, sir.

Senator NEW. Do you think the kind of inspection that permits that sort of patch work to pass is proper inspection?

Constructor HUNSAKER. No.

Senator REED. You turned back all of these machines that had been turned over to the Navy?

Senator NEW. All that had not gotten away from them.

Senator REED. That is, all that had not gotten away to France?

Constructor HUNSAKER. All that had not been shipped, except four that are in Florida and will be repaired.

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Senator REED. That is, you have four that you are going to try to patch up?

Constructor HUNSAKER. Yes, sir.

Senator REED. How many do you say went abroad?

Constructor HUNSAKER. About 50.

Senator REED. What steps have been taken to prevent the employment of those machines on the other side, before they are reconstructed?

Constructor HUNSAKER. I understand the Office of the Chief of Naval Operations will communicate with the American naval organization in charge of aviation in France, informing them of the situation in regard to the planes, and advising them to get in touch with the experts who are to be sent abroad to fix up Gen. Pershing's planes, and to arrange to have the naval planes fixed up at the same time and by the same people.

Senator REED. There is a force of men being sent abroad, then, to try and patch up the planes that have already been sent to Pershing; is that the case?

Constructor HUNSAKER. I know nothing of it from my own knowledge. I understand that certain men—I do not know whether it is enough to be called a "force" are already on their way abroad.

Senator REED. Who sent them? The War Department?

Constructor HUNSAKER. Yes, sir.

Senator REED. How many are there, do you know?

Constructor HUNSAKER. No, sir.

Senator REED. Do you know any of them?

Constructor HUNSAKER. I understand that Col. Hall has already sailed.

Senator REED. The Hall who had to do with the Liberty motor—that Hall?

Constructor HUNSAKER. I do not know.

Senator REED. The Liberty motor is theoretically supposed to have been principally created by Col. Vincent and Col. Hall, then civilians. I was wondering if it was the same Hall?

Constructor HUNSAKER. I did not inquire. I was told it was "Col. Hall."

Senator REED. Do you know whether he had been recently at the Dayton-Wright plant, doing the inspecting there, and at the Curtiss plant? Do you know whether it is the same Hall?

Constructor HUNSAKER. No, sir; I do not know.

Senator REED. Well, what department or division of the War Department sent these men? Do you know that?

Constructor HUNSAKER. The Bureau of Aircraft Production.

Senator REED. Do you know when they were sent?

Constructor HUNSAKER. No, sir.

Senator REED. When did you first hear of them being sent? About how long ago?

Constructor HUNSAKER. Last Monday.

Senator REED. Which would be July what?

Constructor HUNSAKER. Twenty-ninth.

Senator REED. What I am trying to get you to do is to give us the information, as best you have it, as to about when these men were sent over to repair these planes or to rebuild these planes that have been sent to Gen. Pershing.

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Constructor HUNSAKER. I am not a good witness for that. I know nothing about it.

Senator REED. When do you understand them to have gone? I am not asking you to be technical. I just want the information for what it is worth.

Constructor HUNSAKER. I did not bother to inquire. I was told that Col. Hall had left some time ago and was on his way.

Senator REED. Did the Navy need these planes when they got them?

Constructor HUNSAKER. Yes, sir; the Marine Corps did.

Senator REED. The Marine Corps did?

Constructor HUNSAKER. Yes, sir.

Senator REED. To operate in France or to operate in other places?

Constructor HUNSAKER. In France.

Senator REED. Do you know whether they have a single American-made plane now, except these defective ones that have been started over there?

Constructor HUNSAKER. Our marines?

Senator REED. Yes.

Constructor HUNSAKER. I believe not.

Senator REED. Do you know whether any of these planes that were started over there—these DH. 4's—have arrived?

Constructor HUNSAKER. No, sir.

Senator REED. Do you mean by that that they have not arrived or that you do not know?

Constructor HUNSAKER. That I do not know whether they have or not.

Senator REED. When were they sent?

Senator NEW. Will you let me ask a question right there, ahead of that, Senator?

Senator REED. Yes.

Senator NEW. Will the use of those planes that have now been shipped be permitted until after they have been overhauled and placed in condition, if it is possible to put them into condition?

Constructor HUNSAKER. I do not know whether it will be permitted, but full information will be supplied the people who might have to use them as to their condition.

Senator NEW. Those people will be advised that those machines are dangerous and not fit for use; is that true?

Constructor HUNSAKER. I do not know exactly the form of the advice. I suggest you ask Capt. Irwin, who, I understand, will follow me here. He is in charge of all naval operations of aircraft.

Senator NEW. As a matter of fact, you do not regard those machines as safe in their present condition, do you?

Constructor HUNSAKER. I do not; not, sir.

Senator REED. Who is in command of the Marines who are in France; do you know?

Constructor HUNSAKER. No, sir.

Senator REED. What have the Marines been doing for airplanes up to this time in France?

Constructor HUNSAKER. I do not know that either.

Senator REED. Now, do you know anything about the other planes that have been built for the Navy besides the De Havilands?

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Constructor HUNSAKER. We have got from the Army a rather large quantity of Curtiss JN 4 airplanes, and some Thomas-Morse, and are now getting a few small planes, made by the Standard Aero Corporation, of the training type.

Senator REED. Standard No. 4, did you say it is?

Constructor HUNSAKER. The Curtiss JN 4.

Senator REED. Yes; but what is this third type you named?

Constructor HUNSAKER. Standard Type M.

Senator REED. They are all training planes, are they?

Constructor HUNSAKER. Yes, sir.

Senator REED. Does the JN 4 work reasonably satisfactorily?

Constructor HUNSAKER. Yes, sir.

Senator REED. The Thomas-Morse—how did they work?

Constructor HUNSAKER. We had no complaint about it.

Senator REED. What was the engine employed in the Thomas-Morse; what motor?

Constructor HUNSAKER. The Gnome.

Senator REED. Did you have any trouble in getting all of those Thomas-Morse machines you desired?

Constructor HUNSAKER. We did not desire very many of them.

Senator REED. How many of them did you want?

Constructor HUNSAKER. I am not prepared with the actual number. Do you know, Capt. Irwin?

Capt. IRWIN. I do not remember now.

Constructor HUNSAKER. It was not a large number, and the Army gave them to us very promptly.

Senator REED. Did you get all the Curtiss planes that you needed?

Constructor HUNSAKER. Yes, sir; very promptly, and they were very satisfactory.

Senator REED. The Standard M, what engine has that?

Constructor HUNSAKER. That is the Gnome also.

Senator REED. Did those machines work satisfactorily?

Constructor HUNSAKER. I think we have not yet put them in service.

Senator REED. Oh, I want to go back to the defects. There is one thing I did not speak of. You said "the rigidity of the tail." I am speaking now of the DH4. Do you mean that the tail was not sufficiently rigid or that it was too rigid?

Constructor HUNSAKER. Not sufficiently rigid.

Senator REED. What was the reason that it was not sufficiently rigid? What was the fault in the construction there?

Constructor HUNSAKER. There was not enough bracing, but they have been able to correct it by the addition of steel tubing.

Senator REED. Now, coming back again to the other planes that the Navy has; what other planes has the Navy received, either built for themselves or received from the Army?

Constructor HUNSAKER. I recall no other planes received from the Army. We build our own seaplanes independently.

Senator REED. That is, you have them built?

Constructor HUNSAKER. We have them built and build them ourselves, in our own factory, both.

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Senator REED. Where is your own factory?

Constructor HUNSAKER. At the navy yard, Philadelphia. We have the naval aircraft factory there.

Senator REED. How many of those seaplanes have you turned out at the Government factory?

Constructor HUNSAKER. About 60.

Senator REED. With what motor are they equipped?

Constructor HUNSAKER. Each carries two Liberty engines.

Senator REED. Who designed those seaplanes that you are speaking of?

Constructor HUNSAKER. The design has been a development from Mr. Glenn Curtiss's original "America" of 1912–13, which was, as you know, unsuccessful. Its successive modifications were carried out by Mr. Curtiss, with various other engineers contributing ideas, until they developed the Curtiss model H–12, which was built for the British Admiralty and shipped to England during the years 1915–16, I believe, or 1917. The English have redesigned the H–12, and have returned it to us as the H–16.

Senator REED. Is that what you are now building?

Constructor HUNSAKER. It is that which we are building, and we are proceeding to change to the latest improvement of the H–16, also made after British experience, called the F–5.

Senator REED. Who made the latest design; American or English engineers, changing from the H–16 to the F–5?

Constructor HUNSAKER. The general design came from England, and American engineers have had to modify it to take the Liberty engine, and to suit our conditions of quantity production.

Senator REED. Have the changes been radical or have they simply been in the nature of modifications?

Constructor HUNSAKER. They have been in the nature of modifications, but to the extent of some 2,000. A complete redesign of all details. The general type remains the same.

Senator REED. In other words, you recognize in the Navy the fact that if a machine has been designed originally for a certain kind of engine, of a certain horsepower, and you change the weight of the engine and the power of the engine, that that necessarily involves changes in the fuselage and changes in the wings, and in all parts of the airplane?

Constructor HUNSAKER. In these boats we were not concerned with any great difficulty, because they had in England the Rolls-Royce engine, which is substantially of the same weight and power as the Liberty motor.

Senator REED. Senator New, I am going to have to excuse myself. I have just gotten word of the death of a very close friend, and I will have to go now, and you will go ahead with the hearing. The officers will excuse me and I will read their testimony.

Senator NEW. Yes, Senator. Just what is the Navy building? What is your program?

Constructor HUNSAKER. The Navy is building, as its program, the H–16, or its improvement, the F–5 flying boat, with twin Liberty engines, and the HS flying boat, with single Liberty engine. These machines are service types and are sent abroad. In addition to these

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types we construct for school purposes a 100-horsepower single-float seaplane made by the Aero Marine Plane & Motor Co., of Keyport, N. J.; a 100 horsepower single-float training seaplane, by the Boeing Airplane Co., of Seattle, Wash.; a 100 horsepower training flying boat, by the Curtiss Engineering Corporation, Garden City, N. Y.; and a 150 horsepower single-float training seaplane, by the Burgess Co., of Marblehead, Mass. The principal production is divided between this training craft and the two types of service craft. Besides these we have always under construction various experimental designs, which may have been initiated either by private firms or by the Navy Department. In these cases a few units only are built for demonstration and decision whether they are of sufficient merit to warrant their production for service use.

Senator NEW. Have the various boats that have been delivered to the Navy been satisfactory?

Constructor HUNSAKER. I think I can answer that the boats are satisfactory, although, of course, we have minor defects which develop from time to time, and improvement must be constant. The general theory under which the Navy operates is that the operating personnel—that is, the flyers—are the customers, and they must be supplied with what they want. The structural safety and integrity of the machines supplied is guaranteed by the matérial bureau supplying them.

Senator NEW. The defects of which you speak you regard as minor defects, do you?

Constructor HUNSAKER. They are minor to the extent that as soon as they are known they can be and are corrected.

Senator NEW. That is it; they are such mistakes as can be corrected?

Constructor HUNSAKER. Yes, sir.

Senator NEW. And do not so impair the strength or character of the machine as to render it obsolete—as to call for its rejection?

Constructor HUNSAKER. No, sir.

Senator NEW. Constructor Hunsaker, I think that is all I care to ask you, except that when you were last here you had a report of the test made on four De Haviland-4 machines at Miami, that report having been filed by Capt. McCaughtry under date of July 16. Will you please supply the committee with a copy of that report? Can you do so?

Constructor HUNSAKER. I think I must have the permission of the Secretary of the Navy. Under the naval regulations, I am bound not to divert any official correspondence, or copies of it, outside of the Naval Establishment.

Senator NEW. Of course, I do not want to call on you to supply anything that you should not supply, or anything of that sort.

Constructor HUNSAKER. I venture to suggest, sir, that you request the Secretary of the Navy——

Senator NEW. I know that request has been made of the Secretary, and it probably will come in that way. That is all right.

Capt. IRWIN. I can tell you that was sent, sir.

Senator NEW. It has been?

Capt. IRWIN. Yes, sir; it was mailed last night.

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Senator NEW. All right. Then, I think that is all at present, Constructor Hunsacker. Now, Capt. Irwin, will you take the stand?

STATEMENT OF CAPT. N. E. IRWIN, UNITED STATES NAVY.

Senator NEW. What is your present detail of duty?

Capt. IRWIN. Director of Naval Aviation, under the Chief of Naval Operations.

Senator NEW. Can you tell us just what the Navy program is: that is, what different types of aircraft, hydroplanes, and so on, the Navy is producing?

Capt. IRWIN. In heavier-than-air craft, for service use, we are producing the large two-engine flying boat, called the H–16, and a smaller type using one engine, called the HS–1—HS–1 or 2, according to the number; and for training purposes we are using the N–9, which is a seaplane that very much resembles the Army JN–4; the Aero Marine, which is very similar to the N–9 in its general outline, and the training boat, called the F boat—a small type of boat.

Senator NEW. Have the different types of planes which you have just enumerated, as delivered to the Navy, been reasonably satisfactory?

Capt. IRWIN. Yes, sir; reasonably so.

Senator NEW. You have not been called upon to reject any of them?

Capt. IRWIN. Some of the Aero Marines, when they were first delivered, developed weaknesses that we discovered, and we had to get new parts in the place of them before we could go on and use them.

Senator NEW. What was the character of those weaknesses?

Capt. IRWIN. It was in the bedplate of the engine, which was a special design of the Aero Marine Co., and it did not develop until after the engine had been running for some time.

Senator NEW. What was the type of engine?

Capt. IRWIN. The Hall-Scott 4-cylinder. These defects were apparently developed, due to the vibration of the engine, after some hours of flying.

Senator NEW. What was the conclusion of the Navy with reference to the Hall-Scott engine?

Capt. IRWIN. Well, we have stopped the use of it.

Senator NEW. You have abandoned its use?

Capt. IRWIN. Yes, sir.

Senator NEW. What was done with the planes in which it was used?

Capt. IRWIN. The ones that had been flown for some time were strengthened in those places where they gave way, and the new ones were supplied with new parts.

Senator NEW. All of them reequipped?

Capt. IRWIN. Yes, sir.

Senator NEW. With engines of a different type?

Capt. IRWIN. No, sir; I do not think so. We continued to use the Hall-Scott, but we changed, after a certain number had come out, to the Curtiss engine, but we strengthened the plane so that it would resists the vibration even of the Hall-Scott.

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Senator NEW. But I understand, do I, that the Hall-Scott is not used at all now by the Navy?

Capt. IRWIN. It is not being produced any more. There may be some still in use in the Navy.

Senator NEW. I asked that for the reason that Gen. Kenly testified here that the Army had entirely abandoned the use of the Hall-Scott machine; that 1,200 standard training planes equipped with Hall-Scott engines were relegated on account of the engine——

Capt. IRWIN (interposing). Scrapped?

Senator NEW. Well, their use discontinued.

Capt. IRWIN. We have discontinued their use, but the ones that were actually gotten on contract, before we concluded that they were not satisfactory, we have gone on and used them. I do not think it would make the plane dangerous, but they will give way or wear out quicker, and are harder to keep up.

Senator NEW. Captain, what information have you concerning the DeH4 planes which were recently delivered to the Navy for the Navy's use?

Capt. IRWIN. You mean what information relative to their condition?

Senator NEW. Yes.

Capt. IRWIN. We received a report from the commanding officer of the Marine Flying Field, at Miami, where four of these planes had been sent for training purposes, stating a number of defects that he had noticed in the planes. That report, as soon as received, was forwarded on to our matériel bureau that looks after the provision of the machines, and they took it up with the production division of the Army; and I afterwards learned, or was informed, that most of these defects—most, if not all, of them—had been previously reported to the Army, and that they had taken steps to make them good.

Senator NEW. But do you recall just how many of those planes were delivered to the Navy in that defective condition?

Capt. IRWIN. No, sir; I could not state that, because I do not think anyone would know where changes had been made in the machines that came along. We did not get them all at one time, and these four that were sent to Miami were among some of the first that we received.

Senator NEW. The Navy had had in an order for a given number of DeH4 machines?

Capt. IRWIN. Yes, sir.

Senator NEW. Can you tell us how large an order that was?

Capt. IRWIN. One hundred and fifty-five.

Senator NEW. One hundred and fifty-five?

Capt. IRWIN. Yes, sir.

Senator NEW. Then Constructor Hunsaker has testified that about 50 were actually shipped abroad?

Capt. IRWIN. Yes, sir.

Senator NEW. And that about 100 had been rejected here and returned to the production department; that is correct, is it?

Capt. IRWIN. Well, after this report of defects was made to us we said we did not believe these others, the remaining 100, should be

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sent abroad, and we took it up with the Army, and they said they would take them back and make good the defects.

Senator NEW. If that is the case, it is true, however, that the entire order of 150 machines ordered by the Navy was delivered in that defective condition?

Capt. IRWIN. Not necessarily, according to my understanding, sir, because this delivery has been going on for a period of over two months, and I understand they have remedied in the later machines some of the defects that were in the first machines.

Senator NEW. This 100 machines were not accepted?

Capt. IRWIN. No, sir; because we do not know where the remedies were installed, and in order to make a clean job of it——

Senator NEW (interposing). The Navy has declined them all?

Capt. IRWIN. The Navy has sent all of them to be inspected and to see that the defects have been made good.

Senator NEW. Will the use of the 50 that were sent abroad be permitted before they are overhauled and those defects remedied?

Capt. IRWIN. We are preparing a telegram to the commander of the aviation forces abroad now telling him all of the defects.

Senator NEW. Who is the commander abroad?

Capt. IRWIN. Capt. Cone. The telegram, of course, will go to Admiral Sims.

Senator NEW. The telegram will go to Admiral Sims and down from him through naval channels?

Capt. IRWIN. Yes, sir.

Senator NEW. Are you at liberty to state what the character of that cablegram will be?

Capt. IRWIN. Well, in a general way, stating all of the defects that have been reported to us, and to take it up with the Army as to the best way of repairing them or making them good. I say, "taking it up with the Army," because they probably have better facilities at their assembling base there for making these changes or replacing these things.

Senator NEW. Captain Irwin, it is perfectly well known that the Army has met with many difficulties in its aircraft production program and some conspicuous failures. I would like to ask you if the Navy has had corresponding difficulties of major or minor importance.

Capt. IRWIN. We have had difficulties. I do not think I would call them of major importance, but both the matériel bureaus and the Office of Operations—that is, the matériel section of the Office of Operations—try to have the commanding officers of the air stations report all defects or supposed defects that they find in the machines that are issued for use, and to keep on reporting those continuously. It may be simply that they think they do not operate well, and when we get those reports in we take it up with the matériel bureaus, and sometimes they agree at once that it is a defect; that it has been reported, and they start in to make it good. On other things, after talking it over, we say that the man who made the report is in error; that he wants an easy appliance for operating, and we do not make the change. We decide there in the department whether it will be done or not.

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Senator NEW. Have such a number of reported defects come with reference to any one particular type of plane in use by the Navy as to indicate that that type should be abandoned—or I will change the last of that question; I do not care to say "should be abandoned," perhaps, but that the manufacture of that type should not be continued?

Capt. IRWIN. I do not remember any that we have had in quantity production. We have had some that we had gotten a small number of—that is to say, we had gotten one and tested it out, and thought it was going to be a good machine—one or two—and we had gotten a dozen or more, and with a little more use we decided that was not a suitable machine and discontinued it. Now, the defects in the Aero Marine that I have mentioned—it could not have been continued in its original form of production; that is, with the original material, the way it was put into it—in the original form of manufacture.

Senator NEW. There were substantial changes found necessary in that?

Capt. IRWIN. Yes, sir.

Senator NEW. Are you still making them?

Capt. IRWIN. Yes, sir. That is correct, isn't it?

Constructor HUNSAKER. Yes.

Capt. IRWIN. It is a training machine.

The CHAIRMAN. On July 29 last I wrote the Secretary of the Navy requesting a copy of a report on "Defective parts found on De Haviland airplanes" as submitted by Capt. McCaughtry, which I now have, and will ask the stenographer to have the same inserted in the record at this point.

(The matter referred to is here printed in full as follows:)

NAVY DEPARTMENT,
OFFICE OF NAVAL OPERATIONS,
Washington.

HON. C. S. THOMAS,
Chairman Subcommittee on Military Affairs,
United States Senate, Washington, D. C.

DEAR SENATOR: The receipt is acknowledged of your letter of July 29, 1918, requesting for the use of the Subcommittee of the Military Affairs Committee investigating the production of aircraft a copy of a report on "Defective parts found on De Haviland airplanes" submitted by Capt. Walter E. McCaughtry, United States Marine Corps, commanding the Marine Flying Field at Miami, Fla.

A copy of the report mentioned is herewith inclosed as requested by you. In connection with this report I am glad to inform you that this matter has already been taken up by the Bureau of Construction and Repair of the Navy Department with the Aircraft Production Division of the War Department, and information has been received that the defects mentioned in this report had practically all previously been presented to the Production Division and steps had been taken to remedy them in future output of this type of machine.

Very truly, yours,

JOSEPHUS DANIELS.

MARINE FLYING FIELD,
Miami, Fla., July 16, 1918.

From: Commanding Officer.
To: Director of Naval Aviation, United States Navy, Washingtonfi D. C.
Subject: Defective parts found on De Haviland airplaines.
Reference: (a) Op. Air 0146–Y–66, letter Naval Operations. July 18. 1918.

1. Numerous cases of wire terminals pulling out have been found on the De Haviland type machines at this station. Close inspection of all terminals on these machines shows that while on many the free end has not started to

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pull out, practically all are loosened until they are unfit for further service. The cause of the failure of these terminals is that the wrapping is all in one section, no spacing being allowed for the solder to run in. Terminals taken from these machines were unwrapped without applying heat to the solder, thereby proving that the thimbles are held in place by the friction of the wrapping alone and not by accepted solder-filled connection.

2. The aileron control sheaves on the upper panel are causing much trouble through defects which are as follows: (a) Bending of the bolts which holds the fitting to the spar, thus causing the sheave to be out of line with the control. (b) By shearing the bearing stud, which allows the sheaves to come entirely loose from the fitting.

3. The stream-line shields covering the sheaves do not allow for any inspection of these contracts. This should be remodeled by cutting away part of the shield or by changing its form.

4. The horizontal stabilizer is too weak in structure to be used for instruction purposes. It is recommended that for this use the horizontal stabilizer be made more secure by further bracing, as sharp glides show excessive vibration.

5. Some cases of control cable terminals, letting go were found, the cause being the same as those assigned to other wires.

6. The fabric used on these machines has never been properly stretched. This is probably due to not enough "dope" having been applied, or to an inferior grade being used. The thread that holds the fabric to the ribs pulls through, allowing the fabric to raise up from the ribs. With all machines at the station it has been necessary to restitch the fabric, and it is recommended that all surfaces be re-covered with a better grade of fabric.

7. The pin that secures the axle cap has in several instances sheared off. This allows the wheel to come off. Larger pins should be used in this place.

8. The aluminum stream line shield covering, the landing gear shock absorbers should be made of a stronger material, as vibration causes the aluminum to break off where it is secured to the struts.

9. The brace wires inside the fuselage used on this machine are unsafe, as they are held in place only by lock nuts on each end. An examination of these wires shows that after a few hours flight a majority of those lock nuts have backed off, allowing the brace wires to screw out.

10. The drag wires are too small to take up the necessary land. This is shown by the fact that they all show signs of strain after a few flights. It is recommended that these wires be made double strength.

11. It is the opinion of pilots flying this machine that entirely too much force must be applied to the stick to operate the controls. It is recommended that more leverage be given, as it is often vital to have the controls respond quickly.

12. The foot board next to the fuselage on the wings should be made to extend to the entering edge. This would save the wing from getting broken up in front.

13. At present the wing skids are secured by a bolt on the outside of the fitting and a small wood screw on the inside. The screw pulls out, allowing the skid to break or bend in landing. The screw should be replaced by a bolt.

14. The arrangement of the radiator overflow is very inconvenient. The overflow is taken from the radiator cap. This necessitates breaking the overflow line each time the radiator is filled or inspected. It is recommended that this overflow be taken out below this cap.

15. The auxiliary gas tank overflow is so located that there is considerable loss of gasoline when the machine is put in a glide. It is recommended that this overflow be placed on the top of the wing where the filler-cap is situated.

16. Much trouble in the cock pit has been experienced due to radiator shutter control handle interfering with the operation of the synchronizing pump. It is recommended that the shutter control cable be made longer so that the shutter handle will clear the pump.

17. The design of the fuselage gives a poor view from the cock pit.

18. The spacing of the ribs of the wing in the outer section is so great that it is almost impossible to keep the fabric secured.

19. With the machines in their present condition, it is considered that they are not safe for flying, and it is recommended that they be temporarily placed out of commission until material and parts can be secured to eliminate the defects above mentioned.

WALTER E. MCCAUGHTRY,
Captain, United States Marine Corps, Commanding.

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WAR DEPARTMENT,
BUREAU OF AIRCRAFT PRODUCTION,
Washington, July 27, 1918.

From: Maj. H. S. Brown, Chief of Finance Division.
To: The Hon. Charles S. Thomas, United States Senate, Washington, D. C.
Subject: Cancellation of Bristol contracts.

1. Complying with your letter of the 22d instant, addressed to Maj. F. E. Smith.

2. Attached hereto is copy of memorandum addressed to me by Capt. M. J. Abbott, under date of July 27, 1918, which is self-explanatory.

3. Briefly, we estimate that the cost of the cancellation of the Bristol contracts (planes and spares) will total $6,482,000, subject to a material deduction for salvaging, the amount of which can not be estimated without a more detailed survey than we have been able to make at the present time.

H. S. BROWN,
Major, Signal Corps, Chief Finance Division.

WAR DEPARTMENT,
BUREAU OF AIRCRAFT PRODUCTION,
July 27, 1918.

From: Capt. Abbott, finance department, approvals section.
To: Maj. H. S. Brown, finance department, administration section.
Subject: Cancellation of contracts in connection with Bristol planes.

1. In connection with letter of July 22, from Mr. C. S. Thomas, of the Senate Subcommittee on Aviation, in which he requests statement of the cost incurred by the Government of the United States in designing, constructing, and testing the Bristol planes, now abandoned by official order.

2. The contracts involved in this cancellation are contract No. 2463, with the Curtiss Co., which contract calls for 2,000 planes and certain specified spare parts; contract No. 2800, with the Lewis Spring & Axle Co., for certain specified spare parts; contract No. 2798, with the Hayes Ionia Co., for certain specified spare parts.

3. The amounts of the contracts involved are: Curtis Co., spare parts, $5,770,521.58; planes, $13,500,000; Hayes Ionia Co., $1,890,000; Lewis Spring & Axle Co., $1,890,000; making the total amount of contracts involved $23,050,521.58.

4. The estimated costs of the cancellation of the above-mentioned contracts are as follows: The Curtiss Co., $6,000,000; the Lewis Spring & Axle Co., $169,000; the Hayes Ionia Co., $313,000; making a total of $6,482,000.

5. You will find attached hereto five copies of the details showing how these figures were compiled.

6. I feel that the amounts shown as costs of cancellation are liberal and will be reduced materially by salvaging the materials involved.

By authority of Maj. Frank E. Smith.

Capt. M. J. ABBOTT,
Finance Division, Approvals Department.

Estimated cost of cancellation in connection with Bristol contract.

Curtiss Co.:		
Paid voucher	$1,250,000.00	
Unpaid vouchers and damages	4,750,000.00	
		$6,000,000.00
Lewis Spring & Axle Co.:		
Paid vouchers	41,000.00	
Vouchered but not paid	41,000.00	
To be vouchered	25,000.00	
Estimated cancellation charges	16,000.00	
Overhead and depreciation	33,000.00	
Profit, 10 per cent less tools, etc	13,000.00	
		169,000.00

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Haynes Ionia Co.:		
Vouchered and paid	$110,000.00	
Vouchered and not paid	26,000.00	
Overhead and depreciation	24,000.00	
Estimated cancellation charges	138,000.00	
Profit, 10 per cent less special tools	15,000.00	
		$313,000.00
		6,482,000.00
Contractors involved in cancellation:		
Curtiss Co.—		
Spares		5,770,521.58
Planes		13,500,000.00
Haynes Ionia, spares		1,890,000.00
Lewis Spring & Axle Co., spares		1,890,000.00
Total amount contracts involved		23,050,521.58

Senator NEW. Captain, I think that is all I will ask you.

(Whereupon, at 3.45 o'clock p. m., the committee adjourned subject to the call of the chairman.)

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AIRCRAFT PRODUCTION.

TUESDAY, AUGUST 6, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met at the call of the chairman, at 3 o'clock p. m., in the committee room, Capitol, Senator Harry S. New presiding.

Present: Senators New (acting chairman) and Reed.

The CHAIRMAN. The committee will be in order, and we will first hear Mr. Potter.

STATEMENT OF MR. WILLIAM C. POTTER, ASSISTANT DIRECTOR, BUREAU OF AIRCRAFT PRODUCTION.

Senator NEW. Will you please state your name and your position?

Mr. POTTER. Assistant director of the Bureau of Aircraft Production.

Senator NEW. How long have you occupied that relation to the board, Mr. Potter?

Mr. POTTER. Since the appointment of the Director of Aircraft Production.

Senator NEW. The committee desires to interrogate you a little concerning the production program of the department, both in reference to past accomplishments and future prospects. What program has the Aircraft Production Department made for the future?

Mr. POTTER. For the next 12 months we have a program which is based upon the cabled reports from Gen. Pershing, dated some time in June. I believe that is the date. That calls for a very large number of planes and engines, and the things that go on them, and we, in turn, cabled Gen. Pershing what we might hope to do. We did not base our hopes on the most conservative judgment of what could be done, but what we would try to do. We expressed at the same time enough doubt in our confidence of being able to accomplish all that we hoped to do so that Gen. Pershing would realize that we were aiming rather high and that we knew that we were aiming rather high. Now, if you want to have me give you numbers I would want to be called again and be advised of the fact that you did want numbers.

Senator NEW. We would like numbers, Mr. Potter.

Mr. POTTER. I could only give you approximations from memory, because I did not know exactly what would be wanted here.

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Senator NEW. Suppose that you do that, with the understanding that you are speaking from memory and that you will have an opportunity to correct that from your tables of the department?

Mr. POTTER. How would it be, Senator, if I sent you, in writing, a copy of this thing? I might give you some figures that would be referred to later and would be misunderstood.

Senator NEW. The better plan would be for you to submit the program in writing.

Mr. POTTER. I would be very glad to do that.

Senator NEW. For purposes of the present inquiry, can you tell us approximately what Gen. Pershing's requests were?

Mr. POTTER. I think that his request covered something in the neighborhood of 25,000 airplanes between now and the 1st of next July, with their accompanying spares, their accompanying spare engines, and their accompanying spare parts, plus armaments and instruments, and all the necessary tools and apparatus that go with them. I think we stated that we might hope to get something like 18,000 to 20,000, and I want it to be understood that I am speaking from memory.

Senator NEW. By what time?

Mr. POTTER. By the 1st of July, 1919.

Senator NEW. Mr. Potter, what type of planes did that request include?

Mr. POTTER. That included, first, single-seater fighters.

Senator NEW. Can you tell us about how many, from memory?

Mr. POTTER. I think it would be better if I did not try. It would be several thousand—2,000 or 3,000. Then, second, a much larger number of two-seater fighters. Third, a very considerable number of Army observation planes; fourth, an equally large number of corps observation planes; fifth, a very large number of day bombers; sixth, 2,000 or 3,000 night bombers. Those are the principal items which were involved in Gen. Pershing's program; and, in addition to that, he asked us to do development work on two or three other types of planes which he did not expect to have delivered for some time, a rather indefinite time in the future, but wished us to do the work on them. One was a low-flying infantry-harrassment plane, armored. The other was what is known as the three-seater gunner machine, carrying at least three men and several guns. He did not ask for any special number of those, but simply asked us to go to work on them and develop them.

Senator NEW. Will you pardon an interruption right there? Did Gen. Pershing recommend any particular type of these experimental machines which you refer to as those which were not to be delivered at any particular time?

Mr. POTTER. No; he did not recommend any particular type by name, but he did——

Senator NEW. What I seek to learn is whether he expected you to design a type of plane to cover that particular line of work?

Mr. POTTER. He did.

Senator NEW. Or whether he recommended a particular type that had been already developed somewhere else?

Mr. POTTER. No, sir. In those two cases that I spoke of he did not.

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Senator NEW. He wanted us to design and experiment with—in other words, to develop planes intended for that particular line of work. Is that right?

Mr. POTTER. That is right; yes, sir. Nothing that Gen. Pershing said would prevent us from taking the best results from what had been done abroad, but he left it up to us as to whether we should take the results of what had been done in France, England, and Italy—whether we should do it all here or make a combination of the two.

Senator NEW. Mr. Potter, this may be a somewhat leading question, but have we in this country aircraft engineers who, in your judgment, are capable of designing and building military planes of that character?

Mr. POTTER. That is a leading question, and I suppose that it deserves a leading answer. I think we have, but in very limited numbers, and I will tell you who I think they are. I think to-day there landed in New York an Italian, with 5 or 6 engineers and 25 workmen, by the name of Pomelio who is capable of doing that work. We sent for him, and he is here. We have in Detroit a Frenchman by the name of Le Pere, surrounded by quite a group of skilled men. My humble opinion is that he is capable of designing airplanes. Outside of those two men I personally do not know of an airplane designer in this country that I think has had the experience close to the front and in contact with the military necessities who is capable of designing by himself a successful battle plane.

Senator NEW. They are not American engineers.

Mr. POTTER. No, sir.

Senator NEW. You say that Pomelio and his outfit landed this morning?

Mr. POTTER. As far as I know.

Senator NEW. But until to-day we did not have them.

Mr. POTTER. We did not; no sir, but we did have Le Pere.

Senator NEW. As a matter of fact, is it not true that Pomelio was brought over by request of the Italian Government in order to take charge of the development in this country of the Caproni plane?

Mr. POTTER. Oh, no; he has nothing to do with the Caproni.

Senator NEW. For what purpose, then, is Pomelio intended? Is he intended to be a general designer?

Mr. POTTER. I will give you the story, and perhaps that will be the best answer.

Senator NEW. We will be glad to have it.

Mr. POTTER. Last winter in February a man by the name of Ellis, who is an attorney of the Union Pacific, and who, I believe, is solely actuated by patriotic motives, called my attention to the fact that a very prominent Italian airplane designer by the name of Pomelio would be willing to come to this country and erect a factory to build planes of his own design. After discussing the matter with the Aircraft Board, I finally recommended that we do not bring Mr. Pomelio here for the purpose of entering into commercial pursuits; but that if he would be willing to come here with his associates in the pay of the United States Government, in an advisory and helpful capacity in the designing of such types of airplanes as we should submit to

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him, that we would be glad to have him come and pay him a reasonable compensation and pay his men the usual compensation for men of their character, and he is here to do that thing. We are going to put him in a shop which we have selected in Indianapolis for the reason that it has a great surrounding country where labor is fairly plentiful and good machine-shop facilities, and we are going to say to Pomelio, "Gen. Pershing has asked us for these general types of planes. Now, we will give you one or two types. Now, you design those types to the specifications asked for by Gen. Pershing and submit your drawings to our technical section in the Department of Military Aeronautics for their approval; and if they seem to suit them, we will ask you to go ahead and build several samples and see how they turn out."

Senator NEW. So Mr. Pomelio is looked to for the possible development of new types of planes?

Mr. POTTER. Yes, sir.

Senator NEW. Mr. Potter, you say Gen. Pershing asked for a number of specified types of planes?

Mr. POTTER. Yes, sir.

Senator NEW. What do you propose to supply in the way of a single-seater?

Mr. POTTER. We propose to supply for the time being an exact copy of the British S. E. 5, which was recommended by Gen. Pershing as being one of the two best types of single-seaters on the front, and we are building them now, and the first sample plane ought to be ready now to fly.

Senator NEW. They are being built at the Curtiss plant?

Mr. POTTER. Yes, sir.

Senator NEW. They are not building the Martinsyde?

Mr. POTTER. No, sir; not yet.

Senator NEW. Do you have that in prospect?

Mr. POTTER. Yes; but the Martinsyde is not ready to ship. The first sample. fitted for the 300 Hispano-Suiza engine, will be shipped to us from England some time this month. It is not done yet.

Senator NEW. I know the Martinsyde was recommended by the board of the United States officers who were sent abroad for the purpose and I wondered what had been done to carry out that recommendation.

Mr. POTTER. Every one of their recommendations has been acted upon and the first sample of the Martinsyde plane for the Hispano-Suiza will be shipped in August, and three more will be built as soon as they can be obtained.

Senator NEW. What in the way of a two-seater fighter?

Mr. POTTER. We have two samples of the actual English Bristol fighter, which is supposed to be the best two-seater fighter that we know of, recommended by Gen. Pershing. We have them both equipped with 300-horsepower Hispano-Suiza engines, and, to the best of my knowledge, they are in the hands of the testing squadron of the department of military aeronautics now.

Senator NEW. Where?

Mr. POTTER. At Dayton.

Senator NEW. And if found satisfactory, that machine is to be adopted and put into production; is that correct?

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Mr. POTTER. Yes, sir.

Senator NEW. Then that is not the same type of Bristol fighter that was produced in some quantity and recently abandoned by the Government?

Mr. POTTER. Most decidedly not.

Senator NEW. Mr. Potter, I would like to have you tell us in your own way what, in your judgment, was responsible for the failure of the Bristol fighter.

Mr. POTTER. To give you the gist of it first; lack of experience and knowledge of the science of aeronautics on the part of the men who were——

Senator REED. You speak of building the real Bristol fighter in this country. What kind of a motor will be used in it?

Mr. POTTER. First, the 300 Hispano-Suiza engine. Secondly, possibly the 8-cylinder Liberty engine.

Senator REED. When did you conclude to go to manufacturing them again?

Mr. POTTER. Quite recently—provided both those engines, or either of them, should prove satisfactory on sample tests in battle planes submitted to the Department of Military Aeronautics.

Senator REED. When you say that you are going to build the real British Bristol the question is still open of a new motor for it; that is, a more powerful motor—the Hispano-Suiza—and that is still a matter of experiment whether that will work just right or not.

Mr. POTTER. That is correct.

Senator REED. Why do you not put in the same engine that the British use?

Mr. POTTER. Because we have not got it.

Senator REED. What is that?

Mr. POTTER. They put in several motors. They put in the Sunbeam, the 275-horsepower Rolls Royce, and several other motors.

Senator REED. Why can not those motors be produced here?

Mr. POTTER. They can.

Senator REED. Just one word about the 8-cylinder. Am I correct in this: That when it was first proposed to manufacture the Liberty motor it was contemplated that this motor could be used in many different kinds of machines by making the motor with a different number of cylinders; that is to say, perhaps a 4-cylinder, then a 6 or 8, and then a 12; that was the plan first, was it not?

Mr. POTTER. I think I was not here then.

Senator REED. That is your understanding?

Mr. POTTER. Yes, sir.

Senator REED. Then they abandoned all other kinds of the Liberty for the 12?

Mr. POTTER. That is correct.

Senator REED. And now we are going back again to try the 8?

Mr. POTTER. That is right.

Senator REED. Then they abandoned all other kinds of the Liberty for the 12?

Mr. POTTER. That is correct.

Senator REED. And now we are going back again to try the 8?

Mr. POTTER. That is right.

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Senator REED. Do you know who is responsible for the conclusion that we should go back to the 8 and make machines of that type?

Mr. POTTER. I think several people. A number of people are. The thought was first expressed to me in cablegrams from abroad. It became very evident to me that we needed an engine in quite large quantities of lesser bulk, weight, and power than the 12-cylinder Liberty. That was brought to my attention very emphatically by the failure of the Bristol, due to too much power and weight and size. It was suggested to me by an Englishman attached to our bureau by the name of Commander Briggs, and it was concurred in by Col. Vincent, and the idea appealed to me.

Senator REED. What does Col. Vincent have to say for the abandonment of this plan of motors of a different number of cylinders, which was done while he was connected with the air service? What explanation is there for starting out with a plan, abandoning it, and then going back to it again?

Mr. POTTER. I have just told you what the explanation was for going back to it. I have heard that the reason why they abandoned it in the first place was that they first designed the 8, and it was quite satisfactory as far as I know. Then word came from abroad that the tendency was toward higher powers; that they wanted a 300-horsepower motor, and then a 400-horsepower motor, so the Aircraft Board said that the tendency is toward the higher powers, why make this little engine? So they abandoned the 8, which I think was a mistake. They could have made the 8 and they should have made the 12, too, because there is no question that one engine in an aircraft program will not do. We have to have a number.

Senator NEW. Mr. Potter, right there, was not that a fact that the production department was some time in discovering?

Mr. POTTER. I think so.

Senator NEW. That one engine was not suited to all types of planes?

Mr. POTTER. I think so.

Senator NEW. Do you not think that a part of the delay in the production of machines by this country is due to the fact that too much effort was made to make the Liberty motor serve for all purposes?

Mr. POTTER. I think that is a true statement; yes.

Senator NEW. You spoke a minute ago of the Sunbeam motor and of the fact that we have not got them in this country. Is it not true that an effort was made here a year or more ago to induce the Aircraft Board to adopt the Sunbeam?

Mr. POTTER. Yes; so I am told.

Senator NEW. That was before your connection with the board?

Mr. POTTER. Oh, yes. I have since looked into it and I can tell you some facts about it.

Senator NEW. We shall be glad to have them.

Mr. POTTER. About three months ago a gentleman by the name of Beach called on me with a very good introduction from a friend of mine and told me that he was interested in the manufacturing rights of the Sunbeam engine in the United States, and he wanted to give

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them to this Government. I became interested and I sent engineers up to Toronto, in Canada, where the engine is being made, and they made a very careful examination of it and within the last few weeks have received the first sample which they could turn over to us of that engine, which is now being tested at McCook field. I will say, however, that there are many types of Sunbeam engines—several, and this type happens to be the 180 or 200 horsepower engine, whichever you wish to call it. I can not say that that engine is as good an engine, certainly no better than our 180 Hispano-Suiza which we have in production.

Senator NEW. At New Brunswick?

Mr. POTTER. At New Brunswick. The production of these Sunbeam engines, or rather the order for these Sunbeam engines, was placed with the company in Canada sometime last fall, nearly a year ago, and I think it is fair to say that they have not produced more than a handful of them since. By a handful, I mean less than 20. That is my understanding. At least at the time my engineer was there a month ago they had not produced any, and they could not even give me one until the last two or three weeks. Now, the British Government has the entire output of that factory for some months to come and I have given instructions to the Wright-Martin people to increase their production, which I hope will be accomplished by December, so we have no use for this Sunbeam engine which is being manufactured in Canada. Besides, that engine would not be sufficiently powerful to put into the Bristol fighter.

Senator NEW. My recollection is that our committee—not the present subcommittee, because it had no existence then—but the full Military Affairs Committee was informed several months ago that some Canadian company was then engaged in manufacturing Sunbeam engines, all of which were being taken by Great Britain, and they were producing it at the rate of either 100 a week or 100 a month.

Mr. POTTER. All I can say is that if you received that information it was entirely incorrect.

Senator REED. Now, on this point of one engine not being usable for all planes: Have you in mind the dimensions of the different planes, their weights, etc.?

Mr. POTTER. Do you mean could I quote them to you?

Senator REED. Yes.

Mr. POTTER. No, sir.

Senator REED. Can you furnish them to us?

Mr. POTTER. Yes.

Senator REED. I would like to have the dimensions, the spread of the wings, and the weight, for instance, of the small one-seater fighters, then of the two-seated fighters, then of the typical bombing planes, and then of the great planes like the Caproni.

Mr. POTTER. If you will make your request, Senator, to suit the cloth, I can give it to you very promptly. If you want them all——

Senator REED. I do not want them all. I want to illustrate why the same engine can not be used. That involves the question of the spread of the wings, the weight, and the speed.

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Mr. POTTER. I have a book in my desk which I can send over to you which will give you most of the engines, types of planes with their engines, their performance, and with pictures of them.

Senator NEW. I think I asked you, Mr. Potter, if you would give to the committee your idea of the causes responsible for the failure of the Bristol fighter.

Mr. POTTER. Yes, sir; I can do that. To sum it all up: The faulty design and construction of the Bristol fighter was due entirely to a lack of detailed knowledge of aeronautical design on the part of the men who had the matter in hand. There is no question about that.

Senator NEW. Do you think that it was originally a fault of design?

Mr. POTTER. I do not think there is any question about it.

Senator NEW. Then, was that the controlling cause?

Mr. POTTER. I can not think of any other, Senator.

Senator NEW. Well, is it not true, Mr. Potter, that the Bristol fighter was very materially changed between the time it was given to the Curtiss Co. for production and the turning out of the machine?

Mr. POTTER. Yes, sir. But the design that was handed to the Curtiss Co. was so designed that it was unsafe to fly. It was not strong enough. It had factors of safety that were very low, and had to be strengthened.

Senator NEW. It called for a weight of 2,937 pounds. Is that correct?

Mr. POTTER. I would not like to certify to that weight.

Senator NEW. Do you know how many changes were made in it and the character of any of those changes?

Mr. POTTER. I know of some of them and I know a great many changes were made. Of course, I do not pretend to follow all the changes that are made in all these airplanes. I have not time. But I do know of numerous changes that were made, and I know of some of them in detail.

Senator NEW. At all events the machine that came out was not at all the machine that went in. That is correct?

Mr. POTTER. It was a heavier machine.

Senator NEW. And in your estimation the machine would not have been quite as conspicuous a failure if made in accordance with the original design as it was after the changes had been made?

Mr. POTTER. I think it would have been a much greater failure. I do not think you could have landed twice in succession with it and had a plane. We proved that on the first few planes that we built. Every one of them were crashed. The tail skid would not stand the strain. The whole rear end of the fuselage would break. The landing gear broke and everything else except the wings, and, in fact, after all this weight had been put on and added to it the factor of safety was only five and a half, which indicates that still more weight could have been added.

Senator NEW. What should the factor of safety have been?

Mr. POTTER. It will be at least six or seven on a fighter.

Senator NEW. I do not know as I personally care to go into detail as to what made the Bristol fighter a failure. It is admitted

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to be a fact that it was a failure, whether that was due to the design or to the manufacture.

Senator REED. As a matter of fact you did find a very great deal of bad workmanship, did you not?

Mr. POTTER. Oh, yes; plenty.

Senator REED. So there were two things, bad design and bad workmanship. That is about enough to spoil anything if you get enough of it.

Senator NEW. Once more returning to our original line of inquiry. What has the board in prospect as an Army observation machine?

Mr. POTTER. Three planes. The Bristol fighter can be used as an Army observation plane, and is so used. We have another plane, called the U. S. D. 9, which is practically nothing more or less than the De Haviland-9 with the Liberty engine in it. Samples of it are now being flown by the Department of Military Aeronautics, and they are passing their criticisms upon it. Depending upon what they have to say about it finally depends whether we will manufacture that plane or some modification of it. Capt. Le Pere has now completed three samples of a plane with the Liberty engine in it, and at least one and perhaps two of those planes are in the hands of the Department of Military Aeronautics for tests at Wilbur Wright Field.

Senator NEW. Mr. Potter, you speak of the U. S. D. 9 as being in point of fact very definitely similar to the De Haviland-9?

Mr. POTTER. Except that it has the Liberty engine in it?

Senator NEW. That, of course, is one very material difference.

Mr. POTTER. I embodied that in my statement as a difference.

Senator NEW. Is not a considerable change of design necessary to accommodate that machine to a Liberty motor?

Mr. POTTER. I should not say that a very considerable difference in the design was necessary; but it is quite possible that quite different results will be obtained from the operation of the plane.

Senator REED. It is quite possible that quite different results may be obtained, by which you mean to say that the Liberty engine may or may not be a success in that plane?

Mr. POTTER. I mean by that that the installation of the Liberty engine may require larger gasoline capacity, greater weight of water, greater radiator weight, and changes in weight which may affect the performance of the machine, but not the design of the machine. The machine is practically the same design as the De Haviland 9 itself.

Senator REED. Is not the greater weight liable to produce the same results that you had heretofore by overloading the machines?

Mr. POTTER. That is just exactly what I say. The fact that you put more weight into the machine may give you entirely different results.

Senator REED. You may find that machine breaking to pieces.

Mr. POTTER. We may. We propose to find out before we build them.

Senator NEW. Mr. Potter, is it not a fact that the factory out there was about ready to proceed with the production of the so-called U. S. D. 9, when it was discovered that, owing to the changes made in

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it, it was being subjected to a wing load of 9.6 as against one of less than 8.6 on the plane as originally designed?

Mr. POTTER. I can not corroborate the 9.6 and the 8.6 figures because I have not got them in my mind, but it is not a fact that the plane was going to be put into production before it was tested by the Department of Military Aeronautics and approved by them. There was no intention on my part or on the part of anybody else that had the authority to give the contract for the U. S. D. 9 until it was approved, if that is an answer to your question.

Senator NEW. Yes; that is an answer. Mr. Potter, the machine, however, was made, was it not—that is, samples of it were made?

Mr. POTTER. Yes; one sample was made.

Senator NEW. And it was at least intended to proceed with the manufacture of that plane. As a matter of fact, had the technical department ever been called upon to pass upon that design?

Mr. POTTER. Yes, sir; they had.

Senator NEW. Had they ever checked up those plans?

Mr. POTTER. I do not know whether they had ever checked them up or not; but in June I sent the technical department of military aeronautics all the information that I had on that plane, as well as on the U. S. D. 9A and the two forms of Bristol fighters and, I think, one other plane, inviting their attention to such figures as we had on those planes and asking them to make suggestions in regard to them. They made some suggestions and note was taken of them. Between that time and perhaps a week ago one sample, I think, of the U. S. D. 9 was made and turned over to them, and they had certain criticisms to make of the weight of it, which are being carefully analyzed and taken cognizance of, and the Department of Military Aeronautics and our department are cooperating to see if they can adjust those difficulties and arrive at a satisfactory plane. If they can not, it will not be built.

Senator NEW. At all events, as the plane stands, with the wing load that it is made to sustain in the sample which has thus far been presented, it is not a satisfactory plane?

Mr. POTTER. That is correct.

Senator NEW. There is a mistake somewhere. If the technical department had an opportunity to examine and made recommendations and failed to do so, the fault may rest with them; if not, it rests with the production department; but somewhere there has been a collapse on that? Is that correct?

Mr. POTTER. That is correct, sir.

Senator NEW. Then that eliminates it for the present from the list of Army observation machines?

Mr. POTTER. Yes; for the moment.

Senator NEW. It may be restored?

Mr. POTTER. Yes.

Senator NEW. What does that leave?

Mr. POTTER. The Le Pere and the Bristol fighter.

Senator NEW. The Le Pere is the machine designed by Capt. Le Pere, of the French service?

Mr. POTTER. Yes.

Senator NEW. He has designed that plane here since he became connected with the United States service?

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Mr. POTTER. In Detroit. That is right.

Senator NEW. And it is an entirely new thing. That, I believe, has been experimentally flown, has it not?

Mr. POTTER. Oh, yes.

Senator NEW. And with fairly satisfactory results?

Mr. POTTER. So they report to me.

Senator NEW. And the true English type of Bristol fighter?

Mr. POTTER. In so far as the plane is connected with the 300 Hispano-Suiza motor in it.

Senator NEW. And that is also being experimented with?

Mr. POTTER. It is.

Senator NEW. You say two samples of them have been made?

Mr. POTTER. Yes; sent to the Department of Military Aeronautics.

Senator NEW. Where will they be made?

Mr. POTTER. Samples are being made at the McCook Field from copies of the actual English planes.

Senator NEW. One of those machines will probably be selected as the type of Army observation plane?

Mr. POTTER. I think so.

Senator NEW. It is hoped that one of them may prove so satisfactory as to warrant your adopting it?

Mr. POTTER. Yes.

Senator NEW. What for—a corps observation machine?

Mr. POTTER. Either one of those two planes would serve for a corps observation plane with slightly different equipment on it. They would serve for an army observation. They would serve for a corps observation plane differently equipped.

Senator NEW. I would naturally so infer; but the two are separated here in these recommendations, and I therefore assumed that a different plane might be contemplated for one use than what would suffice for the other.

Mr. POTTER. If the U. S. D. 9 could be made satisfactory as to weight it would probably be a slightly more serviceable plane than either of them for corps observation.

Senator NEW. Mr. Potter, what has the department in the way of a day bomber?

Mr. POTTER. The only plane that we have in prospect for a day bomber, outside of the De Haviland 4, which is now being built, and which is found to be perfect, is the U. S. D. 9A, which is in the same stage of development as the U. S. D. 9, but I understand that an analysis of its weight and the report on its flying tests by Col. Samphill, a very well-known technical flyer, lead me to believe that the combination is somewhat more satisfactory than the U. S. D. 9. It is the same plane as the U. S. D. 9 to all intents and purposes, except that it has larger wings, and Col. Samphill, who was here with Gen. Brancker recently, flew the plane twice. The last time he flew it he said, "It is all right. Go ahead and build it," but that does not relieve us sufficiently of the responsibility, and we will not build any of them except samples unless they are approved by the Department of Military Aeronautics.

Senator NEW. What in the way of a night bomber?

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Mr. POTTER. We are shipping now parts already fabricated of the Handley-Page. We have shipped 20 sets of parts up to to-day, and we have a factory in England to put them together.

Senator NEW. Where are those parts fabricated here?

Mr. POTTER. They are fabricated in a good many places. The wooden parts in Grand Rapids and the metal parts are largely made in Ohio, but some of the metal parts, like axles and other special features of metal parts, are made in several different places, and are brought together at the Standard Aircraft Co.'s works in Elizabeth, and are there assembled in sets and shipped abroad for assembly in a large plant which has been erected for the purpose in England.

Senator NEW. You say assembled in sets. Does that mean that they are set up as a completed machine?

Mr. POTTER. Only one out of fifty.

Senator NEW. Only one out of fifty is set up as a completed machine?

Mr. POTTER. Yes.

Senator NEW. Is that a sample to be test flown over here?

Mr. POTTER. Yes.

Senator NEW. Before shipment abroad?

Mr. POTTER. Before shipment of the plane itself?

Senator NEW. Yes.

Mr. POTTER. It is not intended to ship these planes abroad except in parts.

Senator NEW. I understand; but before a shipment of the parts?

Mr. POTTER. No, sir; we are shipping the parts now, and we have only completed one plane, which is being retained at Elizabeth to use as a model, and the second plane is approaching completion and will be tested and flown by the department of military aeronautics.

Senator NEW. That is being produced at Elizabeth?

Mr. POTTER. Yes.

Senator NEW. Can you give us some idea of when you think those Handley-Paige parts may be assembled in England for use as completed planes?

Mr. POTTER. No, sir; I have no way of giving you any estimate that would be of any value to you.

Senator NEW. You can not say whether it will be 90 days, 6 months, or you can not fix the time at all?

Mr. POTTER. I have not really any better basis to judge from than you have except I am told they are already ready for them and have skilled workmen to put them together, and judging from our experience here, I think that from the time that they actually arrive at the factory they should be finished inside of 90 days thereafter, but how long it will take them to go over there, or how long they will lie around the docks, or how long it will take to get them to the factory I have no idea.

Senator NEW. The element of doubt enters into that so that it is only a guess?

Mr. POTTER. Yes, sir.

Senator NEW. Reference was made a little while ago to the De Haviland 4. We are all very much interested at present in the De Haviland 4. You said that it was found to be unsatisfactory?

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Mr. POTTER. Yes, sir.

Senator NEW. What we want to ascertain here is just how unsatisfactory the De Haviland 4 plane is. How many of them have been produced to date, say to August 1?

Mr. POTTER. Over 1,000.

Senator NEW. About a thousand?

Mr. POTTER. Just about a thousand.

Senator NEW. All at the Dayton-Wright plant except half a dozen or thereabouts?

Mr. POTTER. I think a little more than that, but a few have been produced at the Standard Works and a few at the Fishers, but practically the full thousand have been produced at the Dayton-Wright factory.

Senator NEW. How many of those 1,000 planes have been submitted to actual flying tests?

Mr. POTTER. I can not answer that question, but a very considerable number.

Senator NEW. How many of them have been sent abroad, Mr. Potter, up to August 1; how many have been shipped?

Mr. POTTER. I think that up to August 1 about 700 had been freighted. By that I mean actually on the water.

Senator NEW. You do not know how many have been delivered to the other side?

Mr. POTTER. No, sir.

Senator NEW. Can you tell us whether you have any information as to whether any of those machines have been put into actual use on the other side? I do not mean flown as we see machines flown about Washington.

Mr. POTTER. You mean on the line?

Senator NEW. On the line; yes.

Mr. POTTER. I received a cablegram perhaps a week ago indicating that none of them had been put on the line.

Senator NEW. What was the reason for that?

Mr. POTTER. It did not give any reason.

Senator NEW. Would it be fair to ask from whom that cablegram came?

Mr. POTTER. I suppose I am here to answer any questions you want to ask me.

Senator NEW. I want to ask you that question.

Mr. POTTER. It came from Gen. Pershing.

Senator NEW. What did he say was the reason for it?

Mr. POTTER. He did not give any, and I did not ask him.

Senator NEW. Was there not a previous communication from Gen. Pershing some time along in June enumerating a considerable number of faults in the De Haviland 4 plane?

Mr. POTTER. Yes, sir.

Senator NEW. And did not this cablegram at that time say that those machines could not be used or would not be used at all until after they had been put in different condition?

Mr. POTTER. I am just trying to think whether he said that or whether he said the synchronizers could not be used until they had been put into different condition.

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Senator NEW. It did not say that. We have a copy of that report.

Mr. POTTER. I think he said that the synchronizer was the thing that could not be used until it was put into different condition. He may have said that about the plane, but I think not.

Senator NEW. Referring to this last cablegram, you said that Gen. Pershing said a week ago that none of these machines were in operation on the front?

Mr. POTTER. Yes, sir.

Senator NEW. Did he state why?

Mr. POTTER. No, sir.

Senator NEW. He did not give any reason for it?

Mr. POTTER. No, sir.

Senator NEW. Was there just the cablegram?

Mr. POTTER. No, sir. This was in reference to one I sent him asking if any De Havilands had been put on the front; and if any, what had been their performance, and he said: "No; we expect to have an answer for you soon" or something of that kind, but I did not ask him why, because I could imagine why.

Senator REED. What did you think was the reason?

Mr. POTTER. Because they had to be gotten ready; certain changes had to be made in them, and he had to get his pilots used to them.

Senator REED. But these machines that were sent over there contained the very same defects that had been specified in a previous letter as making the machine unfit for use?

Mr. POTTER. Certainly.

Senator REED. So, then, it is not a question of the training of the flyers, but a question of having the planes for the flyers?

Mr. POTTER. I said so, exactly, that he would have to change the planes.

Senator NEW. The point I was trying to establish was that the first cablegram enumerated a number of faults with the planes, and that since those faults were set forth in that cablegram many others had been sent over containing those same defects?

Mr. POTTER. Some had and some had not. I mean all of the planes sent over contained some of the defects, and some of the planes did not contain all of the defects. We have been correcting them and have been trying to correct them as fast as we could.

Senator NEW. Some time ago the Navy took 155 of those planes, did it not—the De Haviland fours.

Mr. POTTER. Yes, sir.

Senator NEW. Somewhere around 50 of them were shipped abroad, I believe, for the Navy's use, to an address designated by the Navy authorities?

Mr. POTTER. That is correct.

Senator NEW. About 100 others were crated up and delivered to the docks for shipment, were they not?

Mr. POTTER. Yes, sir.

Senator NEW. Is it not true that about that time, concurrent with this, 4 of the lot of 155 were sent to the flying field of the Navy at Miami, Fla., and there submitted to tests?

Mr. POTTER. Yes, sir.

Senator NEW. Is it not true that the commandant of that flying field, Capt. McCaughtry, made a report to the effect that the ma-

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chines were unsatisfactory and that they ought not to be flown and could not be flown in the condition in which they were delivered down there to that field?

Mr. POTTER. I received a report, the contents of which emanated from the officer you speak of, indicating a number of defects, most of which were identical with the defects found by Gen. Pershing. As far as I can remember, the report that I received was signed by Commander Atkins and simply stated that these were the criticisms found.

Senator NEW. You have not seen a report filed by Capt. McCaughtry, the commandant at that field?

Mr. POTTER. If I have, I do not remember it as such.

Senator NEW. Then, of course, you have not seen paragraph 20 of the report submitted by Capt. McCaughtry?

Mr. POTTER. I think I have not seen that paragraph.

Senator NEW. That was the particular paragraph of the report that I had in mind when I asked that question. Following that up, Mr. Potter, is it not true that the 100 machines which had been crated and delivered to the Navy for shipment abroad were turned back upon the Aircraft Production Board?

Mr. POTTER. Yes, sir; it is.

Senator NEW. Where are they now—in Dayton or en route there?

Mr. POTTER. They are either at the port of embarkation, all or part of them, or part of them are on the way back to Dayton.

Senator NEW. Can you tell us what it is proposed to do with those machines?

Mr. POTTER. Take them apart and fix them up. I mean by that, tear the wing coverings off of them, put in extra ribs, put on new wing coverings, put in better sewing, and do all things that we have to do to them to meet those criticisms.

Senator NEW. Is there an instance of the De Haviland 4 machine having been tested or submitted to the judgment of any competent authority where the report upon it has been favorable?

Mr. POTTER. I think not.

Senator NEW. As a matter of individual judgment, just how serious, in your opinion, is the trouble with the De Haviland 4 machine?

Mr. POTTER. You know what the troubles are. You have seen the list of troubles. I can not think of any of the troubles that are reported in the lists that we have as coming from Gen. Pershing and the Navy which can not be and are not being corrected but one. In the criticisms that I can remember as coming from the Navy there is one that can not be corrected. That is, they say that the view from the pilot's seat is not very good. That can not be corrected. That is inherent in the machine.

Senator NEW. I will say this, Mr. Potter: This committee in the last 10 days, or approximately that time, has had before it quite a number of practical flyers, many of them men who have seen actual service abroad, and I think with no exceptions they have passed that same criticism upon the De Haviland 4 and say that the arrangement of it is such that it is no good as a day bomber nor as a fighter.

Mr. POTTER. It is not supposed to be a fighter.

Senator NEW. As a matter of fact, isn't it?

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Mr. POTTER. No, sir; it is not.

Senator NEW. I think it has been referred to both as a day bomber and as a fighter, and if it is not a fighter, where have we a fighter machine?

Mr. POTTER. I say we have none.

Senator NEW. Provided these machines can be rebuilt so as to make them at all serviceable, how long would it take to do it?

Mr. POTTER. I issued instructions last week, after a conference with the Department of Military Aeronautics' technical people, that no more airplanes, De Haviland 4's, were to be shipped or accepted from any of the factories until a list of changes which I stipulated had actually gone into effect, and which were changes which were considered by this conference, at which Col. Bane and Col. Jones and others were present, had gone into effect.

Senator NEW. Where did that conference take place?

Mr. POTTER. Here in Washington.

Senator NEW. When?

Mr. POTTER. Last week sometime.

Senator NEW. So that the production of the DeHaviland 4 machine is in a state of suspension; is that correct?

Mr. POTTER. I would not exactly say that; but it is being slowed up a little.

Senator NEW. No more of them will be turned out in the shape in which those that were delivered to the Navy were delivered in?

Mr. POTTER. Not if my instructions are carried out.

Senator NEW. And no more similar to those that have been sent to Gen. Pershing?

Mr. POTTER. The same answer, sir.

Senator NEW. This committee has been informed that following the report that was made to it by the Navy an officer—Col. Hall, I think— accompanied by a force of assistants, was sent abroad for the purpose of going over those machines and attempting to put them into condition. Is that correct?

Mr. POTTER. Yes, sir; that is correct; but it did not follow the report of the Navy. It preceded it, as far as I know. I had not seen the report of the Navy when I sent Col. Hall abroad. He was sent abroad on July 16.

Senator NEW. That is, Col. Hall who collaborated in the——

Mr. POTTER. Yes, sir; Lieut. Col. E. J. Hall.

Senator NEW. Now, do you or do you not, as a matter of fact, know that a cablegram was sent to Admiral Sims calling his attention to the defective character of the DeHaviland planes that were sent abroad by Navy order?

Mr. POTTER. I do.

Senator NEW. And warning him that they should not be used until they had been gone over.

Mr. POTTER. I do.

Senator NEW. Getting back to Col. Hall; Col. Hall is an engineer, I believe.

Mr. POTTER. He is.

Senator NEW. And I am perfectly willing to assume that he is a very good one. What type of engineer is he, mechanical or——

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Mr. POTTER. Do you know his history?

Senator NEW. Not fully. I know that he is one of the brothers who designed and produced the Hall-Scott motor.

Mr. POTTER. That is correct. That is, a member of the corporation of the Hall-Scott Co., which has produced aviation motors of different types for some years. He has been more or less connected with the aviation business before the war. He is a mechanical engineer and a mechanic of considerable ingenuity, and I differentiate between his being a mechanical engineer and a mechanic, because he is both. He had a great deal to do with the designing or adoption of the design of the so-called Liberty motor. He had a great deal to do with the placing of the equipment on the De Haviland 4, much of which he did with his own hands, and he knew all the details of it. That is the best description of the type of man that he is that I can give you.

Senator NEW. I asked that question because I wanted to inquire further if Col. Hall's training was such as to qualify him to sit in final judgment on the design of aircraft, not of motors, but of aircraft?

Mr. POTTER. I think not.

Senator NEW. This committee has heard, among many other reports, that Col. Hall has said that he made something like 3,600 changes in the De Haviland 4 machine from the time it entered the factory until it emerged in its present shape. Do you know anything about how many changes were made and who was responsible for them?

Mr. POTTER. I have not the faintest idea how many changes were made, but I think Col. Hall did make some changes in the De Haviland 4 in detail, but those changes, to the best of my knowledge, were not fundamental changes; they were of guns, gun sights, and instruments, shell chutes.

Senator NEW. As a matter of fact, at somebody's instance, either wisely or unwisely, a very considerable number of changes were made in the design of the De Haviland 4 machine before it was put into production. Is that not so?

Mr. POTTER. I presume that a large number of changes were made, though some of them were as unimportant as the substitution of a cotter pin for a set nut, or something of that kind.

Senator NEW. However, is it not true that there were many important changes made?

Mr. POTTER. If so, I am not aware of it.

Senator NEW. Is it not true, however, that the De Haviland 4 machine, as it stands to-day, is a very unsatisfactory plane?

Mr. POTTER. It is quite unsatisfactory to everybody, I think—not to everybody. There are some few men who say it is pretty good.

Senator NEW. Can you tell this committee how long it will be, in your estimation, before we are able to put an acceptable machine of American manufacture in actual combat on the front?

Mr. POTTER. No, sir.

Senator NEW. You can not answer that question?

Mr. POTTER. No, sir.

Senator REED. Will you tell us why you can not give us an estimate of that, Mr. Potter?

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Mr. POTTER. In the first place, we will say that the first few machines that have been designed, readapted, and made in this country have been unsatisfactory, therefore we have not got any satisfactory machine to-day. Secondly, in order to make a satisfactory machine and put it on the front it has to pass to the satisfaction of the technical section of the Department of Military Aeronautics. I can not tell whether they are going to find these various designs satisfactory or not. They have not found any that are satisfactory yet. I do not mean to say that as any criticism upon them, because I do not think it is. I can not tell, nor can anybody else, whether they will find these things satisfactory or not, and after that they have to be built and have to be shipped and put on the front. Therefore, I can not estimate it. The machine that is to be satisfactory to the Department of Military Aeronautics has yet to be built.

Senator REED. Has yet to be created?

Mr. POTTER. You might use that word; yes.

Senator NEW. Mr. Potter, in view of those facts, is it not true that it will be at least some months?

Mr. POTTER. I think so, unless the faults of the De Haviland 4 can be corrected so it will be satisfactory, otherwise it will be some months.

Senator NEW. Under the generic term I included day bombers and all machines that are to be used in actual combat, everything other than training planes.

Mr. POTTER. That is what I thought you meant. I may say this, in further explanation of my estimate, that it is quite possible that we may have some single seater fighters that will be satisfactory in a very reasonable length of time, but whether they actually will be satisfactory or not I can not tell.

Senator NEW. What are those?

Mr. POTTER. The S. E. 5's. If they are not satisfactory, I do not think anything ever will be, because they are an exact copy of the English single-seater fighter, with an almost exact copy of the same engine.

Senator NEW. How long is it going to take to get into quantity production of those?

Mr. POTTER. They tell me about 60 days.

Senator NEW. What do you mean by quantity production?

Mr. POTTER. I mean several hundred a month.

Senator REED. Let me summarize this thing, if I may. As a matter of fact, you have not yet developed or put upon the battle front a successful fighter, a successful day bomber, or a successful reconnaissance machine?

Mr. POTTER. That is correct.

Senator REED. And we have not put on a successful heavy, or night, bomber?

Mr. POTTER. That is correct.

Senator REED. And we have not yet made any of these machines that we can say with any degree of certainty will be a success?

Mr. POTTER. That is correct.

Senator REED. We have expended or committed ourselves to expenditures of about how much?

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Statement of obligations and net expenditures of aircraft production and Signal Corps (old) appropriations as of May 31, 1918, and July 31, 1918.

Appropriation.	Amount of appropriation.	Allotments as of May 31, 1918.	Expenditures as of May 31, 1918.[1]	Allotments as of July 31, 1918.	Expenditures as of July 31, 1918.[1]
Air service production, 1919	$760,000,000.00	.....	.....	$38,137,795.21	$9,011,925.00
Increase for aviation, Signal Corps, 1918	640,000,000.00	$661,248,815.71	$281,355,494.17	714,091,950.72	366,371,836.82
Signal service of the Army:					
1918	51,800,000.00	51,099,375.93	17,789,856.58	51,796,754.12	20,167,617.62
1917-18	47,267,766.00	45,500,082.48	39,979,438.83	47,327,912.28	41,030,589.30
No year	4,500,000.00	4,333,495.57	4,225,000.00	4,333,484.59	4,475,000.00
Maintenance, etc., fire-control installations:					
Seacoast defenses	141,339.43	80,905.59	129,667.15	94,885.47	140,667.10
Seacoast defenses, insular possessions	12,506.58	10,981.26	9,721.77	12,078.42	10,786.46
Seacoast defenses, Panama Canal	10,650.68	9,326.26	10,525.68	9,334.12	10,525.68
Fire control:					
In insular possessions	12,834.38	4,251.59	10,196.68	11,238.48	11,496.68
At fortifications	16,025.90	8,826.94	7,348.80	10,826.94	7,698.80
At fortifications, act June 15, 1917	446,761.96	191,565.01	333,988.04	213,610.47	349,550.00
Washington-Alaska military cable and telegraph system, 1918-19	50,000.00	49,901.22	49,305.75	49,905.00	49,905.00
Contingent expenses, seacoast fortifications, act June 15, 1917	51,038.68	46,573.30	29,869.05	46,573.30	49,000.00
Board of Ordnance and Fortifications	15,088.43	689.13	23,793.65	689.13	13,254.09
Aviation seacoast defenses	2,839,010.98	21,407.12	24,511.14	21,407.12	24,511.14
Insular possessions, Hawaii	438,677.97	84,445.00	52,509.70	84,445.00	52,509.70
Insular possessions, Philippines	578,110.36	2,078.66		2,078.66	
Panama Canal	500,000.00	482,000.00	485,739.00	484,000.00	485,739.00
Supplies, services, and transportation, etc.:					
1918	16,882.73	15,000.00	.....	15,000.00	15,000.00
1917-18	100,000.00	.....	.....	100,000.00	100,000.00
Ordnance and ordnance stores, Bureau of Ordnance, 1917-18	9,600.68	1,086.00	.....	1,086.00	1,086.00
Aviation, Navy, 1917-18	350,000.00	350,000.00	333,000.00	350,000.00	350,000.00
Signal equipment, Enlisted Reserve Corps, 1918	300,000.00	300,000.00	295,000.00	300,000.00	300,000.00
Commercial telephone service at Coast Artillery posts, 1918	13,500.00	13,500.00	13,416.00	13,500.00	13,500.00
Replacing Signal Corps supplies and equipment:					
1917-18	136,918.43	136,328.09	123,360.50	136,283.34	133,589.86
1918-19	361,954.21	124,914.23	125,000.00	124,944.23	124,383.70
Total	1,509,968,667.40	764,115,582.09	345,406,742.49	857,769,782.60	413,300,171.95
Increase for aviation, Signal Corps, 1918 (apportionment, 525 materials for resale)	.....	[2]175,772,585.02	[3]11,161,708.00	[2]187,565,392.93	[3]19,001,862.69
Grand total	1,509,968,667.40	939,888,167.11	334,245,034.49	1,045,335,175.53	424,298,309.26

[1] All advance payments have been deducted from expenditures as of May 31, 1918, and July 31, 1918.
[2] These allotments include orders and authorities for material, etc., purchased by the Bureau of Aircraft Production for resale. A portion of this amount, to be later determined, will be an allotment against the appropriation "Increase for aviation, Signal Corps, 1918."
[3] All uncollected payments on "sales department" allotments are deducted from expenditures as of May 31, 1918, and July 31, 1918.

HAROLD MCLEHMAN,
Captain, A. S., A. P.,
In Charge Appropriations Department.

Approved:

C. C. CAMPBELL,
Major, A. S., A. P.,
Executive Officer, Finance Division.

WASHINGTON, D. C., *August 15, 1918.*

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Senator REED. Please tell us the amount of money that has been expended or that the Government has become obligated to expend in the production of aircraft. I mean by this how much money it would take for the Government to settle up to-day if it was going to step out of the business; and in that connection please give us the amount of money that has been lost on the Bristol fighter, which has been condemned; the amount of money that has been lost or expended on the Standard J machine, which was thrown out; and the amount of money that has been expended or lost on the De Haviland 4, assuming now that all of these machines are worthless, and then give us, if you have any figures upon which you can base an estimate, your best estimate as to what, if any, salvage there may be in each of these kinds of planes, respectively; and if you can not give anything but a mere wild guess, just merely state that fact.

Senator REED. You have stated, Mr. Potter, a very fundamental fact, that the lack of success in these planes is due to a lack of knowledge of the design, chiefly, and in addition to that there is imperfection of construction, etc., and you also stated that you had now an Italian expert here, Mr. Pomelio, who is about to undertake the designing of planes in which the Liberty engine could be employed, if I understand you right.

Mr. POTTER. Other engines as well.

Senator REED. You, therefore, recognize the wisdom of utilizing the services of genuine aeronautical engineers?

Mr. POTTER. I do.

Senator REED. I think that is indisputable. Now, will you tell me why it is Caproni sent over the experts who had been the controlling end of his great factories, Capt. De Annunzio, and sent over some other men, why they have been practically marooned down here on Long Island and left there and have not been placed in charge of factories engaged in the production of that machine?

Mr. POTTER. That is not a fair statement. I have to take exception to that. Capt. De Annunzio came here and was welcomed and every possible facility that I know of was given him to build his machines. No limit was put on him on what he could or should do, and the experimental ship of the Standard Aircraft Co. at Elizabeth, N. J., was turned over to him and he built a machine which is now at Mineola and has been in the air. It is true he has not been turned over a factory to build large numbers of these planes because he is not ready to do it. He was given carte blanche to get up drawings—his drawings are not finished yet—that plane which he has at Mineola is not finished yet. He is not willing that it should be tested by American flyers, and, unfortunately, the two Italian flyers of the Caproni machines were killed. Other Italian flyers are now on the way. Mr. De Annunzio has not been marooned anywhere.

Senator REED. That is my expression.

Mr. POTTER. I take exception to it. I want to lean over backwards and not say anything that is not so, and on the other hand I want to give ourselves justice. Mr. De Annunzio has been given every facility that the United States Government offers to develop his machines.

Senator REED. When was he given those facilities?

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Mr. POTTER. As soon as he came here, which was, to the best of my knowledge, in February. If there is any facility which he has not been given, I do not know what it is.

(At this point informal discussion took place outside of the record.)

Senator REED. In view of the fact that it is your opinion that aeronautical engineering talent ought to be employed and that the fault lies in the design, why is it that the men who have made a reasonable success at making airplanes have not been requisitioned and their talent employed instead of the talent of a lot of automobile men and carpenters and fellows of that kind for the purpose of designing?

Mr. POTTER. As a matter of fact, their talent has been availed of, but I think that the reason why those men are not in the Government employ is that they can not afford to be in Government employ. You will find, Senator, that most all the men who are in the employ of the Government, giving their entire time and attention to the Bureau of Aircraft Production are men who, although it is a considerable sacrifice to them, can afford to come down here perhaps and work for nothing. We have endeavored on several occasions to enlist the services of aeronautical engineers. I prefer not to mention any names, but those men have not found that they were able to do it.

Senator REED. Then, why are they not paid a sufficient sum so they can come? Here is the loss of millions of dollars because of incompetency. Under such circumstances, how much any expenditure would be preferable to the waste of this time and money and the tragic situation on the western front?

Mr. POTTER. You probably know it is rather difficult to arrange salaries in the War Department.

Senator REED. The executive department has not asked Congress for a single power that has not been granted, except one relating to the press. There is not a question about the fact—and there has not been a question, in my opinion, for many months—that if you or Mr. Ryan or your predecessors were to say to Congress that you had to have some experts to plan these planes, and that you could not get them without paying large salaries, that you would be granted that permission; and I am asking now whether the way out of this difficulty is not to summon to your aid the men who have been able to produce practical airplanes; the best constructive talent there is, and surround yourselves with that sort of talent and let it plan the machines?

Mr. POTTER. That certainly will help.

Senator REED. Why are we to stop short of that? Let a board or commission of that kind, or, what is better than that, in my judgment, a body of engineers, working under the general direction of some head, and then after they have conceived the machine, let the practical manufacturer produce it. In other words, put the construction and the designing ahead of the production proposition. Why is not that the right thing to do?

Mr. POTTER. I think it is.

Senator REED. Now, what is being done to have it brought about, Mr. Potter?

Mr. POTTER. As I said to Senator New, that is just one of the things we are trying to do. We are inviting Italian designers to

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come to this country. We have already invited and have here with us French designers. We have sent over to England for some of their best technical men. We have a man abroad to study foreign types, and we have several airplane designers with them. I hope they will come back with new ideas, but all these things take time.

Senator REED. In addition, however, to sending men abroad, why is it that men who have successfully built flying machines in this country are not called in?

Mr. POTTER. They are.

Senator REED. We have had complaints made to this committee by men who have been building machines that they can not even get orders for machines.

Mr. POTTER. That is right, they can not. Too many orders have been given for machines already to Tom, Dick, and Harry, and they have produced miscellaneous types of machines, not one single one of which has been any good up to date.

Senator REED. There has not been a single one of those that the Government has been spending a billion on that has been any good, but that is no worse than spending the money on experimental machines.

Mr. POTTER. Well, the Government has only tried to build two machines in actual production. I suppose that if I could count up the list of experimental machines that had been ordered by the Government, none of which are of any service, it would run into the hundreds. We have adopted lately the following scheme: We get our requirements from abroad in performance and type and we submit those requirements to various airplane designers who are asked to build certain numbers of machines on that basis. They submit designs first, and the designs are gone into by the Department of Military Aeronautics to criticize and offer suggestions, and if they are finally accepted, an airplane designer is asked to build five or six samples of the machine. You can not give a vast number of these orders out because we have only certain types that are desired by the Army.

Senator REED. Why have not the piano makers and other manufacturers of wood which required a high knowledge of fine woodwork and cabinet work; why have they not been called in for the purpose of doing some of this manufacturing of those parts, particularly that require great strength and lightness at the same time?

Mr. POTTER. Furniture people have been called in.

Senator REED. I am not speaking of the furniture people. I am speaking of these people that——

Mr. POTTER. Some piano manufacturers have been called in to make propellers, but, as you know, we have ample airplane manufacturing facilities in this country. We have more than we can fill up at the present time.

Senator REED. You have people who have been doing work some of which has been described here, and I am hestitating because I can not see how a human being can do the kind of work that has been described here in some instances.

Mr. POTTER. Our principal orders are with airplane factories.

Senator REED. That depends on what we call an airplane factory, of course. The Curtiss we call an airplane factory and yet we have had some very bad work from there.

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Mr. POTTER. Yes; and also some very good work from there.

Senator REED. What good work?

Mr. POTTER. The Curtiss training planes, of which they have made thousands, and the Navy has had very good work on their boats, so they tell me.

Senator REED. Would you call the Dayton-Wright factory in Dayton an airplane factory?

Mr. POTTER. They had a little airplane factory before they built the large one.

Senator REED. That was practically built for the purpose of manufacturing airplanes. You would call the Fisher Body Corporation an airplane factory?

Mr. POTTER. No, sir; but they do wonderful work.

Senator REED. What I am coming to is this, the question of inspection. Why is it that you can not get enough competent inspectors so that this bad work which has been described can be prevented? That is why I suggested cabinetmakers. I suggest utilizing men who can make pianos and musical instruments, etc., as inspectors.

Mr. POTTER. I think that is a very good suggestion.

Senator REED. That is not original with me. That suggestion has been made here by witnesses some of whom are flyers and some of whom were engineers. Why is it that you do not keep and have on your staff when it comes to the question of the planning of these machines some of the best flyers our country or other countries have developed, so that they may point out in advance points of weakness? I am going to illustrate that. Here comes in a young fellow who has had three years over there fighting, and has been in command of 40 or 50 airplanes, who sits down here and proceeds to tell us out of his head the defects of a certain machine. He has never flown in it, and yet he tells those defects as accurately, it seems to me, as they have been told by all of the engineers who have been here, and because evidently he gained by his practical experience. Why is it that those men are not brought in?

Mr. POTTER. Those men are not under our control.

Senator REED. You can get them.

Mr. POTTER. Well, I do not know whether you can get them or not. We have tried to get them.

Senator REED. If you can not get them there is something wrong about the whole organization.

Any organization that will proceed to produce airplanes without availing itself of the talent that the country possesses has some defect in the organization. It may be due to the law or any one of many causes, but, whatever those causes are, we ought to get rid of them, should we not?

Mr. POTTER. We should; yes.

Senator REED. I am asking you more by the way of suggestion than anything else why is it that there men who know what makes the strain on the plane—who know it practically from being in the air with them—should not be about and around and consulted before planes are put into production and as they are put into production, so that they can point out the weaknesses?

Mr. POTTER. The answer is, of course, that they should be.

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Senator REED. Then I hope they will be. There are a number of these defects on these machines that came from bad workmanship. I am not asking you now about the defects in the planes that may or may not be the fault of the manufacturer, but when it is the result of bad workmanship who stands the loss?

Mr. POTTER. The United States Government.

Senator REED. That is to say, if the United States Government has the Curtiss Aircraft Co.—I will just use them for an example—or the Dayton-Wright Aircraft Co. make 100 machines and finds out that all of those machines are defective, the Government stands the loss?

Mr. POTTER. Yes, sir.

Senator REED. Do those people still get their percentage upon this bad work?

Mr. POTTER. They do.

Senator REED. Do you regard that as businesslike or fair?

Mr. POTTER. Well, Senator, that depends. If the Government gives an airplane manufacturer an order—if it is bad workmanship—no; it is not right. But if we permit bad workmanship through faulty inspection, it is our fault.

Senator REED. No; it is a fault. I agree with you that the Government inspection is a means provided to keep a scoundrelly manufacturer from putting over a fraud on the Government, and if we are sufficiently alert we can protect the Government; but if never inspected at all, we still have the right to expect good workmanship and honest dealing. I must insist upon that as the principle of it all. So that, summing this thing up in all this vast amount of work, the aggregate of which you have not as yet given us in dollars and cents, has proven worthless thus far. These gentlemen who have been producing this work will fare just as well in dollars and cents as if they had produced first-class work.

Mr. POTTER. They will.

Senator REED. I now suggest a criticism of the Aircraft Board for the first time. It is that that sort of contract should not be written again.

Senator NEW. Mr. Potter, Senator Reed just made a reference to the inspection. Are you satisfied with the character of the inspection that has been had?

Mr. POTTER. No.

Senator REED. Do you think that that has been in certain instances, at least, very defective?

Mr. POTTER. Yes.

Senator NEW. What steps are being taken to remedy that?

Mr. POTTER. We are constantly trying to get better men and constantly trying to improve the organization and using every effort that we can to make our inspection more efficient.

Senator NEW. I strongly suspect myself that the one great difficulty in that is the inability of the Aircraft Board or anybody else to find men who are competent as inspectors.

Mr. POTTER. Why, certainly. It is a matter of education, and another cause for some very inferior personnel is the limited salaries we are permitted to pay to our inspectors.

(Whereupon, at 5.45 o'clock p. m., the subcommittee adjourned to meet at 2.30 o'clock p. m., on Thursday, August 8, 1918.)

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AIRCRAFT PRODUCTION.

THURSDAY, AUGUST 8, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met pursuant to adjournment at 2.30 p. m. in the committee room, Capitol, Senator Charles S. Thomas presiding.

Present: Senators Thomas (chairman), New, Frelinghuysen, and Reed.

The CHAIRMAN. The committee will now resume the hearing. Mr. Nash, we will hear you first.

STATEMENT OF C. W. NASH.

Senator NEW. Please state your name.

Mr. NASH. C. W. Nash.

Senator NEW. Your present position with the Aircraft Production Board?

Mr. NASH. Assistant to the director in charge of engineering and production.

Senator NEW. What was your business before you came to the board, Mr. Nash?

Mr. NASH. President and general manager of the Nash Motors Co.

Senator NEW. How did you happen to take service with the Aircraft Production Board?

Mr. NASH. At the very urgent request of Mr. John D. Ryan.

Senator NEW. Is it a fact that you were more than once solicited to come to the board?

Mr. NASH. Yes, sir.

Senator NEW. State to us some of the efforts that were made to induce you to come?

Mr. NASH. I think perhaps within a week after Mr. Ryan was appointed to the position that he now occupies he wired me at Kenosha to know if he could see me at Washington or New York at an early date. I replied that I would be in Washington in a week. I went there, and I called upon him, and he explained to me that he had taken hold of this very troublesome problem and wanted to know if I would not come and help him out. I replied by saying that I would investigate the situation and would make a decision. I went to Detroit and made a little investigation and talked with some of my friends, and after a few days I wrote him that I did not feel it was possible for me to do it under the conditions; that

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I did not feel that I would be of enough service to him to warrant the undertaking.

Senator NEW. Mr. Nash, were you influenced in that by the conditions that you discovered as existing in the organization?

Mr. NASH. Yes, sir; I was.

Senator NEW. State just what your impressions about it were and why you hesitated to take hold of it.

Mr. NASH. I felt that the situation had been very badly handled from the start; that there was not any organization that you could start to build on; that it would be necessary to begin back pretty near to the foundation and build up if you were to handle this matter in a manner that would be a credit to yourself, to the industry, and to the country, and I felt that I would be handicapped perhaps to such an extent that I could not go ahead and build up the necessary organization to make a success of the aircraft production, and for that reason I wrote Mr. Ryan that I did not feel that I could undertake it.

The CHAIRMAN. How long ago was that?

Mr. NASH. If you know the date on which Mr. Ryan accepted the position—within a week, about two weeks after he had taken the position. To continue, I suppose perhaps a matter of three weeks may have elapsed when I received a call from Col. Mixter, wanting two friends and myself to meet him at the Blackstone Hotel in Chicago. I did not know what his wishes were and why I should meet him, but he explained that he was there to get me to reconsider my decision.

The CHAIRMAN. Tell us who Col. Mixter is and what his relation to the aircraft activities was at that time?

Mr. NASH. My understanding was and is now that he was assistant to the Chief of the Production Section, who was Mr. Landon. Col. Mixter explained the condition that the aircraft service was in, and after discussing it at some length he remarked that he thought I knew more about how bad it was than he did. I told him at that conference that I would reconsider to the extent that I would go to Detroit and look into what was being done there and to Dayton, Buffalo, and then on to Washington. I left Chicago on the 2 o'clock train, and when I arrived at my office in Kenosha there was a telegram on my desk saying that Mr. Ryan would be in Detroit on the next Tuesday and desiring that I meet him there and go from there to Dayton with him. I went to Detroit, as I had planned, and met Mr. Ryan and visited four or five of the plants doing work, and then at Mr. Ryan's invitation accompanied him to his room in the evening, when he impressed upon me the necessity of having some help in this matter, and I agreed with him, and he put it up so strongly that I could not very well retain my self-respect and that of my friends without doing something. I told him I would look things over, and I went to Dayton and visited the McCook Field and the Dayton Wright plant and what is known as the South Field, and then came on to Washington.

The CHAIRMAN. When was that?

Mr. NASH. About the 12th of June. I returned home on the 13th of June, and I wrote Mr. Ryan what I thought was wrong with this proposition, and that if I was to undertake anything it would have

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to be to set up the organization in an entirely different manner, and that if he wanted to discuss the matter further with me I would have to come to Washington, which I did; and after discussing it with him I had the assurance that I could set this organization up in any way I thought best, and that he would back me. With that understanding about two weeks ago I started into this proposition.

Senator NEW. Is it not a fact that from your investigation at that time you found that as a manufacturing proposition the aircraft business was in just about an impossible shape?

Mr. NASH. Yes, sir; it was.

Senator NEW. Do you feel at liberty to state just what you said to Mr. Ryan; what recommendations you made for changes?

The CHAIRMAN. Perhaps we should say to Mr. Nash that the purpose of this meeting has been to have Mr. Ryan come before us when we had virtually completed the taking of testimony, but at about that time Mr. Ryan went away, quite unexpectedly to the committee.

Mr. NASH. I said to Mr. Ryan that, in my judgment, if this thing was to be made a success it would have to be—that the three branches of the business would have to be coordinated and organized under one head.

The CHAIRMAN. What three branches?

Mr. NASH. The technical section of the military aeronautics, the engineering department of the aircraft production, and the production department, and that he would have to select a competent man to head that; and, if I was to be the man, that I would have to sit in when the program was made up as to what was required in the way of airplanes, and it would be up to me to make the investigation and report whether it was possible to carry out what would be desired or not.

Senator NEW. To carry out what was recommended?

Mr. NASH. By Gen. Pershing, if you please. He is the man who makes the requests for what is wanted overseas.

Senator FRELINGHUYSEN. In this engineering department, the Bureau of Aeronautics, what kind of engineers are there in there? Who are they?

Mr. NASH. You are speaking now of the engineering department of aircraft production?

Senator FRELINGHUYSEN. Yes; the men who have been responsible for the numerous changes in type and design.

Mr. NASH. When you say the men who have been responsible, you are covering a pretty wide field, because everybody has assumed the responsibility and then avoided it.

Senator FRELINGHUYSEN. I mean the men who have drawn plans and designs and changed the types, changed the designs of the English models. That is a group of engineers in the aeronautical division, is it not?

Mr. NASH. Well, I would not say so.

Senator FRELINGHUYSEN. Where I have been confused is this: As I have heard the testimony there have been a whole lot of automobile-engine builders in this enterprise. The criticism which was made in the beginning was that the best engineering talent in this country, familiar with the fundamental principles of explosion engines, had not been employed; they had not been considered; their advice had

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not been taken, and I was anxious to find out just who was responsible for the engineering policy of the aeronautical division. Have they engineer officers that have been changing these designs? Who has been doing it? Has it been the automobile engineers who are officers there? It seems to me, as I have stated, there should be one engineering authority to produce the best type of airplanes.

Mr. NASH. That we have now.

Senator FRELINGHUYSEN. And they should be the best engineers.

Mr. NASH. We have got together the technical section of the Military Aeronautics Division, which really is the division that says what is wanted after the information comes from Gen. Pershing and the Engineering Department of the Aircraft Production Board, and they will be located in one central building at Dayton, Ohio. They will go over the requisitions for different types of planes and together will decide as to what is the best method to pursue in accomplishing what is wanted. After they have reached an agreement then there will be built either at McCook Field or at some other engineering place, or by some airplane makers in the country, four samples of any type of machine that it is decided we should build. One will be turned over for sand test, the other will be turned over to the engineering department of the Aircraft Production Division; the other two to the Military Aeronautics for final test and approval. Then, if those machines are found satisfactory, there will immediately be furnished a complete set of drawings and bill of materials and specifications covering the type of plane, and upon those the contractor or whoever is to build the plane will start to work.

Senator FRELINGHUYSEN. Have you, or are you going to get rid of the men who have been responsible for the costly mistakes and blunders?

Senator NEW. Is it not a fact that at this time it is going to be months yet before we have airplanes on the front?

Mr. NASH. Yes, sir; excepting the De Haviland 4's.

Senator FRELINGHUYSEN. Have you, or are you going to get rid of the men who have been responsible for the costly mistakes and blunders?

Mr. NASH. I do not know as that is within my jurisdiction.

Senator FRELINGHUYSEN. You have referred to the fact that you are going to have a new engineering department. Will any of the men, who have been responsible for these mistakes and blunders, be in that department?

Mr. NASH. Not knowing whether the men that you have referred to are responsible, I would not be in a position to answer that question.

Senator FRELINGHUYSEN. Would Col. Vincent, Maj. Hall, or Col. Deeds be in that engineering department?

Mr. NASH. I only know that Col. Vincent will be there under my direction.

Senator NEW. You say "except the De Haviland 4." That introduces a new subject. What is the present condition of the De Haviland 4 program?

Mr. NASH. Last week, for the first time, I came into possession of the complaints and suggestions of changes that are desirable to make the De Haviland 4 a fair machine. I immediately sent out a

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wire to all the factories building that machine that not another machine was to go out of the door until the changes enumerated were made, and I enumerated the changes in a telegram.

Senator NEW. Then, all the De Haviland deliveries have been suspended for the present?

Mr. NASH. Suspended for a period of, perhpas, 10 days..

Senator NEW. Who, besides the Dayton-Wright people, are making the De Haviland 4, if anybody?

Mr. NASH. The Fisher Body Co. is the only one outside of the Dayton-Wright people that has delivered any. The Standard Aero have about 75 that are very well along, and could begin to deliver in a very few days.

Senator NEW. The Fisher Body Co. have how many?

Mr. NASH. About 6 per day was coming off their line when I stopped them.

Senator NEW. And the machine, as made by all of these concerns, had the same defects, did it?

Mr. NASH. Yes, sir.

Senator NEW. Were those defects enumerated in a cablegram from Gen. Pershing some time during the month of June?

Mr. NASH. Yes, sir; I think so.

Senator NEW. Could you tell us how many of those changes were listed in that cable?

Mr. NASH. I do not think I could. Many of those suggested changes had been made prior to the cable being received here. A number of important ones had not been made and were not made until now.

Senator NEW. Is it not a fact that between the date of the receipt of that cablegram from Gen. Pershing in which those complaints were made that deliveries of the machines were continued without corrections being made?

Mr. NASH. Yes, sir.

Senator NEW. Can you tell us how many of those machines were delivered in that shape?

Mr. NASH. No, sir; I have not a record of the number.

Senator NEW. It continued, however, for several weeks, did it not?

Mr. NASH. Yes, sir.

Senator NEW. It is true, is it not, that 155 of those machines were ordered by the Navy?

Mr. NASH. I do not know how many. I know there was an order placed.

Senator NEW. That was the number, 155. Do you know what disposition was made of that order?

Mr. NASH. There have been to my knowledge four of those delivered to the Navy at Miami, which they have reported on, and something in the neighborhood of 90 have been delivered to them at some seaport down here in the East.

Senator REED. What was the report on the four?

Mr. NASH. They recommended practically the same changes and made practically the same complaints that Gen. Pershing did in his cable.

Senator REED. They rejected the planes, did they not?

Mr. NASH. I think they did.

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Senator NEW. Do you know what was done with the 90 which were delivered at the seaboard for shipment?

Mr. NASH. Those planes were held there until we could find out whether the best method would be to ship the parts on here and correct those here or whether it would be better to send the planes back to the factory which made them.

Senator NEW. Which was the Dayton-Wright?

Mr. NASH. Yes. The only reason I advised against shipping those back in the trainload shipment at this time was on account of the publicity that had been given to the planes as being absolutely no good, etc., and I thought that would serve to confirm that report and would stir up a worse muddle than we had, and we are losing nothing by letting them remain here until we decide whether to ship the wings and stabilizer devices, etc., down here.

Senator REED. How long is it going to take to determine that?

Mr. NASH. Not very long. We will not lose any time because they are turning all their energies now to correcting the stuff we have coming through from plants. I thought we would get some good planes quicker by fixing the planes coming through production than by shipping planes back to the factory.

Senator FRELINGHUYSEN. Is not the engine too heavy and powerful for that type of plane?

Mr. NASH. I do not think so. You can get about as many reports as you can get pilots. I have talked with some of the oldest pilots that this Government has and they tell me that the corrections that we are now going to put in this machine will make a very good plane out of it.

Senator FRELINGHUYSEN. I would like to direct your attention to the testimony of three flyers who are back here from the front. One of these men has been on the front practically since the war began, and has been sufficiently important so that he was in command of 40 or 50 flyers. The other two men have been on the front, one of them about three years and the other a shorter time. They are all men who have distinguished themselves over there. These men told of some defects in this machine—I am speaking of the De Haviland 4—that I have not heard in the criticisms of other men. Some defects they spoke of they described as remedial. These men stated that they would not fly the machine and they would not send anybody up in it. I also call your attention to the testimony of Maj. Reinhart. I hope that you will take the time to read that testimony and I think we ought to furnish you with a copy of it.

Mr. NASH. I would not think this case was being helped very much if you did not. My contention is that the moment anything is known in reference to defects or the possibility of making any article better, that is the time that action should be taken and taken immediately.

Senator NEW. Mr. Nash, you say a few more than 1,000 De Haviland planes have been delivered to date?

Mr. NASH. Yes, sir; right around 1,000, as I understand it.

Senator NEW. Is it not true that every one of them possesses the defects that have been enumerated in the Pershing complaints, and in the complaint made by Capt. McCaughtry at the Miami field?

Mr. NASH. They contain some of the complaints. Some of them had been corrected, I found.

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Senator NEW. Were they not all put out in the shape in which they were when those complaints were made?

Mr. NASH. Yes, sir; I think that is true.

Senator NEW. Corrections have since been made in some of them. Do you know how many?

Mr. NASH. All the corrections have not been made in any up until now when we stopped everything and put them in.

Senator NEW. Of course, you are a manufacturer and not an aircraft expert, I know, but is it not your belief, based upon what has come to you from pilots and such reports as that of Gen. Pershing to which I referred, the report of Capt. McCaughtry and others like them, that those machines delivered in the shape that they are are entirely unsafe and unsuited for operation?

Mr. NASH. My judgment and belief is that every one of those machines, before they attempt to fly them, should be corrected and brought up to date, as those are that we are going to put out now.

Senator FRELINGHUYSEN. I heard a great deal of the testimony from these flyers, and the principal criticism seemed to be that the engine was so high powered that it would strip the covering off the wings. Has any consideration been given to the fact that this engine is 200 pounds heavier than any other engine that has ever been put in there, with the exception of one Rolls-Royce 375 horsepower?

Mr. NASH. Yes; there is now. Consideration has been given to that and corrections are being made in these wings by putting in extra ribs and the new method of attaching the fabric to take care of that very condition that you mention.

Senator FRELINGHUYSEN. Would not the increased weight of 200 pounds be making the airplane nose heavy; can that be overcome by any structural improvements—structural strengthening? Is it not true that the engine is too heavy and that a lighter engine should go in that plane?

Mr. NASH. I would not say that that is so. I would say this: That if we were starting out anew, without doubt it would be desirable to do that very thing.

Senator REED. What very thing?

Mr. NASH. Putting a lighter motor in the place of the heavier one—but we can get some planes that will be safe and will be, perhaps, 80 per cent as efficient as we would like to have them, and the question arises whether we should have something that is 80 per cent as good within the next six months, or have nothing.

Senator FRELINGHUYSEN. I noticed in the list of engines that were in the De Haviland 4's manufactured by engine concerns that the majority of the engines were 200 horsepower; that there was one engine of 300 horsepower, and one of 375 horsepower, but that they were all lighter engines. Would not the 300-horsepower Hispano-Suiza which we are manufacturing be a more dependable engine in the De Haviland 4 than the Liberty?

Mr. NASH. The trouble is that we are not manufacturing the Hispano-Suiza.

The CHAIRMAN. We expect to pretty soon?

Mr. NASH. No, sir. That is where the trouble is. The public and the people who are in charge all believe that the engine is in production, and, as a matter of fact, it is at least five months away.

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The CHAIRMAN. We do not believe it is in production, but Mr. Houston, of the Wright-Martin Co., appeared before Senator Frelinghuysen and myself, representing the committee in the latter part of June, and detailed the preparation that his company was making for the production of that motor, and also a test of a sample motor which his company had produced and which he saw at New Brunswick. My recollection of his statement was that his company would be in production of that machine early this fall. That is my reason for saying——

Mr. NASH. I am basing my judgment upon what I have seen and know of the production of gasoline motors, and I am going to state that you need not look for the production of any of those motors before the 1st day of January.

Senator FRELINGHUYSEN. Then you have no 300-horsepower motor, or about that horsepower, in sight?

Mr. NASH. We have not.

Senator FRELINGHUYSEN. We have only the Liberty motor, which is a much higher horsepower.

Mr. NASH. That is the only one.

Senator FRELINGHUYSEN. Would many of these defects and structural weaknesses we overcome if we had a lighter motor?

Mr. NASH. I do not think so.

Senator FRELINGHUYSEN. Why have the English limited their horsepower and weight in that machine?

Mr. NASH. Because they happened to have those motors. I do not wish to be understood that if I was starting out I would have gone and designed the Liberty motor to put in the De Haviland, but that was the one motor we did have and it was a question whether it would work in there, but they put it in and I think now, while I am new at this, that there is a good deal of prejudice against the De Haviland 4 that will be removed when we have these so-called defects remedied and get the machine up to where it has been recommended.

Senator NEW. Mr. Nash, in that connection I am going to ask you if, based upon the complaints that have been made by Gen. Pershing, by Capt. McCaughtry, by pilots and flyers, some of whom have testified before this committee, and to which your attention has been called, if you believe that with those mistakes corrected the De Haviland 4 would be a first-class machine?

Mr. NASH. I would not say that I would believe it would be a first-class machine. I believe it would be an average machine.

Senator NEW. An average machine for what purpose?

Mr. NASH. For the purpose that the De Haviland 4 was designed for, which is, I believe, called a day-bomber machine.

Senator REED. But not for a fighter?

Mr. NASH. No, sir.

Senator REED. What are we going to do for a fighting plane?

Mr. NASH. We have to start to make them.

Senator REED. I notice that you concur in what Capt. Kelley said. He was one of these flyers.

Senator NEW. Mr. Nash, what is the essential difference between the English and American De Haviland 4 plane?

Mr. NASH. I am not posted on that, Senator.

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Senator NEW. Do you know how many changes were made in the plane of that type as compared with the English model in our manufacture over here?

Mr. NASH. No, sir; I do not know.

Senator NEW. Report comes to me that the Handley-Page machine, which we recently turned out at the Standard works, can only be taken to a heighth of about 3,500 feet with the two Libery motors. Do you know whether that is true or not?

Mr. NASH. No, sir; because they have built only one machine and it has not been turned over to the engineering department of the Aircraft Production or to the technical section of the Military Aeronautics. They are building the second machine, which is to be immediately shipped to Wilbur Wright Field when it is completed to make those very tests to see whether it will be——

Senator NEW. There never has been an official Government test made of that machine?

Mr. NASH. No, sir.

Senator NEW. I asked you that question for the reason that the point was made by my informant that the Liberty motor in its present condition would not suffice to take a heavy machine to an altitude that would be necessary in order to render that machine effective; that realizing that this is the case the English are transforming the Libery motor into a geared motor in order to make it effective in the heavy machines to which they are adapting it over there. Do you know anything about that?

Mr. NASH. Yes, sir; that is also being worked on in this country, to adapt the gearing to the Liberty motor so that we can use it in the same way that we do the Rolls-Royce.

Senator NEW. It is true, then, as it stands to-day, that the Liberty motor is not adapted for use in the heavy planes?

Mr. NASH. I would not say that that is so, because they have not tested it to find out.

Senator REED. Do you not think it is pretty nearly time that men connected with aircraft production should cease making speeches and giving out interviews to the newspapers and telling them that the whole problem is solved?

Mr. NASH. Senator Reed, I have talked by the hour about that thing. To my mind that is where the great mistake has been made. They have gone and given out this great publicity, and they have led the public to believe that the so-called Liberty motor was a cure-all for everything; that we are going to march right into Berlin with it; and in order to keep the public in any sort of frame of mind they have done more to get production than to get something which was right.

Senator REED. I refer to the alleged speech of Mr. Ryan when they tried the Handley-Page; that at last America was in production, and that it was a great success; and if the plane, according to your own views, had only been partially tried, and according to my views and the views of everybody who has studied this question, no plane should be pronounced a success until it has been tried in every conceivable situation.

Mr. NASH. I agree with you, and provision is being made now to do that thing, or I will not be connected with aircraft production.

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Senator NEW. I have here a statement sent out by the Associated Press from Portland, Oreg., under date of August 1. The headlines over this state what Mr. Ryan does not fully say in his speech, but they are so entirely misleading as to call for some comment. Here they are: "Director Ryan indicates United States will soon have 50,000 planes ready." Then follows the dispatch: "Portland, Oreg., August 1. John D. Ryan, director of aircraft production, told a crowd of several thousand soldiers working in spruce camps at Vancouver, Wash., that the United States aircraft program is rapidly coming to fruition; so rapidly, in fact, that thousands of airplanes for service overseas now are in sight. The number of planes soon available was indicated when Mr. Ryan said: 'Fifty thousand motors have been ordered for them, and that the new motor was worthy of the highest praise.'" Now, that dispatch, with headlines similar to these, appeared in every newspaper in the western country on the morning of August 2 and on the afternoon of the same day. Mr. Nash, is any such performance as that even remotely possible?

Mr. NASH. It certainly is not and I believe that Mr. Ryan has been misquoted.

Senator NEW. I am not saying that he was not, but I am saying that this interview, a copy of which I hold in my hand purporting to have been given by him, was widely and generally circulated all over the United States on August 2, and has never been denied by Mr. Ryan or anybody else and never will be denied perhaps until it is denied on the floor of the United States Senate and then the Senator who denies it will be accused by all the publicity agents of the United States Government with being pro-German and a friend of the Kaiser.

Mr. NASH. If I am ever given permission to address a large gathering I expect that I will be kicked out of the service of the United States Government, because I do not believe that it gets you anywhere to tell anything except the truth. I believe that the public are entitled to know what we are doing, and we are a part of the public, and I do not see that anything will be gained by doing otherwise.

The CHAIRMAN. I am satisfied that Mr. Ryan was misquoted in what he said at Elizabeth.

Senator NEW. Mr. Nash, is it not true that 50,000 aeroplanes is practically twice as many as have been even asked for by the American Army on the other side.

Mr. NASH. I have not the figures in my mind, Senator, of just the number that Gen. Pershing has requested, but I am inclined to think that it is considerably under the figures you have stated.

Senator NEW. Mr. Potter stated when he was testifying before this subcommittee the day before yesterday, that the program called for 26,000 planes of different types, and Mr. Potter also said that he had very promptly sent forward a reply to the effect that it was hopelessly impossible for the Aircraft Board here to begin to comply with it; that while he made no promises, that he hoped that by the 1st of July, next year, they might be able to furnish a total of 18,000 planes; that he gave no guarantee of being able to do that and that that was nothing but a hope. Now, what have you to say along that same line, Mr. Nash?

Mr. NASH. From my small investigation of the situation my judgment is that we will deliver no planes excepting the De Haviland

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4 prior to January 1, 1919, and that if we should be able to deliver 10,000 by July 1, 1919, we would have accomplished almost a miracle in this country.

Senator NEW. Ten thousand planes of all types combined?

Mr. NASH. To go across the water. I do not wish to include in that training planes that are used here.

Senator NEW. We are speaking, of course, of planes that are intended for practical use by the military on the other side, not training planes.

Mr. NASH. That is what I referred to.

Senator FRELINGHUYSEN. I have been away from the hearings and am not well informed as to what the evidence has been, but you are in Mr. Ryan's organization now, are you not?

Mr. NASH. Yes, sir.

Senator FRELINGHUYSEN. Are you the efficiency expert?

Mr. NASH. My position is assistant to the director of aircraft production in charge of engineering and production.

Senator FRELINGHUYSEN. What is Mr. Landon's position?

Mr. NASH. He is in charge of production and comes under me.

Senator FRELINGHUYSEN. Mr. Ryan has had no previous experience in aircraft production?

Mr. NASH. No, sir.

Senator FRELINGHUYSEN. Has Mr. Landon?

Mr. NASH. No, sir.

Senator FRELINGHUYSEN. Have you?

Mr. NASH. No, sir.

Senator FRELINGHUYSEN. What has been your experience?

Mr. NASH. I was 20 years in the vehicle business, connected with the largest concern in the United States, and I have been eight years in the automobile business, six years of which I was at the head of the General Motors Co. and two years with the Nash Motors Co.

Senator FRELINGHUYSEN. You have had experience with men connected with the Aircraft Production, and I should like to know whether you have associated in your organization any men who have had any experience in aircraft production, either here or abroad in this new organization.

Mr. NASH. As far as I know there are no men in this country who have had experience in aircraft production, except those connected with the Curtiss people, other than to make a few sample planes.

Senator FRELINGHUYSEN. In other words, it is practically a new profession to the men connected with it.

Mr. NASH. Yes, sir.

Senator FRELINGHUYSEN. The policy of the old Aircraft Production Board has been, as I have observed the evidence, to ignore the advice of the men who have had experience in England and France and Italy. What is to be your policy in regard to the various experienced aircraft engineers, flyers, and builders who are over here?

Mr. NASH. My understanding, Senator, is that there is now connected with this aircraft production organization a Commander Briggs, whom England has furnished to our country and who they claim to be their most expert man on aircraft over there.

Senator REED. Is Commander Briggs now associated with you?

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Mr. NASH. He is now at the present moment in England, but will be back in six weeks.

The CHAIRMAN. He has been released by the British Government from service for the purpose of assisting in this country?

Mr. NASH. That is my understanding.

The CHAIRMAN. Will you tell us what authority he will have when he comes here?

Mr. NASH. His position will be an advisory position.

Senator FRELINGHUYSEN. The evidence that the committee has taken shows that the advice of the experienced men who have come here in the various commissions from France, Italy, and England have been ignored, and you now state that Commander Briggs will be associated with the engineering corps in your department.

Mr. NASH. In an advisory position.

Senator FRELINGHUYSEN. In an advisory capacity. Then he will be under the direction of Col. Vincent, will he not?

Mr. NASH. I would not put it just that way, because I would not permit any man in the organization to direct a thing if his directions and my judgment did not agree. I reserve the right in this whole program of engineering and production to cast a deciding vote before we make any moves. If I am to take the responsibility and be responsible to the United States for doing something, I propose to be clothed with the authority that will let me do something.

Senator FRELINGHUYSEN. Well, we have had a lot of men who have faced this problem and have solved it. They have produced combat planes, they have produced fast-flying fighters, and the organization has gone along trying to produce airplanes, relying upon their own experience and knowledge, and, in my opinion, it has been an absolute failure. Now, the question is whether we are going to take the advice of men who have made a success of it or whether we are going to get along trying to make experiments ourselves, without using that expert knowledge. There are men here from Italy and from France and from England who have advised the Aircraft Production Board. The testimony shows that their advice has been ignored. The question is whether this new organization, in their effort to produce airplanes, is going to listen to those men, because as far as I can learn there is no one in America that knows anything about airplane production.

Mr. NASH. The organization that I hope to build in Dayton will be composed of the best engineering talent we can secure in America. Those that we are unable to secure the services of continually we hope to have them serve as consulting engineers in conjunction with the best talent that we can secure from England, France, and Italy, and when any new type of plane is discussed I propose we will set in in conference and discuss that plane and get the views of the best talent that there is here. I reserve the right after we have listened to all the evidence in the case to render a decision as to what we shall do. It would make no difference if Col. Vincent or Col. Bane or anyone in America differed from the gentlemen abroad or differed from my opinion. I have made it plain to Col. Vincent he would have to smile and put in his best efforts to accomplish whatever I have in view.

Senator REED. Can you give us the names of those men that you now have in mind that you intend to have associated with you?

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Mr. NASH. I can not give you the names of the men that I intend to have associated with me continually, because I have not had an opportunity to see them. I do not know whether we can go out and hire these men or not. I would like very much to have Mr. Day, of the Standard Aircraft Co., but we are unable to get his services permanently. He has consented to come in at any time into any conference and give us the best advice he can. I know Mr. Crane, of the Wright-Martin Co., will do the same thing. I have not yet been in touch with the engineers of the Curtiss people, but I believe——

Senator FRELINGHUYSEN. How about Mr. Kettering?

Mr. NASH. I believe that he is one of the brightest men in the engineering profession in the United States. I think he knows more about airplanes than many men who have been in it for years and he has agreed to sit in any conference, night or day.

Senator FRELINGHUYSEN. Who have you from the Italian Commission over here?

Mr. NASH. That I do not know because I have been in it only two weeks. My judgment is this: That if we have to start out now and design new motors and new planes, the war will be over before we have any; we will be licked or the other fellow will be licked. I think that we have to take some of the best things that are in production on the other side and duplicate them and get them over here. So you will know just where I stand on this. There have been in this country for several weeks and maybe for several months, two Bristol planes shipped over here with Rolls-Royce motors. They finally reached the McCook field and it is not possible to go to work and jig up and tool up and build Rolls-Royce motors within a year. You might just as well say that you are going to be a year when you start. They have, however, this 300 Hispano-Suiza that I think will be in good production about January. They have the Liberty eight that should get into production about the same time. Now, in order that we might use these motors and make time we have put into one of the Bristol planes the 300 Hispano-Suiza, which is on the Wilbur Wright field and is going through a series of tests, and Mr. Day was over there yesterday and brought me back the figures, and I want to say that they are very fine.

The climbing and everything with that Hispano-Suiza 300 seemed to be fine. They did not do as they have been doing; take an empty machine and go out and do some things, but they loaded that machine with all the bombing devices, if it has bombing devices, and the electrical clothing that the pilots wear and went so far as to put in sand to make up for the lack of weight in the observer, and the first test was really remarkable. He is not connected with the department and I got it from him and it would be an unbiased opinion. They did not change a thing in that plane. The only thing they did was to fix the front end so the Hispano-Suiza would set in. In the other one we have set in an eight-cylinder Liberty and they did not even change the English radiator and it was all ready to go out the door last night. My idea is if those machines prove up, I will say to the boys, "Now, just don't mind whether you think you know better than the English do. We will just duplicate those machines to every nut, bolt, and screw, and in January we will be building some

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planes for our boys on the front." They say to me this, Senator Reed: "We could make this better if you let us use laminated wood." I say, "We have no time to experiment. The house is afire and we have to put it out." That is my position if I stay with this proposition, and I will only stay just so long as they will let me run it as a business proposition.

Senator REED. You have expressed so many views here that I can say are the views of this committee that I am going to venture to make a suggestion and then I want to ask a question or two. Some commission, board, or officer, or somebody else representing the United States Government, went over to France—I think it is about a year ago, or something like that—and they saw the Caproni machines and fell in love with them, and sent for Mr. Caproni and brought him over to the front and practically made an arrangement with him by which this Government was to enter into the production of those machines, and thereupon Mr. Caproni took the head man of his factory, Capt. D'Annunzio, and two of the best flyers they had, and some other experts, and sent them over here; and those men tell us that they came over here expecting that this Caproni machine and one other which they brought with them, which was a fighter, would be tested out by our Government and that they would be at once put into production and these men would be put in charge of plants and given a free hand to get the work out. We learn, not only from them but from flyers at other fields and places, that when these flyers came there they were treated with a sort of cold politeness; their machines were given a perfunctory test, then sent to Long Island, where they have been doing apparently nothing except that, after a long delay, they were asked to develop the plans of one or two Capronis. Now, those men are here and you are now talking about organizing a commission or board of experts. In other words, I take it you have spent enough to realize the fact that there has to be a plan for a machine before the machine is built.

Mr. NASH. I think I do.

Senator REED. And if that plan is perfect the machine may work, and if it is imperfect the machine can not work. Now, I hope that you will see those men. They have been eating their hearts out down there, and the two flyers have both been killed here.

Mr. NASH. I have gone into that Caproni situation at some length and I have found this: That D'Annunzio was given authority to go to work and build three machines at the Standard plant; but, like lots of other engineers, instead of building a machine just like the Italian machines, he thought that he could make it better, and in the three machines that he started out to build there are no two of them alike. They have built one and that is over at Mineola, and the reason it is not flying is because there is no one to fly it. They have sent for some Italian flyers. I also was in Detroit the week before last for the purpose of seeing Mr. D'Annunzio, and found that he was out at Mineola and was there with some of his men taking the motor out of the machine and doing something with the machine which had already been built. I had proposed to be in Detroit to-morrow morning, and that was the object of my trip. This Government attempted to let a contract for 500 Capronis to the Curtiss Co. and 500 to the Fisher Body Co. without having built any machines and proved

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them up. I maintain that whenever you bring a machine over here, no matter how successful it has been on the other side, and equip it with an American motor you are going to have different results. It would be suicide to do it. I told Maj. Vincent not to do a bit of work, and we gave the Fisher Body Co. an order from the engineering department at Dayton to build, under the direction of D'Annunzio, three machines and to do it in the quickest possible time that they could, and upon the tests of those machines—one by sand test and one on the Wilbur Wright Field—would depend whether we would proceed with the construction of Caproni machines.

Senator REED. In other words, the Caproni machine, having to be equipped with Liberty engines, you can not just copy the Italian Caproni.

Mr. NASH. Certainly not. Because you are putting in a heavier motor and with a different action and power and you can not do that any more than you can take a Ford automobile and put in a Cadillac eight-cylinder motor.

Senator REED. That is exactly what we have been trying to do with all these aeroplanes here, is it not?

Mr. NASH. Of course it is. I feel that it is unbecoming to me—I have been forced into this work very much against my will and I think it is unbecoming in me to criticize the people who have preceded me, but I told them if I was ever called before the committee I would call a spade a spade.

Senator REED. You owe these boys who are going up in these machines the best machines you can produce.

Mr. NASH. You bet we do, and I owe the best service I can render to this Government. That is why I am here.

Senator REED. I want to ask you about placing Col. Vincent in this important position under these conditions. Have Mr. Vincent and Mr. Hall, the two men who have created what was finally called the Liberty motor——

Mr. NASH. No; I would not say so. I do not think that Hall had anything to do with it.

Senator REED. I am saying that on the strength of the testimony that has been given to us, that Vincent and Hall were locked in a room and were told to agree upon plans, that they agreed upon this motor, and that they then went together and drew the plans and sent the plans of the parts to different factories and had them back and assembled on the road to Washington in a car and set the machine up and it ran. That is the story as it has been told to us. I will say now, so there will be no misunderstanding about the facts, that we have learned the Packard people had been experimenting with a motor and they had produced what appeared to be a pretty likely sort of airplane motor, not yet perfected, and that that was based itself upon the Mercedes, and that the Liberty motor is really a development now of this Packard motor. Now, Col. Vincent was very active in that, was he not?

Mr. NASH. Yes; I think he was the engineer on the job at the Packard plant.

Senator REED. That emphasizes more what I am going to call your attention to. He was the engineer. This engine is the child of

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his brain, and Col. Hall was certainly intimately associated with the initial production of this machine. Now, we have run across this, that Col. Hall was out here in a plant inspecting engines and planes that are to contain the Liberty engine, and then those planes when they were produced with this engine in them were sent out to Dayton, Ohio, to be subjected to their final tests by Col. Vincent. In other words, one of the men who helped conceive the engine passed upon its production and the other man whom you think really did conceive the engine passed upon its performance in the plane.

Mr. NASH. They may have in the past but they will not in the future. They are relieved of that responsibility. The military aeronautics are the people that are going to use this production, and they are the people who will pass upon anything and everything that is produced.

Senator REED. Will you put into this corps some practical actual flyers?

Mr. NASH. The man who is to head that corps is reputed the best flyer that the United States has, and that is Col. B. Q. Jones.

Senator REED. And, generally speaking, production has been stopped until you have tested things out and have some reasonable ground to believe they are going to work?

Mr. NASH. Absolutely. It is suicidal to handle it in any other way.

Senator REED. As we went around to the factories and I saw them putting together the parts of these machines, little pieces of wood here and there and the other place, I confess to you it looked to me at the time that it was very loose work, but I did not know anything about it and I assumed that Government inspectors and factory inspectors together with the enormous responsibility that any man would take in turning out a machine was certainly a guarantee that this work was all right, but it now transpires that it is admitted that a great deal of this work has been inferior. We have been told that carpenters are used as instructors and that there are in this country cabinetmakers, men who know all about close and correct fittings of wood—I want to know what is going to be done towards getting that kind of talent, the kind of men who can put together the wooden fittings accurately, the piano and the musical-instrument makers, putting them into your organization.

Mr. NASH. The policy is going to be to no longer try to plug round holes with square plugs, but to put round plugs into round holes.

Senator REED. In other words, you intend to get some men who know something about close woodwork to do this sort of instruction?

Mr. NASH. Yes. If I want to find out something that I do not know I usually go to the man who is reputed to have that knowledge in order to get it, and I quite agree with you that there have been a lot of mistakes made. It has been a mushroom growth, and in many cases they had no conception of what had been accomplished or what they were trying to accomplish.

Senator REED. One of these officers who is back from the front who has been with the English and French, his testimony is to the effect that the making of an airplane is largely a question of handwork—that is, of making everything perfect.

Mr. NASH. Yes, sir.

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Senator REED. Can not something be done so we can use this great factory force and get work done that will be firm and solid?

Mr. NASH. There is no question about it. There is nothing mysterious about this work, Senator. To me there is nothing mysterious about the airplane program. It is just to secure men possessed of the knowledge to do certain things and put them on it and let them do it.

Senator REED. We have had complaints made to us by men who have been engaged in the airplane business in perhaps a small way that they have not been called in or consulted or given any work. What is the objection to giving a large number of small factories contracts for the production of such a number of machines as they can get out?

Mr. NASH. Why, there are, in my judgment, very few of the small factories that are capable of building anything but the first sample, three or four planes. They could not get out any considerable production on account of lack of facilities.

Senator REED. Suppose they worked slowly and yet produced five or six planes in five or six months; that would help.

Mr. NASH. My purpose is to make use of the present facilities in this country and not build up new facilities.

Senator REED. The thing I am trying to bring to your mind is this: Instead of limiting the construction of these aeroplanes to four or five factories, if you have a type of plane that is approved it would be a desirable thing if there is a small factory over here with a few men to let them build such of them as they can.

Mr. NASH. It would depend entirely on whether they would be able to produce any number which would be worth while, because the expense of jigging up and tooling up in a factory—the expense to this Government—would be just as great as it would be to jig and tool up for a plant to build 4,000 planes, and you would have to have the same kind of inspectors. I think the smaller plants should be used to produce sample planes, and after they have the specifications they would be kept busy.

The CHAIRMAN. By way of illustration we had before us the representatives of the Wittemann-Lewis Airplane Co., of Newark, who have been in the business since 1903 or 1904, building, of course, planes for such a demand as existed before the war, but excellent workmen with a small factory thoroughly equipped with first-class men. In 1916, in the month of October, they got an order to make a sample plane and made it and flew it under its own power over to Mineola where they were not afterwards allowed to make a test of it and have not been able to go and test it since. Then Mr. Lang came before us, an expert maker of propellers engaged in the business for a year before the war broke out, who came over here and expected to engage in the program. He was said to be an expert manufacturer of propellers, and he complains that his little force, that he could increase with first-class men, was given no opportunity to make propellers. I am sure I express the opinion of the committee that such men to the extent of their capacity ought to be employed on a program involving an article too much of which we can not get.

Senator REED. In that connection I will call your attention to the man named Lawson, from Green Bay, Wis., I think. He says that he has been building airplanes, that his planes have flown, and that he

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has a plane that he is anxious to have tried out and that he has been refused a permit to fly the machine down here to show it. He was afraid to tell me about it, saying that he was afraid he would get in bad. He told me that he had studied this question in England, and has for 10 or 14 years been in the aircraft business. If such men come around I am sure you will not be too busy to listen to them.

Mr. NASH. I certainly will not. I know Mr. Lawson, and I wrote him the day before yesterday that next week we will be at the office and we would go over his drawings. We have a committee now who will go over these things. When he comes over there with his drawings there are well-established rules now with reference to airplanes that they must have a certain ceiling and certain factors of safety and must be able to carry a certain number of pounds for the wing area. He has to do now with the committee which will be composed of the technical section of the military aeronautics. It will be Cols. Bane and Jones, who is an engineer, and a good flyer, and such other engineers as we have there, and they will take those drawings and go over them and criticize them, and if they prove all right the chances are that that man will get an order to build four of these planes, one for a sand test, one for the engineering department, and two to be turned over to the military aeronautics to be proved up.

Senator REED. Will you not at least let this fellow fly this machine down here?

Mr. NASH. I have not the slightest objection to that.

Senator NEW. Both Col. Bane and Mr. Potter testified as to the expenditures made in the experiments on planes.

Mr. NASH. You say this man is building a plane. If he has not taken a stress analysis and has not made a test of his plane—anybody can build a plane that will fly, but when you have to do the things that they have to do in warfare it requires greater factors of safety and greater range, and we have that information, and what we want to do before spending any of the Government's good money is to start the fellow off right.

Senator FRELINGHUYSEN. The criticism of the policy of the Aircraft Production Board and the treatment of the Wittemann-Lewis Co. was this, that the Wittemann-Lewis Co. had a factory and had been manufacturing aircraft prior to the war and without the utilizing of that factory they went out and encouraged people to take old factories and start in the airplane business without any experience whatever. These boys have built a number of aeroplanes and flown them for exhibition purposes. They have factories well equipped. They have been surveyed by the engineers of the department, and then when they asked for a contract they were penalized by being asked to pay $500 for the plans and $200 for every machine that they turned out. Now, that was manifestly unfair, and especially when they were practically putting up for other fellows to start in who had had no experience. Now, Voght is a little manufacturer; and if he is entitled to consideration, these boys are entitled to the same consideration, particularly after you have made an inspection of their plant. I have no interest in it except that it was a policy that I condemned of the Aircraft Production Board.

Mr. NASH. Of course, I am in an unfortunate position, being so new in this business, and I am not responsible for the errors of my

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predecessors, but there have been a lot of mistakes made, and I think it is largely due to the newness of the industry.

The CHAIRMAN. Have you heard of the cross-license agreement?

Mr. NASH. I have heard of such an agreement similar to the one we have in the automobile industry.

The CHAIRMAN. It is an agreement which was executed subsequent to our entering into the war and having for its purpose the handling of the patent situation. Those who have signed the so-called cross-license agreement after obtaining contracts from the Government without exception say that they did so because, and only because, the representatives of the Aircraft Production Board required them to do so or requested them, and when they requested it these contractors construed the request into a license requirement. They say that in addition to the royalties which they have to pay on their machines is the added fact that they have to pay for copies of plans and specifications, furnished generally by the Curtiss people, and who will only deliver them upon receiving 1 per cent of the contract price. I would like to ask you what the policy of the new organization is going to be in regard to that.

Mr. NASH. That is too entirely new to me, and I have never heard of it, except that there was an agreement in vogue.

The CHAIRMAN. I should add, perhaps, that since Mr. Potter came in the requirement does not seem to have been made.

Mr. NASH. My position is this: We are at war, and I think aircraft licensing, or anything else that you may call it, should be waived and we should go out and build the best planes at the best places and get them to France at the quickest possible moment.

Senator REED. There is no monopoly that the United States has ever granted to an individual that ought to stand in the way of the United States itself in a time of war.

Mr. NASH. I do not believe there is.

The CHAIRMAN. What is your opinion of the expediency of the Government's taking over of some of these plants and operating them itself?

Mr. NASH. I think it would be suicidal.

The CHAIRMAN. Take, for instance, such plants as the Standard and the Curtiss, whose organization is reported to us to be very bad, and which do not seem to be able to get anywhere, and who are engaged in a sort of chronic difference with the expert accountants of the department. What are you going to do with them?

Mr. NASH. I am going to get them together with the people who executed those contracts and get those contracts interpreted. There is a misunderstanding in every plant, as far as I have been able to discover, as to the interpretation of those contracts, and they were not made plain when they were made, and the only way I know of to straighten them out is to get the contractors and the people who made the contracts together and get them straightened out in that way.

The CHAIRMAN. That does not meet the other situation, which is a lack of efficiency and organization on the part of the contractor.

Mr. NASH. My judgment is that if efficiency and organization does not exist you do not want to go and look for it in the United States Government.

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The CHAIRMAN. I should perhaps say in this connection that I had an informal talk with Mr. Ryan about it, and he believes that as to some of these concerns it is absolutely necessary to take them over.

Mr. NASH. He is basing his opinion upon the report of somebody who had a chewing match with somebody in the plant. I think you will find it is about fifty-fifty—that the Government's part of it is about as bad as the contractor's part.

Mr. FRELINGHUYSEN. I understand that the Japanese Government controls the Standard Aircraft Co. at Elizabeth, or at least the Japanese bankers who have represented the Japanese Government in the past have loaned money to its president—Mitsui Bros. In that connection, would it not be advisable for you to look into that ownership, particularly when you are manufacturing airplanes of foreign design and patent? Do you know that?

Mr. NASH. I heard of it yesterday.

Senator NEW. I can add to that that the Handley-Page people tell me that their planes were placed for manufacture here in the hands of the Standard Co. and that it was no time at all after they had received the plans that they found that that plane, according to those plans, was being manufactured in Japan.

Senator FRELINGHUYSEN. In that event, would it not be advisable for the Government to assume some control over the plant?

Mr. NASH. I do not know. It is not very much use of putting up the bars after the horses are out of the stable. If what you say is true, the damage is done.

Senator FRELINGHUYSEN. Not entirely. If its ownership could be transferred so that it would be in the hands of American owners, it would be much better.

Senator REED. What is the matter with them?

Mr. NASH. I think they have gone ahead on some people's say so, that they were going to get to those orders, and have bought materials, and they are now trying to sell the materials to pay their bills. I understand they have got more money from the Mitsui Co., and I do not believe they are a very sound company.

Senator REED. Ought they to be allowed to have it in the sense of that company being dissipated and that company going out of commission?

Mr. NASH. I think not. I think that the Standard Aircraft should immediately be gotten together with the people who made the contracts with them and with the Aircraft Production Board and agree as to what their standing is and what is to be done in the future and then go ahead and do it. First of all, I think it should be investigated, but not in the way that they have been investigated. I walked through the plant, but I can not say they are rotten, but others have said they were rotten.

The CHAIRMAN. You made a statement just now to the effect that the Standard Co. was headed for the rocks. I was going to ask your opinion of the Curtiss plant.

Mr. NASH. I have not been near the Curtiss plant. If the Standard Aircraft Co. proceeds as they are now proceeding, they will be in financial difficulties.

Senator FRELINGHUYSEN. If you need their production, and that plant is valuable to you, it would seem the part of wisdom for you

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to make an investigation of their ownership and their financial condition.

Mr. NASH. What would be the attitude, providing we found that the company was owned and controlled by the Mitsui Co.?

Senator FRELINGHUYSEN. That is a question of policy that you yourself must determine.

Mr. NASH. No; I can not. That question came up to the Assistant Secretary of War the other day, and that, I think, is beyond the power of any of us.

Senator FRELINGHUYSEN. That should be submitted to the department, and you should be relieved from any breakdown in its ownership. I take it that you are willing to accept suggestions and criticisms in regard to these plants. Now, I have been in the fire-insurance business for 30 years, and I made a bird's-eye view inspection of the Curtiss plant, the Wright-Martin plant, and one of the plants of the Fisher Body Co., and the Standard Aircraft Co. at Elizabeth, and I want to say to you that if you are relying upon each one of those plants to produce airplanes and you would be embarrassed and your production checked by fire, that you ought to take up with those plants the question of extending their fire protection, particularly their sprinkler apparatus. Confirming my judgment, the fire-insurance men have formed a bureau in Washington to aid the Government in inspecting the fire hazards at the various plants that are making munitions of war and they have a report on each one of these plants. The committee is headed by Mr. Henry Evans, of the Continental group of insurance companies, a very able man, and he calls my attention to the fact that he has spoken to Mr. Ryan, and so have I. I would suggest to you that you include in your contract a clause that will compel these men to follow out the recommendations of this fire-prevention bureau in the plants in order that you may be assured that the capacity of that plant will be continued for Government uses. I have the letter and the suggestions, and if you are handling it I would be glad to give them to you.

Mr. NASH. I think they should go to Mr. Ryan, and they have agreed that no contracts shall be executed until I say whether they are ready to produce of not.

Senator FRELINGHUYSEN. I have no hesitancy in saying that the Standard Aircraft plant or the Curtiss plant is liable to burn down any minute: that unless they increase their hydrants and establish more rigid rules in regard to drying their wood and the use of their dope, they are liable to have accidents there at any time.

What was the concern that bought the Delco Ignition System?

Mr. NASH. The United Motors.

The CHAIRMAN. We thank you very much, Mr. Nash, for appearing and testifying before this committee.

MOTION OF SENATOR REED.

Senator REED. I move that 500 copies of the complete testimony taken by the subcommittee and 500 copies of the condensation of said testimony be ordered printed by the Government.

The CHAIRMAN. As I hear no objection, it is so ordered.

(Whereupon, at 5.30 o'clock p. m., the subcommittee adjourned to meet at the call of the chairman.)

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AIRCRAFT PRODUCTION.

FRIDAY, AUGUST 9, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met pursuant to adjournment at 12.30 p. m. in the committee room, Capitol, Senator Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, Frelinghuysen, and New.

The CHAIRMAN. We have with us the Secretary of War, whom the committee will be glad to hear this morning.

STATEMENT OF MR. NEWTON D. BAKER, SECRETARY OF WAR.

Senator NEW. Mr. Secretary, I have just a few questions that I would like to ask you with reference to aircraft matters. Are you acquainted with the conditions of the country's aircraft program?

Secretary BAKER. In a general way.

Senator NEW. What is the general situation with regard to it?

Secretary BAKER. In what particular?

Senator NEW. Is it satisfactory or otherwise?

Secretary BAKER. I do not like to indulge in generalities about it. The aircraft program is being worked upon by the largest number of most expert persons we can find, and progress is being made. It is not such progress as the country desires to see made, but it is the best that we have been able to do.

Senator NEW. Has this country produced any combat planes that are now in use with our forces abroad?

Secretary BAKER. I can not answer that. I do not know.

Senator NEW. Is it not a matter of official record in the War Department that there are no American-made airplanes now in use by our Army in France?

Secretary BAKER. It was some time ago. I do not know what the present status is.

Senator NEW. You are Secretary of War.

Secretary BAKER. Yes.

Senator NEW. And that is certainly a very important bureau of the War Department, is it not?

Secretary BAKER. Obviously.

Senator NEW. Has there been brought to your attention the cablegram sent by Gen. Pershing, or in his name, under date of June 26, enumerating a large number of defects in the De Haviland 4 planes, and stating that the machines of that type already sent him can not be used in their present condition?

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Secretary BAKER. Yes.

Senator NEW. Are you aware that a considerable number of those machines have been sent to Gen. Pershing since the cablegram was received in which the defects of which he complains had not been remedied?

Secretary BAKER. No; I am not aware of that. I have no doubt that some have been sent in which some of the defects in which he pointed out were not remedied, but whether they are identical with the machines he was then describing, I do not know.

Senator NEW. It has been testified to here by various witnesses, among them Mr. Potter, Mr. Nash, and, I think, Maj. Muhlenberg—at all events, by several officers of the department—that that is the case. In that case, Mr. Secretary, what is the War Department going to do about it?

Secretary BAKER. About what?

Senator NEW. About those machines having been sent in that condition?

Secretary BAKER. Those machines will undoubtedly be placed in repair and in proper condition abroad.

Senator NEW. Do you think that after complaints of that kind were lodged against it by Gen. Pershing that they should have been sent before these defects were remedied?

Secretary BAKER. Many of the defects pointed out by Gen. Pershing's associates in the aircraft division over there were minor and were in process of correction by them. The question as to whether it was wise to continue sending machines or to wait until all of those defects could be corrected was a question of judgment and was solved in favor of sending them and not interrupting the flow of machines while the change was being made, and I think that was wise.

Senator NEW. The Bristol plane has been ordered out of production?

Secretary BAKER. Yes.

Senator NEW. The Bristol and the De Haviland 4's are the only types of planes on which we had reached production basis, are they not, other than training planes?

Secretary BAKER. Yes.

Senator NEW. Have you any knowledge as to how long it will take to make over the De H. 4 in accordance with the complaints made by Gen. Pershing and Capt. McCawtry?

Secretary BAKER. I have not.

Senator NEW. In that connection I might state that Capt. McCawtry is an officer of the Navy in charge of the naval testing field at Miami, Fla., and that at a recent date he made a report concerning the De Haviland 4 planes to the effect that they could not be used until after a number of alterations had been made in them. Mr. Potter and Mr. Nash have testified before this committee that it will be several months—January 1, 1919, and perhaps later—before we are able to supply our forces with any serviceable combat planes. Have you any knowledge that causes you to controvert their statement upon that point?

Secretary BAKER. I did not hear their statement, but I do not believe that it will be any such date before American-made planes are being used in France.

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Senator NEW. That was their statement.

Senator REED. Do you mean American airplanes used in quantity long before that date?

Secretary BAKER. Yes. Gen. Pershing has requested preferred shipments for a large number of De Haviland 4's in August, and reports we have here are that they are repairing the ones that they found possible to repair there and were intending to use this plane in combat. I assume that will be done.

Senator THOMAS. When did Gen. Pershing make that request?

Secretary BAKER. I can not give the date.

Senator THOMAS. Is that something recent?

Secretary BAKER. Yes; within two or three weeks, I should think.

Senator NEW. I would call your attention to paragraph 7 and subparagraph (a) of the Pershing cablegram of June 26. Paragraph 7:

None of the above planes can be used until some of the above changes are made, causing vital delay in the program.

Subparagraph (a):

Planes sent here must be inspected and thoroughly tested before being shipped.

In view of what Gen. Pershing says in these paragraphs, do you not think it was a very grave error to send forward machines of that type before those corrections were made?

Secretary BAKER. No, sir.

Senator NEW. That is all.

Senator THOMAS. Just one moment right there. I think it will be well to state in the record that Gen. Kenley, I think it was, stated that machines were sent over there before they were tested here by Gen. Pershing's request, the idea being they should all have been tested out completely here before they were consigned for shipment. If that is correct, it may be that those original shipments are due to the insistence of Gen. Pershing rather than the action of the War Department.

Secretary BAKER. If I may put this statement into the record, this will explain my answer to Senator New. The shipment of De Haviland 4 planes was inaugurated by sending a very few planes. They were tested at the fields in France, and a very large number of more or less minor defects were discovered in them, and some more or less fundamental changes were recommended. Those were the first few planes produced in this country. The policy has been adopted of testing about 1 out of every 10 planes as ordnance is tested, and it led to their sending over to France a number of others which had not been tested in this country by flyers before being sent.

When Gen. Kenley was put in charge of military aeronautics, he insisted that each machine ought to be tested in this country by flyers before being sent over, and that policy, I understand, is now being pursued. The De Haviland planes, which went over after the first consignment, had many of the minor defects pointed out by Gen. Pershing's associates, corrected and some of them had not. In my conversation with Mr. Potter and others about it I was informed that the facilities for making changes in the method of binding wires and things of that sort in the planes in France, were quite as good as they were here, and that the continuous shipment of the later De Haviland planes themselves, improved over the earlier

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models, would enable Gen. Pershing's associates in France to put them in condition for combat flying, and so large numbers have been sent over, and they are being sent, the minor changes and betterments being made in them; and the last information I had was too obscure to base an opinion upon it, and so I express no opinion; but it rather led to the inference that some of them were being actually used.

Senator REED. If that is a correct statement of affairs, why is it that an order has been issued to stop shipment of these planes?

Secretary BAKER. I do not know that it has been issued.

Senator NEW. I was about to call attention to that.

Senator REED. Let me read you the following:

AUGUST 2, 1918.

The following telegram to be sent to Mr. L. E. Bauer, Aircraft Production District Office, Dayton; Maj. Rose, care of Standard Aircraft Corporation, Eliazbeth, N. J.; Aircraft Production 31, Paterson, Detroit, Mich; Mr. Victor M. Tyler, Aircraft Production District Office, New York.

Also to senior inspectors at the Dayton-Wright and Fisher Body factories.

You are instructed to incorporate following number 1 changes in production of D. H. 4 planes; that is, no further machines are to be shipped without them. First, solder ends on all landing and flying wires must be wrapped with one-eighth inch spacing with seven-eighths to 1 inch solid wrapping between. All terminals shall be subjected to an inspection where 5 per cent of the ends are cut open and examined, also cut must show solid soldering. Second, the tubular brace between lower longerons and horizontal stabilizer is to be installed. Third, all control cable ends must be made with a splice of not less than four tucks and wrapped with twine. Fourth, intermediate ribs must be installed in the first panel of both upper and lower wings and the spacing of stitches and use of five-eighth-inch strip under stitches as per recent telegraphic instructions must be installed, each stitch secured by knotting and varnish dispensed with under fabric. Fifth, nickel steel bolt must be used in place of old taper pin securing the axle cap. Sixth, olive type of connection must be used on all rubber joints in the gasoline line. No more planes are to be shipped which do not include above changes. We realize that some of these are already in production. Wire me to-morrow the highest serial number shipped to-day. Further instructions will be sent you covering replacement on above machines already shipped. These instructions are in conformity with those of Capt. Roe.

AIRCRAFT PRODUCTION,
MIXTER.

Senator THOMAS. The statement of Gen. Kenley to which I referred is as follows:

In fact, we preferred to withhold the first 75 or 100 De Havilands to test here, but, due to the insistence of the authorities in France, they were sent over at once. Our test would probably have revealed the same defects.

Secretary BAKER. Yes.

Senator NEW. It is a fact that every flier that we have had before this committee as a witness, including several who have seen long service abroad both with our own forces, the British forces, and the French forces, has testified that the De Haviland-4 machine with the defects appearing in it as it has been produced at the Dayton-Wright factory is highly dangerous and ought not under any circumstances be used, and at least one officer has testified that he would no longer send men up from his field in a machine of that type until after these defects had been remedied. In view of that condition, as it has been expressed and recorded by the men who are best qualified to pass on the conditions and quality of that machine, I at least think that it was a very great error of policy and judgment to have sent

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them forward before those mistakes were corrected, and I wanted to know whether or not you agreed with that view.

Secretary BAKER. The subcommittee, of course, has a great advantage over me in that I have not been permitted to see any of the testimony the committee has taken, so that I do not know anything about this concurrence of opinion to which you refer.

Senator NEW. I am telling you now what that opinion is.

Secretary BAKER. You are summarizing it, and of course I have no opportunity to know who the officers are who have testified or what their opportunity for observation was or what officers might say who have not been summoned; but this is one observation I can make in reply to your statement, that Gen. Kenley is himself an experienced flyer. His reorganization of the Bureau of Military Aeronautics is to equip it with flying men and that whatever has been done there has been the result of the judgment of expert flyers and of men who have a devoted interest in this subject, and while it may be open to the charge that it was a mistake of judgment, I feel quite certain that it ought to be fairly heard on both sides before such a judgment is regarded as final.

Senator FRELINGHUYSEN. Have you read the cablegram of Gen. Pershing?

Secretary BAKER. Yes.

Senator FRELINGHUYSEN. Do you consider the defects pointed by him to be minor?

Secretary BAKER. Some of them.

Senator FRELINGHUYSEN. Not all of them?

Secretary BAKER. I do not know enough about it; I am not an expert and I do not know the effect of many of the things described by Gen. Pershing.

Senator THOMAS. Gen. Kenley said, I think, that a majority of them were not vital; that some of them were important. I refer to paragraph 2.

The Liberty motor is defective, indicating shop inspection not satisfactory. Lincoln apparently better than Packard.

Secretary BAKER. Now, that you read it, I remember that.

Senator NEW. To my mind, Mr. Secretary, there are very much more serious objections to machines than the one to which Senator Frelinghuysen has just called attention. I do not have the numbers of them, but they are included in this. One has reference to the weak condition of the stabilizers, another to the manner in which the wings are fastened to the fuselage, permitting the wires to pull out and thereby permitting the wings, of course to double back on the body and come off, as they undoubtedly did in the case of the Patterson accident out at Dayton field, when that machine simply went to pieces in the air and that man rode down 15,000 feet on the fuselage without wings. They were evidently pulled out from that defect.

Secretary BAKER. I have heard the defect referred to, an improper method of fastening the wires. Of course, gentlemen, the questions that you are asking are not proper questions for me to try to answer. I am not a mechanic or a scientific man or an aeronautic expert. Such facts can be established only by experts.

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Senator REED. But a good while ago the committee sent and asked for Gen. Pershing's report upon these points. It was refused us. We afterwards got the report from other sources.

Secretary BAKER. How?

Senator REED. We simply asked some Army officers if they had the report, and they got it.

Secretary BAKER. There is not the slightest objection to your having it.

Senator REED. Why was it not sent?

Secretary BAKER. The reason is that the communications from Gen. Pershing to the War Department are really confidential communications and they are available for the committee. The Secretary of War, Gen. Kenly, the Chief of Staff, are, all of us, perfectly willing to come down and answer any questions and give any information you want, but the whole character of communications between the commander in chief in the field and the War Department are essentially confidential.

Senator THOMAS. Afterwards we specified some cablegrams and those were sent.

Senator REED. The point I am making is not that. I do not understand how a committee of Congress, particularly the Committee on Military Affairs, can be refused documents relating to the condition of supplies, not relating to the finesse of the Army, the technical movements, but to the condition of supplies.

Secretary BAKER. Those telegrams you got.

Senator REED. We did not get them when sent for, and afterwards Senator Thomas says we got some, but I do not care anything about the other matter and I speak of it only because of the effect on the future. The point is this. This telegram of Gen. Pershing's was a complete demonstration, first, that this machine as being turned out and sent to him was a machine exceedingly dangerous and unfit for use; second, that a large number of these defects were the result of inexcusable recklessness or wantonness in manufacture.

Secretary BAKER. Failures in the inspection and things of that sort.

Senator REED. Failure of the manufacturer himself in the first instance to do a decent job, and, third, that they were defects which went with the matter of the design. What I am interested in is in knowing why that did not result in immediately stopping the production away back in June when this cablegram came until these defects were cured, particularly in view of the fact that scarcely a day was passing without somebody getting killed.

Secretary BAKER. Senator, I think I can answer. The defects pointed out by Gen. Pershing and discovered by observation and experiment everywhere were referred to the engineering section and to the production division, and instant directions were sent by telegram that in all future production beginning immediately they were to correct everything which was corrigible and the things which had caused the danger, like the pulling out of wires and the lack of inspection, were instantly corrected.

Senator Reed. You just simply gave them directions.

Secretary BAKER. That is what we tried to do, whether we accomplished it or not.

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Senator REED. You may have tried to do it, but, unfortunately, the record will show that somebody below you failed to do those things.

Secretary BAKER. No; I will tell you exactly what happened as far as I have any relation to it. The day that cablegram came I sent for Mr. Potter and Gen. Kenly, and had them in my office, and read the cablegram to them and directed them to make a report upon all those defects, and they made a report showing that some of them had been corrected before we received this cablegram. Others were immediately corrected, and then the question arose whether it would be better to go ahead with continued production and make the changes and repairs in the machines in France and install these fundamental changes in later machines, or whether to stop the whole program and make no more machines. The wisest thing was decided to be to let the machines go forward on the theory that these minor repairs and changes could be made and the machines could be used.

Senator NEW. Do you not know, as a matter of fact, that there is now at sea a force of American officers and artisans under charge of Col. Hall, who are on their way over there to make changes in these machines?

Secretary BAKER. Not essentially to make changes in these machines. The mission which Col. Hall has, and of the men who are going with him is, to establish a more immediate and direct contact between the fields here and there in working out of these defects and to bring back to us a closer view of what they discover in the use of the machine.

Senator REED. Do not think I ask this of you because you are a member of the Council of Defense, because I understand that the information bureau is part of it, but is it not time to stop Mr. Creel sending out his false statements and false pictures about aeroplanes?

Secretary BAKER. What have you in mind, Senator?

Senator REED. I have in mind a persistent campaign which he has made and which he has the insolence to try to back up; but I can epitomize it. There are many other things of this character in the Official Bulletin of March 28 of this year. He states:

A partial list of photographs released March 30 by the Division of Pictures, Committee on Public Information, herewith is presented. A complete list of all pictures may be had on application. Copies of these pictures may be obtained for private collections at 10 cents each by application to the Division of Pictures, Committee on Public Information, 10 Jackson Place, Washington, D. C., in writing. Order by number and inclose coin well wrapped. Stereopticon slides of photographs listed below may be obtained at 15 cents each. No. 6858. Aeroplane bodies, ready for shipment over there. These aeroplane bodies, the acme of the engineering art, are ready for shipment to France, though hundreds have already been shipped. Our factories have reached quantity production and thousands upon thousands will soon follow.

Now, the truth about that was that those were the pictures of a few training planes. The truth about it was that they were not the acme of the engineering art and the only thing we had to photograph in the world was some training planes.

Senator NEW. Not one of which either before or since has ever been sent to France.

Senator REED. Now, I read on:

No. 6859. The result of long experiments. Scientists and engineers have worked long in our aeroplane factories before perfection was attained, but now

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that success has crowned their efforts, the factories have been put on a quantity production basis and many thousands of these efficient machines will be sent to France.

Secretary BAKER. The comment is on the use of the word "efficient"?

Senator REED. It says we have attained perfection.

Secretary BAKER. Of course, that is an improper word.

Senator REED. And that success has crowned our efforts.

Secretary BAKER. Most of those are terms which are relative and are matters of opinion. Perfection, of course, is not a matter of opinion, and it is an improper word.

Senator REED. The statement must strike you as——

Secretary BAKER. Unwarranted. Yes; it does.

Senator REED. I read on:

No. 6860. Speeding up aeroplane production. These cylinders for our perfect airplane engine are the product of the best engineers and scientists in this country and now that perfection has been finally attained, the engine factories have been placed on a quantity-production basis; huge amounts will be turned out to supply our ever-increasing force in France with motive power until victory is ours. No. 6861. Building airplane bodies. These carriages are models of efficiency and are built along the models furnished by the best engineers of this country. They are now being manufactured by the thousand and rushed to France to become part of our ever-increasing air force.

Secretary BAKER. That is true, except the perfection of the——

Senator REED. Except that they were perfect and except that they were being manufactured by thousands and rushed to France by thousands.

Senator FRELINGHUYSEN. Those were training planes to be used over here.

Secretary BAKER. If that applies to a training plane picture, it is a total misapplication of it. It states that planes are being manufactured by the thousands to send over by thousands; that is accurate.

Senator FRELINGHUYSEN. It is also true, Mr. Secretary, that instead of being efficient that with the exception of training planes there is not a single American combat plane on the front.

Secretary BAKER. That certainly was true at the time that was said.

Senator FRELINGHUYSEN. It was not there at the time this was said.

Secretary BAKER. It was not.

Senator FRELINGHUYSEN. There was not a single bombing plane at the time this was said.

Secretary BAKER. Of course not.

Senator FRELINGHUYSEN. And not a single reconnaissance plane on the front at the time this was said.

Secretary BAKER. Of course not.

Senator NEW. There had not been even a sample copy manufactured at that time.

Secretary BAKER. On March 28 there had not. I might say generally that I know nothing about these pictures. Describing the Liberty engine as perfect is wrong. The Liberty engine is a very excellent engine, and the British and French and everyone else want it in large quantities, and it is certainly the best engine ever made by machine tools in the history of the world; and it is probably as good as the Rolls-Royce. But it is not perfect.

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Senator REED. I have a letter from Mr. Creel in which he denies the statement in the paper that he had sent out the pictures of Penguins as flying machines in France. There is the very picture that he sent out. [Handing a photograph to the Secretary.] And it is labeled on the back "American planes," as you will see. That is the original label placed on there.

Secretary BAKER. That does not say "American planes."

Senator REED. What does it say?

Secretary BAKER. Aviation. Planes at an American aviation field in France.

Senator REED. They are not aviation planes; they are Penguins that can not fly.

Secretary BAKER. I think that is straining the point, Senator.

Senator REED. He denied to me that he had sent out the pictures of Penguins as planes.

Secretary BAKER. Penguins are planes.

Senator REED. Do you think that any man representing this Government and sending out a propaganda such as I have read to you about our perfect planes and then put out a lot of pictures of these little Penguins with that sort of label is not engaged in deliberately trying to deceive the American public?

Secretary BAKER. I do not think your inference is justifiable.

Senator NEW. To be sure it does not say that these are "American planes."

Secretary BAKER. Nor does it say they are combat planes or fighters or anything else.

Senator NEW. It says that they are planes at an American——

Senator REED. They are planes that run on the ground used for beginners to practice with.

Senator NEW (reading). "Planes at an American aviation field in France." Is not the whole import of that misleading to the public? Do you not think it was intended to impress the public with the fact that those were American planes?

Secretary BAKER. I can not answer either of those questions. I can only say that as far as I am concerned its effect on me is that it is a truthful statement.

Senator REED. You do not think it was deceiving the public?

Secretary BAKER. I do not think so. It would not deceive me.

Senator REED. You would not know they were Penguins yourself if I had not told you.

Secretary BAKER. No, sir.

Senator REED. What do you think of sending this out?

No. 2939. The terror of the air. This Nieuport monoplane, the fastest machine in the world, and used extensively by the French in this war, has been loaned to our forces over there to chase and bag retreating German flyers.

The machine shown there is an old, slow, monoplane which has not been used by the French for two years, about, and is at least 40 miles an hour slower than the Spad or Nieuport plane.

Secretary BAKER. Of course, I do not know the facts about it, Senator, at all.

Senator REED. What would be the use of sending out to the public pictures of little Penguins? What is the object of that?

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Secretary BAKER. The only part of this that appeals to me is that this does not say that this is an American-made plane. It does not say that this is a combat plane, but gives information in the language characteristic of these pictures, and this seems to be a harmless picture to me.

Senator REED. It is deceptive, because if the public had been told the truth it would say that it was a picture of three little machines that could not rise from the ground. They would not have been impressed with the fact that we were prepared over there to create devastation.

Senator NEW. The Penguin is not an advanced training plane, but it is a training plane, but it does not leave the ground.

Secretary BAKER. It is the A. B. C.'s of the business, the grasshopper type.

Senator REED. "No. 12470. Aviation. Planes at an American field, France." What would you get from that?

Secretary BAKER. I think that is a practically colorless description. It might be of any kind of planes.

Senator REED. But if it was coupled with the words "American aviation field," would you understand there was anything there except some French planes?

Secretary BAKER. In view of what has been stated in our newspapers; our papers have carried the story over and over again that there was nothing there except the French planes.

Senator REED. On the contrary, there was published in an American paper the statement that we had gotten in great quantity production and were sending over enormous quantities of planes, and that was followed by Mr. Creel's statement on March 28. Following those bombastic and false statements these pictures are shown to the public.

Secretary BAKER. They are all French planes.

Senator REED. Planes in an American aviation field.

Senator NEW. Yes; but they are all French training planes, and if you look at them closely you can see the French names on them.

Senator REED. As late as May 28 this picture was sent out, showing your picture over there where you are looking at those planes. Those certainly are French planes.

Secretary BAKER. Those are, certainly, and are labeled as nothing else.

Senator REED. I have the labels.

Senator NEW. I think it is perfectly plain that those pictures were issued by Mr. Creel's bureau with the express intention and purpose of misleading and deceiving the American public, and I think it is perfectly plain on the face of it that that was his intention.

Senator REED. Mr. Secretary, I have gone far enough. I can pursue this thing if it has not been completely demonstrated. Either wittingly or unwittingly this man has given the American public to understand that we had a great and successful air program. As a matter of fact, you know today and we know to-day that the aeroplane program up to this date is a conspicuous failure—a very sad fact, and one that we regret—and that the only thing we can do now is to put our best foot forward and try to remedy these evils.

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I do not care that this thing be exposed more than need be, but I do think we ought to stop that sort of thing and we ought to go on and try to get some planes built, and I am calling attention to this not from any trifling reason but because I think the thing to do now is to tell the American people very plainly that they will have to abide with patience.

Secretary BAKER. I do not draw from those pictures the same inferences that you do. Mr. Creel did not know anything about aircraft. Mr. Creel had not had the advantage of sitting in with this committee. Pictures came to Mr. Creel showing aeroplanes in the air and on the ground. People told him that that picture would interest the American people and he issues the picture, and I think there is nothing in any of the descriptions which have been shown me beyond some language of hyperbole, and I think there is nothing indicating any intent on Mr. Creel's part to deceive the public.

Senator REED. Outside of the fact that he has not stated the truth.

Secretary BAKER. He has overstated the perfection of the Liberty motor and he has overstated the quantities of the machines undoubtedly.

Senator REED. And he has led the American public to understand that we have a vast number of machines over there, American machines. And he has been furnishing the American public with these pictures of French machines under the label "American aviation field," and when his attention is called to it he undertakes to defend it and to insist that it is true, and this country is to-day carrying these same pictures in the newspapers. Now, I think it ought to be stopped. I would rather stop it here than on the Senate floor, but it must be stopped.

Senator NEW. You say that Mr. Creel has not had the opportunity to sit in with this committee and hear the evidence which has been produced here. That is true, but it is also true that time and time again, repeatedly, have statements been made by the members of this committee to the effect that Mr. Creel's statements were untrue and were not supported by the facts. They have no further effect upon Mr. Creel, apparently, than to cause him to redouble his output and no attention has ever been paid to an authoritative word uttered by any member of this committee. Mr. Creel, apparently, at least, acts upon the statements made by people who do not know what they are talking about.

Secretary BAKER. With the greatest deference to you, I think you are unjust to Mr. Creel. The legends on those pictures are out of proportion. The words he uses imply quantities which do not exist, but a picture containing the phrase, "Planes at an American field in France," is absolutely and literally true, and to say that that deceives the American people because they will imagine that they are combat planes——

Senator REED. You must take that in connection with the statement which I read to you, that we have these fighting planes on the front, which preceded the sending out of these pictures. I am not

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interested in it further than that I would like to know whether you sanction it or whether you do not sanction it?

Secretary BAKER. I will be happy to say to Mr. Creel that in dealing with the aircraft situation that all such words as "perfect" are misleading.

Senator REED. You dwell on the word "perfect," but he has dwelt on the word "quantity," and you have no quantity over there.

Secretary BAKER. We have some over there.

The CHAIRMAN. That will be all for to-day.

(Whereupon, at 1.30 o'clock p. m., the subcommittee adjourned to meet at the call of the chairman.)

PRINCETON UNIVERSITY,
Princeton, N. J., June 20, 1918.

MY DEAR MR. SENATOR: As requested by your investigating committee I beg leave to submit the following report on the United States School of Military Aeronautics at Princeton University.

This school was established on July 3, 1917, at which time we entered into a contract with the Signal Corps to properly maintain and equip a school for the purpose of giving ground instruction to officers and enlisted men in training for the aviation branch of the service. The course of instruction at first was of eight weeks' duration, but later as the school developed and the scope of the work was broadened it was found advisable to lengthen it, and in April, 1918, the course was extended to 12 weeks.

Instruction is given in the following subjects: Aerial Observation, Gunnery, Gas Engines, Theory of Flight, Radio and Wireless, Aerial Tactics, and Military Studies.

For certain phases of the work it was necessary to design and equip the apparatus to be used in the instruction, as nothing of this kind had ever been attempted before—for instance, the miniature ranges used in the work of the department of aerial observation were planned, designed, and executed by our own instructors and mechanics. The same thing also applies to other lines of work. We were given an idea by the Signal Corps, and we in turn worked out the manner in which the instruction should be given and provided the equipment needed for it.

We have placed at the disposal of the Signal Corps the facilities of the university and have endeavored in every way possible to give a thorough course of instruction and make the school efficient in every detail.

The instruction is carried on in our two large laboratory buildings (Palmer Physical Laboratory and Guyot Hall, the geological and biological laboratory), and two additional laboratories constructed last winter for the work of the theory of flight and the gas engine divisions. It was found necessary to construct the latter two buildings when the school was increased to more than 600 students and the Signal Corps was considering a still further increase to 1,000.

The students are housed in three large dormitories, which have been turned over for the exclusive use of the school as barracks. These buildings are very conveniently located to the laboratories in which the instruction is given and also to the drill grounds.

Two sections of our large new dining halls have been assigned as mess halls, and this very important feature in the life of the men is most carefully looked after in a thoroughly hygienic and sanitary manner.

For the maintenance of this school, exclusive of the mess halls, we were paid $60 for the instruction of each student on an eight weeks' basis, and are now being paid $80 on the 12 weeks' basis. The total tuition received from the opening of the school July 3, 1917, to June 1, 1918, is $112,954.97. The amount expended during the same period is $139,625.80, leaving a net debit balance of $26,670.83. Provision has been made to reimburse the university for this deficit, and the new contract prepared for the second year's operations, beginning July 1, 1918, has made provision for carrying on the school without loss to the university.

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It was a great pleasure to me to meet you and your colleagues in Princeton on Tuesday. I was disappointed, however, that you were not able to remain for luncheon.

If there are any further particulars which you or the members of your committee wish to know will you kindly inform me.

With assurances of my highest personal regard, believe me,

Faithfully, yours,

JOHN GRIER HIBBEN.

Senator C. A. THOMAS,
Chairman Committee on Military Affairs,
Washington, D. C.

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AIRCRAFT PRODUCTION.

TUESDAY, AUGUST 13, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, at 3 o'clock p. m. in the committee room, Capitol Building, Senator Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, New, and Frelinghuysen.

The CHAIRMAN. We will hear Mr. Ryan this afternoon.

STATEMENT OF MR. JOHN D. RYAN, DIRECTOR OF THE BUREAU OF AIRCRAFT PRODUCTION.

Senator REED. Mr. Ryan, before you became connected with the aircraft service of the Government, what was your business and life?

Mr. RYAN. My principal occupation was president of the Anaconda Copper Mining Co.

Senator REED. You never had any experience in manufacturing?

Mr. RYAN. Well, no; except in so far as manufacturing goes with mining and metallurgy, as it does to a considerable extent. I mean that we have big shops—machine shops, pattern shops, and foundries—and all that kind of thing. To that extent only have I had anything to do with manufacturing.

Senator REED. That, of course, was confined to production for your own business?

Mr. RYAN. No; we had an incidental business, supplying the mining machinery, and that kind of thing, for the northwestern country. We carried on that manufacturing for others as well as ourselves.

Senator REED. But you never had anything to do with aircraft production, did you?

Mr. RYAN. No.

Senator REED. What is the position you now hold, Mr. Ryan?

Mr. RYAN. It is a dual position, in a way. Under the President's order of May 20, under the so-called Overman Act, I have been made director of the Bureau of Aircraft Production. I mean by that that the bureau was created by the President's order of May 20, and under that order, by virtue of my holding the position of chairman of the Aircraft Board, I became director of the bureau. I hold both those positions.

The CHAIRMAN. At 50 cents per year apiece? [Laughter.]

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Mr. RYAN. I would not swear to that. I have not collected any money, and a man never knows what his wages are until he has collected.

Senator REED. Who comprise the Aircraft Board?

Mr. RYAN. The Aircraft Board consists of three civilians—the chairman, Mr. Richard F. Howe, and Mr. W. C. Potter.

Senator REED. Those are the three civilians—Ryan, Howe, and Potter?

Mr. RYAN. Yes, sir; the three members representing the Navy are Admiral Taylor, Capt. Irwin, and Commander Atkins. The three members representing the Army are Gen. Kenly, Col. Deeds, and Col. Montgomery; the latter two being detached from duty and not acting as members of the board; but, as I understand it, not removed.

Senator REED. This composes the Aircraft Board?

Mr. RYAN. Yes, sir.

Senator REED. Where is Col. Deeds now? You say that he is detached?

Mr. RYAN. I do not know. He has not attended a meeting of the board for some time.

Senator REED. He is in the Government service somewhere, though?

Mr. RYAN. Not so far as I know. So far as I know, Col. Deeds has no connection with the bureau of aircraft production; and, of course, outside of that I have no knowledge.

The CHAIRMAN. He still holds a commission in the Army, and is a member of the board?

Mr. RYAN. He is a member of the board; but, being detached, he is not acting as a member of the board.

Senator REED. I was wondering whether he was detached and sent to some other place.

The CHAIRMAN. I think I can inform you about that. My understanding is that he was detached, as was also Col. Montgomery, and that they were placed at the disposal of Mr. Hughes and his committee, pending their investigation.

Mr. RYAN. I can say that as to the order detaching them from their duties, after it was issued by the Secretary of War, that Col. Montgomery never appeared at any meeting of the board; or, so far as I know, never performed any act or did anything as a member of the board. Col. Deeds did come to two meetings. At the second meeting I told him it was my impression that the order detaching him detached him from activity and should prevent his taking any action on the board. He never came to a board meeting after that. That was some time in June.

Senator REED. That, I think, would be very natural.

Mr. RYAN. That is my construction of the order.

Senator REED. Certainly.

The CHAIRMAN. That is the proper construction.

Senator REED. When was the order of detachment issued?

Mr. RYAN. I do not remember the date.

Senator REED. Could you approximate it?

Mr. RYAN. No; I could not.

The CHAIRMAN. It was about the time that the Hughes commission was requested to conduct the investigation.

Senator REED. What has become of Col. Montgomery?

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Mr. RYAN. I have not seen him.

Senator REED. Do you know whether it is true that he is on the General Staff now?

Mr. RYAN. I do not know. He has never appeared in our work, so far as I know, and outside of that, I have no knowledge.

Senator REED. I want to come now to another point.

Mr. RYAN. I will say this. So far as I know, Col. Montgomery, from the date that he was detached, just walked out of the office, and I do not believe he has performed any service of any kind in connection with aircraft production since. He has never appeared in any way.

Senator REED. Was Col. Montgomery a civilian before the war?

Mr. RYAN. I believe he was. I never knew him until I came down to take up this work.

Senator REED. Will you kindly give us the personnel of the Bureau of Aircraft Production, of which you are director?

Mr. RYAN. I am director; Mr. Potter is my assistant, with the title of assistant director, and Mr. C. W. Nash is assistant to the director in charge of engineering and production.

Senator REED. Will you let me get that now. You say that you are director. That means that you are a general director?

Mr. RYAN. So I understand.

Senator REED. Potter is assistant?

Mr. RYAN. Assistant to me; yes, sir. He is assistant director with general duties as my assistant. I have said, without making a definite order to that effect. "You must consider me and Mr. Potter as one man. In my absence Mr. Potter speaks for me, and any act of Potter's is my act. Mr. Nash acts as assistant to the director in charge of engineering and production.

Senator REED. You spoke of a Mr. Howe?

Mr. RYAN. Yes, sir.

Senator REED. What is his position?

Mr. RYAN. He is a member of the Aircraft Board. He is not in the Bureau of Production.

Senator REED. Then we have Mr. Nash, and he is assistant director?

Mr. RYAN. No; assistant to the director in charge of engineering and production.

Senator REED. Now, will you let me follow the personnel of these boards? Take the Aircraft Board. You have already stated that you were not an aeroplane man. Was Mr. Potter experienced in aircraft production before he joined or was made a member of the board?

Mr. RYAN. Mr. Potter had been chief of the equipment division of the Signal Corps since February, I think, and was made a member of the Aircraft Board in——

Senator REED. February, 1918?

Mr. RYAN. Yes, sir; and was made a member of the Aircraft Board in July.

Senator REED. He had that much experience?

Mr. RYAN. Yes, sir.

Senator REED. Mr. Nash had never had any experience in aircraft?

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Mr. RYAN. Mr. Nash had been engaged in the motor-car manufacturing business, as president of the General Motors Co. and of the Nash Motor Corporation, and probably had as large a general experience in motor-car manufacture as anybody in the country.

Senator REED. Automobile motors, you mean?

Mr. RYAN. Yes, sir; automobile motors.

Senator REED. The Navy is represented on the Aircraft Board by Admiral Taylor. Had he had any experience in aircraft?

Mr. RYAN. I do not know.

Senator REED. How about Capt. Irwin?

Mr. RYAN. I do not know what his experience is.

Senator REED. How about Commander Atkins?

Mr. RYAN. I do not know as to any of them. I never knew any of them until I came here. Yes; I did know Atkins as a boy. He came from Butte, which is my town, but I do not know as to his experience with aircraft or aviation.

Senator REED. Gen. Kenly, we all understand, has been an experienced man in aviation.

Mr. RYAN. He was put on the board to succeed Gen. Squier when he was put in the position of Chief of the Department of Military Aeronautics.

Senator REED. Who is Mr. Landon?

Mr. RYAN. He is in charge of production.

The CHAIRMAN. Under Mr. Nash?

Mr. RYAN. Under Mr. Nash; yes, sir.

Senator REED. He was also in charge of that before Mr. Nash was appointed?

Mr. RYAN. He was in charge of that before Mr. Nash was appointed.

Senator REED. When did he get in charge of production first?

Mr. RYAN. About the latter part of May.

Senator REED. When did Mr. Nash come in?

Mr. RYAN. About 10 days ago—no; three weeks ago.

Senator REED. That would be practically the 25th of July?

Mr. RYAN. About the middle of July.

Senator REED. What had been Landon's business before he took this position?

Mr. RYAN. He had been vice president in charge of production of the American Radiator Co.

Senator REED. He is that now, is he not?

Mr. RYAN. I do not know whether he has resigned or not.

Senator REED. Had he ever had any experience in aviation?

Mr. RYAN. He had some connection with the Aircraft Board a year ago, or some such matter, and he severed his connection with them the last of October or in November.

Senator REED. You do not know of him having practical experience in aviation or the production of flying machines?

Mr. RYAN. I do not know.

Senator REED. You are the director of the Bureau of Aircraft Production?

Mr. RYAN. Yes, sir; I am.

Senator REED. I assume that when we use the term "director," in this instance, it means that you are manager and controller of the Aircraft Production Board, and whatever you say goes.

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Mr. RYAN. I would not say "controller." "Controller" is often used in another way. I am afraid we might confuse it. You might say I am the man who controls the production of aircraft for the Army.

Senator REED. That is, you mean to say that you are the man who controls; in other words, this board, which is called the Aircraft Production Board, of which you are the director, and which is composed of Ryan, Potter, Taylor, Irwin, Atkins, and Kenley, is under your direction?

Mr. RYAN. Not at all. That is an advisory board. It has nothing to do but advise. It has no function but an advisory one in the production of aircraft. The Bureau of Aircraft Production is the arm of the Government that is responsible for the production of aircraft.

Senator REED. Now, the Bureau of Aircraft Production is composed of yourself as director and——

Mr. RYAN. Yes; I am director.

Senator REED. Which means that you are the head and that you control the aircraft production, and that the other members who have been named, or persons who have been named, work under your direction?

Mr. RYAN. I so understand; yes, sir.

Senator REED. So that Potter and Nash simply are assistants to you?

Mr. RYAN. Yes, sir.

Senator REED. That is correct, is it?

Mr. RYAN. Yes, sir; as their titles would indicate.

Senator REED. That organization which you have created in that way for the purpose of carrying out the functions and duties that are imposed upon you has a number of other employees, I assume?

Mr. RYAN. That organization?

Senator REED. Yes. You have a number of other employees?

Mr. RYAN. Yes, some hundreds of them.

Senator REED. I will come to that in a moment. Now, I want to go back to the Aircraft Board.

Senator THOMAS. Just a moment, if I may interrupt. As I understand the situation, the Aircraft Board was the institution which had charge of production until the Bureau of Aircraft Production was created by Executive order, and you were placed in charge of it.

Mr. RYAN. That is not strictly true, Senator. The Aircraft Board, if you take pains to read the act creating it, you will see is purely an advisory body. It never had any other power, and the equipment division of the Signal Corps occupied the place that to-day is occupied by the Bureau of Aircraft Production; that is, it was a body that was responsible for the production of aircraft. The board was advisory purely.

The CHAIRMAN. Then there were two advisory boards—the advisory association of which Durand was chairman and the Aircraft Board?

Mr. RYAN. That was an advisory association connected with the Council of National Defense?

The CHAIRMAN. Yes; but created by statute.

Mr. RYAN. The Aircraft Board is the only advisory body that I know of that was engaged in this work prior to my coming in.

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(Informal discussion followed which the reporter was directed not to record.)

Senator REED. What I want to do, Mr. Ryan, in the briefest possible way, is to arrive at the control of aircraft production as it now exists. Now, there was a National Advisory Committee for Aeronautics at one time. That was composed of whom?

The CHAIRMAN. Mr. Durand was chairman. Then there was Dr. Walcott.

Senator REED. I want to get them in the record, and also when that was created, if anybody knows.

Mr. RYAN. I have not the date.

The CHAIRMAN. It was created by the act of March, 1917, I think.

Senator REED. Does anyone know what the law is under which it was created?

Senator FREINGHUYSEN. I think it was created under the national-defense act.

The CHAIRMAN. It was earlier than that.

Mr. RYAN. I am not certain about it, but my recollection is——

Senator REED. It was composed, I see here, of Prof. Ames; Col. Clark, of the United States Army; Prof. Hayford; Prof. Marvin; Hon. Byron R. Newton; Prof. Pupin; Maj. Gen. Squier, United States Army; Rear Admiral Taylor and Lieut. Commander Towers, of the Navy. Director Charles D. Walcott was chairman of the executive committee, and the secretary was Dr. S. W. Stratton, while the special secretary and disbursing agent was John F. Victory.

I assume you can not tell us the date when this Advisory Committee for Aeronautics was created, but it preceded your connection with the aircraft business?

Mr. RYAN. It did; yes, sir.

Senator REED. Now, I am going, if possible, at the risk of repetition, to clear up what seems to be a matter of doubt. There was also at the time that you became connected with the Aircraft Production Board some sort of other board that was engaged in a general way in managing the production of aircraft, was there not?

Mr. RYAN. There was a board known as the Aircraft Board.

Senator REED. Yes. That Aircraft Board is the one that you have just described as having upon it Admiral Taylor, Capt. Irwin, Capt. Atkins, Gen. Kenly, Col. Deeds, and Col. Montgomery.

Mr. RYAN. Yes, sir; and Mr. Howe and Mr. Potter and myself.

Senator REED. I am speaking of this board. It existed before you became a member, did it not?

Mr. RYAN. It did.

Senator REED. I am trying to get the civil members of the board at the time.

Mr. RYAN. Howard Coffin was chairman, and then there were Mr. Howe and Mr. Thayer.

The CHAIRMAN. May I interrupt just a moment?

Senator REED. Just let me finish this, if you please. Now, when you came into this business, you took the position that Coffin had formerly held?

Mr. RYAN. On the Aircraft Board.

Senator REED. On the Aircraft Board; and Mr. Potter took the position that Mr. Howe had formerly held?

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Mr. RYAN. No. Mr. Howe still retains membership on the board. Mr. Potter was appointed in July to fill a vacancy created by the resignation of Mr. Thayer, whose resignation was in the President's hands when I accepted the chairmanship, and was accepted about the time I was appointed.

Senator REED. So that Potter was then and still remains upon the Aircraft Board?

Mr. RYAN. He was not on the board until July.

Senator REED. When did you come in?

Mr. RYAN. About the 1st of May.

Senator REED. Well, then, who was on it.

Mr. RYAN. I think my actual appointment was confirmed by the Senate later, some time around the 10th or 15th of May. My appointment was announced about the 1st of May.

Senator REED. What I am trying to get at is who were the civilian members at the time you came. One was Coffin, whose place you took.

Mr. RYAN. I took his place. One was Mr. Howe, who still retains his membership, and there was Mr. Thayer, who resigned before I came in and whose resignation created a vacancy which was filled by Mr. Potter.

The CHAIRMAN. I find that that advisory committee was created by the naval bill approved March 3, 1915.

Senator REED. This Aircraft Board was doing something when you took your position upon it, was it not?

Mr. RYAN. Yes.

Senator REED. What was it doing; what had it been doing?

Mr. RYAN. As I have read the minutes of the Aircraft Board to familiarize myself with the history of the board and the whole aircraft production plan, the Aircraft Board was passing upon contracts that had been negotiated and authorizing negotiations looking toward contracts—not authorizing, but approving in a way and generally considering in their sessions questions relating to the production of aircraft.

Senator REED. It really had charge, did it not, of the whole production of airplanes?

Mr. RYAN. I have never so construed it, and I have never treated it as though it did have charge.

Senator REED. Who did have charge?

Mr. RYAN. The Equipment Division of the Signal Corps.

Senator REED. At the time you came in?

Mr. RYAN. The Equipment Division of the Signal Corps had charge of the actual contracting, production, and purchase of aircraft.

Senator REED. So that we had, then, a civil board, or a statutory board—I will use that term—composed partly of civilians and partly of the officers of the Army and Navy, who recommended contracts, or supervised contracts, and all that sort of thing, but the actual contracting was done by the Equipment Division of the Signal Corps?

Mr. RYAN. In so far as Army aircraft was concerned.

Senator REED. By whom on behalf of the Navy?

Mr. RYAN. By the Navy. I do not know just who.

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Senator REED. As a matter of fact, though, did not this Aircraft Board really dominate and control in the matter of the contracts so far as the Army was concerned?

Mr. RYAN. That would be a matter of opinion, Senator. I do not think you want my opinion.

Senator REED. I thought it was a matter of fact.

Mr. RYAN. No; it is not a matter of fact. It would be a matter of opinion whether it did or not.

Senator REED. This Aircraft Board still exists?

Mr. RYAN. Yes, sir.

Senator REED. What is its function; what is it doing now?

Mr. RYAN. Its function, as it is exercised now, is to meet and discuss matters relating to aviation. For instance, the advisability of entering into a contract for engines, the advisability of contracting for aeroplanes, the advisability of adopting types after the engineering work has been done and recommendations are made. Recommendations are made and they pass approval or disapproval upon them.

Senator REED. But they have no power to contract?

Mr. RYAN. No power to contract.

Senator REED. No power to produce?

Mr. RYAN. No power to produce.

Senator REED. And no power to spend money?

Mr. RYAN. No power to spend money except for their own expenses.

Senator REED. And their opinion in regard to any matter is purely advisory to whom?

Mr. RYAN. I would consider that approval or disapproval of the Aircraft Board was not binding in any sense upon me, if I elected to do any certain thing with respect to aircraft production.

Senator REED. Then we get to this point: While we have this Aircraft Board, and while you have your various assistants, in what you call the Bureau of Aircraft Production, you are master of the situation.

Mr. RYAN. I understand you, I think. I so construe my duties.

Senator REED. You decide the question ultimately?

Mr. RYAN. I so construe my duties; yes, sir.

Senator REED. It appears from your previous answer that the Equipment Division of the Signal Corps at one time had the ultimate say as to whether a contract should be entered into, or if certain things should be done.

Mr. RYAN. I think so.

Senator REED. Do I understand that those functions and powers have been transferred to you?

Mr. RYAN. They have been definitely transferred by the order of the President of May 20, creating the Bureau of Aircraft Production.

Senator REED. Then, whatever Col. Deeds, if he were restored to the active list, might recommend, or whatever Col. Montgomery, if he were restored, might recommend, or Gen. Kenly might recommend, would only be advisory, and you would be the man to finally determine and answer the problem, whatever it is; is that right?

Mr. RYAN. I would so construe my authority; yes, sir.

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Senator REED. Do you know who was on the Equipment Division of the Signal Corps at the time you were appointed to your present position?

Mr. RYAN. Mr. Potter was the chief.

Senator REED. And who else that you know was on it?

Mr. RYAN. Well, they were all under him. He was the chief. There were a number of individuals in charge of the different departments, but he occupied the position of chief of the Equipment Division.

Senator REED. Were Col. Deeds and Col. Montgomery and Col. Waldon also upon that Equipment Division?

Mr. RYAN. I do not know of any official connection that they may have had with the Equipment Division. That may not be true. They might have been officially connected with it, but not to my knowledge.

Senator REED. My understanding is, Mr. Ryan, that these men I have just named, or some of them, at least, had a great deal to do with the matter of making contracts. I am trying as hard as I can to find out who is responsible for this condition which existed at the time that Mr. Potter took charge.

Mr. RYAN. Senator, I will be very frank to tell all I can.

Senator REED. I know that.

Mr. RYAN. I will say this: When I took charge, when the President's order of May 20 creating the Aircraft Production Bureau was issued, I was made director, and in so far as possible I wiped the slate clean and started with a new organization chart. I took Mr. Potter out. I took over the whole Equipment Division of the Signal Corps and put Mr. Potter, who was then in charge of the Equipment Division, with me as assistant in the Bureau of Aircraft Production. The work of the Bureau of Aircraft Production entirely covered the scope of the work of the Equipment Division, but I did not go back of that to find out what position and what authority each individual had, but relied upon Mr. Potter to work out the organization which we have worked out to carry on the work from that date.

The CHAIRMAN. Whom did Mr. Potter succeed as head of the Equipment Division?

Mr. RYAN. I would not state it as a fact, but it is my impression he succeeded Col. Deeds.

(At this point informal discussion occurred.)

Senator REED. Mr. Ryan, you took over the various forces that you found on hand to a large extent, did you not?

Mr. RYAN. I took over the Equipment Division of the Signal Corps. That was the principal force.

Senator REED. How many men were there in that division?

Mr. RYAN. There were hundreds. I do not know just how many.

Senator REED. Who were the leading men besides those you have named?

Mr. RYAN. Mr. Potter was chief. Mr. Kellogg was his assistant. Maj. Wolff, I think, was in charge of the finances; Maj. Brown was his assistant. Mr. Fletcher was in charge of purchases and contracts. Maj. Downey was in charge of disbursements. Mr. Lockhart was in charge of raw materials. Col. Mixter was in charge of production. Maj. Leadbetter was in charge of the supply of wood. I think those cover the principal activities.

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Senator REED. How many were Regular Army officers and how many were civilians who got into Army uniforms?

Mr. RYAN. I can not say positively. I am not sure, but I think Maj. Downey was the only Regular Army officer in the list I have mentioned.

Senator REED. The rest were civilians?

Mr. RYAN. Yes, sir.

Senator REED. Mr. Potter came in from civil life?

Mr. RYAN. Yes, sir.

Senator REED. What was his occupation or business before he came in?

Mr. RYAN. He was in the mining and metallurgical business and connected with the Guggenheims.

Senator REED. And never had anything to do with aircraft?

Mr. RYAN. I think not.

Senator REED. What was Mr. Kellogg's business?

Mr. RYAN. Mr. Kellogg was a manufacturer. I do not know just what he manufactured, but I think he was a metal manufacturer. I do not know exactly what line.

Senator REED. Was he an automobile man?

Mr. RYAN. I think not. He might have made parts for automobiles, but he was not an automobile manufacturer.

Senator REED. Mr. Mixter was in charge of production you say. Who was he?

Mr. RYAN. He is connected with one of the plow companies, I think. I believe it is the John Deere Co. or one of the harvester companies. I do not mean the harvester company, so called, but one of the companies manufacturing harvesting machinery.

Senator REED. Mr. Wolff was in charge of finances. Who was he?

Mr. RYAN. I think he was a certified public accountant.

Senator REED. And Mr. Lockhart?

Mr. RAYN. I really do not know what his business was.

Senator REED. And Mr. Leadbetter?

Mr. RYAN. I do not know what Maj. Leadbetter was.

Senator REED. How about Mr. Downey?

Mr. RYAN. I think Maj. Downey was a Regular Army officer.

Senator REED. There was not a single one of these men who had had experience, so far as you know, in aircraft production?

Mr. RYAN. Not so far as I know.

Senator REED. They were men that you think actually had the final say in regard to contracts before you took charge?

Mr. RYAN. Subject, of course, to Gen. Squier, who was Chief of the Signal Corps. They were all under him.

Senator REED. Yes. Do you know how much money, approximately, had been expended at the time you took charge in the production of aircraft? When I say "expended," Mr. Ryan, I mean actually paid out or that the Government obligated itself to pay out.

Mr. RYAN. The actual expenditure, up to the time I took charge was something like $350,000,000.

Senator Reed. Do you include in that the commitments?

Mr. RYAN. No; the actual expenditures. The commitments beyond that were sufficient to absorb all of the appropriation that had been made the year before, of $640,000,000. However, a good part of

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these commitments or a considerable part of these commitments, over and above actual expenditures, were for things for which they would be reimbursed. For instance, take the production of things for the allies and that the Equipment Division would be reimbursed for when they completed deliveries on work that they were doing, principally for the allies. But the commitments plus the actual expenditures had reached a total of the appropriation of the year before, so that I was unable from the time I took hold until the new appropriation bill passed to authorize or approve any contracts for material.

Senator REED. You asked for a new appropriation and got it, did you not?

Mr. RYAN. Yes, sir.

Senator REED. How much was it?

Mr. RYAN. The appropriation asked for was a lump appropriation to cover the Department of Military Aeronautics and the Bureau of Aircraft Production. It was $1,032,000,000.

Senator REED. The new appropriation?

Mr. RYAN. Yes. That was afterwards subdivided between the two departments.

Senator REED. And $640,000,000 would make $1,672,000,000 that has been appropriated up to this date for aircraft?

Mr. RYAN. That has been appropriated up to this date to carry us until June 30 of the next year.

Senator REED. What are the Government's commitments and expenditures up to this time, as nearly as you could tell?

Mr. RYAN. I have not got them accurately. I have been away four weeks, and I have not got them accurately. I would not like to state it. I can get it for you later.

Senator REED. I wish you would do that and insert it in the record. What I want to get at is an accurate statement in regard to the expenditures and commitments as they existed at the time you came in. You say there was an actual expenditure of $350,000,000?

Mr. RYAN. About that.

Senator REED. In round numbers?

Mr. RYAN. Yes, sir.

Senator REED. And there were commitments?

Mr. RYAN. For approximately $300,000,000 more.

The CHAIRMAN. Has not Mr. Potter furnished that?

Mr. RYAN. I think that information was furnished by either Mr. Potter or Mr. Brown.

Senator REED. Now, you said that a part of the money on these commitments would come back by virtue of the fact that we were producing certain things for other countries who would pay us in return for it, and we were also producing for the Navy?

Mr. RYAN. Yes, sir.

Senator REED. How much would come back altogether?

Mr. RYAN. I do not know, sir.

Senator REED. Can you approximate it?

Mr. RYAN. No, sir.

Senator REED. Can you get it for us?

Mr. RYAN. I think I can get it for you. I think I can get it as of June 30.

Senator REED. That is about the time.

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Mr. RYAN. I think I can get it.
Senator REED. Will you give us all the figures as of June 30?
Mr. RYAN. Yes, sir.
Senator REED. That is, give all the figures as of a certain date.
Mr. RYAN. Yes.
Senator REED. What I want to get is an actual statement of the amount of money that our Government had paid out or committed itself to pay or, net, so that you may deduct any money that would come back from other sources than our own Goverment.
Mr. RYAN. Wouldn't you say including moneys that would come back from the Navy as well as other countries?
Senator REED. It is all right to state it that way, but what I am trying to get at is how much of this money this Government expended or committed itself to expend in order to get aircraft production. If it has made some for foreign countries and the money comes back, of course, we are not out that money, but if we are doing work for the Navy, even though it comes back from their appropriation, it simply means that it is being taken out of one hand and put into another. It is the Government's money. I want to get at the amount of money that this Government has spent on aircraft.
Mr. RYAN. This thing would have to be taken into consideration and could not be shown. For instance, we are entering into large contracts for engines. A large part of them, for foreign governments. A large part is for the Navy. Now, what proportion of the initial expenditures that were made in order to get that engine production going and finally to be reimbursed, would be impossible to determine, because we could not determine what proportion of the engines were finally going to be delivered. We do not know how many are going to be delivered to the allies or anybody.
Senator REED. That is what I want to get at. I want to find out how much Uncle Sam is out of pocket for airplanes, or was at the time you took charge. It is not a matter of bookkeeping with me at all; it is a matter of plain, practical, common sense. Let me put it this way: There is a Treasury down there which belongs to the people of the United States. It was filled up by the taxpayers of the United States. We have taken a lot of money out of it. We have expended it in aircraft; we have obligated ourselves for a lot more money. Now, as to any money that is going to come back to us from foreign governments, I want to know about, but I do not consider it as an expenditure in the sense I am now speaking of. On the other hand, any part of that money that Uncle Sam has to pay, either out of this appropriation or out of another appropriation for the Navy, is a Government expenditure, and I want to know the amount. I think your statement will show that, will it not?
Mr. RYAN. Of course, I want to give you all the information I can, because it is nothing that could reflect on me one way or the other, because it antedated my connection. I will say this, however, if you want that clearly and concisely stated, so that you can best have it before you, I think it would be very much better to get it from the Chief of the Finance Department than to attempt to get it from me, because he has the figures.
Senator REED. I have had a table that is so complicated that I do not intend to study it during this hot weather.

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Mr. RYAN. Working out that thing I would perhaps only complicate it further, and the man who is responsible for doing that can certainly clear it up to your satisfaction better than I can.

Senator REED. The people of the United States are interested in how much they are out of pocket for these airplanes, or were out of pocket at the time you went in. At least, we can arrive at this point, that there were $350,000,000 paid out and expended, and there have been commitments which have absorbed $640,000,000, and we are in such condition that in order to carry on the airplane program for the next fiscal year you have asked and been given a further appropriation of $1,032,000,000?

Mr. RYAN. That includes not only the appropriation for aircraft production, but the appropriation for military aeronautics. That is to pay for flyers and mechanics and everybody beyond the point of production.

Senator REED. Will you give us a statement of how much of that goes to production?

Mr. RYAN. Yes, sir. Maj. Brown can get that accurately.

Senator REED. When you came in after this vast sum of money had been expended, or we had made these commitments for this other vast sum of money, you found that the Government had some considerable number of training planes of American make, did you not?

Mr. RYAN. Yes, sir.

Senator REED. I suppose that you have not in mind the number of those training planes?

Mr. RYAN. I could not give it accurately. I think I can get it for you. I can give it to you to date.

Senator REED. How is that?

Mr. RYAN. I can give it to you to date.

Senator REED. I would very much rather have it up to this date that you speak of.

Mr. RYAN. Well, then, probably I had better give it later.

Senator REED. If you haven't got it here, give it to me to date.

Mr. RYAN. Six thousand three hundred and fifty-nine.

Senator REED. Those were all training planes, and were generally of what types; what were the principal types?

Mr. RYAN. The J. 1, 1,600; the J. N. 4D, 3,195; the J. N. 4H, 1,235; the S. 4, 233; the Penguin, 90; the M. Defense, 6.

Senator REED. What has become of the Standard?

Mr. RYAN. They made some of these. They made some of the J. 1 and they made some of the J. N. 4D.

Senator REED. Oh, that is the Standard J. 1?

Mr. RYAN. The Standard Aircraft people made 750 of them, I think.

Senator REED. Generally speaking, you found the situation with reference to the number of planes and with reference to the capacity for the training planes, was not bad, did you not?

Mr. RYAN. I would consider that at the time I took hold the number of training planes, elementary-training planes, was entirely sufficient.

Senator REED. How was it about the advanced-training planes?

Mr. RYAN. The advanced-training planes were somewhat backward.

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Senator REED. How were you situated with reference to the advanced training planes? Did you include them in the number you have given?

Mr. RYAN. Yes, sir. They are included in that—that is, what we called at that time advanced training planes.

Senator REED. What did you call at that time advanced training planes?

Mr. RYAN. The J. N. 4H was as advanced a training plane as we had at that time.

Senator REED. Yes; but you found that while they called them advanced training planes, they were, in fact, not suitable for that work?

Mr. RYAN. Well, they were as suitable, I think, as anything else up to that time. I do not think there was anything anywhere, perhaps, that would be considered better for advanced training up to that time. There has been a marked change in the requirements for advanced training planes in the last two months.

Senator REED. Since May, 1918?

Mr. RYAN. Yes, sir; since then.

Senator REED. With the exception of these advanced training planes, you did not have a single plane at the time you became connected with aircraft production that would now be regarded as an advanced training plane, did you?

Mr. RYAN. Well, I still think that we would still consider the J. N. 4H as an advanced training plane.

Senator REED. You had 1,235 of those?

Mr. RYAN. Yes, sir.

Senator REED. That, of course, is utterly inadequate to supply the present needs of the country?

Mr. RYAN. I think it is inadequate. I think we need more than that.

Senator REED. What was the condition at the time when you became connected with the board with reference to fighters?

Mr. RYAN. By that you mean not combat planes, but strictly fighters?

Senator REED. I mean a fighting plane.

Senator NEW. You mean a combat plane.

Senator REED. I mean a plane used to fight with.

Mr. RYAN. Fight or bomb?

Senator REED. I mean a plane used to go out and fight another man with.

Mr. RYAN. So that we may not be confused, the so-called fighter is a small, light, fast, maneuverable machine.

Senator REED. That is what I mean.

Mr. RYAN. The only fighter that was on the way, as far as I know, at the time I took hold, was the Bristol fighter, which was an adaptation of the English machine in an endeavor to utilize the Liberty motor in it.

Senator REED. What was the situation with reference to the Bristol fighter when you took hold?

Mr. RYAN. I am afraid I have not the actual number contracted for. The trouble with my figures is that the statistics that I brought and that I thought you would want to question me about are statistics up to date, and not those that you want. The Bristol fighters num-

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ber, as I recall it, was 2,000. There was a contract with the Curtiss Co. for 2,000 Bristol fighters. They commenced production. They had turned out, I think, three or four planes that upon trial developed defects.

Senator REED. You say that they were in production and that they turned out three or four machines?

Mr. RYAN. Yes.

Senator REED. But didn't that involve the utilization of a very large part of their factory that covers 22 acres?

Mr. RYAN. It did.

Senator REED. In the preparation of parts of these machines and in the employment of thousands of people?

Mr. RYAN. It did.

Senator REED. When you say three or four had been produced, that means that many finished planes had been turned out and there were a great many partly finished lying back of them in course of construction?

Mr. RYAN. That is exactly true.

Senator REED. Now, what was the experience when you came to try these planes out, these so-called Bristol fighters?

Mr. RYAN. The first experience with the Bristol that I have definite knowledge of was almost immediately upon my assuming my duties. Two of them, I think, were sent to Dayton. They were sent to McCook Field, I think. One of them, in a flight, developed a weakness in the fabric which resulted in an accident. The plane got out of control of the operator and dropped into a nest of telegraph wires and it was broken up, but the flyer and observer were not seriously hurt.

Senator NEW. Was that the accident in which Doolittle was pilot?

Mr. RYAN. I do not recall the name.

Senator FRELINGHUYSEN. Did you see the accident?

Mr. RYAN. No.

Then the department or our engineers and the Curtiss people at Buffalo went to work to reinforce the wings of two more, and paid particular attention to putting on the fabric, fastening it, and they thought that they had overcome the defects. These two planes had flown at the time at Curtiss Field in Buffalo. One of them had been flown, say, four or five times, to a total, I think, of 2 hours and 56 minutes in the air. About the 12th of June, when I was at Buffalo with Mr. Potter, Mr. Landon, and others who were on an inspection tour with me, this plane that had already been flown something over two hours in the air was taken up by a man named Rader, with an observer by the name of Connors. Before they went up we talked with them. We looked over the machine and got their comments upon it. They were enthusiastic about it.

The flyers and the people who were connected with the thing were quite enthusiastic about it, and felt that they had found the trouble and corrected it. The machine was taken up into the air, perhaps 2,000 feet. The flyer did several very sharp stunts, one known as the Immelman turn, which is a very quick, sharp movement in the air, and very hard on the plane. Almost immediately after performing this stunt, we noticed that he was volplaning and coming down, and some of the men standing in the group on the field wondered why he

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was coming down so soon. Just about that time—it all happened so quickly that it is almost impossible to say how it did happen—we all noticed the fabric on the upper wing was flapping and loose and just as some one mentioned that—we all saw it at the same time—the machine turned nose down and shot down to the earth and buried itself almost the length of the engine. Flames burst from the gasoline tank and shot up into the air 25 or 30 feet. Of course, the men were killed instantly. The machine was destroyed right there in front of our eyes and in less than 100 yards from where we were standing, as a result of that accident.

Senator REED. That turn that was made with this machine was one of the maneuvers that flyers are required to make and that a good machine ought to perform?

Mr. RYAN. Yes, sir; and that machine, if it was the kind of machine that we were trying to build, should perform that maneuver. It was not anything unusual for that type of machine.

Immediately after that accident took place—we stayed there to get the men out and all that—we held a short conference, and I gave orders that the other machine of that type that had been completed and was there on the field ready to fly should not be flown, and that machine, or any of its type, should not be flown until they were sure everything was correct, or that its defects were corrected.

Two other machines, I think, were then reconstructed by putting in additional ribs and strengthening the wings. The general consensus of opinion among the experts was that it was the vibration in the wings that caused the fabric to give way. The wings were strengthened by putting in additional ribs. A new and coarser and heavier fabric was obtained, and two of these machines were built, and one of them was flown every day, I think, for a week. The reports on the flights of that machine were again quite enthusiastic. It gave a splendid performance. They were all quite sure that the defects had been remedied. Mr. Landon had been up there and seen these flights. He came back and told me they thought that there was no doubt but what they had the Bristol fixed at last. They felt very well satisfied with the performance, believing that it was quite satisfactory and there was no indication that these machines were defective. He attributed it largely to the strengthening of the wings and the use of stronger and coarser fabric. Then it was decided that we should go on and make a few of the wings with that fabric. There was a delay waiting for the manufacture of the fabric because there was none to be had. There was only a small quantity to be had in the first place. While we were waiting for the fabric the machine was flown again—I do not know just how many times—but at last, on one flight, practically the same thing happened to it.

Senator REED. The same as what?

Mr. RYAN. As happened to the one I saw on the field. The fabric came off, and the plane came down and killed the pilot and the observer.

At that time I was in Washington. Of course, I did not see that. I called a conference of all the men who had anything to do with that, including the technical section in Gen. Kenly's department. There was a conference between Gen. Kenly's technical men, Mr. Landon, Col, Mixter, Mr. Potter, and all of our men, and they decided and reported to me that, in their opinion, it was unsafe to go

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on manufacturing that machine, with which opinion I was entirely in accord. I had my own opinion formed before the result of their conference was known to me, and it was that I would not allow another one of those machines to be flown or be finished, and it did not make any difference what their conference reported. That was my own frame of mind about that, so that I was very much pleased when they decided that it was an unsafe machine to build and fly, and that we had better abandon production, which we did.

Senator REED. What were the reasons upon which the board of experts condemned the machines?

Mr. RYAN. The reasons were that it appeared to be impossible to build a machine of that type that would be so free from vibrations with a motor as powerful as the Liberty motor as to render it a safe machine for effective military use.

Senator REED. Now, there had been a Bristol machine in England of which this Bristol was an adaptation?

Mr. RYAN. There had been.

Senator REED. The Bristol in England had performed well.

Mr. RYAN. Yes; with the 225 horsepower motor, and the attempt to adapt the Bristol plane, as used in England, to an engine of 400 horsepower, caused the trouble.

Senator REED. The much greater weight.

Mr. RYAN. Its added weight. There was such vibration in flying it that it was absolutely unsafe—as was proved by those two accidents.

Senator REED. In a word, this engine's power and weight combined, tore that machine to pieces?

Mr. RYAN. There is no doubt about that.

Senator REED. Therefore, you concluded that the Liberty motor could not be used in that type of machine?

Mr. RYAN. Exactly.

Senator REED. It would have to be used in a more powerful and sturdier machine?

Mr. RYAN. Exactly.

Senator REED. So that the Bristol fighter has been put into the discard?

Mr. RYAN. The adaptation of the Bristol fighter to use the Liberty motor has gone into the discard permanently, so far as I am concerned.

The CHAIRMAN. Do you mean the Liberty motor or the Liberty 12?

Mr. RYAN. I mean the Liberty 12.

Senator REED. How much money has the Government expended on them?

Mr. RYAN. I have not got the figures on that. I have asked for it. I asked some time ago for them accurately for our own satisfaction. There is some dispute about what the expenditures were, and what they were properly chargeable against.

Senator NEW. It was a question of salvage?

Mr. RYAN. Not only that but a question of charges of the manufacturer not being properly chargeable.

Senator FRELINGHUYSEN. It was stated in the evidence that it was about six and a half million. Do you believe it is more or less than that?

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Mr. RYAN. I believe it is less. I do not think it can possibly reach those figures.

The CHAIRMAN. Those figures were furnished either by Maj. Smith or Brown.

Mr. RYAN. I do not think the figures will reach that amount.

Senator NEW. I would like to ask one question right there. Is it not true that after all the most serious feature of the loss is not the loss of the money but the loss of time in the Curtiss factory which was put on the manufacture of machines that proved so unsatisfactory as to have to be abandoned?

Mr. RYAN. Unquestionably. The loss of money, as I regard it, is not of any importance as compared with the loss of time, or, for that matter, the loss of life.

Senator FRELINGHUYSEN. How many men lost their lives?

Mr. RYAN. Four.

Senator REED. If we are going to discuss that point, how many men are going to lose their lives or have already lost their lives on the battle front, that might have been saved if we had a thousand planes over there? However, that is water over the dam.

Mr. RYAN. Just in passing, so that you will understand how they felt, these engineers that had constructed this plane and had seen it flown for about three hours in the air, walked around and talked about it that day. They felt so sure that they proposed to take me in the plane and fly to Dayton with it. They proposed to fly to Dayton in that plane that came down within 20 minutes afterwards.

Senator REED. What is being done now with reference to an attempt to procure an engine that can be employed in this plane so that the work may possibly be saved?

Mr. RYAN. I do not know how much work will actually be changed, because this plane is not at all the original Bristol plane. We now have two British Bristol planes of the regulation Bristol type, one in this country and the other about to arrive. One is a complete Bristol plane with the English engine in it. We are to put the U. S. Hispano Suiza engine into the two other British planes.

Senator REED. Of what power?

Mr. RYAN. Three hundred horsepower into these strictly British planes to test them, and we are about to send them out to the Wilbur Wright field for tests.

Senator REED. There will not be anything much to test about that, because the English have used the Hispano-Suiza motor.

Mr. RYAN. Not in this particular plane. They have used the same power in the plane.

Senator REED. They have not used it in this plane?

Mr. RYAN. Maybe they have. I may not be correct about that.

Senator REED. So that you do not hope, then, to find an engine that will fit this plane as it is now built in this country, but you do hope that you are going to produce a fighter by copying an English Bristol and by putting in this Hispano-Suiza engine?

Mr. RYAN. That is true.

Senator REED. Are you also going to try the 8-cylinder Liberty motor?

Mr. RYAN. Yes, sir.

Senator REED. You are having some made now?

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Mr. RYAN. We have ordered the Liberty 8. They will be in production later on.

Senator REED. The original plan, just to put the history in here, with reference to the Liberty motor, was that it should be made in 6 cylinders, 8 cylinders, and 12 cylinders. That was afterwards abandoned for the 12-cylinder motor, so that they never got into production on the smaller types.

Mr. RYAN. They canceled production on the 6's and 8's?

Senator REED. Just in order to settle the question we discussed a moment ago, here [indicating photograph] is a Bristol fighter, the F2B. One is shown with the 190 horsepower Rolls-Royce-Falcon. There is another Bristol fighter with a 200-horsepower Hispano-Suiza engine, so that I take it, this being a copy of an official table, they must have been using the Hispano-Suiza in England.

Mr. RYAN. Yes; they did use it.

Senator REED. As a matter of fact, if we had been content at the time that we first started into airplane work and after we entered the war to take the Bristol fighter and employ the facilities of this Government and its factories already existing for the manufacture of the Hispano-Suiza engine for that plane, we could have had a large number of these planes by this time, could we not?

Mr. RYAN. The 200-horsepower Hispano-Suiza engine has only just reached production.

The CHAIRMAN. The 300 horsepower?

Mr. RYAN. The 300 horsepower has just started.

Senator FRELINGHUYSEN. You mean the 180?

Mr. RYAN. The 180; yes. It is really a 200-horsepower motor. Here is a picture [indicating] of the Bristol fighter F2B, with the Rolls Royce 190-horsepower motor. That is given as one of the typical planes now in use.

Senator REED. Don't you find the Hispano-Suiza in there, too?

Mr. RYAN. No, sir; it is not.

Senator REED. It is undoubtedly used.

Mr. RYAN. Yes.

Senator REED. Do I understand that the Hispano-Suiza is a motor that we have been capable of producing in considerable quantities?

Mr. RYAN. The 180-horsepower Hispano-Suiza is a modification of the 150. We have ben producing 150-horsepower Hispano-Suiza engines in quantities. By making it a high-pressure engine they made it 180 horsepower. The 200 horsepower is now practically the high-pressure type of the 150 engine, and it is now just in production. It is just commencing to come in.

Senator REED. If we had started on them when we started into the aircraft business at the time we appropriated $640,000,000, they could have been in production long ago?

Mr. RYAN. I think, Senator, changing that engine from 150 to 180 horsepower was the result of French development. The application of high pressure to the engine has only recently taken place. I think as soon as the French accomplished that and demonstrated it, the drawings were sent over here and the work of changing production in this country from 150 to 180 was undertaken immediately; and it is only just now resulting in production.

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Senator REED. This is true, anyway, is it not, that we were capable of quantity production of the 150-horsepower Hispano-Suiza, is that right?

Mr. RYAN. Yes, sir.

Senator REED. It is also true that that engine works admirably in the Spad machine, which was an up-to-date fighting machine?

Mr. RYAN. I think so.

Senator REED. It is a machine that is still used by the French and is regarded as one of the best machines?

Mr. RYAN. That is true.

Senator REED. If we had started on that type of machine, where we could have the plane and copied where we could have the engine, we would have a fighting machine now?

Mr. RYAN. I think so.

Senator REED. As a matter of fact, we have not a single American-made fighting machine on the front.

Mr. RYAN. Do you know why the Spad production was stopped?

Senator REED. I say, as a matter of fact, we have not a single American-made fighting machine to-day on the front?

Mr. RYAN. I think that is true.

Senator REED. As a matter of fact, we have not a single American-made fighting machine anywhere, have we?

Mr. RYAN. I think that is true; that is, that is finally accepted.

Senator REED. You are experimenting now with some other machines; what are they?

Mr. RYAN. We are building the S. E. 5.

Senator REED. And the S. E. 5 is, after all, a very close copy of the Spad?

Mr. RYAN. I think you would call it an interchangeable machine. The French prefer one and the British prefer another.

Senator REED. There was a contract before you were connected with the board for 2,000 of these Spad machines. That contract was made with the Curtiss Co.?

Mr. RYAN. Yes, sir.

Senator REED. The contract, after the work had progressed to some considerable extent, was canceled?

Mr. RYAN. Yes.

Senator REED. And now the Government is making a machine which you say is practically interchangeable with the S. E. 5?

Mr. RYAN. I would say that it is interchangeable as far as use is concerned. The British prefer one and the French prefer the other.

Senator REED. It is not supposed by the experts to be very much better?

Mr. RYAN. One nation prefers one.

Senator REED. And the other nation prefers the other?

Mr. RYAN. Yes, sir.

Senator REED. We had the Spad machine practically in quantity production and we had contracts made and work laid out for 3,200 which were ordered from one factory. Months afterwards we start in the production of another fighter, which is practically an interchangeable machine, in the sense that it performs the same duties as the Spad; is that the situation?

Mr. RYAN. Yes, sir; that is the situation.

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Senator REED. Why was it that the work on the Spad machine was stopped?

Mr. RYAN. It was stopped by Gen. Pershing.

Senator REED. Have you that order? I have never seen that order.

Mr. RYAN. That order came in November. My connection dates from May 20. You would not expect me to go back and criticize or make any comment upon anything that happened that far back?

The CHAIRMAN. We have that telegram. The Spad order was canceled in October. Gen. Pershing's telegram upon the subject bears date of December 14, two months later.

Senator REED. And, as I understand it, it is not an absolute rejection?

The CHAIRMAN. No.

Mr. RYAN. My recollection was it was November, but, as I say, it was a thing before my time. I have not been delving into past history. I have had too much ahead of me. I have taken it for granted that the cancellation came from Gen. Pershing.

The CHAIRMAN. We were told so. Finally Col. Arnold told us he had never had a telegram. It was sent, together with others, as one telegram upon the subject. It bears date two months after the cancellation of the contract.

Senator FRELINGHUSEN. Why did you decide upon the S. E. 5?

Mr. RYAN. It is a serviceable machine. It has a long service and splendid record.

Senator FRELINGHUYSEN. Isn't the Spad a faster and better machine?

Mr. RYAN. That is a matter of opinion, Senator. The English will tell you that the S. E. 5 is a much more reliable machine, while the French, on the other hand, will tell you that it is the other way about. There you are. If you were to sit down and listen to these people, you will find that they will convince you against your will.

Senator REED. Where are you going to get an engine to put into the S. E. 5?

Mr. RYAN. The 180 Hispano-Suiza or the Liberty 8 motor.

Senator REED. The 180 Hispano-Suiza you could have gotten in the form of the 150 a year ago?

Mr. RYAN. That has not power enough.

Senator REED. That 30 horsepower makes a difference?

Mr. RYAN. The 180 really makes a 200-horsepower engine. You see, the French rating of horsepower is different from ours.

Senator REED. The English and French were both using an engine of 150 or less.

Mr. RYAN. They were a year ago, but they have gone to a higher power.

Senator REED. But I am speaking about having ability and chance to get something, and we did not get it.

Mr. RYAN. No.

Senator REED. We fooled away our time and tried to build a machine that would fit the 12-cylinder Liberty motor. That is what we did, is it not?

Mr. RYAN. I think we did, so far as the fighter is concerned.

Senator REED. We have had experience also with the DH 4?

Mr. RYAN. Yes, sir.

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Senator REED. What was the condition of that as to its production when you took charge?

Mr. RYAN. The production had just started.

Senator REED. The DH 4 was planned for what?

Mr. RYAN. For the Liberty motor.

Senator REED. But for what service?

Mr. RYAN. For observation or day bombing.

Senator REED. To use for photographic work, also?

Mr. RYAN. It would be an observation machine. If you did not carry bombs, you could carry cameras.

Senator REED. Was it ever planned to be both a bomber and observation machine?

Mr. RYAN. Oh, yes.

Senator REED. To carry a camera and bombs?

Mr. RYAN. Not altogether. It is not likely that they would carry them together. They would load one or the other going out.

Senator REED. You say that that machine is just coming into production?

Mr. RYAN. Just.

Senator REED. What about the contracts?

Mr. RYAN. I think we had 4,000 on order with the Dayton Wright people. We had quite a fair sized contract with the Fisher Body Corporation.

Senator REED. How many, do you remember?

Mr. RYAN. One thousand, and five hundred with the Standard Aircraft people.

Senator REED. That would make 6,500?

Mr. RYAN. We had that or more.

Senator REED. How much money has the Government expended or committed itself to expend so that it will have to be paid on these machines?

Mr. RYAN. That is a thing that can not be stated definitely, because they are under a cost-plus contract. We do not know what the cost is going to be.

Senator REED. By the way, the Bristol Fighter was under a cost-plus contract, was it not?

Mr. RYAN. Yes, sir.

Senator REED. I am not asking you to tell with absolute accuracy, but give me your best estimate as to the amount of money the Government has become committed to pay on account of the DH 4.

Mr. RYAN. I could not determine that accurately. We have never been able to determine accurately.

Senator REED. It will run into some millions, will it not?

Mr. RYAN. Undoubtedly.

Senator REED. The fact of the matter is that the manufacture of the material had progressed to a very large degree?

Mr. RYAN. Oh, yes, sir.

Senator REED. Do you know what the contracts called for?

Mr. RYAN. They were cost-plus contracts, as I say. I do not know what they will run.

Senator FRELINGHUYSEN. About $5,000 or $6,000?

Senator REED. Is there any way in which we can estimate that? What did you find out about the De Haviland plane as a flyer?

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Mr. RYAN. Should you mind if I should tell this story as it comes to me regarding the De Haviland plane?

Senator REED. No. All I want is the facts. If you give them to me in your own way, that will be quite satisfactory.

Mr. RYAN. When I took hold of this business, the De Haviland plane was in production at Dayton. The contracts had also been let to the Fisher Body Corporation and the Standard Aircraft Co. I visited all those plants in June. The Fisher Body Corporation was just commencing to make parts. They had not turned out the finished plane. The Dayton people were producing. I think they made an effort to make a record production about that time, because your committee was going there and I was going there. I think they reached a production of 16 planes the day before I was there. The first thing that we asked for—and this was one of the first acts of my administration—was that the first 100 De Haviland planes should be left in this country to be sent to all the flying fields and practically flown to destruction to determine any mechanical defects, any defects in design, or any faults that could be found in the planes. Our proposal to keep 100 planes here and to find out what was wrong with them—and we were sure there would be things wrong, as there would be with anything of the kind that was manufactured practically new in a new country with new labor and new conditions and new materials—was refused because Gen. Pershing thought he ought to have the planes just as soon as they could be sent to him.

Senator REED. When did he make that known?

Mr. RYAN. I do not know, sir.

Senator REED. In what way did he make it known?

Mr. RYAN. Through the chief of staff.

Senator REED. Is there any telegram or letter from Gen. Pershing to that effect?

Mr. RYAN. I think there is. I think I can find it for you.

Senator REED. Upon what information did he act when he demanded these planes?

Mr. RYAN. Upon the need for them, I suppose.

Senator REED. Did he know that the plane was experimental?

Mr. RYAN. No.

Senator REED. Did he know the workmanship was imperfect?

Mr. RYAN. I do not know. We did not know.

Senator REED. Could you get these documents?

Mr. RYAN. I think I could. I do not know that I could. I only know that in a general conference, in talking the thing over, we were told that we must send them over as fast as we could produce them. That information does not come to me. That comes to Gen. Kenly. I take orders from him. I have to turn the planes over to him at the door of the factory.

Senator REED. Let us discuss this a moment.

Mr. RYAN. May I continue? I would like to go on.

Senator REED. Yes.

Mr. RYAN. When we learned that we were not to be allowed to keep these planes here and try them out and find out if there were any defects, as we were sure there would be, we decided to send a man—Lieut. Farwell—to France, to be there when the first ones arrived. He went to France. He went to the chief of the air service

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of the American expeditionary forces and asked for some one to be assigned to look after these machines. We were going to try to find out everything there was to be found out about them as soon as possible. He explained that we had none in this country from which to get that information. Col. Dodd, of the American expeditionary forces, was assigned to that duty with Lieut. Farwell. I am not sure he was a colonel, but his name was Dodd, anyhow. Lieut. Farwell and Dodd then conducted all of the flights and reported on them, made examinations of the machines, and got all of the information upon which Gen. Pershing's long cable, giving the list of defects in construction and everything of that kind, was based.

Now, it has been generally supposed that Gen. Pershing's cable was the result of their finding out all these things over there without anybody on this side being concerned at all, and that we did not know anything about this. As a matter of fact, Lieut. Farwell, who was sent for that very purpose, came back and reported on the 13th day of June, giving all these defects and setting forth all those troubles, and stating practically, line for line and word for word, everything that was set down in Gen. Pershing's cable that was dated the 24th of June, 10 days after a report was made by our own man.

Senator REED. That does not make any change as to the condition of the machine.

Mr. RYAN. It does change it to this extent, and I want that made clear for the sake of my predecessors. Mind you, that is a thing that I could not have had anything to do with, because my connection was so recent. Whether it was bad or whether it was good design, or whether it was faulty in construction, it could not affect me one way or the other, but the knowledge that machines made under the conditions that these machines were made under were likely to develop defects, and all that, was in the minds of these people here. That was thought of over here. This man was sent over for that purpose, to look out for those things, and he found them. He was employed by the production department and sent over by the production department, and to my mind it is as important to realize that as it is to——

Senator REED. Very well. The De Haviland 4 was an English machine that had been adapted to the 12-cylinder Liberty motor?

Mr. RYAN. Yes, sir.

Senator REED. It never had been tried out when the 100 planes had been sent?

Mr. RYAN. That is virtually correct.

Senator REED. It had never been tried out. Therefore, of course, until 6,000 or 6,500 planes had been ordered and put into production——

Senator FRELINGHUYSEN. That is, 8,500.

Senator NEW. Eight thousand five hundred is what the contract called for.

Senator FRELINGHUYSEN. Four thousand for the Fisher Body Corporation and 4,000 for the Dayton-Wright people and 500 for the Aircraft Co.

Senator REED. Of course, if it had never been tried out before it was sent to France it was never tried out before the 8,500 were put into production?

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Mr. RYAN. I think the individual machines had been tried out, but the production machines had not been.

Senator REED. The machine had not been tried out to a point where you regarded the machine as safe to send, or your predecessors regarded it as safe to send, so that you sent a man along to see what the defects were?

Mr. RYAN. I do not think I would allow any batch of production machines, no matter how many individual machines had been tried out, to be sent out for service, if I could avoid it, without giving them a trial. The production machine is entirely a different thing from the individual machine, made more or less by hand and made more or less under close supervision, while production, on the other hand, goes along at the rate of from 5 to 10 and 20 a day. The two machines are entirely different. Those machines should be tried out and must always be tried out after production has been reached.

Senator REED. You have discontinued the manufacture of the De Haviland 4?

Mr. RYAN. No.

Senator REED. What have you done? There has been an order that there shall not be a De Haviland 4 made until certain changes, being principally those mentioned in the cablegram of Gen. Pershing, are adopted.

Mr. RYAN. Incorporated.

Senator REED. Incorporated; yes.

Mr. RYAN. Those changes will take probably a week, but there has been no cancellation of the De Haviland 4. There has been only an order to this effect, that these changes shall be incorporated.

Senator REED. Do you intend to go on making the De Haviland 4 after making these changes?

Mr. RYAN. Unquestionably.

Senator REED. What do you expect to use it for?

Mr. RYAN. For observation and day bombing.

Senator REED. How do you know that these defects that attention has been called to can be remedied?

Mr. RYAN. Well, I have the opinion of the engineers.

Mr. REED. The same engineers who had the opinion were the engineers who produced the machine?

Mr. RYAN. No; not entirely. These changes had been agreed upon by the engineers of the technical section of the Department of Military Aeronautics and of the Bureau of Aircraft Production as being practicable and desirable to make.

Senator REED. These same gentlemen are the men who approved changes in the Bristol Fighter and thought it was perfect?

Mr. RYAN. I think not. I do not remember that any of them were. I think it is practically a new set of engineers.

Senator REED. Do you think they are better ones?

Mr. RYAN. I would not want to express an opinion as to my own selections.

Senator REED. Putting this thing in plain language, you are going back to making these changes in the Bristol Fighter. It has never been tested or given a thorough test with the changes made. You hope it will fly; I mean fly with a reasonable degree of safety, but you do not know; that is the situation, is it not?

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Mr. RYAN. No, Senator.

Senator FRELINGHUYSEN. Senator Reed, did you mean to say the Bristol Fighter?

Senator REED. No; I mean the De Haviland.

Mr. RYAN. We are going to make the changes that have been agreed upon by the engineers, including those that have been recommended by the men who have observed the flying on the other side and the men who have flown them on this side, aid we feel that with those changes made the De Haviland is serviceable, useful, and of military value.

Senator REED. Do you think it is a good machine?

Mr. RYAN. A very good machine for certain purposes.

Senator REED. You agree, do you not, that it it is not a fighting machine?

Mr. RYAN. It is not a so-called fighter; it would not come under that term "fighter."

Senator REED. You agree, do you not, that the pilot and the so-called observer are so far apart that it is very difficult for them to communicate with each other?

Mr. RYAN. It is.

Senator REED. You agree, do you not, that the line of observation is very much obscured? In other words, the machine is so built that the line of observation by the pilot is very much obscured?

Mr. RYAN. We are aiming to correct those things in what is known as the De Haviland 9, which we are aiming to put into production as soon as we can without materially reducing the production of the De Haviland 4.

Senator REED. I am speaking of the 4.

Mr. RYAN. Those are other improvements, but they do not prove that the 4 is not a good machine.

Senator REED. You agree, do you not, that as a bomber it is subject to a very great criticism because the point of observation downward is so circumscribed that the operator can not properly sight when he undertakes to drop a bomb?

Mr. RYAN. Well, I do not think it is as good, or that he has as clear observation, as he will have in the 9, which we are building, but the 4 is practically a copy of the British machine, and that has been and is a very useful machine.

Senator REED. But you have put a Liberty motor in it, have you not?

Mr. RYAN. We have put a Liberty motor in it, which does not affect observation. It does not affect any of the features which you have spoken of.

Senator NEW. But you have added several hundred pounds of weight to the machine; that is, comparing the American-built with the English-built De Haviland 4, the American plane weighs several hundred pounds more than the English plane.

Mr. RYAN. The plane weighs a little more, not very much more, but the amount of water and gasoline necessary to be carried for the Liberty motor is in excess of the amount carried by the Rolls-Royce motor, which is used in the English plane.

Senator NEW. The weight of the English plane, as I recall it, is 1,630 kilograms, and that of the American plane is 3,423 pounds.

The CHAIRMAN. And a kilogram is 2.1 pounds.

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Mr. RYAN. The De Haviland 4 is a faster machine, of splendid climbing power, but of short radius; that is, short endurance. As a machine for a quick trip, for observation, or for bombing, or for machine gunnery it is a very effective machine. It is a quick-acting machine; perhaps the most effective of any of its type. It has not a large radius of action. It can not be gone from base but an hour and 50 minutes, but during the time it is up it is a very effective machine, and its performance in speed and climbing excels the British machine of the same type materially.

Senator REED. Now, Mr. Ryan, you agree, do you not, that some of the trouble reported by Gen. Pershing, and perhaps reported by some of these other men, was bad workmanship?

Mr. RYAN. Entirely. There is no doubt about that.

Senator REED. You agree, do you not, that no living man can successfully sight a gun and at the same time steer a machine when the gun is off to his left so that he has to throw his body over out of line with the flight of his machine?

Mr. RYAN. I have never heard any serious complaint as to the ability of the gunner to handle the gun in the De Haviland plane.

Senator REED. Do you know that the best and most experienced flyers, a number of them in this country, have testified before this committee that they regard the De Haviland machine as utterly unsafe, and that they would refuse to go up in it or send subordinates up in it?

Mr. RYAN. I understand that some have testified that they have refused to go up in it or let subordinates go up in it, but then these officers in charge of a field, where within a short time—when I was on the field, D. H. 4's were in the air. They were being flown.

Senator REED. You do not understand my question. No officer in charge of a field, as I recall it, has testified in that way.

The CHAIRMAN. Yes; Reinhardt did.

Mr. RYAN. I heard in a roundabout way that an officer had testified that he would not fly and would not let anybody else fly in a De Haviland 4. I was on Reinhardt's field the other day when there were three of these machines flying. I talked with the flyers and spent several hours going over the D. H. 4's right there.

Senator FRELINGHUYSEN. Was he in charge of the Hazelhurst field?

Mr. RYAN. Yes, sir. In charge of the flyers—

Senator REED. If the machine is all you say it is, why is it you are making a different type of machine?

Mr. RYAN. We are finding methods of improving. It is a desirable thing to bring the pilot and the observer together. It is a desirable thing to build a machine for better observation, for dropping bombs, and those things. We will constantly improve these machines, but we will not discard the ones we are building meanwhile.

Senator NEW. Then it is the purpose to supplant the De Haviland 4 with the De Haviland 9, or the American equivalent?

Mr. RYAN. U. S. 9.

The CHAIRMAN. Or the U. S. 9-A.

Mr. RYAN. And the U. S. 9-A. They are machines used for different purposes.

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Senator NEW. It is the intention to supplant one of these machines as speedily as it can be done?

Mr. RYAN. Without affecting the production of the De Haviland 4.

Senator REED. You propose to go on making the De Haviland 4 machine?

Mr. RYAN. Until we can put the De Haviland 9 into production.

Senator REED. Do you intend to do that regardless of any testimony that may be given by experienced flyers that the machine is utterly unsafe?

Mr. RYAN. I am not convinced that the burden of testimony of the flyers throughout the country that are flying the De Haviland 4's, is to the effect that it is an unsafe machine. I do not think it is. There are individual flyers who will express such an opinion, and there are others who speak in the highest terms of the De Haviland 4.

Senator FRELINGHUYSEN. Outside of what may appear in the testimony—and I have read a great part of the testimony, including that of Maj. Muhlenberg and some others from the testing department at the Wilbur Wright Field—there was one officer from Hazelhurst, who said the machine was structurally weak and extremely dangerous. Then there was an officer, Capt. Kelly, I think, and one or two other flyers, who gave some testimony. They said that the machine was extremely dangerous. The points that were made were that it was structurally weak in some of its connections with the fuselage; and the thing that I can not understand is why won't the same thing happen, when using this high-powered Liberty motor, that has happened with the Bristol fighter?

Mr. RYAN. It will not happen because the De Haviland has been flown a total of hundreds of hours, and they have never killed a man that I know of.

Senator NEW. They killed Patterson.

Mr. RYAN. Yes; but he was doing a nose dive. It is not a machine that that thing can be done with. Every flyer that I have heard has said that the stunt that Patterson did with the De Haviland 4 was something that no one who had a proper conception of what the machine was able to do would attempt.

Senator NEW. It has been testified to here that Lieut. Patterson was sent up under orders to obtain a ceiling of 15,000 feet, and then to plunge downward in order to test out his guns in vertical fire, and that it was in the execution of that order that the linen came off the wings, and then it was followed by the wings leaving the fuselage.

Senator FRELINGHUYSEN. In Gen. Pershing's cablegram, one of the criticisms was to the effect that the Liberty motor was defective, that the Lincoln was better than the Packard. That would seem to indicate that more than one Liberty motor was defective. Now, is the Liberty motor defective?

Mr. RYAN. I would not consider it so. I think, Senator, every motor in the world, and particularly every aeronautical motor, is defective in degree. There is no such thing as a 100 per cent efficiency, and there will never be. The question is whether the product of one company is more defective than that of another. It may be a question

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of workmanship. That is corrected from one day to another or one hour to another in a given shop. It may be a certain batch of Lincoln motors might be better than a certain batch of Packard motors. It might be the other way about. These things are changed all the time. To say that it is a defective motor, I think is a mistake, because the purpose for which the Liberty motor is designed, from my observation—and I have talked with manufacturers, with flyers, with plane manufacturers, and everybody else—makes it the best motor on either side. There is no motor on either side that compares with it. That is my opinion after what I have heard. I have no reason to be prejudiced in favor of or against the Liberty motor, because I have had nothing to do with its design or manufacture. I had nothing to do with it up to the time it was in production. Without a doubt, in my opinion, for heavy work and for fast work in heavy planes, there is no motor on either side that compares with it.

Senator FRELINGHUYSEN. Do you recall that criticism in that cablegram?

Mr. RYAN. Yes, sir.

Senator FRELINGHUYSEN. Do you know what caused it?

Mr. RYAN. No. I think it would come about more as an individual opinion, and probably would not be, and I think has not been, admitted or borne out. I mean, admitted by our engineers in this country or by the British engineers, or both. Certainly they are as well qualified as anybody can be to pass on the merits of the motor.

You understand, of course, that I do not want to appear in the record as making a stump speech, but as far as the Liberty motor is concerned, perhaps as thorough a trial of the Liberty motor as has ever been made, has been made in England, and they are unqualified in their statements that it is the best motor of high power that has been produced. There are certain improvements that they make, principally with the carburetor, but they distinctly cabled us not to make any changes, to make them as we were making them and send them over, as their changes were slight and they could make them. Immediately when we got that telegram we sent the engineers to England to learn all they could find out about these carburetors.

Senator NEW. Is it not also true that they gear the motor over there to use in their heavy planes?

Mr. RYAN. Yes, sir; and we are starting to gear it.

Senator NEW. To make it a geared motor?

Mr. RYAN. To use a geared motor. We use a geared motor in one and a direct drive in another. We are starting to make both. They want some geared motors for the Navy.

Senator NEW. It is necessary to reduce the speed of the propeller in the heavy plane?

Mr. RYAN. Yes, sir.

Senator FRELINGHUYSEN. As I understand it, the equipment division of the Aircraft Production Board was in charge of three officers, Col. Deeds, Col. Montgomery, and Col. Walden, who, from the evidence and various experiences that I have had, practically controlled the policy of production prior to your directorship. Now, have those men, or any of them, at the present time, anything to do with your department?

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Mr. RYAN. Not so far as I know.

Senator FRELINGHUYSEN. Do you intend to allow them to have any influence in your department in aeronautics?

Mr. RYAN. I do not think it would be fair to ask me to answer that question in the light of the investigation that those men are under by the Department of Justice. I do not think I ought to say what I think. I do not think I ought to prejudice their cases that are under investigation by any statement as to what I intend to do, without having the result of the investigation made by order of the President placed before me. I do not want to do that.

Senator FRELINGHUYSEN. Under those circumstances I will not urge you to answer the question, but I attribute so much of the breakdown to either poor judgment or something else in this aircraft program that I feel that those men should not have any interest or say in aircraft matters hereafter.

Mr. RYAN. The only thing I can say, Senator, about that is that since this investgation by the Department of Justice was commenced and the order of suspension was issued affecting those three officers, so far as they have taken any part in discussions, their advice has not been asked or received, and they have had no official connection with the Bureau of Aircraft Production.

Senator FRELINGHUYSEN. Is Col. Vincent still with your department? Has he a position in your department?

Mr. RYAN. Yes, sir. Col. Vincent is the engineer in charge of the McCook field.

Senator FRELINGHUYSEN. Is he at the present time?

Mr. RYAN. Yes, sir; he is under Mr. Nash.

Senator FRELINGHUYSEN. In what capacity?

Mr. RYAN. McCook field is largely a testing field, as you know. It is almost entirely a testing field.

Senator FRELINGHUYSEN. Do you believe it is good policy to have a man who has been connected in an official and technical capacity with a company that has large contracts with the Government in such a responsible position?

Mr. RYAN. I will answer that by saying that I believe that the man who has the greatest knowledge and the greatest ability in a particular engine's construction is invaluable regardless of what his connections have been. He has nothing to do with making contracts; he has nothing to do with anything relating to the money end of this business; that is entirely out of his hands. Considering his technical knowledge, if he has more experience and more knowledge of a particular type of engine that we are committed to in our whole air program than any other man, I would consider it a great mistake to dispense with his services.

Senator FRELINGHUYSEN. Do you not think it would be as well to have a man who was familiar with aero dynamics who was not connected with any manufacturing interest doing business with the Government?

Mr. RYAN. Of course. We have many of them and Col. Vincent has not been a superior officer. He has always been subject to a higher authority. Now he is under the control of Mr. Nash.

Senator FRELINGHUYSEN. Has he not had a great deal to do with the testing of the De Haviland 4 in flying?

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Mr. RYAN. Undoubtedly.

Senator FRELINGHUYSEN. Those tests have been reported heretofore—I do not know whether to your department or to the equipment division—as satisfactory, have they not?

Mr. RYAN. I think generally so; yes, sir.

Senator FRELINGHUYSEN. In view of the rather discouraging reports of Lieut. Farwell, do you think that Col. Vincent is capable, having passed the De Haviland 4 in his tests?

Mr. RYAN. I do not know that Col. Vincent has ever absolutely approved the De Haviland 4 in its entirety. There have been constant changes made and there always will be. Things will be corrected from one week to another. We will have another batch of changes in this plane or another. They never stand still. The question of these changes rests very largely upon the individual judgment of engineers. They disagree about these things. In those changes we are making our engineers are not in accord. They are necessary according to a preponderance of opinion, but changes are constantly occurring, varying with individual opinion.

Senator FRELINGHUYSEN. I understand the final decision in regard to those tests, engineering tests, rests at the present time with Mr. Nash and Col. Vincent?

Mr. RYAN. No; rests at the present time with Mr. Nash and Mr. Landon, and also with Col. Vincent and Col. Bane, of the department of military aeronautics. I might add also with Maj. Jones and others. It is a combined board of the department of military aeronautics and the Bureau of Aircraft Production. As far as the bureau is concerned, they are under the direction of Nash.

Senator FRELINGHUYSEN. Is Mr. Day, engineer of the Standard Aircraft Co., of Elizabeth, N. J., one of your board?

Mr. RYAN. He may be called in, but he is not a part of the board.

Senator FRELINGHUYSEN. And Mr. Crane, of the Wright-Martin Co.?

Mr. RYAN. He may be called, but he is not a member of the board.

Senator FRELINGHUYSEN. Then they would have no final say in the decision, because at the present time they are engineers whose companies have contracts with the Government?

Mr. RYAN. They call in these engineers that have connections with other companies because, in some cases, they are men who know most about these things, but they have no final decision in the matter.

Senator FRELINGHUYSEN. Have you any interest in the Wright-Martin Co.?

Mr. RYAN. I did not consent to the reorganization of the Wright-Martin Co., which I think took place several years ago, so that I sold my stock in the open market at the time of the reorganization. I have held no interest since that time and hold none now.

Senator FRELINGHUYSEN. Have you any interest in any other company which has contracts with the Government?

Mr. RYAN. Not any.

(Informal discussion followed, which the reporter was directed not to record.)

The CHAIRMAN. Having completed your trip out West, I wish you would tell the conditions and prospect with reference to the spruce situation.

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Mr. RYAN. I took a three weeks' trip. I made it three weeks because of my realization that the whole air program, not only of this country, but of the allies, was absolutely dependent upon the spruce situation, and it had to come from that section. I have had some experience, as Senator Thomas knows, in the lumber business, because in my own business we have conducted a large lumbering operation, and I have had for about 20 years something to do with it. I felt, therefore, that I was fairly well qualified to pass upon the work they were doing and the probabilities of production and everything of that kind. I spent days and nights in the woods. I talked with hundreds of people, dozens of men who are operators out there, and I saw the operations.

One of the things that impressed me most was the fact that the spruce we are after was one of the most despised woods in the forest until the need for it for aeroplanes arose. Spruce and hemlock grow together. An operator going in there to carry on his operations would avoid this stuff that we have got to have now. All that had to be corrected. We had to build new lines of railways; we had to build new lines of logging railway; we had to organize a situation that, so far as labor was concerned, was about the worst in the United States. The whole country was literally held by the throat by the I. W. W., and there was no production going on. There had not been for six months in the Puget Sound district.

They organized up there what is known as the Loyal Legion of Loggers and Lumbermen. To-day there are in that organization 125,000 men, each one of whom has signed a pledge that he will work, without cessation, to the end of the war; that he will put all questions in dispute in the hands of Col. Disque for adjustment. Every operator in the district has consented to place in his hands the matter of pay, of hours, and conditions of labor and to abide by his decision. He has increased the efficiency out there very greatly. It has been increased beyond what it was before war times. They were getting, in the month of July, a production of first quality spruce and fir of 15,000,000 feet, and it will be 18,000,000 in August. We have to provide, at the end of four or five months, for the failure of production in the camps where the production is now coming from. that is because they are going to be exhausted. We have got to make provision for other large production to come in about that time, say, about the first of the year. There are about twenty-odd thousand soldiers under the command of Col. Disque, most of them on the railroads and in the forests, doing the hardest kind of work, and they are just as good soldiers as Pershing has in France, and just as anxious to go to France as any he has there. They are working willingly and with a spirit that I have never seen equalled before anywhere in the world. While I would not want to say that this spruce can be produced at a reasonable cost compared with ordinary times, considering the difficulty of selecting every tree, marking it by experts, cutting it down and transporting it, and then, when you put it on the carriage in the mill and find a spot or blemish in it, using it for the cheapest kind of cull, the present increased cost that is being realized is reasonable.

The CHAIRMAN. Of course, that must be subordinated to this great emergency.

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Mr. RYAN. Entirely; and I so treated it.

The CHAIRMAN. Do you feel, from what you have seen, that we can rely upon the spruce production? Is there sufficient spruce for aeroplane purposes?

Mr. RYAN. I have not much doubt of it. I am convinced that we have that situation in hand; that it is being well handled; and that it is gradually being reduced to a reasonable cost basis.

They have built what they call a cut-up plant. They have built the biggest plant of its kind in the world out there. It has been increased since it was built. They cut 1,100,000 feet of lumber into small pieces, suitable for wing pieces and suitable for small stuff, in 24 hours. They built that mill in 45 days with soldier labor. That is a big job.

Senator FRELINGHUYSEN. Have you considered the Maine forests?

Mr. RYAN. Yes. We have turned over New England to the Navy. They are conducting operations in New England. We turn everything up in New England over to the Navy and everything in Canada to the British.

Senator FRELINGHUYSEN. I spent some few days in the Maine forests and I saw some very fine lumber. I am not an expert in lumber, but I considered it an excellent spruce forest that I saw.

Mr. RYAN. The Navy has charge of that. Of course, if a tree that is not absolutely clear, without a spot or blemish 100 feet from the ground, it is not fit for this work.

Senator FRELINGHUYSEN. I wrote you in regard to the observations we made in looking at the aeroplane factories with regard to fire. I consider that some of these factories are extremely dangerous. I have talked with Mr. Evans, and I think the committee feels that every effort should be made to see that the owners of the factories should protect them with every conceivable apparatus. I would not mention the factories by name.

Mr. RYAN. I think we are following it as far as we can. At least my directions are explicit to follow out the recommendations of the War Industries Board of the Council of National Defense in that respect.

The CHAIRMAN. If it is agreeable, we will adjourn now to meet again on Thursday.

(Whereupon, at 5.30 o'clock p. m., the committee adjourned until Thursday, August 15, 1918, at 10 o'clock a. m.)

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AIRCRAFT PRODUCTION.

THURSDAY, AUGUST 15, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE OF MILITARY AFFAIRS,
Washington, D. C.

The committee met, pursuant to adjournment, in the committee room, Capitol, at 10.30 o'clock a. m., Senator Charles S. Thomas presiding.

Present: Senators Thomas (chairman), Reed, and New.

STATEMENT OF MR. JOHN D. RYAN, DIRECTOR OF THE BUREAU OF AIRCRAFT PRODUCTION—Continued.

The CHAIRMAN. Mr. Ryan, have you received any reliable information in the past two or three days with regard to aviation conditions at the front?

Mr. RYAN. Yes, sir. Maj. Brett, who is connected with the overseas expeditionary force, or the aviation division of the American expeditionary force, has just returned. He had to do with the setting up and sending out of the De Haviland planes that were sent over there. He came back on a mission for the purpose of getting some help—some men and things. He told me that before he left they not only tried out the De Haviland plane, and that they had worked out very satisfactorily, but they had sent three squadrons to the front. They were on the front when he went there on July 31. The last one went from a point the name of which I have forgotten, but it is near Paris.

The CHAIRMAN. It is a large aviation camp?

Mr. RYAN. It is an aviation camp near Paris, where they get them ready to fly and then fly them to the front. They are put together at ———. They are assembled near Paris and flown to the front in squadrons. The third squadron had gone before he left there. He has had at first hand more to do with setting up and starting out the De Haviland planes that have been sent over than anyone we have in this country now.

The CHAIRMAN. I want to say at this point that I unexpectedly met Maj. Brett this morning. He tells me he is a member of the Regular Army and was assigned to this duty.

Mr. RYAN. He is not connected with the Bureau of Production. He is with the overseas service.

The CHAIRMAN. What information have you, if any, from Maj. Brett with regard to the number of planes that the American Expeditionary Force has?

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(Informal discussion followed, which the reporter was directed not to record.)

Senator REED. Maj. Brett came over for the purpose of getting parts and accessories that they need over in France, I understood you to say, Mr. Ryan, a moment ago?

Mr. RYAN. Yes, sir.

Senator REED. As I understood your testimony before we adjourned the other day you were then of the opinion that the De Haviland, while not a machine that you regarded as in any respect perfect, was one that you hoped to be able to make considerable use of. That was about your opinion, was it not?

Mr. RYAN. Senator, I woud say that perhaps that statement that I did not regard it in any respect perfect might be misunderstood. I do not think there is any perfect airplane—far from it. I do not regard the De Haviland that we are putting into production now, improved as it has been improved by these changes, of great military use. Until the time arrives when we can put into production the U. S. 9 or the U. S. 9–A, which are machines of the same general type as the De Haviland 4, it is my intention, as far as I have anything to do with continuing to produce the De Haviland 4's in quantity, to make such improvements as we can and not materially slow up production.

The CHAIRMAN. Always assuming, of course, that these structural and other changes shall be made?

Mr. RYAN. I think I stated that in the beginning.

The CHAIRMAN. You have held up production until that can be done?

Mr. RYAN. I have held up production until that can be done. We think production can start again by next Saturday.

The CHAIRMAN. Day after to-morrow?

Senator REED. That will mean that you will produce of the De Haviland 4's about how many machines?

Mr. RYAN. Probably from the 1st of September 30 machines a day; from the 1st of October 50 machines a day.

Senator REED. But how many do you contemplate having to produce before you get into production of the other kinds of machines that you just mentioned?

Mr. RYAN. That we can not tell accurately. It will be different times in the plants. Some of the plants will produce 9's earlier than the other plants, because their tools and jigs were made for the 9's.

Senator REED. What plants, for instance?

Mr. RYAN. The Fisher Body Co., for instance. However, the plants that are making the 4's ought to be into the 9's pretty well, I should say, by the middle of September or the 1st of October.

Senator REED. Getting into quantity production?

Mr. RYAN. We do not aim to slow up quantity production in going from 4's to 9's.

Senator REED. I understand. When you say you are going into 9's, you mean to produce in substantial numbers?

Mr. RYAN. Yes, sir; to produce in substantial numbers.

Senator REED. So, to put this thing in a word, you believe that the De Haviland 4 is of sufficient utility so that its manufacture should be proceeded with in quantity until you have developed and gone

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into quantity production of the De Haviland 9, and also the other one? What is the other?

Mr. RYAN. I would not call them that. We call them the U. S. 9, and the U. S. 9-A, which we consider improvements.

Senator REED. But they really are similar, and are taken from it?

Mr. RYAN. They are taken from it; yes, sir.

Senator REED. What are the principal changes in the U. S. 9, and the U. S. 9-A?

Mr. RYAN. The U. S. 9 is much the same kind of a machine as the De Haviland 4. It has the observer and the pilot seated together, with only a thin partition between them. It is strengthened materially here and there in a number of places that I could not describe without the drawings and without the help of a technical man; and it would not be of any use in the record. It is, generally, an improved machine of the same general type as the D. H. 4. The 9-A is the same machine as the 9 with a larger wing spread. It is our intention to build the 9 and the 9-A interchangeably; that is, we can put the 9-A wings on the 9 machine. The 9-A will be used for slightly different purposes than the 9.

Senator REED. What are the different purposes?

Mr. RYAN. The 9-A will carry more bombs, having larger wings.

The CHAIRMAN. Can you give the wing spread?

Mr. RYAN. I can not do that accurately.

Senator REED. Are we making any fighting planes now—that is, a plane of attack?

Mr. RYAN. Yes, sir; the De Haviland 4.

Senator REED. You do not call that a plane of attack, do you?

Mr. RYAN. Certainly. I call it a combat plane; certainly. I do not call it a pursuit plane or a scouting plane, but I call it a combat plane.

Senator REED. I do not want to misunderstand the terms; but, as I understand it, the De Haviland 4 was intended for reconnaissance work and could be used for photographic work, but I did not know that anybody contended that it was a plane that you could send out and clear the air of German machines.

Mr. RYAN. It depends upon the German machines that are out. It is fitted with machine guns and with bombs. It is certainly fast, and is a good climber.

Senator REED. It is a good climber?

Mr. RYAN. Yes, sir.

Senator REED. It takes 45 minutes to go up 10,000 feet.

Mr. RYAN. That is not the fact, I think, Senator. I will give you the performance on that climb. We had it the other day, Senator. The De Haviland 4, equipped with a Liberty motor, has a ceiling of 19,700 feet and a speed of 118 miles an hour at 6,500 feet. It climbed 6,500 feet in 7 minutes and 2 seconds, with 4 guns—4 machine guns.

Senator REED. I can not understand those figures in connection with the ones that we have been given. They are utterly irreconcilable.

Mr. RYAN. I am willing to give these figures. They are under the stamp of the Bureau of Military Aeronautics. I am willing to put them in the record.

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Senator REED. I do not challenge your statement. I simply say that I do not understand them. Was that climb made with a military load?

Mr. RYAN. These are secret documents. You will see that it says: "Service planes in use at the front, statistical branch, executive division, General Staff, War Department, July 25, 1918." Now, I can not put that in the record.

(Informal discussion followed.)

Senator REED. I do not believe that you answered my last question. Was that climb made with a military load?

Mr. RYAN. I do not know what climb you speak of. The record states that the plane was equipped with four guns; that is, the plane that made that climb.

Senator REED. That is not a full military load, is it?

Mr. RYAN. It was not carrying bombs, but it is equipped as a fighting machine.

Senator REED. If I understand you correctly, Mr. Ryan, you maintain that this De Haviland 4 is suitable for use as a combat plane; that is, as a plane of attack. Secondly, you say that it is suitable for use as a reconnaissance or a photographic plane. Thirdly, you say that it is of use as a day bomber; that you can use it over the line. It has all three of these uses combined in one. That is your opinion?

Mr. RYAN. I think we must misunderstand each other somewhat. When I say it is a combat plane, I contend that it is useful as a combat plane. In speaking of a plane of attack, you evidently speak of what we call a fighter. It is not that type of plane.

Senator REED. What do you mean by a combat plane?

Mr. RYAN. It is a plane that is so equipped that it can go out and take care of itself in combat. It is not the type known as a fighter.

Senator REED. How can it take care of itself in a combat with a fighter?

Mr. RYAN. It is not as maneuverable as a fighter, but it can take care of itself as a plane of its kind.

Senator REED. As a matter of fact, these machines to which you refer as combat machines, the primary purpose of which is observation, have some guns on them, and they are supposed to defend themselves, but they are not fighters in the sense of cleaning up the air and putting the other fellow out of business?

Mr. RYAN. They are not what is technically known as a fighter, but they are combat planes, and they can and do fight. Senator, to define what is known as a fighter, I will say that I mean a machine like the Bristol fighter or the S. E. 5. I mean a small, maneuverable, quick-acting machine that will not carry weight and can not be equipped with a large number of machine guns or any bombs; but the combat planes include fighters and bombing machines, such planes as the D. H. 4. They are all combat planes.

Senator REED. I have only one or two more questions to ask. We have no heavy bombing planes except the Handley-Page, and there is only one machine of that kind that has been made?

Mr. RYAN. We have shipped 20 machines.

Senator REED. Twenty Handley-Paige machines?

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Mr. RYAN. I may not be exact. We have shipped 10 and there are 10 that were to have been shipped yesterday or the day before, and will certainly be shipped this week.

The CHAIRMAN. Do you mean the parts are shipped to be put together over there?

Mr. RYAN. Yes, sir.

Senator REED. You made the Handley-Page machine at the Standard Aircraft factory, and that was the first one equipped with the Liberty motor?

Mr. RYAN. I think so.

Senator REED. That machine was tried out at the Standard Aircraft factory?

Mr. RYAN. Just a moment. I think that the Liberty motors were used quite extensively in the Handley-Page machines on the other side before this plane was built at Elizabeth, N. J.

Senator REED. Why did they take so much time planning the machine if the motor was tried out over there?

Mr. RYAN. I do not know that they did.

Senator REED. I want to know how much of a test was given down here before you began to produce in quantities?

Mr. RYAN. I think the test was made on the other side. I think the Handley-Page with the Liberty motor was tried out on the other side before it was tried out here.

Senator REED. That is, before it was made here?

Mr. RYAN. Yes; or during that time.

Senator REED. Were the machines on the other side identical with the machine made here?

Mr. RYAN. Not exactly, but near enough so that I think any demonstration that was conclusive on the other side would not be affected by any change in construction.

Senator REED. You mean that the changes were so slight that they could not have affected the performance of the planes disadvantageously?

Mr. RYAN. I think so.

Senator REED. I want to know if you are sure that this Handley-Page which was very nearly identical with the one made down here had been tried out on the other side with the Liberty motor?

Mr. RYAN. I am quite sure it was.

Senator REED. When was it tried out?

Mr. RYAN. I can not give you accurate data.

Senator REED. Who would have that data?

Mr. RYAN. I do not know that anybody would. The people we relied on, who brought us information regarding the Handley-Page machines, have gone abroad. I imagine we could get the information from the English commission.

Senator REED. I understood, though I may have been in error, that this Handley-Page which was made had to be redesigned in order to receive the Liberty motor.

Mr. RYAN. I think that is true, to some extent.

Senator REED. Of course, if it was redesigned on the other side for the Liberty motor, it would not have to be redesigned here for the Liberty motor.

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Mr. RYAN. I think the original drawings that came over provided for the Rolls-Royce engine, but the change was not material.

The CHAIRMAN. My recollection is that the chief changes were with what they call the nacelle, in the shape of the engine.

Mr. RYAN. I think that would be so.

Senator REED. What I want to get at with absolute certainty is that this Handley-Page machine was tried out—thoroughly tried out—with the Liberty motor before the machine made at the Standard Aircraft Works was constructed, and that the machine there made is a substantial copy of the one abroad. In other words, I want to know that this machine which we are now making has actually been tested out with a Liberty motor, because my own opinion is, to make a somewhat long statement, that a machine may be perfected with a certain engine in it, but when you change engines you may have a machine that is a complete failure because the machine and the engine do not fit. I am very much concerned about that question, whether or not this Handley-Page was really tried out in England with the Liberty motor.

Mr. RYAN. I think our main reliance, Senator, on that point came from the fact that the English had been doing everything possible to get us to give up, as fast as possible, all the Liberty motors that we could, so that they might put them in the Handley-Page machine and other bombing machines, after the Liberty engine had been tried on the other side.

Senator REED. I understood that a very eminent Englishman stated that if we would send them Liberty motors they would build machines that would fit, the inference being very broad that we did not know enough to build them.

Mr. RYAN. Senator, a cable on the 2d of July from the British minister of the air stated that they would have to stop production of the Handley-Page machine in two weeks unless we could furnish engines to put in them; that their Rolls-Royce production had not been up to expectations, and that they were dependent absolutely upon our shipments of Liberty motors for the Handley-Page machine, and would have to stop production in two weeks if they did not come.

Senator REED. I have pursued that as far as I care to, because I must go in a few minutes. You have produced how many of these machines up to date?

Mr. RYAN. Twenty have been shipped, I think. I think 30 machines have been shipped or are ready for shipment. That is my information this morning.

Senator REED. You are going to be able to produce them how fast?

Mr. RYAN. We expect to ship 30 in August. This is approximate, of course. We will ship 60 in September, 80 in October, running up to a maximum of 140 machines a month, which will be reached in February.

Senator NEW. Handley-Pages?

Mr. RYAN. Yes, sir.

Senator REED. How many factories are working at that?

Mr. RYAN. A number of factories are making different parts. The wood parts are being made in Grand Rapids. The metal parts are being made at certain other places.

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Senator REED. Who is doing the assembling? Are several different factories doing it?

Mr. RYAN. The parts are all shipped to the Standard Aircraft Works at New Jersey, and the parts are shipped from there to England, and the assembling is done in England.

Senator REED. With the exception of one or two tests that you had with this Handley-Page machine when they had that big meeting and speeches were made, and so on, and when some flyers took the machine out and flew it around, what tests have they given?

Mr. RYAN. I do not know that any tests have been made to determine whether it was a machine that we wanted to go into production on. As I say, we are relying on the experience of the English with the Liberty motor.

Senator REED. Have you been making tests with these other machines? Have they been sent out to the testing ground?

Mr. RYAN. No.

Senator REED. You are in quantity production without having put one of those machines through a testing station?

Mr. RYAN. Yes, sir..

Senator REED. If you will pardon me, that has been the occasion of our trouble heretofore.

The CHAIRMAN. You are not producing and testing and assembling here, but you are producing parts and they are being sent to England, and the tests are made there after they go to the front?

Mr. RYAN. Yes, sir.

Senator REED. Are none assembled here?

Mr. RYAN. One in so many. I think one in 25 or 30 machines is to be assembled in this country and used in tests and flights here.

Senator REED. Just let me ask the committee to do this. I wish the committee would follow this same line of investigation with regard to the Caproni. I would like to know what became of our Italian friends.

Senator NEW. I would like to ask a question, if I may. Have you any knowledge, Mr. Ryan, as to how long it would take to assemble those machines and put them into commission after the parts have been received on the other side?

Mr. RYAN. After the parts have been received on the other side, 60 days. We think 120 days from the time that the parts are ready will be sufficient to have the machines on the front.

Senator NEW. But the point I wish to develop is that it will require approximately three months to assemble the machine and put it in operation after the parts have been received on the other side?

Mr. RYAN. Sixty days.

The CHAIRMAN. This arrangement to which you have just referred was the result of a previous understanding with the British aviation authorities?

Mr. RYAN. You mean the assembly of the Handley-Page?

The CHAIRMAN. Yes.

Mr. RYAN. I think so; but they are doing it for us. It is our operation. We have sent people there to be trained and work into the thing. There is an agreement with them.

Maj. CAMPBELL. There is a contract.

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The CHAIRMAN. When the machines are assembled and tested they are turned over to the Army, to Gen. Pershing? After the machines are assembled and tested, do they belong to the Army or to the English?

Mr. RYAN. To the American Army.

The CHAIRMAN. You say 10 have been sent?

Mr. RYAN. I am sure of 10, and the other 10 were to have gone yesterday or the day before.

The CHAIRMAN. You expect to have how many in February?

Mr. RYAN. One hundred and forty or 150 a month.

The CHAIRMAN. And after that?

Mr. RYAN. That will be the maximum. That is the maximum under the present plan.

The CHAIRMAN. Is this arrangement for the assembling of the parts in England in any manner due to the problem of transportation?

Mr. RYAN. Very largely due to it.

The CHAIRMAN. It is a saving of space and time?

Mr. RYAN. A very large saving of space and time.

The CHAIRMAN. That is because of the size of the machine?

Mr. RYAN. Yes, sir. They will save our aviation centers in France, which, at the best, are bound to be congested. They are bound to be congested from handling these great big machines. When they are put together in England they will be flown directly to the front.

The CHAIRMAN. How many of these machines are to be built and assembled that way?

Mr. RYAN. A thousand under the present contract.

The CHAIRMAN. Under the present contract?

Mr. RYAN. Yes, sir.

The CHAIRMAN. Coming to the Caproni, have the tests of the Caproni machine so far advanced as that you have entered into production?

Mr. RYAN. We have not entered into production. We have been trying to push the engineering work on the drawings. We have started work on the metal parts, because they are the parts that will delay construction when we do get into production. The Caproni machine has not been tested out fully to our satisfaction here, because the Caproni pilots who were sent to test out that machine have been killed; that is, two have been killed, not in that machine, or even one like it, but in machines.

The CHAIRMAN. One was killed in a Caproni machine?

Mr. RYAN. One was killed in a Caproni machine, but not one similar to this one. This week Capt. D'Annunzio, Caproni's engineer, has gone to Detroit and promised to stay there and push the work. The pilot from Italy to fly this Caproni machine that was built at Elizabeth is expected in New York to-day or to-morrow.

The CHAIRMAN. In other words, the Caproni program is held up in part because of the absence of competent Italian flyers to make the appropriate tests?

Mr. RYAN. I do not know, Senator, that we are actually losing time on it, because we are making the metal parts, the slow things to go into production on. Those things will not run into a large amount of money, even if the tests should fail and we should condemn the machine. It would not mean a great loss in the progress

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that we are making now to insure production as soon as the tests are proven to be satisfactory.

The CHAIRMAN. When you were on the stand before you were asked regarding your authority in aviation production, and you made the statement that you regarded yourself as being the official having ultimate authority in those matters. Is it not true that you and Gen. Kenly have a working agreement, approved by the Chief of Staff, regarding the manner in which the types of machines to be constructed are designed or tested, or both, by the military bureau of aeronautics?

Mr. RYAN. Senator, if you do not mind, that is the department of military aeronautics. I know that you want the correct term.

The CHAIRMAN. Yes. Your department then is to produce such a machine?

Mr. RYAN. There is not any actual agreement, Senator, between the department of military aeronautics and the Aircraft Production Bureau, but a general understanding between Gen. Kenly and myself.

(Informal discussion followed.)

The CHAIRMAN. Gen. Kenly stated that there was an agreement that existed between you and himself.

Mr. RYAN. It was understood that we were both trying to reach a working basis so as to facilitate production and give the department of military aeronautics all of the opportunity to test and try out machines and advise us with respect to them so that we could still maintain production.

The CHAIRMAN. Is it the intention, as soon as the sample machines are tried out and tested, to enter also upon their production?

Mr. RYAN. We expect to build, as soon as it can be done, upon the conclusion of satisfactory tests, a thousand of that particular type of Caproni, each with three Liberty 8-cylinder engines.

The CHAIRMAN. Liberty eights?

Mr. RYAN. Yes. We expect to try both the Liberty 8 and the Liberty 12. It is our judgment, or the judgment of the best informed men we have, that the Liberty motor will be the most effective engine in the Caproni machine.

The CHAIRMAN. How soon do you expect to be in production of the Liberty 8?

Mr. RYAN. Some time in December.

The CHAIRMAN. What concerns are to manufacture them?

Mr. RYAN. I think the Buick is the one we expect the first production from, and the principal production.

The CHAIRMAN. Has the Buick Co.'s contract for the 12's been canceled?

Mr. RYAN. No. The Buick and the Cadillac are owned by the General Motors Co. The General Motors Co. took the contract and started work on the Liberty 12 in both places—the Buick and the Cadillac plants. Upon their receiving a contract for the Liberty 8, as I understand it, they intend to put the Liberty 12 production into the Cadillac plant and the Liberty 8 in the Buick. They are very much the same; there are only a few parts that are not identical.

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The CHAIRMAN. Has the contract been let for them?

Mr. RYAN. I do not know that it has been actually signed, but it is understood.

The CHAIRMAN. What is the estimate of price on the Liberty 8?

Mr. RYAN. We do not think it will be far from $3,000.

Senator NEW. Mr. Ryan, I want to call your attention to the evidence elicited by this committee from some of the flyers who have been before it, especially with reference to the De Haviland 4 machine. Take, first, Capt. J. H. Kelley. Do you know Capt. Kelley?

Mr. RYAN. No, sir; I do not know him.

(Senator New here read aloud from page 1052 of the record from the testimony of Capt. J. H. Kelley, setting out Capt. Kelley's qualifications.)

Senator NEW. In response to a question by Senator Reed as to what opportunity he (Capt. Kelley) had had to observe the De Haviland 4 as built in this country, he said that he had arrived for duty July 15 at Wilbur Wright Field and inspected for his satisfaction the American-built De Haviland 4's. He says:

After seeing the bad structural weaknesses on the machines that had just arrived, or had been there a short time from the factory, and hearing the reports on the machines that had been flown, and seeing in the repair shop defects that were taken out of the machine, in my opinion the machine is not safe to fly. I mean to fly. I mean to say it is not an airplane. I do not mean a surface machine. I mean to take it off the ground. Every time a man takes it off the ground he takes his life in his hands.

That is scarcely to be regarded as a favorable opinion by a man of large experience?

Mr. RYAN. I do not know Capt. Kelley.

Senator NEW. Capt. Kelley is just what I have explained to you.

Mr. RYAN. That is his own statement. I have never seen him. I would not know what credence to put in his statement, or what reliance to place on his judgment as to the machine.

Senator NEW. Senator Reed also asked something as to structural defects, to which Capt. Kelley replied, among other things:

The tail plane on its leading edge is spliced. You can take hold of the outside of the tail plane and show a play of at least an inch from where it is spliced to the edge. It is spliced about a foot away from the edge. Where the tail plane is attached to the fuselage there is a very decided play. It must be one-eighth of an inch, so that when the machine is in flight there will be constantly a vibration on that which you must get away from.

Then, further on, he says:

Where the tail plane is attached to the fuselage on its leading edge are two small wires. The late construction on all heavy machines, and on some light machines, is a metal tube going from the leading edge to your fuselage, making that tail plane solid, as it should be.

Still further on he says:

On inspecting a machine that had done about 60 hours' flying I found that both front bolts had been bent and all eight holes had been enlarged by the constant vibration until there was a play in each hole of at least a quarter of an inch; one of them was about half an inch.

Then Senator Reed asked:

Those holes go through what?

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Capt. Kelley replied:

Through the wood. There are four spars on each side, and they take the strain off the wings. The fitting from the fuselage onto these main spars is too short. None of these holes are metal bushed, so that the least play or vibration allows the bolts to chew into the wood, enlarging the hole, and making the machine very dangerous.

Then I asked him to be a little more specific about the danger that would result from the loosening of this bolt hole. He replied:

By these holes becoming enlarged and bending the bolts in ordinary maneuvers the wing is very liable to drop off, which, of course, would kill whoever was in the machine.

Further on, with reference to the same reported defect, he said:

The effect would be that the wings would fall off in the air after 3 to 10 hours, depending upon the strain which would allow that to give. It might be flown for five hours and that particular strain not be put on it.

Senator Reed then asked:

But that machine was delivered for service?

Capt. Kelley replied:

Yes, sir.

Now, is there anything that you can say, Mr. Ryan, or that you care to say about that testimony further than the reply you have already made?

Mr. RYAN. Of course, I do not know anything about that particular machine, but if I understand the testimony correctly, the machine had been flown 60 hours, which is quite a considerable performance for a defective machine, and it is very likely that repairs or maintenance should have been made on the machine after any such period of flight as 60 hours. That is a pretty long service to get without extensive repairs.

Senator NEW. He said:

About June 22 or 23, when I was in Paris, I met a pilot who had flown the American-built D. H. 4. What his name was I can not remember. I asked him his opinion of the machine and he told me it was the poorest job he had ever seen on an airplane, and that he did not like to fly in it at all, and would not fly it unless he was ordered to do so.

Further on he said:

So far as I know, I can not find out what the D. H. is to be used for, so far as the American Army is concerned; but such a combination as a reconnaissance, bombing, and fighting machine—by that, I mean carrying a load of bombs sufficient to go over and do some damage—I do not mean 50 or 60 or 100 pounds of bombs, but enough to do some damage—I do not know of such a machine at all.

That goes to the value of the machine for more than one purpose.

Mr. RYAN. I do not think any of us, Senator, would claim that the D. H. 4 was a fighter, observation plane, and bombing machine of great size, all in one, but it is an observation and bombing machine of a size that gives it great military use and makes it a very effective machine.

Senator NEW. I want to call your attention to the testimony of Maj. Muhlenberg, or to just one point in it, at least. Do you know Maj. Muhlenberg?

Mr. RYAN. Yes, sir; I met him at Dayton.

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Senator NEW. I asked him if he were satisfied from his observations with the present conditions of the De Haviland 4 machine, to which he replied:

No, sir. It is by no means the machine we want for a fighter nor the machine we want for a bomber. As a reconnaisance machine, and, possibly as an artillery observation machine, it would be all right, but certainly not as a fighter nor as a bombing machine. It will not fill the bill of either one.

Do you agree with that?

Mr. RYAN. Of course, he is right. It is not a fighter. We do not class it as a fighter. When he speaks of bombing machines he probably means bombing machines of great size and radius. It is not that. We have got to have machines in between those machines. In between those machines a great deal of space is to be occupied, not only by machines of the De Haviland 4 class, but other machines. There is a wide range between the big bombing machines and the fighter that has got to be covered by several types of machines and can not be covered by any one.

Senator NEW. Maj. Muhlenberg also says, in answer to a question asking him to speak of some of the structural defects:

There are three or four points in which it is not strong enough. * * * I wish to draw your attention here to the two nose drift wires. These two wires [indicating] both run to the same fitting. * * * These two wires run to the top and bottom, respectively, of the first strut, and are the only effective means of preventing the wings sweeping back in a dive.

Do you know whether anything has been done to correct that particular defect?

Mr. RYAN. I do not know, Senator. I am not familiar with the engineering features of the planes, nor am I capable of judging.

Senator NEW. With reference to the matter of the organization, Chairman Thomas asked Col. Bane a question, to which he replied in part as follows:

There is no head or chief of the air service. A single head to the two divisions could quickly, by the use of common sense, settle many questions that now remain unsettled or must be carried to the Secretary of War. The result is that we get nowhere. We are unable to get anywhere. No one is running us. We feel that it is vitally wrong and that there should be a common head to go to and force the other man to listen to reason.

Do you think that is a correct statement of the situation?

Mr. RYAN. I would not coincide entirely. I think it is very desirable that there should be one head to anything and everything, particularly one head to a thing like production and the use of aircraft. I think they have got to go together.

Senator NEW. Mr. Ryan, on that subject, don't you think it is absolutely necessary that there should be one head to any big enterprise?

Mr. RYAN. I think it is very desirable.

Senator NEW. Having complete and absolute control of the organization, whatever it may be, whether it is aircraft or anything else?

Mr. RYAN. I think it is very desirable.

Senator NEW. Don't you think it is essential?

Mr. RYAN. Well, I do not know. Of course, I would not say that a business might not be successful that had two men in two different departments.

The CHAIRMAN. You never heard of such a thing, did you?

Mr. RYAN. It is not often that you find that such a thing is the case. Businesses that are not concentrated are not, as a rule, successful.

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The CHAIRMAN. You can not divide authority without dividing responsibility?

Mr. RYAN. That can not very well be done. I will tell you how it works in this aircraft production business. If one department had the use and the real say so as to the types and another had production, and both were trying to play safe, there would not be any production. You have got this evidence from some of these flyers and some of the engineers with regard to the De Haviland planes, and the men who are producing the De Haviland planes want to be sure that their reputation does not suffer. As soon as they hear a criticism they stop production. Now, some one has got to be at the head of it and take the responsibility. Unless some one takes the responsibility on both sides and says when the argument and discussion shall cease and the work shall commence, of course you do not get very far.

Senator NEW. A man must have complete authority in order to do that?

Mr. RYAN. Yes, sir; he should have.

The CHAIRMAN. That is one thing all of our witnesses agree on.

Senator NEW. I think that is all I care to ask.

Mr. RYAN. Senator Reed asked the other day for some figures. Maj. Campbell has those figures.

The CHAIRMAN. What he wanted in terms was the amount of the expenditures.

Mr. RYAN. As I recall it, he wanted the total expenditures up to the time I took hold. We haven't that date exactly. That was May 20. We have the figures as of May 31. Would that be acceptable? [Addressing Maj. Campbell:] Major, on May 31, what was the total amount of money that had been expended for the production of aircraft?

Maj. CAMPBELL. $370,369,942.60.

Mr. RYAN. Now, from that we will deduct the amount of money that was advanced to manufacturers, and that will come back upon the completion of their contracts. Give that amount.

Maj. CAMPBELL. $24,971,871.10.

Mr. RYAN. Now, give it for the sales of materials to the allies and others.

Maj. CAMPBELL. $11,161,708.

Mr. RYAN. Leaving a balance of expenditure as of May 31 that would represent the amount of money actually paid out that would not come back——

Maj. CAMPBELL (interposing). Of $334,236,363.50.

Mr. RYAN. Give the total commitments on May 31.

Maj. CAMPBELL. They were $764,115,582.09.

Mr. RYAN. I think that is what Senator Reed asked for.

Senator NEW. Yes; I think that is what Senator Reed wanted, Mr. Ryan.

(Whereupon, at 12 o'clock noon, the committee adjourned to meet at the call of the chairman.)

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AIRCRAFT PRODUCTION.

FRIDAY, AUGUST 16, 1918.

UNITED STATES SENATE,
SUBCOMMITTEE ON MILITARY AFFAIRS,
Washington, D. C.

The subcommittee met, pursuant to adjournment, at 2.30 o'clock p. m., in the committee room, Capitol Building, Senator James A. Reed presiding.

Present: Senators New and Reed.

The CHAIRMAN. We will now hear Maj. Brett.

STATEMENT OF MAJ. G. H. BRETT.

Senator REED. You are in the flying corps?

Maj. BRETT. Yes, sir; I am in the air service.

Senator REED. How long have you been in the air service?

Maj. BRETT. I have been in the air service since October, 1915.

Senator REED. What were you before?

Maj. BRETT. I was second lieutenant in the Cavalry.

Senator REED. Are you a graduate of West Point?

Maj. BRETT. No, sir.

Senator REED. How long have you been in the Army?

Maj. BRETT. I have been in the Army a little over eight years.

Senator REED. Did you enter as a private?

Maj. BRETT. No, sir; as a second lieutenant of the Philippine Scouts, and I served a year and two months as a lieutenant in that service, and then I was commissioned in the Regular Service.

Senator REED. Then, you remained in the Cavalry until October, 1915, when you went into the air service?

Maj. BRETT. Yes; I am still in the Cavalry. I am at the present time a temporary major of Cavalry, but detailed to the air service.

Senator REED. And you have been detailed since October, 1915, to the air service?

Maj. BRETT. Yes, sir.

Senator REED. What have you been doing in the air service?

Maj. BRETT. I took the eight months' course at San Diego, the flying course, and passed my qualification test in July, 1916. Then, due to the fact that there was an operation necessary, I came to Washington and was detailed in the office of the Chief Signal Officer on the 1st of September, 1916, for temporary duty. I worked in his office until the first of September, 1917. Then I went to the hospital and stayed there during September. I was on sick leave, supposedly on sick leave, although I was working during the entire

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time during the month of October, 1917, and I sailed for France on October 29, 1917.

Senator REED. Have you been there ever since until you returned?

Maj. BRETT. Until last Sunday, when I arrived in the United States. I am sailing again on the 1st of September.

Senator REED. Your total practical experience in this country, then, with the flying machines was in taking the eight months' flying course?

Maj. BRETT. Yes, sir; that is, of actual flying.

Senator REED. The rest of the time you were in the Signal Corps?

Maj. BRETT. I was in the aeronautical end of the Chief Signal Officer's office.

Senator REED. What were you doing in the aeronautical end of the Chief Signal Officer's office?

Maj. BRETT. I was under Col. Wallace in what is called the financial supply division. We bought all the matériel, airplanes, etc., for the then aviation section of the Signal Corps and paid for the same. I remained in that place until the advent of—there was Col. Thompson and Col. Waldon and Mr. Coffin. They all came in about the time that I left.

Senator REED. You went to France, you have stated, about the last of October, 1917, and have been there since. What have you been doing in France?

Maj. BRETT. I am chief of the matériel division of the supply section of the A. E. F., which means that I handled every bit of material with the exception of furnishing airplanes and furnishing airplane parts and motors and balloon material which is purchased in France comes from the United States.

Senator REED. You have not been doing any flying over there yourself?

Maj. BRETT. Yes, sir; I have done flying, but purely——

Senator REED. You have gone up as a passenger?

Maj. BRETT. I have operated machines also.

Senator REED. To what extent?

Maj. BRETT. To a very minor extent.

Senator REED. Just a few times?

Maj. BRETT. Just a few times.

Senator REED. Without in any way disparaging your ability, I suppose we might say that you are a graduated flyer, but that you have not had much practical experience.

Maj. BRETT. Yes, sir; that would be correct.

Senator REED. You have not had any practical experience in operating planes over the battle lines?

Maj. BRETT. No, sir.

Senator REED. How many flights did you make in France yourself; that is, where you operated the machine?

Maj. BRETT. I probably made 15 or 20.

Senator REED. Short flights?

Maj. BRETT. Yes, sir.

Senator REED. In what machines?

Maj. BRETT. Training machines; that is, the French type of training machines.

Senator REED. You never flew in a pursuit plane?

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Maj. BRETT. No, sir; a pursuit plane is a monoplane.
Senator REED. Well, they have pursuit planes which carry two passengers now, do they not?
Maj. BRETT. Very few. They have a fighting machine which is called a biplane fighter.
Senator REED. You never flew in a Spad or S. E. 5?
Maj. BRETT. No, sir; I have flown in the two-place Spad.
Senator REED. Did you ever fly in the Caproni?
Maj. BRETT. No, sir.
Senator REED. Did you ever fly in the Handley-Page?
Maj. BRETT. No, sir.
Senator REED. Did you ever fly in the Bristol fighter?
Maj. BRETT. No, sir.
Senator REED. Neither American nor English?
Maj. BRETT. Neither one.
Senator REED. Did you ever fly in a De Haviland?
Maj. BRETT. Yes, sir; as passenger.
Senator REED. When?
Maj. BRETT. About three weeks before I left France.
Senator REED. What was it, a 9 or 4?
Maj. BRETT. It was a 4.
Senator REED. How many times did you fly in it?
Maj. BRETT. I took one trip.
Senator REED. How long were you up?
Maj. BRETT. Probably 20 to 25 minutes.
Senator REED. Who operated the machine?
Maj. BRETT. I do not know the man's name. He was a test pilot at the production center No. 2.
Senator REED. How many De Haviland 4's were there on the front when you left France?
Maj. BRETT. I was informed on the day that I left France that there were three squadrons completely equipped with airplanes, personnel, and matériel in the zone of the armies, ready to go to work, composed of 18 machines to a squadron.
Senator REED. In the zone of the armies means somewhere in France?
Maj. BRETT. No, sir; in a locality where they are in a position to operate over the lines at a place called Amanty.
Senator REED. Were they De Haviland 4's?
Maj. BRETT. Yes, sir; with minor changes.
Senator REED. Eighteen to a squadron?
Maj. BRETT. Yes, sir.
Senator REED. That would be 54 machines?
Maj. BRETT. Yes, sir.
Senator REED. Who gave you that information?
Maj. BRETT. Col. Dunwoodie, chief of the supply section.
Senator REED. What date was it that you got this information?
Maj. BRETT. The 30th of July.
Senator REED. You did not see the planes yourself?
Maj. BRETT. I did not.
Senator REED. How did Col. Dunwoodie come to tell you this?
Maj. BRETT. Because one of his duties is to provide all equipment and airplanes for the squadrons going to the front. In the supply section that is one of his duties.

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Senator REED. How long have these planes been there?

Maj. BRETT. As I understand, they were flown from Amanty to the park at Arlie on the 28th, 29th, and 30th of July.

Senator REED. How long a flight is that?

Maj. BRETT. Approximately 125 miles.

Senator REED. Were these machines in the condition that they had been delivered from America or had they had the changes made in them to remedy the defects which had been discovered?

Maj. BRETT. They had had changes made in them.

Senator REED. Do you know what those changes were?

Maj. BRETT. They were all minor changes. There is a V coming down from the fusilage to the axle. It was found that the V would separate on landing. One change was a small steel plate placed in there to strengthen that. Another change was a pair of metal struts running from the tail stabilizer down to the rudder post.

Senator REED. For what reason?

Maj. BRETT. Because it was claimed that the stabilizer was not strong enough to stand the terrific strain of acrobatics.

Senator REED. It not only was claimed but it was demonstrated, was it not?

Maj. BRETT. It was demonstrated that the machine was weak.

Senator REED. It had also been demonstrated that the machine was weak at this other place that you refer to as the V where it separated?

Maj. BRETT. Yes, sir.

Senator REED. What other defects were there?

Maj. BRETT. There was a defect in the construction of the gravity-feed gasoline tank in that they did not take the precaution to handle an oveflow; merely a small mechanical change whereby a drainage pipe was run from the overhead gasoline tank down so that in case too much gasoline was pumped the gasoline would flow out from underneath and there was a change in the carburetor.

Senator REED. A change in the carburetor might be important, might it not?

Maj. BRETT. The motor and the airplane, when they first arrived in France, were subject to the severest criticism by our own people. We had three or four men who were theorists. Their idea was that a motor or a plane were no good unless they were perfect. They worked with the plane and with the motor for approximately three or four weeks, I should say.

Senator NEW. It is understood that the Liberty motor is in use in these planes.

Maj. BRETT. Absolutely; yes, sir. Col. Kilmer, in charge of Isender, which is our biggest training school in France, and which is a model of efficiency, asked that he be sent some of these planes and he was sent four of these planes. Col. Kilmer was commended by the Secretary of War. He put his practical men on the airplane and the motor and they rectified these small mistakes, that were real minor jobs, and flew the machines. After his men had played with them for a while, as you might say, they took these machines and did every stunt in the air that they can do with any chasse machine. Every man in the school was keen for an opportunity to fly the machine. The pilots were enthusiastic about it. They

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changed the carburetor. They found it was getting too much gasoline, so they put outside scoops to force more air into the carburetor to equalize the mixture. They found a certain minor defect in the oil pump in the engine iself, so, in order not to feed so much oil, they bored a couple of holes in the pump whereby, when the piston was forced down, a certain amount of oil would come back of the piston and only a certain amount would be forced back into the engine; and other minor changes of that character, which any practical man would pick up.

Senator REED. You said that the machines first arrived some 30 days ago. Was that when they first arrived?

Maj. BRETT. No, sir. Those machines have been coming into France. There were 354 of them in France on the 31st of July and they had been coming in on the average of about 45 a week prior to that time, as I remember my figures. They started to come in about the 1st of May.

Senator REED. Do you think there were as many as 45 engines over there on the 1st of May?

Maj. BRETT. I can not say offhand, but I moved to Paris on May 12, and as soon as I got to Paris I took up with the people in authority the fact that they must immediately prepare to receive De Havilands, that they were coming in much faster than we had anticipated and at that time, as I remember, I had figures which were based on approximately 45 machines a week.

Senator REED. Did the machines come in in conformity with your figures?

Maj. BRETT. Yes, sir; practically straight throughout at that rate.

Senator REED. Who were these theorists who spent some 30 days and practically condemned the machine?

Maj. BRETT. They were in the supply section in Paris. Maj. Riley was in charge of the engines and there was not so much fault found with the airplane itself as with the motor and it came back on us and I happened to be the second ranking official at the headquarters in Paris and rumors of criticisms came back from the French and I told the officers assembled there that it was absolutely their own fault because they had pulled the motor to pieces and it was time for us to do some boosting and not make so many criticisms.

Senator REED. So you became a booster?

Maj. BRETT. Yes, sir; I have always been a booster since I saw the first flight. I knew an officer who had tested English airplanes for some four years and I asked his candid opinion and he said that it was the sweetest and most responsive motor we have for training and the airplane was one of the easiest handled machines he had ever driven.

Senator REED. You say that the French flyers, however, had condemned it.

Maj. BRETT. Only from a critical standpoint. Some lieutenant would hear somebody higher up say that this was the matter with the De Haviland or the Liberty——

Senator REED. But you found that continuously, so you say, lots of them had condemned the machine?

Maj. BRETT. Yes, sir.

Senator REED. And one of those was Maj. Riley, who was in charge of the engines?

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Maj. BRETT. Yes, sir; he was.

Senator REED. And there was a general feeling of that kind so that you thought it was necessary to boost as against the knockers.

Maj. BRETT. Yes, sir; I do not believe in tearing your own work to pieces until you find out whether it is satisfactory.

Senator REED. There were a good many of these knockers?

Maj. BRETT. Yes, sir; in a small circle.

Senator REED. And all that the knockers said was offset in your own mind by the statement of one British pilot that he thought the machine a very excellent machine.

Maj. BRETT. Yes, sir. Also with other men; I have talked with American pilots. Lieut. ——— made a trip from ——— to ———.

Senator REED. You are speaking now of somebody on this side that we could get?

Maj. BRETT. No, sir; he is still on the other side. He flew the machine from Production Center to Arlie, and I happened to be present when he landed and asked him what he thought about it and he was very keen on the machine.

Senator REED. How many accidents have they had over there on these machines?

Maj. BRETT. I could not say offhand.

Senator REED. There have been a number?

Maj. BRETT. Yes, sir; but I would not say out of proportion to the accidents on other types of machines.

Senator REED. In how many cases have you had accidents due to a defect in the machine?

Maj. BRETT. Quite a few on the landing gear.

Senator REED. How many times has the canvas on the wings loosened?

Maj. BRETT. I could not say.

Senator REED. That has happened frequently, has it not?

Maj. BRETT. I have never heard of that complaint, sir.

Senator REED. I want to ask you whether your attention has been called to this, that the rubber cords for shock absorbers were incorrectly made, the rubber strands not being put under sufficient tension before being covered, and the result is that the estimated weight is too much for underload.

Maj. BRETT. I know that.

Senator REED. Do you regard that as a kind of defect that ought to be remedied?

Maj. BRETT. Yes, sir; it is a defect which is being remedied.

Senator REED. I am asking if it was a defect?

Maj. BRETT. Yes, sir.

Senator REED. Was it in these machines when they first came over?

Maj. BRETT. Yes, sir; it was. I do not know as I consider it a serious defect.

Senator REED. You know of the absence of check cables; that is, that there were no such cables applied to check axles from forcibly striking the running gear V and struts, which are permitted to strike the ground.

Maj. BRETT. That was due to this weak shock absorber cable.

Senator REED. How many men were hurt because of that over in France?

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Maj. BRETT. I could not say. I do not know of anybody who was hurt directly from that point.

Senator REED. Were there some of the flyers hurt over there?

Maj. BRETT. I know a personal friend of mine who made a flight in the De Haviland; when he came down the landing gear broke and the machine nosed up, and outside of a little bump on the head he was not hurt. He was a passenger.

Senator REED. How many men?

Maj. BRETT. I could not say.

Senator REED. Is it or is it not a pretty serious thing to have a machine go to pieces when you land on the ground?

Maj. BRETT. Yes, sir; it is. Understand, Senator, that my knowledge of all these points that you are asking for is purely from observation and hearsay. That is not my line of work, and I am only giving you information which I have picked up from convervations.

Senator REED. Of course, you would not say that your information or any opinion which you have formed from the information which you have picked up in that way would be comparable with the information from Gen. Pershing, based upon an investigation by his officers appointed for that purpose?

Maj. BRETT. No, sir; I would not, except that I would like to hear that information if I may.

Senator REED. I have been reading you some of that information.

Maj. BRETT. Those opinions were largely made up in the office in which I was working.

Senator REED. You do not think that Gen. Pershing would send over a lot of criticisms unless they were pretty well founded?

Maj. BRETT. Unless the theorists made a lot of criticisms which were later rectified by practical men.

Senator REED. You think they might have put them over on Gen. Pershing?

Maj. BRETT. Gen. Pershing never sees the cables. I write many cables myself. If the chief of the air service approves of the cable, it goes through.

Senator REED. You have heard two things from this which you say were correctly stated. Let me see if this is correctly stated: The tail plane is of old type and should be braced with stream-line tubes extending from the leading edges to the lower longeron of fusilage. That was a weakness which has been corrected over there and ordered over here.

Maj. BRETT. Yes, sir.

Senator REED. Supposing that had not been done and the tail had given away, what would be the effect on the flyer in the air?

Maj. BRETT. There would be a crash.

Senator REED. That weakness you would not call a minor weakness, a weakness which would cause a crash?

Maj. BRETT. My word "minor" was used in connection with the quantity of work which would be done to rectify the mistake.

Senator REED. The mistake might be fatal in itself, but it would not take a great amount of work to rectify in some instances?

Maj. BRETT. Yes, sir.

Senator REED. Possibly this old type of tail should be replaced by a new type of tail plane. With a new type of tail plane stream lines would not be necessary.

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Maj. BRETT. That is a technical point and I could not say.

Senator REED. Had you observed that wood screws had been used in various parts of the machine instead of bolts?

Maj. BRETT. I have heard that report.

Senator REED. Is that a defect which might be cured?

Maj. BRETT. I could not say offhand. From the discussion I heard on that subject, which was at the production center, they stated, as I remember it, that the possibility of weakness by boring the tail to put the bolt through might offset the strength added to the machine by the use of the bolt.

Senator REED. You heard somebody state that?

Maj. BRETT. Yes, sir; it was a discussion.

Senator REED. But Gen. Pershing departs in substance and effect from the desirability of changing it.

Maj. BRETT. Yes, sir.

Senator REED. I continue reading from where I stopped: "Notably on washer plates at points where tail advancing without tubes passes through fusilage and on wing-skid fastening." Again: "Nuts have been omitted in securing bolts." What does that mean, bolts put in without a nut on them?

Maj. BRETT. Yes, sir.

Senator REED. That is absolutely inexcusable.

Maj. BRETT. Yes, sir.

Senator REED. That also indicates the grossest carelessness in inspection.

Maj. BRETT. Yes, sir; that is where the fault would lie, in inspection.

Senator REED. And also on the man who failed to put on a nut?

Maj. BRETT. Yes, sir.

Senator REED. And next on the factory inspector who failed to observe it?

Maj. BRETT. Yes, sir.

Senator REED. And next on the military inspector who fails to observe it?

Maj. BRETT. Yes, sir.

Senator REED. Did you observe this:

Bolts, shackles, and cotter pins throughout the machine are in many cases loosely and badly fitted.

Maj. BRETT. I could not say that I have observed it, but I heard that they were very carelessly put together in certain instances.

Senator REED. But it is not a very good policy to put an airplane togther carelessly, is it?

Maj. BRETT. No, sir; it is not.

Senator REED (reading):

Cotter pins have been substituted for buffers.

Do you know about that defect?

Maj. BRETT. I could not say.

Senator REED (reading):

Wing skids badly fitted and ash-packing blocks omitted.

Do you know about that?

Maj. BRETT. No, sir.

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Senator REED. The omitting of an ash block and putting in some inferior material would be a serious matter, would it not?

Maj. BRETT. I could not say. Of course, it would depend upon the construction. I was trying to connect that up with the wing skid.

Senator REED. If the wing skids were badly fitted, what would be the effect of that?

Maj. BRETT. In landing; in case the man tipped one wing up and the wing skid gave away it would detach a wheel.

Senator REED. It might kill him or injure him?

Maj. BRETT. The possibilities of his escape are very high.

Senator REED (reading):

Main compression ribs in the main plane are of hollowed-out type with 3-ply web. These should be solid spruce, to prevent flange from bulging up.

Do you know about that defect?

Maj. BRETT. That would be a question for the technical engineer to decide.

Senator REED. As a matter of fact, do you know whether the flange did bulge up and this defect did develop on the trial of the plane?

Maj. BRETT. I have never heard of that.

Senator REED. Do you know whether that occurred or not?

Maj. BRETT. No, sir.

Senator REED. I read again:

No fairing placed between double-fly wire. All these wires should be of stream-line type and not of cable.

Maj. BRETT. That is a defect that existed, and it is a defect that is not vital by any means. It merely cuts down head resistance, and the French very carefully use that type of construction on chasse where the highest speed is obtainable.

Senator REED. It is desirable?

Maj. BRETT. Yes, sir.

Senator REED. But it was desirable to remove that defect?

Maj. BRETT. Yes, sir.

Senator REED (reading:)

Washers under fixing bolts of ailerone pulley wheels omitted, allowing aluminum packing to penetrate into ribs at leading edges.

That is a serious defect, is it not?

Maj. BRETT. I could not say how serious.

Senator REED. Did you learn of that defect?

Maj. BRETT. No, sir; I did not hear of that.

Senator REED. Did you learn of this:

Tail-skid shock absorber wound so tight that skid throws great strain on cross members of fuselage. Rubbish plate for this skid extends only about 6 inches compared with 18 inches extension fitted in England.

Maj. BRETT. I have heard that there was not enough play in the tail skid. It was wound too tight for it to give as it should give.

Senator REED. What might be the effect of that?

Maj. BRETT. It would be the effect that you would get a jerky pull on the craft bar and the leading end of the absorber which would be of an elastic tension.

Senator REED. Would it put an extra strain on the machine?

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Maj. BRETT. Yes, sir. It has a tendency to bulge down the member to which the shock absorber is attached.

Senator REED (reading:)

There is one 8-inch play in hinge of tail plane. This fitting should be made snug to take all play away.

Did you know of that defect?

Maj. BRETT. No, sir.

Senator REED. Do you know whether that defect has been remedied?

Maj. BRETT. No, sir; I could not say.

Senator REED (reading):

Cotter and split pins were used in adjustment of tail hinge instead of bolts and nuts.

What about that?

Maj. BRETT. I think that was so. I have heard that statement.

Senator REED. What would be the effect of that? A dangerous construction, is it not?

Maj. BRETT. I should say not.

Senator REED. Not dangerous?

Maj. BRETT. Yes, sir.

Senator REED. What would be the object of changing it?

Maj. BRETT. To give you a greater factor of safety.

Senator REED. That is to say that the bolts and nuts are safer than the devices which were used?

Maj. BRETT. Yes, sir.

Senator REED. If they are safer, then the others must have been more dangerous.

Maj. BRETT. Yes; but of course there are many sides to that on the production proposition. Of course, fitting a nut and bolt with a cotter pin in a split head is a much longer production problem than using a good cotter pin, in the end——

Senator REED. You do not really mean to say that there is any serious problem in production in this country arising out of getting bolts and nuts enough for the tail hinges of the airplanes?

Maj. BRETT. Probably not in actually getting the bolts and nuts, but there is a question of the time it takes to place them both.

Senator REED. You do not mean to say it takes any such length of time to put a nut and bolt as would warrant anybody in reducing the factor of safety of machines?

Maj. BRETT. I do not know. I am not experienced enough to say. It is nothing but a plain strap hinge, and a bolt passes through it, and you slip a cotter pin in to hold that bolt. Where there is practically no end strain on that bolt it seems to me it would be a matter of great argument whether that cotter pin would not serve the purpose as well.

Senator REED. Have we any right to take chances on a thing of that kind when bolts are about as plentiful as leaves on the trees, as well as wrenches?

Maj. BRETT. They are not. I handle all that material in France.

Senator REED. Do you know whether there is a shortage in these factories?

Maj. BRETT. I do not know. That is the reason I came over.

Senator REED. I think there are enough wrenches in this country to remove all the bolts and put on all the nuts.

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Maj. BRETT. I think so. I think it is a very debatable question myself. I am not learned enough to give a technical answer.

Senator REED. What about this criticism that "stream line covers were omitted from fin and empennage"?

Maj. BRETT. That is another one of those questions such as the stream line for the cables. It makes considerable difference in the speed of the machine.

Senator REED (reading):

In center section main plane fixing bolts are a very loose fit in spar.

Maj. BRETT. That would be a serious defect.

Senator REED. Do you know how many machines had this defect?

Maj. BRETT. I do not.

Senator REED. That indicates bad construction, does it not?

Maj. BRETT. Yes, sir. It does in a way, except that we have found that those machines are placed in boats where they get affected by salt water after coming from the interior and then they go to the interior and there is a great possibility for drying out.

Senator REED. Does that make the hole larger?

Maj. BRETT. It might have a tendency to, I think. I am not sure. That was discussed in connection with the packing question. They sent several special packers over there to investigate how the machines were coming through after packing in the United States, and it was found on the general average they came through in the most excellent condition, but they could not tell as to the effect of the humidity and the weather on the wooden members of the machine and special care was taken at the inspection center in regard to the inspection problem; officers alone could inspect planes.

Senator REED. Do you think that if a stick of wood was thoroughly seasoned and dried and a hole was bored in it that the weather would make that hole bigger?

Maj. BRETT. I do not know.

Senator REED (reading further):

Wrapping of wire terminals in some cases bad.

Maj. BRETT. Yes, sir.

Senator REED. That is a very dangerous thing, if the wrapping was bad, is is not?

Maj. BRETT. Yes, sir; but that is a thing that is liable to happen.

Senator REED. But it should be avoided?

Maj. BRETT. Yes, sir; it should be tested very carefully.

Senator REED. If good workmanship is employed it would not occur. We would not get bad wrapping from good workmanship?

Maj. BRETT. Practically never.

Senator REED. And you would not get bad wrapping if you had good inspection in the factories?

Maj. BRETT. It would depend upon workmanship because an inspector could not tell except by taking about 10 per cent of the output and inspecting it.

Senator REED. Could not the inspector see this work as it was done?

Maj. BRETT. Yes, sir.

Senator REED. And could they not tell whether it was being properly done?

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Maj. BRETT. Yes; by watching it very carefully.

Senator REED. We are talking about something that requires some care when men like yourself are ordered up in the air 10,000 or 20,000 feet and ride around in it, they ought to have whatever care and diligence we can bring to it.

Maj. BRETT. Yes, sir.

Senator REED. Do you know to what extent these wire terminals were bad?

Maj. BRETT. No, sir; except that I heard that they had found grease on the interior of the wire wrapping. That is, in splicing it down with a saw between the two cables, in opening it up they found a semblance of oil there, showing that the terminal had not been allowed to remain in the hot solder long enough to boil the grease out.

Senator REED (reading):

Pilot's wheel on tail planes should be bolted and not secured with lag screws.

Maj. BRETT. It is a wood screw usually varying in length with a very coarse thread and usually a bolt head. It is practically a heavy type of wood screw.

Senator REED. That is a serious defect.

Maj. BRETT. Yes, sir; they should never trust to a lag screw where a man has to depend upon his wheel. They should be bolted.

Senator REED. Did you know of that defect?

Maj. BRETT. I had not head of it; no, sir.

Senator REED. I read again:

Ashes temporarily have been omitted from axles, which break.

I take it that means a part of ash wood. Did you know of that?

Maj. BRETT. No; sir; I never heard. The axles were very weak.

Senator REED. But you did know that the axles were weak?

Maj. BRETT. Yes, sir; and our people over there put in the axle a piece of oak about 14 or 15 inches long. They inserted it in the axle with the fork coming down like that [illustrating] to take the strain at the fork.

Senator REED. In other words, you took something which was weak and you made it by working on it in the field; you made it so it was all right, or approximately all right?

Maj. BRETT. Yes, sir.

Senator REED (reading):

Air-speed indicator heads are heavy and glassy and this instrument is virtually worse as at present fitted.

Maj. BRETT. That was a very, very poor piece of work. We laughed considerably over that because it looked as if some aluminum manufacturer had gotten a contract to sell pounds and pounds of aluminum. Although it was claimed to have been modeled by an expert in delicate instruments of that type, it seemed to us after handling the Frech air-speed indicators to be a very clumsy instrument.

Senator REED. What did you do about it?

Maj. BRETT. We pulled them off and put on French instruments, as I remember.

Senator REED. I suppose that the air speed indicator is a very important instrument to the aviator?

Maj. BRETT. Yes, sir; that is one of the instruments that he depends upon.

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Senator REED. It might cause an accident, especially if he was an aviator who had been trained to regulate his speed not by his eye but by watching the various instruments on the machine?

Maj. BRETT. We never get those.

Senator REED. Not often, but this committee happens to know that there is a class of aviators who teach their students not to rely upon the eye and the sense of speed but to keep close watch of their instruments.

Maj. BRETT. They should be omitted immediately, because flying is the same as riding horseback or playing tennis or running.

Senator REED. There is evidently a difference of opinion, because some very good authorities have claimed—some of them, at least one of them in charge of one of our great flying schools—that the reason so many accidents occur is because the aviator does not follow his instrument but makes a rough guess at it. It is an important instrument, however.

Maj. BRETT. Yes, sir; it is an important instrument.

Senator REED (reading):

Such things as jammed pulley wheels and joints in the landing gear structure show faulty inspections.

Has your attention been called to that?

Maj. BRETT. No, sir; I have not heard them make that complaint.

Senator REED. Did you learn that the Liberty motor was defective and indicated that the shop inspection was not good and that that was especially true of the Packard?

Maj. BRETT. I have heard the fact stated that our first motors were of Packard construction. Our second lot of motor—I can not say exactly how many motors there were in each lot—came from the Cadillac people, as I understand it, and I have heard the man at the production center say that the Cadillac people were keeping up to their usual construction.

Senator REED. You did not hear the Packard work was not satisfactory?

Maj. BRETT. No, sir; I did not. That is the way it was given out; that the Cadillac were keeping up to their usual careful method of construction.

Senator REED. What do you say about this:

Open carbureter inlet not safe.

Maj. BRETT. No, sir; I do not know about that. The only thing I know of is that they, in order to prevent any chance of fire, formed a jacket around the carburetor, practically inclosing it except for the air intake, so that with a drain running down back under the machine so that if any gasoline escaped from the carburetor it would be caught in this jacket and drained down back underneath the machine, so there would be no chance of fire.

Senator REED. In other words, you agree, then, that this open carburetor inlet was not safe, and neither the British nor the French will use them, and that it was imperative to arrange gasoline tightly piped to carburetor and drain it outside fusilage.

Maj. BRETT. I do not know as to that. I only know they spoke of this outside the construction and also of the gas tank.

Senator REED. Did they change these machines so that they had this outside construction?

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Maj. BRETT. Yes, sir; I understand they did. They put this outside jacket on, and I understand they were at the same time experimenting with an English jacket to put entirely around it for the same purpose.

Senator REED. What do you know about the performance of the carburetor at altitudes?

Maj. BRETT. The only thing I know of the carburetor is that it got entirely too much gasoline; that Col. Kilmer in his workings with the machine cut his carburation by 50 per cent, so he said to me one Sunday morning.

Senator Reed. Did they put on a different carburetor?

Maj. BRETT. No, sir; they were working with the carburetor which was then installed.

Senator REED. What kind of carburetor was used?

Maj. BRETT. I think the Zenith.

Senator REED. The Zenith 52?

Maj. BRETT. I do not know the number.

Senator REED. Do you agree with that, that—

Flight tests in England supervised by Capt. Munford indicate Zenith 52 carburetors not satisfactory and cheaply made but better results from Claudel.

Maj. BRETT. I do not know as to their being cheaply made and unsatisfactory.

Senator REED. Was there some trouble as to the water pipes from the radiator to the pump?

Maj. BRETT. The outlet water pipe running from the radiator to the pump, as I understand, was placed in such a position that to get off the bottom of the oil pump to clean it meant that the entire length of pipe, which is a very cumbersome affair, had to be detached. It was a question of faulty design for the handling of this drain for the oil pump. That is the only thing I ever heard of that lower water pipe.

Senator REED. Did you have some trouble with the oil tanks bursting over there?

Maj. BRETT. Not that I know of.

Senator REED. You did not know then that oil tanks burst in the service because the copper tube vents from the oil tanks were too small?

Maj. BRETT. No, sir; I did not know that.

Senator REED. I call your attention to this:.

Copper tube vents for oil tanks should be five-sixteenths of an inch. Oil tanks burst in service because this tube is too small.

What would be the effect of the oil tank pipe bursting?

Maj. BRETT. The motor would be ruined if he did not notice it and attempted to keep on flying.

Senator REED. If a man was some miles back of the German lines he would probably have to light.

Maj. BRETT. Yes, sir.

Senator REED. The engine would heat on him.

Maj. BRETT. Yes, sir.

Senator REED. And that was a serious defect?

Maj. BRETT. Yes, sir.

Senator REED. That was a fault of engineering originally?

Maj. BRETT. Yes, sir.

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Senator REED. What do you say to this:

Vent for radiators must have a tube leading water where it can not blow on spark plug or pilot, and vent should not be in radiator caps.

Maj. BRETT. That is correct. That has been rectified.

Senator REED. Was that a troublesome thing?

Maj. BRETT. Yes, sir; in view of the fact that an ordinary mechanic, as most ordinary mechanics will do, will fill the radiator to the top, and as soon as the motor heats up a little the water boils with such power as to force the water over the head and it drips down onto the spark plugs and you would get short circuits.

Senator REED. And when you get short circuits up in the air your motor stops.

Maj. BRETT. And you make forced landing.

Senator REED. And when you say you make a forced landing you may have a fall?

Maj. BRETT. That depends upon the experience of the pilot.

Senator REED. Did you have some trouble with the oil tubes from the tanks to the pumps?

Maj. BRETT. I do not know. I thought I heard something about that. I think a question of vibration came in there as to whether the joints were properly constructed to stand the vibration on the lengths of the coil.

Senator REED. I will call your attention to this statement:

Oil tubes from tanks to pumps must be 1 inch or larger, and plug for draining oil tanks to be 1 inch. The present sizes will not work in cold weather.

Maj. BRETT. That was faulty design. I had not heard of that.

Senator REED. Now, I come to the matter which I think you had in mind a moment ago:

Gasoline tube to carburetors not secure against vibration and hose connections to carburetors not secure against detachment.

That would be a serious matter, would it not?

Maj. BRETT. Yes, sir; very serious.

Senator REED. What was done about that?

Maj. BRETT. I do not know offhand. It was rectified and made absolutely safe.

Senator REED. Are you sure it was made safe or did somebody tell you that he thought all these defects had been rectified?

Maj. BRETT. They had all the experience that they could get behind them over in France and they were scared to death on account of the fire problem because we had lost men in the Nieuport, which is a French machine. They turned over to us a bunch of machines in which the copper tubing had not been properly annealed and before we found out where the fault was we lost several men burned up, and as a result of it they were very careful of the testing of all connections.

Senator REED. You had some trouble over there with the De Havilands?

Maj. BRETT. As I said earlier in the day, we had one man burned very badly because there was no outlet from the gravity tank to take the overflow in case the pump kept on working.

Senator REED. Was there some trouble about these priming tubes and thermometer tubes being in the wrong place?

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Maj. BRETT. I could not say.

Senator REED. I read:

Priming tubes and thermometer tubes over manifold should be placed so as to leave carbureters accessible.

Maj. BRETT. That would be a question of design and I did not hear of that.

Senator REED. Was there some question about the oil tubes between cylinders not being secured to the crank case?

Maj. BRETT. I could not say. I do not know.

Senator REED. I read further:

Oil tubes between cylinders should be secured to crank case. Interchanging positions of switches and all high-speed indicators so that switch operates with left hand and close to control lever.

What do you think about that?

Maj. BRETT. That would be for the convenience of the driver, the pilot. Undoubtedly that was on the other side of the board, and a man naturally drives with his left hand and any instrument which he has to change should be in close proximity to his left hand.

Senator REED. Was there some trouble with the control lever?

Maj. BRETT. No, sir; not that I know of.

Senator REED. I read:

Engine control lever and mounting not rigid enough.

You do not know about that?

Maj. BRETT. No, sir; I do not. There was a complaint that there was no control lever on the observer's side. He had a stick called the plane-wing control but not for the engine control.

Senator REED. Did you have some trouble with the battery boxes on account of short circuits?

Maj. BRETT. I could not say.

Senator REED. I read:

Battery boxes does not protect against short circuit.

Do you agree with this that the "present system of main gasoline tank under air pressure should be changed because of danger from fire?"

Maj. BRETT. I could not say.

Senator REED (reading):

And because if penetrated above the liquid level by rifle bullets pressure is lost. Suggest enlarging needle valve on carburetor and altitude adjustments and use of gravity feed tanks in upper wing or pumps between tanks and carburetors. Overflow for gasoline from upper tanks should be conducted to point at least 6 feet from exhaust and visible by pilot.

Do you know whether those suggestions have been carried out in France?

Maj. BRETT. I know that the one in regard to overflow has been carried out.

Senator REED. All of those suggestions could not be carried out in the machine as at present constructed.

Maj. BRETT. I hardly see how they could. The problem of gasoline in all motors is a very serious one that they are testing all the time.

Senator REED. Did you have some trouble over there with the mounts of the guns?

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Maj. BRETT. No, sir; I have heard a good deal of complaint on the type of gears used for synchronizing devices and the Pirrell mount, which is a round mount, which fits around the observer and consists of an arc which is movable up and down and the whole thing turns. There is a ratchet-toothed arc running up each side that is clamped together and those arcs were of very poor metal construction, so if the observer leaned his weight on it there was a possibility of that arc bending; not giving away, but it was too soft.

Senator REED. Iron instead of steel?

Maj. BRETT. It did not seem to be iron. It seemed to be a composition of some sort which would bend, crumple, and not crack off.

Senator REED. Did you know about the quadrant scarfs being too light and the gun jumping badly?

Maj. BRETT. I think that is the thing I have just spoken of.

Senator REED. Was there any trouble about the fixed gun mount fastenings being inaccessible and not properly locked?

Maj. BRETT. No, sir; I never heard of that.

Senator REED (reading):

> Fixed gun-mount fastenings inaccessible and not properly locked in place. Removal and replacement of fixed gun destroys alignments of barrels. Gun can not be adjusted so that barrels are parallel to line of flight and still permit line of sight to clear radiator.

Did you know about that?

Maj. BRETT. No, sir; I did not.

Senator REED. Isn't it a fact that when a man is up in the air in one of these machines he is liable to have to fight?

Maj. BRETT. Absolutely.

Senator REED. Isn't it a fact that if it is true that the fixed gun-mount fastenings are inaccessible and not properly locked in place and that removal and replacement of the fixed gun destroys alignments of barrels, and if it is true that the gun can not be adjusted so that the barrels are parallel to the line of flight and still permit line of sight to clear radiator, that machine is almost defenseless as far as those two guns are concerned?

Maj. BRETT. Yes, sir.

Senator REED. That is a very serious matter to a gentleman up in the air with a Hun coming after him, is it not?

Maj. BRETT. Yes, sir.

Senator REED. This says those have not been remedied. Have they been remedied?

Maj. BRETT. They must have been, because those planes went to the front.

Senator REED. Oh, yes; but is going to the front conclusive evidence that they went to the front in proper shape?

Maj. BRETT. They would not send them to the front unless they were in condition to use the four guns.

Senator REED. Suppose you were short of equipment and guns and planes?

Maj. BRETT. Those people over there would not do that, because they have a personal interest in the man who flies.

Senator REED. We all have a personal interest in him.

Maj. BRETT. Although I do not know that those guns were rectified, yet I would say—I know the men who are working on those guns

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and I can not conceive of their letting those front guns go out with men using them as they are intended to be used.

Senator REED. Is there such a thing as the Aldis ring sight?

Maj. BRETT. Yes, sir.

Senator REED. Do you agree with this, that the—

Aldis ring-sight mountings are inconveniently placed and can not be used by pilots.

Maj. BRETT. I heard a discussion that they were placed so high that the pilot would have to raise up in his seat slightly.

Senator REED. He does, does he not?

Maj. BRETT. I do not know. I never tested it.

Senator REED. What do you call the De Haviland 4—a fighter, a bomber, a reconnaissance plane, or what?

Maj. BRETT. Why, my understanding of it was from conversation that it was to be a combination of an observation and day bomber, which would incorporate its ability to fight.

Senator REED. That is, it is really a defensive fighting machine.

Maj. BRETT. Yes, sir.

Senator REED. It is not to be sent to attack?

Maj. BRETT. No, sir.

Senator REED. It is what you speak of as a scouting plane?

Maj. BRETT. We usually speak of it as a pursuit or chasse.

Senator REED. Do you think it is suitable for a bomber?

Maj. BRETT. It is suitable for a day bomber except that its cruising radius is not sufficient.

Seator REED. That is the point exactly. It is suitable for a day bomber except that its cruising radius is not sufficient. Now, a machine whose cruising radius is not sufficient is not fit for the work that it is not sufficient for.

Senator NEW. Its cruising radius is limited by the quantity of gasoline it carries?

Maj. BRETT. Yes, sir.

Senator REED. If its radius is insufficient, is it sufficient as a day bomber?

Maj. BRETT. It would all depend upon the location in the lines and the type of work they wanted to do. The English do a great deal of bombing just behind the lines on the mobile forces or ground forces.

Senator REED. There you use this type of machine for want of a better one.

Maj. BRETT. Yes, sir. On the other hand, they are building a Handley-Page at the present time with a cruising radius of 1,400 miles to go to Berlin in. That is their one object. And that is the question. I understand it has a two and one-half hour cruising radius.

Senator NEW. According to that cruising radius, 66 gallons at 37 miles to the hour takes 48 minutes to reach 16,800 feet high and allows it a cruising radius of 1 hour and 12 minutes.

Senator REED. Do you agree to that?

Maj. BRETT. I do not know.

Senator REED. You agree that if we could have a better machine with a longer radius than this it would be a desirable thing?

Maj. BRETT. Yes, sir; it would be desirable.

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Senator REED. We are using the De Haviland 4 for want of a better machine.

Maj. BRETT. Yes, sir.

Senator REED. England and France do have better machines, do they not?

Maj. BRETT. They have better machines as regards cruising radius; but, whether it is better in other ways, I do not think it is.

Senator REED. You do not undertake to say?

Maj. BRETT. My general opinion, from what I picked up, is that the De Haviland as it stands now for many other purposes and for speed is better than anything they have in France at this time.

Senator REED. What is the ceiling of the De Haviland 4?

Maj. BRETT. I could not say.

Senator REED. What is the speed of the De Haviland?

Maj. BRETT. I had the impression it was around 115 to 120 miles.

Senator REED. What is its climbing rate for minute?

Maj. BRETT. I do not know. I had the impression it was somewhere around 1,000 per minute up to 10,000 feet; something of that sort.

Senator REED. It carries two people?

Maj. BRETT. Yes, sir.

Senator REED. Are there any French or English machines, bombers, where the pilot and the observer are close together, so they can talk to each other?

Maj. BRETT. I do not know. I could not say as to the relative positions of the pilot and observer on the other machines. I was trying to think of the Salmson, which is the French machine they think so much of.

Senator REED. As a matter of fact, we are preparing now to discard the De Haviland 4 and build the De Haviland 9A, I believe; they are going to call it the U. S. 9.

Maj. BRETT. Yes, sir.

Senator REED. And one of the principal changes in the De Haviland 4 is that they put the observer and the pilot in the new machine close together. Did you know of that?

Maj. BRETT. No, sir. I have only been here three days

Senator NEW. The statement is made by Mr. John D. Ryan, and also by Mr. Nash, the manager of the technical department, that the United States will supplant the De Haviland 4 with another and a better machine just as speedily as that can be done. Let us go back to this question a moment of the ceiling. You say that you do not know what was the ceiling is?

Maj. BRETT. No, sir.

Senator NEW. I do not blame you for that; there are so many reports, but let us assume that Maj. Muhlenberg is right. He is the officer who is in charge of the Wilbur Wright testing field. He says that its ceiling is 15,800 feet and that it carries 75 gallons of gasoline and that its consumption, at full throttle, is 37 gallons per hour, so it carries about two hours' fuel at full throttle. Assume that and assume the time that it takes for the machine to reach its ceiling, and bearing that in mind, I want to ask the question, How far back of the fighting lines do these machines have to go to get their gasoline and supplies?

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Maj. BRETT. The observation squadron, in which the De Haviland might be classed, usually run about 10 or 15 kilometers, which is five-eighths of a mile. That would be somewhere around 6 or 10 miles behind the lines.

Senator NEW. Of course, that varies. Sometimes they can not have them so close.

Maj. BRETT. No, sir.

Senator NEW. So that a man must count out of these two hours the time you take to make the ascent, the time to fly to the German lines, and the time to pass over them to your final objective and make your observations and do your bomb dropping, and then the time to get back, not only to your own lines but to your supplies. That is the situation.

Maj. BRETT. Except that they usually climb from the field straight up. They climb as they go toward the lines.

Senator NEW. You agree that is a very serious defect?

Maj. BRETT. Yes, sir; they should have a greater crusing radius.

Senator REED (reading):

The pilot is so situated in between the wings that he can not see the object at the proper time, just before the observer picks it up.

That is, for bombing.

That the pilot should first pick it up, and he should follow it until the observer can pick it up, and the observer should pick it up far enough in advance to set the bomb right at the proper time. As the target comes under the leading edge of the lower wing the pilot loses sight of it and the observer does not pick it up until it is too late to set the sight from the end seat.

If that is the construction of that machine, it is very faulty for a bomber, is it not?

Maj. BRETT. Yes, sir; I should say so, because it seems absolutely imperative that both men should keep the target in view all the time.

Senator REED. You would not say, if this is true, that this machine is a good day bomber?

Maj. BRETT. No, sir; it is not a good bomber.

Senator REED. And you are not prepared to say that that criticism of Maj. Muhlenberg is not correct?

Maj. BRETT. No, sir; I am not.

Senator REED. Have you known anything about the trouble with the fabric covering these wings?

Maj. BRETT. No, sir; I do not.

Senator REED. You say that you did not have any of that trouble in France?

Maj. BRETT. No, sir; I did not say that. I said that I had not heard of it.

Senator REED. If the fabric over the wings of the De Haviland 4's is looser than in the training planes that you have used, it would indicate bad and dangerous construction, would it not?

Maj. BRETT. Yes, sir; the fabric should be stretched as taut as possible without warping the wing members.

Senator REED. I believe you have already stated that you agree that the stabilizer is not fastened to the machine in the proper manner, and that that defect has been partially, or, you think, altogether remedied in France?

Maj. BRETT. Yes, sir; it was remedied as recommended in that cablegram.

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Senator REED. Do you know how long it takes a De Haviland to reach its ceiling of 15,800 feet?

Maj. BRETT. No, sir; I do not.

Senator REED. These defects which you say if they are true would affect the De Haviland as bomber would affect it even more seriously as a fighter, would they not?

Maj. BRETT. I said a combination observation and fighter. That is, it is not an ideal fighter. A bomber can not be an ideal fighter.

Senator REED. But if it had these defects for bombing purposes which I have just been calling your attention to, those defects would count more against it as a fighter than as a bomber?

Maj. BRETT. No, sir; I do not think so.

Senator REED. You do not agree with Maj. Muhlenberg. I will read the question and answer:

Senator NEW. You have spoken of some of the defects which, in some measure, disqualify the De Haviland 4 as a bombing plane. Do you know of any defects which tend to disqualify it as a fighter?

Maj. MUHLENBERG. I believe those that disqualify it as a fighter are really more serious than those that disqualify it as a bomber. The location of the pilot seat is immeasurably bad.

Senator NEW. That is, the De Haviland 4?

Maj. MUHLENBERG. Yes, sir. I see from the French report we have on the De Haviland that the English De Haviland had a pilot seat in approximately the same place; that is, between the wings and very far in front of the observer's seat. That is unquestionably wrong. I have never sat in a machine in which a pilot could see less than in the De Haviland 4. I have sat in the United States D. 9, as it is called, which is an alteration of the D. H. 9.

Maj. BRETT. Well, I could not positively make a statement on that. That is my idea of the fighter. In that case it would be a fighter, but would fight as a bomber.

Senator REED. That is what I am trying to get at. If this machine had the defects, which I have called your attention to, as a bomber—that is, these short ribs, these defects of construction, and this defect in regard to the machine guns, so that a man could not sight—would not all those defects count against it as a fighter of the character it is intended to be?

Maj. BRETT. Absolutely; they would count against it on that basis.

Senator REED. Assuming now that they are getting out a De Haviland 9, or a U. S. 9, that they strengthen the machines in these parts which have been indicated, that they give it a greater radius of action, that they put the pilot and the observer close together, and that it operates successfully, would you then agree with Maj. Muhlenberg that the De Haviland ought to be withdrawn?

Maj. BRETT. I do not think it should be withdrawn until they have something in production.

Senator REED. I say as soon as they can get something better in production.

Maj. BRETT. Absolutely. If they have a better machine they should give it to us, but I do not think it should be withdrawn until they actually start delivering the new machine.

Senator REED. Do you know anything about the attempt that is being made in this country to produce an entirely new machine in place of the De Haviland 4?

Maj. BRETT. No, sir.

Senator REED. Do you knew anything about the Le Pere machine?

Maj. BRETT. No, sir.

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Senator NEW. It would hardly be fair to ask you if you agree with this statement in answer to a question by Senator Reed:

What suggestions have you to make with reference to a way out of these difficulties?

Maj. MUHLENBERG. The relegation of the D. H. 4 to use as a reconnoissance machine solely, the speeding up of the production of the Le Pere machine, and the adoption of that, probably, as a fighter, and the development of the U. S. D. 9 to the point where it can be used as a day bomber.

Maj. BRETT. I have never heard of the Le Pere machine.

Senator NEW. I want to call your attention to the statement of Capt. Kelley. Do you know Capt. John Hubert Kelley?

Maj. BRETT. No, sir; I do not believe I do.

Senator NEW. Capt. Kelley, of the Signal Corps, is at present in charge of what is called the fighter flight, including the De Haviland 4's, and the testing department at Wilbur Wright Field. He has been in the aviation service since 1915.

Maj. BRETT. Did he just come from France?

Senator NEW. Yes.

Maj. BRETT. Yes, sir; I knew him.

Senator NEW. He has the reputation of being a fighter and a good aviator.

Maj. BRETT. Yes, sir; and he also has the reputation of being very intelligent. He used his head and he used his brains.

Senator REED. He said this, in answer to this question by myself:

Senator REED. What opportunity have you had to judge the De Haviland as built in this country, and how does it compare with the British machine of the same type?

Capt. KELLEY. The answer to the first part of that is: I arrived for duty July 15 at Wilbur Wright Field and inspected for my satisfaction the American-built De Haviland 4's. After seeing the bad structural weaknesses on the machines that had just arrived, or had been there a short time from the factory, and hearing reports on the machines that had been flown, and seeing in the repair shop defects that were taken out of the machine, in my opinion, the machine is not safe to fly. I mean to say, it is not an airplane. I do not mean a surface machine. I mean to take it off the ground. Every time a man takes it off the ground he takes his life in his hands.

Did you ever have the opportunity to take these machines apart and examine them in the same way that Capt. Kelley did?

Maj. BRETT. No, sir; I never had.

Senator REED. I call your attention to one other thing. This is a statement by Capt. Kelley:

The way they make them over here, or the way the American-made De Haviland 4—in the first place, the fabric, whether it is the paint which is put on after it is doped—but every fabric that I tested on a wing would not be allowed to be flown, as far as I am concerned. I would condemn it because it is dead. The fabric must sound like a drum. If it leaves an impression of your finger when you put your finger on it and slowly comes back again, that fabric would be condemned and taken out and new fabric put on until it stretched tight.

Do you agree to that?

Maj. BRETT. Yes, sir.

Senator REED. That is absolutely essential and the most important part of the flying machine. Is that true?

Maj. BRETT. Yes, sir.

Senator REED. Did you have any trouble with the fabric over there?

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Maj. BRETT. I do not know. I never heard a complaint of the fabric. I mean, that is a small thing that can be rectified very readily, and they might have had trouble which they went right ahead and changed without calling attention to it.

Senator REED. I believe you never flew in a De Haviland except once or twice as a passenger.

Maj. BRETT. Yes, sir; as a passenger.

Senator REED. You never examined it in reference to the fighting of a machine gun, did you?

Maj. BRETT. No, sir.

Senator REED. If this is true, what would you say about it:

The guns, as at present mounted for the pilot, are absolutely inaccessible. The sights placed on one side, of course, is absurd. In other words, in pointing the machine—which is the only way the pilot can sight his gun—the pilot has to lean over this way [indicating], and when you have a bead on your enemy's machine you have to sit still. If you lean to one side to sight your gun you automatically would move your hand on your control, and that would throw you out of line on the machine you are aiming at. In the position your guns are at it would be impossible to clear any jams that may occur without standing up on the seat—any jam in the mechanism of the gun itself or in the cartridges.

Maj. BRETT. I do not know. If that is a defect, why, it absolutely throws the pilot out of the fighting class.

Senator REED. If a man like Capt. Kelley, who has had experience as a fighter, should say that—if you had not examined it yourself—you would be inclined to accept his judgment?

Maj. BRETT. I would like to make a statement on that first statement of Capt. Kelley in regard to poor construction. I heard Capt. Burton, in Paris, make the statement that Capt. De Haviland, the officer who designed this machine, and Capt. Shonks, had taken one of our De Haviland 4's and had stripped the covering entirely off of it and had examined it, and that their report was exceptionally favorable. In fact, as I remember the report, it stated that the machine was better constructed for a small machine——

Senator REED. Was that an official report, or did Capt. Burton tell you that somebody had told him?

Maj. BRETT. He is in England at this time.

Senator REED. Did Capt. Burton tell you that he had heard this statement made, or did you hear it made yourself?

Maj. BRETT. No, sir; it is a hearsay statement. Capt. Burton did not say that he had heard the statement made, but that the report was made.

Senator REED. Do you think that if these defects are in this machine, which I have called your attention to from Gen. Pershing's report, that it is possible that Mr. De Haviland, of England, ever said that that work was better work than he had ever put in his machine?

Maj. BRETT. That is the way I heard it.

Senator REED. Don't you think there is some mistake about that? You do not think the English have turned out that kind of work?

Maj. BRETT. He was speaking of the general construction of the machine. The way that the general work is placed in the machine.

Senator REED. Speaking of the general construction, I read:

In your opinion, are we sufficiently careful?

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That means in construction.

Would not a large number of these defects which you have spoken of be eliminated if we used more care and time and were not so keen to produce great quantities of airplanes?

Capt. KELLEY. My experience with American mechanics is that they are in too great a hurry to finish whatever job they are on instead of trying to make that job as perfect as they could make it if they take more time.

Senator REED. In other words, the thing we have struggled for largely in this country is quantity more than absolute accuracy?

Capt. KELLEY. The airplane is practically a hand-made machine. Certain parts of it can be turned out by machinery, but the greatest care and exactness must be used in the selection not only of the material, but the way in which the work is carried on and in the final assembly. I can put it this way: This is a phrase that I used to use in talking to mechanics, "An airplane, in my judgment, every time it is wheeled out of its shed to go in the air must be in the same condition that a race-car driver expects of his machine on any big race that he enters."

Would you want us to understand from what you have said about what Mr. De Haviland, the English inventor of this machine, has said, that the workmanship in these American planes is superior to his?

Maj. BRETT. That is the way I understood it; yes, sir.

Senator REED. Did you observe in the planes that you had over there that the fabric in the wings was apparently dead?

Maj. BRETT. No, sir; I did not. That is, the only thing I could say on that was that I have been through our spare-part depot, which is under my control, and I noticed rows and rows of wings in there; I just touched them and they seemed to be all right.

Senator REED. But you did not make any close inspection?

Maj. BRETT. No, sir. Of course, you understand that you can go out before sunrise in the morning and the fabric on the airplane will be dead, but if you go out as soon as the sun comes up, the fabric will be as taut as a drumhead.

Senator REED. When it is properly covered?

Maj. BRETT. I have seen ideal French fabric placed on the best types of airplanes ready to go to the front, and if you caught their fabric before sunrise the fabric would give very readily to the pressure of the hand, and after sunrise the fabric would be as tight as a drumhead.

Senator NEW. Capt. Johnson testified as to the looseness of the fabric in the wing structure. He went over there in 1914 as an ambulance driver and in a few months enlisted in the French Army and was with the French until we went over when he obtained a transfer to the American forces and was with them until about the 1st of July when he came back to this country as an inspector on machines being made at the Dayton-Wright field. Do you not suppose that he would know of that fact after the experience that he had had, to which I have referred, and do you suppose that he would have made this sort of criticism without having that in mind?

Maj. BRETT. I merely brought that out. It is not with the idea that he was incorrect, because if you take a plane which is setting out in the open under the conditions under which you would operate, if your fabric is then loose there is something distinctly wrong with the way that fabric was put on or cured, but I merely brought the idea out that the fabric does loosen.

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Senator REED. We spoke a while ago about the holes for the bolts being too large and there was some question about whether that was caused by the moisture, the changes in humidity between here and France. Perhaps this would furnish you with an explanation, because Capt. Johnson when testifying about machines in this country said:

I have observed the fittings in the spars under the fuselage. In the machines in which I saw the wings taken out, the holes which held the bolts in the woodwork were calked, and the bolts themselves were bent. The enlargement of the holes was due to the fact that there was no bushing put in the holes and the enlargement of the holes was caused by vibration.

Would that not be the fact?

Maj. BRETT. Yes, sir; and also due to the fact that the bushing was left out.

Senator REED. And that would be a mistake and would be dangerous?

Maj. BRETT. Yes, sir. It would lower the factor of safety.

Senator REED. What do you say about the splicing of the cables on the machines. Is not that very defective?

Maj. BRETT. There is an opinion in France that a long cable should never be soldered or never jacketed; it should always be spliced. The spliced cable is the strongest cable and the ideal way of making an eyelet for a cable and wrapping or jacketing of a cable is used on account of the production proposition and when you are in a hurry to get a thing done, although improperly done it is very strong.

Senator REED. I want to call your attention to some statements of Maj. Reinhart. Did you have any trouble with the radiators over there?

Maj. BRETT. On that one point of boiling over.

Senator REED. Did you have any trouble about their leaking?

Maj. BRETT. Not that I know of.

Senator REED. I call your attention to the experience that Maj. Reinhart had:

On the first eight machines the radiators sprung leaks and went out of commission after the first two hours of flight.

Maj. BRETT. I do not know as to that.

Senator REED. Do you know whether if they had any such defect it has been remedied over there?

Maj. BRETT. I do not know. I never heard that defect mentioned.

Senator REED. Suppose that happened to a machine; that it "broke while being lined up on a concrete floor in a hangar from its weight." That would be pretty bad.

Maj. BRETT. Yes, sir.

Senator REED. Are these machines nose-heavy with the Liberty engines in them?

Maj. BRETT. I have never heard that complaint. I do not remember of hearing anything about that. I think it was stated that they were a little nose-heavy without the observer; that the observer was used as an equalizer for them.

Senator REED. Did you have anything like this over there?

Two machines nosed over in attempting to get them out of the airdrome. The landing gears were then examined, and it was found that the little braces above the axle or trunion, around which is wound the shock absorber, were

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hollow and of very thin metal construction, and on examining different machines it was found the thickness of these trunions was variable, so on some it was bigger than on others so this trunion had to be reinforced before the machines were safe to fly.

Maj. BRETT. No, sir; I never heard of it.

Senator REED. I believe you have already stated that you did observe that the stabilizer was not fastened securely to the fuselage.

Maj. BRETT. No, sir; you asked me if there was, and I said if there was I judged they would take that play up.

Senator REED. I will ask you if you observed that the stabilizer was not fastened securely to the fuselage?

Maj. BRETT. No, sir; I do not know about that. The tail stabilizer is supposed to lower and raise and I think there was a possibility that we had to put in an extra piece where it rested at the end of the fuselage. Whether it was for stream-line purposes or strength, I do not know.

Senator REED. As you only rode in two or three of these machines and were not there for the purpose of inspecting the machine itself, it may not be fair to ask this question, but I ask it for such answer as you think proper. Whether or not you observed such conditions as these—I am again reading from Maj. Reinhart's testimony testifying in reference to these eight machines:

After a very few hours' flight—six hours' average—on these eight machines I personally examined these eight machines and found that the canvas had come loose from the wing structure, the ribs, and spars, and wing beams. I first noticed this by its flapping on the ship while it was in flight, and in examining other machines afterwards I found that the canvas near the fuselage on the bottom of the lower wings had come loose and sagged out from 1 to 3 inches. The canvas on the supper wings near the center section had also come loose on the balance and sagged out to the same extent. On all ships—there were about five of these eight we found in this condition and they were put out of commission until the canvass could be replaced on the wings by our repair shop.

Maj. BRETT. I have not heard of it.

Senator REED. You would not want to say that it did not occur over in France?

Maj. BRETT. Oh, no; of course not. I would not know. That thing might occur and they would repair it without any mention being made of it.

Senator REED. If it did occur, it might be a very serious thing to a gentleman up in the air.

Maj. BRETT. It is possible.

Senator REED. That is what happend to the poor fellows who were killed in the Bristol, was it not?

Maj. BRETT. I do not know about that.

Senator REED. Do you know whether the solder on the wires gave way over there in France?

Maj. BRETT. I know that the eyelets slipped, as we call it. We have two strands coming down this way [illustrating] and a strand slips, and I hape seen the actual eyelets where they have slipped in two or three cases.

Senator REED. That is to say, you have a wire cable or a steel rod which is essential to the support of some part of the machine.

Maj. BRETT. Yes, sir.

Senator REED. And at the end of that the method of fastening it to make a loop of the wire cable, drawing it together upon itself, and

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the method in France and England is to splice the cable at that point together.

Maj. BRETT. Yes, sir; in most of them.

Senator REED. But, in this country, in the De Havilands at least, we have been adopting the method of soldering these strands together, and we have found that they give way or pull and stretch.

Maj. BRETT. Yes, in certain instances.

Senator REED. Do you believe that any machine is safely constructed that has the main support of the fuselage, and by that I mean the long pieces that run lengthwise with the fuselage that are about an inch and a quarter or an inch and a half square—I am referring to the longerons—where the longerons are bored through as many as 8 to 10 times in 10 inches and bolts inserted. Do you believe that is safe construction?

Maj. BRETT. I could not say. My common sense would say no.

Senator REED. Do you know that that is the construction of the De Haviland?

Maj. BRETT. No, sir; I do not.

Senator REED. Did you ever take one of these machines to pieces and take the canvas off of it and look at the internal structure?

Maj. BRETT. No, sir.

Senator REED. Of course, if you had done that you might have discovered features or elements of strength or weakness in the machine which are covered up by the fabric. [Senator Reed hands the witness a photograph of the De Haviland machine in which the longeron broke because of the excessive number of bolt holes.]

Maj. BRETT. That does not look as if it was good common-sense construction.

Senator REED. And you would not care under these conditions to order anybody up on the battle front in a De Haviland 4 until you had remedied the defects that we have been going over to-day, would you?

Maj. BRETT. All of those defects, I do not know; but I feel, knowing the men who are working on them——

Senator REED. I am asking you to put yourself on your own responsibility and judgment and not on what somebody else is doing, but on your own responsibility; until the principal of these defects or the chief of them is remedied, you would not feel like sending young men up to battle unless you are forced to send them?

Maj. BRETT. No, sir; not unless those defects were cleared up which you may have shown me there.

Senator REED. You became pretty well acquainted with the character of the machines which our flyers were using on the front, our machines which had just arrived?

Maj. BRETT. I did not become acquainted with them from personal contact; no, sir.

Senator REED. By the way, the De Haviland 4's you stated were arriving, so that there were enough to equip a certain number of squadrons?

Maj. BRETT. Three squadrons, with 18 to a squadron.

Senator REED. When those three squadrons were sent, that was the first practical use of the De Haviland which was contemplated?

Maj. BRETT. Yes, sir.

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Senator REED. Up to that time no De Haviland had been on the fighting front?

Maj. BRETT. No, sir.

Senator REED. And whether those De Havilands have been put into battle or not, you do not know?

Maj. BRETT. I do not.

Senator REED. And that was on the 30th day of July?

Maj. BRETT. Yes, sir.

Senator REED. I will now return to my other question. You said that you did not have any very ample opportunity to observe the kind of machines—that is, the make of machines—that our men were using before the De Haviland arrived and which they must still be using in large quantities?

Maj. BRETT. Yes, sir.

Senator REED. You can state what you learned in reference to the kind of machines our men were using.

Maj. BRETT. They were using the Spad and the Nieuport, English chasse machines; the Salmsons for observation work and the Breguets for night bombing.

Senator REED. Do you know about how many Spads we have in use?

Maj. BRETT. No, sir. I have those figures over in my papers that I brought back from France with me.

Senator REED. You would not object to looking at those figures and giving us the number of Spads and the number of Nieuports and the number of Salmsons and the number of Breguets, and let us have them to-morrow some time?

Maj. BRETT. Yes, sir.

(Subsequently Maj. Brett submitted the following memorandum, which is here printed in full, as follows:)

AMERICAN EXPEDITIONARY FORCES,
AIR SERVICE, SUPPLY SECTION,
AIRPLANE AND MOTOR DIVISION,
August 1, 1918.

Memorandum to Maj. Brett.

1. The following list shows the approximate number of airplanes received from European sources to July 31, 1918:

School planes:		
Breguet 14E2	55	
Nieuport 17	75	
Nieuport 21	193	
Nieuport 23	47	
Nieuport 24	77	
Nieuport 24bis	112	
Nieuport 27 (Rhone 80)	75	
Nieuport 27 (Rhone 120)	183	
Nieuport 80	148	
Nieuport 81	140	
Nieuport 83	211	
Caudron G3	162	
Caudron G4	10	
Farman F. 40	8	
Morane XXX	6	
Rouleurs R. 2	104	
Voisin 8	8	
Avro (English)	6	
		1,617

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Combat planes:		
A. R. 1	21	
A. R. 2	89	
Breguet 14A2	63	
Breguet 14B2	30	
Nieuport 28	197	
Salmson 2A2	267	
Sopwith A2	237	
Sopwith B2	97	
Spad VII	59	
Spad XI	34	
Spad XIII	324	
Spad XII (cannon)	1	
Sopwith Camels (English)	45	
Sia (Italian)	47	
Caproni (Italian)	1	
		1,512
Grand total of all types		3,129

By authority of Capt. Satterfield:

M. B. MOORE,
First Lieutenant, A. S., S. R. C.

Senator REED: The Spad is a single-seater fighter?

Maj. BRETT. Yes, sir.

Senator REED. And so is the Nieuport, is it not?

Maj. BRETT. Yes, sir.

Senator REED. Is the Nieuport an up-to-date machine?

Maj. BRETT. The Spad is considered by people who seem to use it—there is a great difference of opinion on it, but there seems to be a tendency to go to the Spad.

Senator REED. And we use Nieuports because we can not get enough Spads?

Maj. BRETT. They are being converted to the Spads as fast as they can.

Senator REED. The Nieuports we got from France were a class of Nieuports that the French had practically discarded. That is the truth, is it not?

Maj. BRETT. I do not think that. Somebody asked me that question before to-day, if we were not taking discarded French airplanes, and I do not think that we are. I do not order those. But the French Government and our Government are working very close, hand in hand, and as I understand it some French contracts which we have, we get a certain percentage of the output. If the output is 50 machines a day we get 10 per cent. We go in and take 5 of any of those machines.

Senator REED. You do not mean to say that we get 10. You are illustrating?

Maj. BRETT. Yes, sir. That is an illustration. In other words, when the Nieuports come along we get our percentage. They must use those Nieuports on their own front, because our percentage is very small.

Senator REED. You are sure that we do not get some machines of a class that they are no longer producing?

Maj. BRETT. I think not.

Senator REED. Do you know of any way by which that fact can be absolutely ascertained within the next few days?

Maj. BRETT. No, sir; I do not. I know that on the inspection problem we are much superior to the French. That those machines come

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out and we will throw back, I would say, 50 per cent of the machines offered to us, and yet they take those machines which we reject and put them into their own service.

Senator REED. What do they do with them first?

Maj. BRETT. They do not do anything. They have been passed by their own inspectors and rejected by our inspectors.

Senator REED. Are you sure of that?

Maj. BRETT. I have heard a big argument about it. The French Government was complaining of the fact that we were turning down so many machines which had passed their inspectors.

Senator REED. About the Salmson machine, which is an observation machine, is that a French or English machine?

Maj. BRETT. It is French. It is called Salmson because that is the name of the motor which is in it.

Senator REED. Is that machine an up-to-date machine?

Maj. BRETT. I think it is right up to date.

Senator REED. Have we as many of the Spads or Nieuports as we need over there?

Maj. BRETT. I think that we have now more machines than we have personnel or material to keep them up.

Senator REED. In France?

Maj. BRETT. Yes, sir.

Senator REED. Why is it, then, that we are so anxious to get other planes over there?

Maj. BRETT. We have plenty of chasse machines, Nieuports and Spads.

Senator REED. Have we plenty of machines, speaking generally, of all classes?

Maj. BRETT. No, sir.

Senator REED. What are we short in?

Maj. BRETT. In observation, day bombers, night bombers, and night reconnoisance and observation. That is, an observation is really a reconnoissance machine.

Senator REED. We are short in the sense that we can not get enough Spads and have to take Nieuports. You say that the Spad is supplanting the Nieuport.

Maj. BRETT. Yes, sir.

Senator REED. But we are short in every other type of machine.

Maj. BRETT. Yes, sir.

Senator REED. How many squadrons have we that are equipped with chasse machines—that is, squadrons that are to use the fighting machines?

Maj. BRETT. I have those figures and I will give them to you tomorrow.

(Subsequently Maj. Brett submitted the following memorandum which is here printed in full as follows:)

AMERICAN EXPEDITIONARY FORCES,
AIR SERVICE, SUPPLY SECTION,
AIRPLANE AND MOTOR DIVISION,
July 30, 1918.

Memorandum to Maj. Brett.

1. Replying to your request for information as to squadrons in operation, we now have operating on the front the following:

6 squadrons, Salmsons.
8 squadrons, Spad, type 13.

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1 squadron, Spad, type 7.
1 squadron, D. H. 4.
1 squadron, Nieuport 28.
1 squadron, Breguet day bombers.
1 flight night reconnaissance, ARS.

2. We shall deliver:
During the month of August—
17 observation squadrons.
8 pursuit squadrons.
During the month of September—
20 observation squadrons.
7 pursuit squadrons.
During the month of October—
15 observation squadrons.
8 pursuit squadrons.

3. In addition to the above, there will probably be delivered D. H. 4 day bombing squadrons, numbers unknown, owing to the experimental work which is still being carried on.

JOHN M. SATTERFIELD,
Captain, A. S., S. C.

Senator REED. I will ask you at the same time, Major, that you give us those figures, to be so kind as to give us, if you have the data, the number of machines with the French and English Army per 10,000 men or 1,000 men, or some other unit, so that I can compare the number of our machines with the number of our troops and lay that alongside of similar conditions in France and England.

Maj. BRETT. I can not give you that. I have not got it.

Senator NEW. Major, Gen. Kenly told us when he was here as a witness that we had been unable to get from the French the number of machines that we had expected to get from them and had really contracted for, because we had failed to keep our contract with the French in the delivery of materials. Do you know anything about that?

Maj. BRETT. Well, one of the departments in my division handles what we call the J. G. White contract. There was a contract written some time over a year ago whereby the United States Government would deliver to the French Government certain raw materials for completed projects. The present status of that contract is that about 75 per cent of it has been delivered and that, due to the fact that the French have not lived up to their side of it—that is, in other words, they have not given us the equivalent value of airplanes or completed finished product—I am personally holding in my depots lumber and steel and forgings which belong to the French Government because they have not delivered what the higher authorities considered a just quantity. I have quantities of that material in my depots at the present time.

Senator REED. Was that the only contract that you know of in which we failed to make deliveries?

Maj. BRETT. We did not fail. There was a transfer.

Senator REED. Well, in which there has been a failure or refusal.

Maj. BRETT. Yes, sir; that is the only one I know of. That is the J. G. White, and from our standpoint over there the French have not delivered and we are holding the material as a knife over their head to try and make them deliver completed material.

Senator REED. There has been a difference of opinion at all events, whatever the cause and wherever the fault lies, between the French and the American organizations, as the result of which there has been

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a failure or refusal on the part of the French to deliver the number of planes we had expected to obtain from them for our use. Is that the case?

Maj. BRETT. That is about the way I should say it; yes, sir.

Senator REED. You say it was on the 30th of July that Maj. Dunwoody reported to you that those three——

Maj. BRETT. He told me that he had completed his promise of three squadrons. He had promised two squadrons and he had sent up an additional squadron.

Senator REED. So that three squadrons had been furnished on the 30th day of July?

Maj. BRETT. Yes, sir.

Senator REED. Which had not yet been flown, as far as you know?

Maj. BRETT. Which had not flown in fighting on the front.

Senator REED. That is what I meant, in combat.

Maj. BRETT. Yes, sir.

Senator NEW. I happen to have a letter this morning dated July 30 and written by an officer of some prominence over there with whom I have been long acquainted. He is on the front and he writes as follows. I quote a paragraph from his letter:

> Knowing your interest in the work of the air service I know it will be of interest to you for me to tell you a little experience that I had which shows the great need of many fast planes being sent over here. Three boche planes came down over my P. C., which is an abandoned, destroyed farmhouse kitchen, and came down so low that I could see the drivers' faces, and not only dropped signal rockets to direct the fire of their guns on this point but had the nerve to machine-gun us, and then, when we got under the roof, they dropped bombs. We did not have enough planes to drive the enemy off at that time. After he had repeated this a few times we were eventually saved by having some British gun tanks drive up and put up a barrage. In desperation some of our officers fired their pistols at the aviators, which shows how ridiculous it all is.

It looks as though we needed all the airplanes we can get over there, does it not, Major?

Maj. BRETT. Yes, sir, we have four squadrons over there which, from official reports, average about one American to every eight boche. Of course, the French fly about an hour and a half a day and the English fly anywhere from two to two and a half hours a day, and our men fly from four to six hours a day.

Senator REED. Because we do not have the machines?

Maj. BRETT. We have not got the organization to put them up, but the French and the English are both dropping off, not only in the airplane service but in everything.

Senator REED. What do you mean by that?

Maj. BRETT. I mean that they are turning, as fast as they can, everything over to the Americans. Our men will take the work and, therefore, they let them have it. I was in Chateau Thierry five days after the Kaiser was there. I asked my officers how they were coming on and they said, "We have not any airplanes here," and I said, "How do you know we have not?" and they said, "We do not see any stars." And I said "We do not carry stars. We carry a red, white, and blue circle with a white center."

Senator REED. Who said that?

Maj. BRETT. A couple of Infantry officers who had just come off the front.

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Senator REED. Do you want to say or not that we have enough airplanes over there now?

Maj. BRETT. No, sir.

Senator REED. We are away short?

Maj. BRETT. Away short.

Senator REED. Short of fighters and everything?

Maj. BRETT. Yes, sir; there is no question about that.

Senator REED. And our men stay up four or five hours as against the French one and a half hours, because their men have more machines and men?

Maj. BRETT. No, sir; they do not cover a bigger sector than we do. They simply will not fly if it is misty or rainy or the weather conditions are not good. Our men will fly in anything and they will fly 10 hours a day.

Senator REED. Men like that ought to have something good to fly in.

Maj. BRETT. Each unit on the fighting line is well enough equipped but we have not enough units.

Senator REED. But you have enough flyers over there to go on the front?

Maj. BRETT. Yes, sir.

Senator REED. You have not enough machines?

Maj. BRETT. We are getting those all the time. The chasse pilot is a very highly trained organization.

Senator REED. But you have more men than machines?

Maj. BRETT. No; not exactly.

Senator REED. Did I not understand you to say that we needed chasse machines?

Maj. BRETT. I heard a scrap going on in the office about a week before I left due to the fact that a certain number of chasse pilots were requested to take machines from one place to another, and he said that there was a shortage of pilots and, therefore, he should do nothing for them.

Senator REED. Do I understand that the complaint that flyers have been kept over there nearly a year without work and with all this controversy we have had regarding more and still more planes that actually now we have not got more flyers than planes?

Maj. BRETT. I could not say. I do not know.

Senator REED. Major, we are very much obliged to you for your testimony.

(Whereupon, at 4.45 o'clock p. m., the subcommittee adjourned.

During the hearings Senator Frelinghuysen submitted to the subcommittee a statement showing the status of program contracts which is here printed in full, as follows:)

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EXHIBIT A.

Statement showing status of program contracts for airplanes, engines, and spare parts, May 25, 1918, for cities of Buffalo, Detroit, Dayton, Indianapolis, and Cleveland.

Date.	Order No.	Contractor.	Quantity.	Description.	Unit price.	Total value.		Scheduled date for beginning delivery.	Date delivery commenced.	Number delivered to May 25, 1918.	Per cent completed as of May 25, 1918.
						Cost plus.	Fixed price.				
		BUFFALO.									
		PLANES.									
June 30, 1917	8435	Curtiss Aeroplane & Motors Corporation.	600	JN4D, with engines	$8,000.00		$4,800,000.00		Sept. 29, 1917	600	100
Sept. 15, 1917	20001	do	1,400	JN4D	4,750.00		6,650,000.00		Dec. 1, 1917	1,400	100
Jan. 5, 1918	20431	do	600	do	4,750.00		2,850,000.00	Dec. 29, 1917	Jan. 26, 1918	501	83½
Apr. 30, 1918	21036	do	700	do	4,750.00		3,325,000.00	May, 1918	No delivery		
Jan. 10, 1918	20387	do	2,000	Bristol Fighters		[1] $13,500,000.00			Apr. 23, 1918	11	½
Apr. 13, 1918	20954	Wire Wheel Corporation.	500	Sets of wheels with rims for Handley-Paige.			48,000.00	May 1, 1918	No delivery		
		SPARE PARTS.									
Nov. 9, 1917	20215	Curtiss Aeroplane & Motors Corporation.	1,000	Spares for JN4D	Various.		831,435.00	Soon as possible	Dec. 1, 1917		72
Aug. 15, 1917	9479	do	26	Odd lot parts JN4D	do		2,700.00		No delivery		
	9745	do	26	do					do		
Oct. 30, 1917	20175	do	708	do	Various.	[1] 54,580.00		With order 20086	Dec. 1, 1917		100
Mar. 4, 1918	20708	do	150	Odd lot parts JN4D, landing gears.	300.00		45,000.00	Soon as possible	Mar. 15, 1918		100
Jan. 7, 1918	20400	do	510	Odd lot parts JN4H			39,810.00	do	Mar. 11, 1918		90
Apr. 30, 1918	21037	do	879	Parts JN4H		[1] 175,000.00			No delivery		
Apr. 3, 1918	20907	do	1,200	Parts for Bristol Fighters.		[1] 5,690,100.00			do		
Feb. 19, 1918	20662	Wire Wheel Corporation.	500	Parts for JN4D	9.50		4,750.00	Feb. 26, 1918	do		
		DETROIT.									
		PLANES.									
								400 SJ1 December, 1917.	Jan. 15, 1918	400	100
Mar. 29, 1918	20207A	Fisher Body Corporation.	400 4,000 400	SJ1 DeHaviland 4 J1 planes		[1] 34,000,000.00		First 2,000 D. H. 4's comp'leted by Oct. 1, 1918.	No delivery		

		ENGINES.									
Oct. 11, 1917	10138	Packard Motor Car Co.	6,000	U. S. 12 Liberty		[1] 42,000,300.00		November, 1917	Dec. 8, 1917	899	15
Do.	10139	Linco'n Motors Co.	6,000	do		[1] 42,000,300.00		do	Mar. 26, 1918	211	3½
Dec. 4, 1917	30035A	Ford Motor Co	5,000	do		[1] 35,000,250.00		April, 1918	No delivery		
Dec. 13, 1917	30071	General Motors Co.	1,000	do		[1] 7,700,055.00		May, 1918	do		
Mar. 29, 1918	30071-2	do	1,000	do		[1] 6,750,000.00		September, 1918	do		
		SPARE PARTS.									
Oct. 31, 1917	20207-1	Fisher Body Corporation.	60	Odd parts SJ1			7,500.00	Immediately		60	100
Nov. 15, 1917	20207-2	do	150	do		[1] 7,500.00		Prior to Mar. 1, 1918.		150	100
Mar. 13, 1918	20207-3	do	30	do		[1] 3,000.00		Immediately		30	100
Do	10138-4	Packard Motor Car Co.	6,000	Spare parts for Liberty motors.		[1] 6,000,000.00		Soon as possible			
Jan. 24, 1918	27	Ford Motor Co	400,000	Cylinders	8.25		3,300,000.00				
Mar. 7, 1918	10139-3	Lincoln Motors Co.	6,000	Spare parts for engines		[1] 6,000,000.00		Soon as possible			
Apr. 1, 1918	30071-3	General Motors Co.	2,000	do		[1] 2,000,000.00		With engines			
		DAYTON.									
		PLANES.									
Mar. 29, 1918	20038A	Dayton-Wright Airplane Co.	4,000 400	De Haviland 4's SJ1		[1][2] 33,793,500.00		First 1,000 D. H. 4's completed by Aug. 1, 1918. 400 SJ1 December, 1917.	Dec. 22, 1917 Jan. 19, 1918	165 400	4 100
		SPARE PARTS.									
Mar. 29, 1918	20038A	Dayton-Wright Airplane Co.	400 3,266	Spare parts for SJ1 Odd parts	Various.	([3])			Feb. 4, 1918		94
Apr. 23, 1918	20038A1	do	250	Spare parts for De Haviland 4's.		[1] 1,137,500.00		Soon as possible	Feb. 18, 1918		19
Apr. 24, 1918	20038A2	do	6	do		[1] 22,400.00		do			
Apr. 30, 1918	20038A3	do	250	Propellers		[1] 27,500.00		Completed by May 1, 1918.			
		INDIANAPOLIS.									
		PLANES.									
Sept. 15, 1917	7449	Nordyke-Marmon	1,000 3,000	A7A U. S. 12 Liberty		21,000,150.00		January, 1918	Nov. 14, 1917 No delivery	1,000	100
		SPARE PARTS.									
Apr. 2, 1918	7449-2	Nordyke-Marmon	3,000	Spare parts for U. S. 12 Liberty.		3,000,000.00		Soon as possible			

[1] Estimated.

[2] Including spare parts.

[3] Same order planes.

EXHIBIT A—Continued.

Statement showing status of program contracts for airplanes, engines, and spare parts, May 25, 1918, for cities of Buffalo, Detroit, Dayton, Indianapolis, and Cleveland—Continued.

Date.	Order No.	Contractor.	Quantity.	Description.	Unit price.	Total value.		Scheduled date for beginning delivery.	Date delivery commenced.	Number delivered to May 25, 1918.	Per cent completed as of May 25, 1918.
						Cost plus.	Fixed price.				
		CLEVELAND.									
		PLANES.									
Apr. 13, 1918	20938	Ohio Rubber Co	.....	Strand shock absorber for 500 Handley Paige.	[1] $0.48	.....	$48,000.00	May 1, 1918	No delivery	.....	.....
		SPARE PARTS.									
Oct. 8, 1917	20068	Rubay Co	300	Spare parts for JN4D	Various.	.....	233,047.50	January, 1918	Feb. 15, 1918	.....	71
Nov. 24, 1917	20166A	do	300	do	Various.	.....	274,542.00	Soon as possible	Feb. 20, 1918	.....	85
Oct. 17, 1917	20136	do	345	Odd spare parts	Various.	.....	30,015.00	Prior to Apr. 1, 1918.	Feb. 23, 1918	.....	70
Oct. 31, 1917	20180	do	195	do	Various.	.....	16,612.50	do	Dec. 31, 1917	.....	77
Dec. 28, 1917	20386	do	200	Spare parts for JN4D	Various.	.....	173,728.00	.....	Not given	.....	51
Jan. 19, 1918	20398	do	200	Spare parts for JN4H	Various.	.....	164,128.00	Soon as possible	do	.....	88
Feb. 2, 1918	20422	do	500	Spare parts for D. H. 4's	.....	[2] $2,415,000.00	.....	do	No delivery	.....	.....
Feb. 19, 1918	20656	do	2,000	Odd parts for JN4D	2.25	.....	5,500.00	do	do	.....	.....
Aug. 22, 1917	9651	Ackerman Wire Wheel Corporation.	1,000	do	55.00	.....	55,000.00	Sept. 5, 1917	.....	.....	.....
Dec. 13, 1917	20324	do	36	do	250.00	.....	9,000.00	Soon as possible	.....	.....	.....
Dec. 24, 1917	20382	do	50	Odd parts for JN4H	250.00	.....	12,500.00	do	.....	50	100

[1] Per yard.

[2] Estimated.

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