

INVESTIGATION OF THE NATIONAL
DEFENSE PROGRAM

ADDITIONAL REPORT
OF THE
SPECIAL COMMITTEE INVESTIGATING THE
NATIONAL DEFENSE PROGRAM

PURSUANT TO

S. Res. 71

(77th Congress, and S. Res. 6, 78th Congress)

RESOLUTIONS AUTHORIZING AND DIRECTING
AN INVESTIGATION OF THE NATIONAL
DEFENSE PROGRAM

(Submitted under authority of the order of the
Senate of July 7, 1943)

AIRCRAFT



JULY 10, 1943.—Ordered to be printed

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PROGRAM**

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INVESTIGATION OF THE NATIONAL DEFENSE PROGRAM

JULY, 10, 1943.—Ordered to be printed

Mr. WALLGREN, from the Special Committee to Investigate the National Defense Program, submitted the following

ADDITIONAL REPORT

[Pursuant to S. Res. 71, 77th Cong., and S. Res. 6, 78th Cong.]

AIRCRAFT

The airplane has proved to be the most important single weapon in the present war. The possession of large numbers of planes was of incalculable assistance to Germany in conquering France and Poland. Air superiority enabled Germany to conquer Crete despite the naval superiority of the British, and the lack of such air superiority cost Germany North Africa and ultimately will cost it the war.

We have succeeded in building an air industry in the United States which our foes cannot hope to equal. England has a splendid aircraft industry, and Russia, about which little is known, is producing large numbers of planes. The German aircraft industry has suffered heavily from the bombing of Germany and is limited as to certain vital supplies both for the construction and the operation of planes. The Japanese aircraft industry never had a capacity comparable to ours. To reach a production remotely comparable with our own it would be necessary for Japan to expand her industrial resources from the ores to the finished products. She would have to create facilities for mining ores, for smelting and refining, for rolling, casting, forging and extruding, for milling and machining, and, finally, for the assembly of planes. This is impossible for Japan because she cannot produce the machine tools with which to undertake so vast a program. Consequently, we can be certain that we will be able to oppose Japan with incomparably superior air power. Our difficulties will be those of obtaining bases from which to operate against the Japanese and in overcoming the tremendous advantage which they have gained by acquiring numerous such bases in the islands of the Pacific.

During the calendar year 1942 approximately 48,000 airplanes were produced in the United States. During the 12 months ending June 30, 1943, we have produced 64,000 planes. The present enormous rate of production will be vastly increased. Moreover, there will be a greater proportion of the best and most useful planes.

The planes already produced and those to be produced within the next year will largely determine the result of the war. The advantages already obtained are known, but are proportionately very much smaller than those which we may reasonably expect. There is, and of necessity must be, an extended time lag between the production of a plane at the factory and the actual use of the plane at the front.

Our airplanes are being subjected to constant modifications, in some instances several hundred different modifications for a single type of plane. Some modifications are slight and not difficult to make, and some are of such major importance as almost to require the reconstruction of the plane. Some of the modifications are made at the aircraft plants. Others are made in modification centers under the direction of the Army and Navy and several industrial concerns. In some instances additional modifications are incorporated abroad before the planes are put into actual combat. The completion of such modifications sometimes requires many weeks.

On first examination it seems most uneconomical to produce an airplane and then later to modify it to make it suitable for use at the front. The reason for this practice is that an attempt to introduce too suddenly extensive modifications into a large aircraft plant results in a great decrease in the number of planes produced by the plant. For that reason, it is better to make the modifications in special modification centers until such time as the aircraft plant has had an opportunity to make orderly plans to incorporate the modifications into its production lines.

Sometimes the delivery of planes has been further delayed by the inability to obtain all the necessary instruments and equipment for use at particular fighting fronts for which the planes are destined. For instance, planes have to be "winterized" for use in cold climates and "summerized" for use in hot climates. The committee has been assured that there is very much less such difficulty today than existed previously.

The establishment of these modification centers presented a major task. Mistakes were made and delays were incurred in many instances, but, as experience has increased, improvements have been made. Modifications still require considerable time, and every attention should be given to reducing that time. The committee expects to check a number of the modification centers at a later time to ascertain the extent of the progress which has been made.

After the modification has been completed there is a further time lag necessary to permit the flying or shipping of the planes to the fronts and necessary to permit the crews to become familiar with the planes and with the circumstances under which they will have to operate them at the fronts. Also, repair parts, gasoline and oil, and other supplies have to be shipped abroad and servicing depots established.

Consequently, it is apparent that we have an enormous and continuous flow consisting at all times of many thousands of planes between the aircraft plants and the fighting fronts. These factors

are the principal reasons for the great disparity between the number of planes produced and the number actually in operation at the fronts. This means that our enemies have not yet felt the full weight of our airpower and that coming months will bring an ever-increasing flood of destruction.

It is only natural that in so vast a program there have been many mistakes. Perfection must not be expected in war, where it is better to use wasteful methods than to risk having too little. All that can fairly be asked is that reasonable care should be taken and common sense exercised to keep waste and mistakes at a minimum.

Particular attention is called to these observations so as to prevent the action of the committee, in referring in this report to mistakes and difficulties, from being misconstrued as a condemnation by the committee of a program which as a whole has been unequalled anywhere else in the world. However, we should not judge our efficiency simply by comparison with what others have done, but should also take into consideration what could have been accomplished by full and efficient use of the Nation's vast industrial and technical resources. In a great many instances we could have done much better than we have.

The committee in a previous aircraft report called attention to the large number of different types of planes that are being produced. The efficiency of many of these has never been proved on the fighting front. Others are relatively obsolete. The excuse given by the Army and Navy was that they believed it necessary to allow the established companies to produce whatever they said they could produce in order to get quantity production as soon as possible. The excuse for continuing production is that delays would be incurred if an attempt were made to switch to the production of one of the tested superior models. The committee believes that a great mistake was made in adopting such a policy and that, wherever possible, changes should still be made to reduce the number of models and to concentrate production on proven models. The success of the General Motors Eastern Aircraft Division in transforming its Linden automobile plant into a producer of Grumman fighters indicates that even greater changes can be accomplished with facility.

Since the committee's last report progress along these lines has been made, and at the committee's private hearings, both the Army and Navy assured the committee that they were going to abandon certain models and concentrate production on the models which have proved their worth. Such a policy will greatly simplify and facilitate the training of crews and the establishment and maintenance of repair depots.

Experimentation should continue for the purpose of developing and proving new models, but we should not attempt mass production of an entirely new model incorporating a whole series of major improvements until after it has been tested and proved.

The committee has made inspection tours of most of the aircraft plants and has talked with representatives of both management and labor with respect to them. It has also held numerous private hearings at which it received testimony from officials of the Army, Navy, and other war agencies having to do with the production of aircraft. The officials who appeared are commended for their full and frank discussion of their problems, including the difficulties which they have encountered. This was particularly true in the case of Rear Admiral

Ralph E. Davison, Assistant Chief of the Bureau of Aeronautics of the Navy, whose frankness and candor was in sharp contrast to that of some of the Navy officers who have testified before the committee on other matters.

Both the Army and the Navy testified that in general they expect to have trained crews available in sufficient numbers to man the planes which will be produced in accordance with their programs. In some categories, particularly 4-engine bombers, the crews for which require exceptional and lengthy training, a certain amount of difficulty may be encountered. But it is believed that even there it will be possible to provide sufficient trained crews.

The committee has been assured that aluminum sheet will be available in sufficient quantities. As previously reported by the committee, the most critical items are extrusions, forgings, and castings—particularly extrusions. Mr. Charles E. Wilson, Aircraft Production Board Chairman, War Production Board, has been giving special attention to these matters. With the cooperation of the Army additional extrusion capacity has been created, and in many instances softer alloys, with consequent greater capacity of extrusion per press, and rolled forms have been substituted. Efforts along this line will be continued.

To manufacture the required additional extrusion presses, it was necessary to set back the dates on which certain machinery for steel rolling mills would be furnished. This has resulted in a delay in the expected production of steel plate, particularly at the Henry J. Kaiser mill at Fontana, Calif., and at the Provo, Utah, and Homestead, Pa. mills of the Carnegie-Illinois Steel Corporation.

The use to capacity of existing facilities to machine aluminum necessarily places a strain upon such equipment, and care should be taken to provide soon enough for repair and replacement parts.

The airplane plants have also experienced difficulty in obtaining and keeping a sufficient number of skilled supervisors to take care of their ever-expanding production. In some cases, such persons have been drafted for the armed services. This has been as much due to the failure of the aircraft plants to devise the proper method of classifying their employees and to provide the draft boards sufficiently in advance with adequate and fair information on which they could reasonably base deferments, as it has been due to an unwillingness on the part of the draft boards to recognize the importance of the work.

In some instances, there have also been difficulties due to the inability of the aircraft plants under existing regulations to make the changes in wages necessary to make them proportionate to the value of the work done and the responsibility undertaken. This was particularly true of the Lockheed Aircraft Corporation, where increases in the hourly wage rates paid and the inability to obtain permission to make proportionate increases in the wages paid supervisors and foremen frequently resulted in responsible men receiving salaries less than subordinates two or three grades below them.

Difficulties also have been incurred, particularly in the case of the Boeing Aircraft Corporation plant at Seattle, Wash., because other war industries in the area, such as the shipyards, have paid higher wage rates. This has attracted trained aircraft employees to work for which in many instances they had to receive additional training, and it has made it very difficult both for the management and for the

leaders of labor in the aircraft plants. Special studies of this situation are being made, and the committee recommends that they be expedited so that an equitable adjustment of the problems can be obtained promptly.

In other instances, there has been enormous waste of manpower and increased dollar cost because workers were hired by aircraft plants in huge numbers before there was anything for them to do. The reasons for this varied. Sometimes, as in the case of the Columbus plant of the Curtiss-Wright Corporation, it was due to the inability to produce a plane which would meet the requirements of the service involved; sometimes it was due to the necessity of incorporating modifications required by the commanders at the fighting front; sometimes it was due to an inability to make the engines and parts that were needed; and sometimes it was due to faulty plans which the management had made for starting and organizing production. In all cases, it resulted in enforced idleness which led the workers to suspect sabotage and which materially decreased their efficiency as workers.

In the plants where planes with good fighting records were being produced, the workers were more efficient than in those plants which were not producing planes or which were producing planes of an inferior type. This waste of manpower has been decreased as a better flow of materials has been obtained and will decrease further as the Army and Navy eliminate the production of inferior planes or planes with chronic production difficulties.

Mr. Charles E. Wilson of War Production Board was appointed on September 22, 1942, to force the elimination of many of the troubles from which the aircraft plants were suffering. He has succeeded in obtaining the cooperation of the Army and Navy and is doing a very good job along these lines.

Five months before Mr. Wilson was appointed to the War Production Board, the committee recommended that such an organization be set up. On April 6, 1942, the committee recommended:

A. That the War Production Board set up a section charged with over-all planning for aircraft production, such section to be headed by a trained aircraft production executive drafted from the industry. The subcommittee has been told that the War Production Board still does not have a single top-notch aircraft production man in its organization.

B. That instead of wasting its energies on a generalized plea for all-out production, which has confused management, labor, and the public, the War Production Board concentrate its efforts on breaking those bottlenecks which are, in the aircraft industry to the subcommittee's certain knowledge, and probably in other fields, really holding up peak production.

ARMY AIRCRAFT

Four-engine Army bombers.

There are matters with respect to four-engine bombers and improvements thereon which the committee has studied but to which it cannot refer in a public report for reasons of security.

The performance of both the Boeing B-17, popularly known as the Flying Fortress, and the Consolidated B-24, popularly known as the Liberator, is well known. Production of those planes by both Boeing Aircraft and Consolidated Aircraft has been excellent. The Douglas Aircraft and the Vega Aircraft Cos. have also turned in good records in producing the Boeing B-17.

The Ford Motor Co. was relatively very much slower than had been expected in getting into production on the Consolidated B-24. On numerous occasions the committee checked the progress being made by the Ford Motor Co., not only with company officials but with Army and War Production Board officials, and insisted that additional action be taken to expedite production. The building of as huge and complicated a device as a B-24 airplane in large numbers presented many problems, and some delay had to be expected. The production line was set up similar to an automobile assembly line, despite the warnings of many experienced aircraftmen. From the standpoint of the time factor to reach reasonable production goals, this was probably a mistake, because the Ford Motor Co. had not had extensive prior experience in the airplane field and because, even in the automobile field, the assembly line technique was developed and applied over the years without an attempt to improvise it overnight in one single step.

This resulted in slower progress at the beginning, but should result in increased production at a later date, providing there are not too many modifications and changes. It is probable also that the Ford Motor Co. did not take full advantage of the opportunities to send production engineers, layout men and production supervisors, as distinct from designing engineers, to the Consolidated plant at San Diego to find out how the specific work to be done by them was being accomplished at San Diego.

The production problems of the Ford Motor Co. were further complicated by the changes in its contracts and schedules. Originally, it was expected only to produce knock-down subassemblies for final assembly by Consolidated and Douglas at Fort Worth, Tex., and Tulsa, Okla., respectively. This was changed, at the suggestion of the Ford Motor Co., to provide for final assembly of part of the planes by the Ford Motor Co. Still later the entire program was substantially increased.

The Ford Motor Co. was also hampered by the fact that several hundred modifications were ordered to be installed in the plane and that there necessarily was a time lag between the time when such modifications were being discussed and developed by the Army and Consolidated Co. and the time when the actual detailed blueprint specifications reached the Ford Motor Co.

Additional difficulty was encountered because the plant was located before the scarcity of gasoline and tires made it difficult to obtain workmen in competition with other more centrally located plants.

These difficulties made it impossible for the Ford Motor Co. to program its work so as to obtain maximum efficiency from the workers employed, and necessarily resulted in a considerable amount of waste and confusion.

The Ford Motor Co. was not able to furnish parts which it had contracted to furnish for assembly by the Douglas Aircraft and Consolidated Aircraft Companies at plants specially built in Tulsa, Okla., and Fort Worth, Tex., respectively. As a result, the Army was compelled to switch the Tulsa plant to other work, and the Consolidated plant at Fort Worth has proceeded far behind schedule.

Until recent months, the Ford Motor Co. had not produced at Willow Run a plane which was capable of use at the front. The planes produced were used for training. The reason for this was

that in order to get the plant into production and to permit the company to obtain the experience therefrom that would enable the plant to operate efficiently, the Army Air Forces temporarily "froze" the model and permitted production without the incorporation of modifications considered essential for use at the fighting fronts.

The committee has been informed, however, that recently great progress has been made by the Ford Motor Co. at the Willow Run plant, and that it is now producing in substantial numbers planes which, with the average amount of modification, can be used effectively at the fighting fronts. This has been achieved, in part at least, by the subcontracting to other plants of the Ford Motor Co. of portions of the work which originally had been expected to be done at the Willow Run plant. A few parts are also being made or assembled by other firms in the Detroit area. The committee hopes that progress will continue to be made.

Two-engine Army bombers.

The B-25, produced by the North American Co., popularly known as the Mitchell, has proved to be a valuable plane, and the rate of production is very substantial.

The B-26, produced by the Glenn L. Martin Co., popularly known as the Marauder, has had many difficulties. It has high performance both in speed and in load-carrying capacity, and, according to most reports, is an exceptionally fine plane in the air. However, the plane is unsafe when operated by any pilots except those specially trained for its operation, because of unusual difficulties in landing and take-off. It has had a higher accident rate than the B-25, produced by the North American Co., the Army's other plane of comparable size and performance. As a fighting airplane, most pilots who know it like it, and improvements have been made on it. It has accomplished many important missions. However, the difficulties with the plane and the high cost of production and maintenance are such that the Army plans to taper off its production and to use the Martin facilities in Baltimore, Md., and Omaha, Nebr., to produce other types of planes.

In the two-engine light bomber class, the Army has the Douglas A-20, popularly known as the Havoc, the Douglas A-26, and the Martin A-30.

The Douglas Havoc is one of the best-liked planes that has been built in this country. It has performed a large number of tasks, including night fighting, low-level bombing, and strafing. Production has been very substantial. The Douglas A-26 is an improved version of the Havoc.

The Martin A-30 is a less satisfactory but usable plane which has been in production since early in the program. It was originally built for the British and French.

One-engine dive and attack bombers.

The Army has the Douglas A-24, popularly known as the Dauntless, the Curtiss A-25, the Army's version of the Helldiver, the Vultee A-35, popularly known as the Vengeance, and the North American A-36.

The Army has concluded that it will have little need for additional dive bombers for the reason that dive bombers cannot be operated unless there is a clear air superiority and then, only when the ground forces are not adequately equipped with antiaircraft equipment.

The Douglas A-24 is an Army version of the Douglas SBD dive bomber, which was built for the Navy in Santa Monica prior to 1941. These two Douglas planes, one for the Army and one for the Navy, have carried the brunt of the dive-bombing work which has been accomplished by our armed forces to date.

The Curtiss A-25 is the Army's version of the Navy's SB-2C Helldiver manufactured by Curtiss at Columbus, Ohio. The Curtiss A-25 is manufactured at St. Louis, Mo., and the program will be greatly reduced both because of the Army's opinion that the dive bomber is not valuable for most Army purposes and because of the inability of the company to date to produce useable planes. This matter is described in much greater detail in the section devoted to the Curtiss-Wright Corporation.

The Vultee A-35 is a plane which was previously manufactured for the British by Vultee and Northrop. Although a large number are on the program, it is planned to reduce substantially the number to be produced and to substitute another plane.

The North American A-36 is the P-51, or Mustang, equipped with bomb racks. When it became apparent that the Rolls-Royce engine should be substituted in the Mustang for the Allison engine in order to enable the P-51 to function as a first-class pursuit plane, slight changes were made on the P-51's which were being produced with the Allison engine, and it was designated as an attack-bomber until such time as the Rolls-Royce engine could be run into the production line. The Army has informed the committee that as an attack bomber at low levels this particular plane, equipped with the Allison engine, has done excellent work so that both versions of the plane have been valuable.

Army two-engine fighters.

The Lockheed P-38, popularly known as the Lightning, had many difficulties at its inception, but those difficulties have been overcome and a large number of the Lockheeds have been used on various fighting fronts with spectacular success. It has proved to be a very fine plane.

The Northrop P-61 is another two-engine fighter produced for the Army, but progress has been very slow and the plane is far behind schedule. It was intended for use as a night fighter.

Army one-engine fighters.

The Army concentrated on the Curtiss P-40, popularly known as the Warhawk and the Bell P-39, popularly known as the Airacobra. The Curtiss P-40 plane is discussed in more detail in the section relating to the Curtiss-Wright Corporation. The Bell Airacobra has performed very good service in Russia, which has expressed a definite preference for it over the Curtiss P-40. An improved version of the Bell P-39 is under construction. Both planes are limited to use in low altitudes and were designed for use with large land armies locked in combat.

The North American P-51, popularly known as the Mustang, is superior to either the Bell Airacobra or the Curtiss P-40. Equipped with an Allison engine, it is a good low-altitude reconnaissance fighter and fighter bomber. Equipped with the Rolls-Royce two-stage engine, it is a good medium-altitude pursuit plane. It has been characterized by both the British and the Army Air Forces as the

most aerodynamically perfect pursuit plane in existence. Although this plane was a more recent plane than the Curtiss P-40, it was in production in 1941. In the opinion of the committee, it would have been preferable to increase the production of Mustangs and decrease the production of Curtiss Warhawks.

The Republic P-47, known as the Thunderbolt, is a good fighting plane, especially at high altitudes. The Army was slow to recognize the value of this plane, because of the Army's primary interest in low-altitude planes, such as the Curtiss P-40. After belated recognition was obtained, difficulties were experienced in perfecting it for production, which have now been overcome. It has been used in the past several months in England against German fighters, and the committee is informed that its performance is good.

NAVAL AIRCRAFT

Navy dive bombers.

As previously indicated, the Army has concluded that additional dive bombers will not be needed by the Army. The success of Battleship X against an attack by dive bombers, although not conclusive, indicates that dive bombers have very definite limitations even for Navy uses. Skip-bombing may prove to be more satisfactory than dive bombing, but the Navy is still of the opinion that it should proceed with the dive-bomber program.

This is a question of military tactics on which the decision of the Navy should be final. On the statements of the Navy and Army officials with respect to the dive bomber, it appears clear that great caution should be taken by the Navy to make sure that the program for the construction of dive bombers is not greater than that justified by the Navy's own interpretation of its technical value. At present such program calls for the production of many thousands of planes, a figure which is justified by including heavy allowances for attrition and training. The committee believes that the Navy should re-examine its dive-bomber program and make certain that it is no larger than necessary.

The Douglas SBD, popularly known as the Dauntless, has to date been the only dive bomber which has been successfully used in large quantities by the Navy. An improved version of the Douglas SBD is being built. It will be known as the Douglas SB2D. The Navy reports that it is expected to be a splendid plane of high performance.

The unfortunate experience of the Navy with the Curtiss SB2C, popularly referred to as the Hell Diver, is discussed in detail in the section relating to the Curtiss-Wright Corporation. If the Navy really had use for the number of Hell Divers for which it contracted, it has suffered a strategic loss as well as a loss of many millions of dollars.

Similarly, the Brewster Aeronautical Corporation, which was to produce the Brewster SB2A dive bomber, turned in a miserable performance. The bomber is a variation of one originally produced for the British, and very few have been acquired for the Navy. The Henry J. Kaiser Co. has taken over the management of the Brewster Aeronautical Corporation, and the Navy reports that it already has made substantial improvements. The production of dive bombers is being continued temporarily in order to use materials which have already been processed and in order to permit an orderly transfer to

the production by the Brewster Aeronautical Corporation of the S-3A, which is the Brewster version of the Vought-Sikorsky F4U fighter. The Navy has expressed the opinion that the Brewster Aeronautical Corporation under Kaiser management will be able to produce a substantial number of such fighters.

Navy carrier torpedo bombers and fighters.

The Grumman Corporation has done an excellent job in building carrier torpedo bombers and fighters for the Navy, and the General Motors Corporation through its Eastern Aircraft Division has done splendid work in converting its facilities and building Grumman torpedo-bombers and fighters for the Navy. These planes are known as the Grumman TBF (the torpedo-bomber), and the Grumman F4F (the fighter), popularly referred to as the Wildcat.

The Grumman Corporation has developed a new fighter, the F6F, popularly referred to as the Hellcat, which is a plane capable of exceptional performance. Similarly, Vought-Sikorsky has developed a fine naval fighter, known as the F4U. The latter company, however, has not made as good a production record as Grumman. A number of other companies such as the Goodyear Rubber Co., at Akron, Ohio, and the Brewster are to make their versions of the Vought-Sikorsky F4U. The Brewster and the Goodyear companies are both behind schedule, and the Vultee is not yet scheduled to come into production. Vultee, in Allentown, Pa., is making the TBV, a Vought-Sikorsky torpedo bomber.

Navy two-engine medium bombers.

The Vega B-34 is a new version of the old Lockheed Hudson, a transport plane. It is used primarily as an antisubmarine airplane and, although somewhat out-of-date by now, has contributed to the defense of England from submarines.

Navy flying boats.

The Navy had a very large schedule for the production of flying boats of four-engine and two-engine types, the principal use for which would have been long-range patrol and limited bombing operations. There are definite uses to which such planes can be put, but their functions are extremely limited because of their slowness and their vulnerability to attack. It was most improper to use this type of ship in Alaska for bombing operations against objectives protected by Japanese Zeroes unless it was absolutely impossible to obtain any other planes.

The committee has questioned whether the Navy could use profitably, in the limited functions which the Navy itself has assigned to these flying boats, the tremendous numbers which have been programmed. The Navy has informed the committee that for many purposes it would prefer land-based planes in place of these flying boats, and that to the extent that it can obtain such land-based planes, it will severely cut back the production of flying boats.

The committee questioned the Navy to ascertain whether the load-carrying performance of seaplanes might be improved by reducing the Navy requirements for strength and rigidity. The Navy at present requires flying boats to be able to land in a choppy sea with 4- to 5-foot waves, and in order to make the boat strong enough to do this, it must have a large number of bulkheads, which cut up its space and impair

its usefulness. The Navy has always had a predilection toward unusually high-strength factors even at the expense of performance. It prefers to have all of its equipment of such character that it can be used anywhere in the world in which such equipment might be needed. In answer to the question as to why such requirements should be made, the Navy stated that, in order to avoid duplication of models, it did not desire to produce flying boats with less strength built into the hulls, even though there were some sections of the world in which such boats are used where they would not be required to encounter heavy seas.

The committee never attempts to substitute its judgment for that of the Department in question on tactical matters and therefore accepts this conclusion. However, even the Navy agreed that, in the case of cargo planes, other considerations should be taken into account and that experimentation work on flying boats should continue.

In that field a plane like the *Mars* is relatively worthless because of the bulkheads that have been built into it. It has not yet been put to any important practical use.

Experiments have been carried on by the Kaiser-Hughes Corporation to build a large wooden seaplane for cargo purposes. To date, the experiments with the large-sized model have shown it to be aerodynamically, even in the opinion of the Navy, a very good ship, but the Navy does not believe that it can be satisfactorily constructed of wood. The committee believes that credit should be given to Mr. Donald Nelson, Chairman of the War Production Board, for his active interest in the cargo type of seaplane over the opposition of the Navy, which was constructing all of its seaplanes along lines which would not produce satisfactory cargo planes.

The committee believes that it is important to continue experimentation with the seaplane as a possible carrier of large quantities of cargo. One of the most important reasons for doing this is the fact that, as the weight of landplanes approaches and exceeds 150,000 gross pounds, the weight of the landing gear has to be increased to such an extent that it is not capable of carrying as much cargo as a seaplane of similar weight, providing the seaplane is not cut up by a number of bulkheads to the extent required by the Navy in seaplanes for combatant use. Since neither the landplane nor the seaplane could survive a forced landing at sea, it would seem unnecessary to penalize the seaplane as a possible cargo carrier by requiring it to be able to meet unusual stresses and strains.

By this, the committee does not mean to indicate that it believes that the seaplane will be the cargo plane of the future. The development of the flying wing presents attractive possibilities for landplanes, and it has been pointed out that most of the large centers of the world are within 50 degrees of the North Pole and that operations in that area, in large part, will be over land and not over water. Also, many of the centers would have no water available for landing of cargo seaplanes. On the other hand, the landplanes of great weight would require runways of special construction which would be very expensive. If the cargo-carrying advantage is with the seaplane, it might even be possible to make runways in the form of shallow canals which might not be any more expensive than runways specially constructed for large landplanes.

On this question, the committee believes that the United States should take an active interest in forwarding all sound experimentation

on seaplanes as well as land planes so that we do not incur the risk, by reason of miscalculating which type of plane will ultimately be used, of being outdistanced by some other nation.

GLIDERS

The Germans successfully used gliders in Crete to enable them to land large numbers of troops in places where it would have been impossible to land standard aircraft. Through the use of gliders, it is not only possible to transport more men into locations where they could not otherwise be placed, but it is also possible to carry equipment, such as jeeps, which could not be carried by parachute troops. The troops when landed are landed as a unit and capable of fighting as such, whereas parachute troops find it very difficult to assemble. Moreover, gliders can carry troops which have not received the special training that it is necessary to give to parachute troops. For these reasons, the glider has been considered as a possible addition to parachute troops for airborne invasion work.

The Army developed a very large glider program and ordered many thousands of gliders to be constructed by a large number of concerns, many of which had had no experience whatever in similar fields. The gliders which have been built have had to be towed by planes such as the Douglas C-47's, which have a cruising speed of about 180 miles an hour. That speed is too fast for the glider and when the plane is throttled down to the speed at which the glider can be towed, the engine overheats and causes trouble. By reason of the difficulties incurred, the Army is not enthusiastic about gliders, and much of the program has been cut back.

The Army has recently received information from the fighting front that gliders with higher landing speeds can be used. This would enable the Army to design gliders that could be towed without overheating the engines of the towing planes. Work along this line is now being done.

The Navy has also developed an amphibian glider which can be landed either in water or on land, and which generally has shown better performances than the glider which the Army has placed in production.

Gliders also present attractive possibilities for use with certain types of cargo. A glider was recently successfully towed across the Atlantic, and further experimentation will be undertaken.

CURTISS-WRIGHT CORPORATION

The Curtiss-Wright Corporation has enjoyed spectacular and unprecedented success in obtaining war contracts. With the single exception of General Motors Corporation, Curtiss-Wright Corporation received more war contracts than any other corporation. In the period from June 1, 1940, through March 1, 1943, it received war supply contracts in the amount of \$4,717,500,000 out of a total of \$104,953,400,000. These contracts have since been increased. In addition, there have been programs for production by Curtiss-Wright Corporation of many thousands of additional planes and engines which, if reduced to contract, would raise its total by several billions of dollars.

This enormous portion of the war program was granted to a company which as of December 31, 1939, reported a net worth of only \$81,055,029.98 and a net profit after taxes for the preceding year of \$5,218,258.76. To enable it to perform its commitments with the Government, the Government has spent millions of dollars for the creation of new facilities.

Substantially all of the war contracts of Curtiss-Wright are for the production of planes, engines, and propellers.

The Curtiss-Wright P-40 (Warhawk).

The largest number of planes which have been produced by Curtiss-Wright are the P-40 fighter planes, which have been referred to in previous reports of this committee. These planes have performed valuable work on the various fighting fronts, but were relatively obsolete when we entered the war, and of more limited value than other fighter planes produced by other American companies and by the British. Many more P-40 planes were produced than any other fighter plane, and the facilities for producing them were expanded sooner and in larger volume than the facilities for producing other planes of greater merit. Pilots and repair crews were trained to use the P-40's, and repair parts for them were produced and sent abroad. The result was that when the Army, at the committee's recommendation, agreed to eliminate the production of P-40's and to substitute in the Curtiss-Wright plants a better plane to be selected by the Army, the argument was raised that to do so would result in a substantial lessening of production at a time when planes were vitally needed by the Russians and in North Africa. The Army did order the substitution of the Republic P-47 for the P-40 in the Curtiss-Wright plant at Buffalo, N. Y., but after work in that direction had been commenced, ordered the continued production of Curtiss P-40's.

The later decision may have been necessary, but the committee regrets the earlier decisions which concentrated so large a portion of our production on a plane which, although usable, is regarded by the Russian, English, and American forces as at best a second choice.

Curtiss-Wright was also permitted to make a number of modifications which did improve its performance. It was also permitted to attempt to make major modifications on the P-40 in the hope of being able to produce a plane which would compare not too unfavorably with the North American P-51, popularly known as the Mustang, which is regarded aerodynamically as one of the finest, if not the finest, plane of its type in the world.

Curtiss-Wright was also given a large contract for a new Curtiss-Wright fighter to be known as the P-60 (since discontinued), and three of the nine experimental contracts for the development of one-engine fighters. In addition, it was given one of the four experimental contracts for the development of two-engine fighters despite its lack of experience in the field and the success of the Lockheed P-38, popularly known as the Lightning.

The Army has decided to discontinue all production of fighters except for replacements and trainers, and most of the dive bombers now produced by Curtiss-Wright and have it concentrate primarily on the C-46 (Commando) cargo plane, which has proved successful.

The Curtiss-Wright SB2C (Helldiver).

In the case of fighter planes, where Curtiss-Wright had a usable plane approaching obsolescence, the bulk of the contracts were given to Curtiss-Wright, but in the case of dive bombers, where the Douglas SBD dive bomber, which has provided the dive bombers for Navy battles to date, an experimental plane designed by Curtiss-Wright was selected as the dive bomber to be produced in greatest numbers. This Curtiss-Wright experimental plane was designated SB2C and has been popularly referred to as the Helldiver. Many thousands of this plane were to be produced for the Navy in a new plant built for Curtiss-Wright at Columbus, Ohio, at an expense to the Government in excess of \$27,000,000. The site for this plant was selected by the Advisory Committee for National Defense. A large number of such planes were also to be produced in Canada by Fairchild Engine & Airplane Corporation and Canadian Car & Foundry. Many more thousands of an Army version of this same plane, designated as the A-25, were to be produced by Curtiss-Wright at St. Louis, a plant originally built for other purposes.

This was a most unfortunate decision, as a result of which many tens of millions of dollars have been wasted. The present opinion of the Army Air Force is that dive bombers cannot be used against land forces except where there is clear air superiority and even then would be effective only in those cases where they are not opposed by effective antiaircraft fire. The Army has assured the committee that steps are being taken to materially reduce the production of dive bombers at St. Louis and to make some worth-while use of the plant facilities there, probably by producing at that plant Curtiss-Wright C-46 Commando cargo planes. There are at present in the St. Louis plant approximately 16,145 workmen receiving a weekly pay roll at the expense of the Government of \$778,011. Of those, approximately 117 are paid more than \$5,000 per year. As of June 26, 1943, the Government had made advance payments against the A-25 contract in the amount of \$62,500,000. Of this amount almost \$50,000,000 had been expended.

The Navy is still of the opinion that the present type dive bomber has substantial uses despite the fact that it may soon become obsolete. The Navy reiterated this opinion after consideration of the success which some months back was achieved by Battleship X in resisting an attack by dive bombers. For this reason, the Navy desires to produce large numbers of dive bombers, although it has promised to reexamine and reduce the program for the production of SB2C dive bombers by Curtiss-Wright at Columbus.

Production of such dive bombers was to have been commenced by Curtiss-Wright at Columbus in December 1941. Production did not actually commence until September 1942. It has been hopelessly behind schedule and to date Curtiss-Wright has not succeeded in producing a single SB2C which the Navy considers to be usable as a combat airplane. In addition to the moneys expended at St. Louis on the Army version and in Canada at other plants to produce the same plane, and in addition to the \$27,000,000 cost of building the plant at Columbus, advances have been made on the SB2C contract at Columbus in the amount of \$98,484,238.

On May 31 there were 21,012 workmen employed at Columbus, most of whom have been diverted from farming or industrial work. The aggregate weekly pay roll is \$969,355, and approximately 133 persons at Columbus are paid in excess of \$5,000 per annum.

The Navy believes that the difficulties with the plane can be overcome and expresses the opinion after conferences with the company that they will be overcome within 2 or 3 months. The committee hopes that this opinion will prove to be correct, although it notes that during the last 8 months it has regularly received opinions with respect to this plane to the same effect, which have not as yet in any case proved to be correct.

In addition to the persons employed at the Columbus plant of the Curtiss-Wright Co. there are a large number of subcontractors employing in the aggregate many tens of thousands of people. The inability of Curtiss-Wright Co. to produce a satisfactory Helldiver has caused a loss of production by such subcontractors of great value, the extent of which cannot be ascertained.

The Curtiss SB2C also had in it a turret, designed by Curtiss-Wright, which Curtiss-Wright exhibited to the committee as a vast improvement upon turrets and with the statement that it had been developed by Curtiss-Wright. The committee was not impressed with the turret and recommended to the Navy that the matter be investigated vigorously for the purpose of ascertaining whether it was in fact the best turret which could be used. The Navy has recently informed the committee that it has found the Curtiss-Wright turret unsatisfactory and expects to place an improved turret in the plane. The Army should do likewise. The company explains that it was necessary for it to design a turret because there was no turret available in this country suitable for installation in the SB2C and because the Emerson Electric Co., on which they relied for production of turrets, was unable to take on the added work.

The loss involved in these matters cannot be ascertained. One of the most important losses is due to the psychological effect upon the workmen in the plant. In the main they have had little to do, and many have suspected that the war effort was being sabotaged, because they did not realize that the inactivity was due to the inability of the company to produce a satisfactory plane and to obtain sufficient experienced working personnel. The knowledge of the inactivity at the plant has become widely known among the friends and relatives of the workmen there and throughout the area adjacent to Columbus and has had a bad effect upon morale in that area.

Despite this most unsatisfactory performance, Curtiss-Wright has advertised the Helldiver plane as the "world's best dive bomber." The company has expended in such eulogistic self-praise of the Helldiver the sum of \$12,448.95. Numerous news stories have appeared to the same effect. Additional advertising by the company on other subjects was placed in 1942 at a cost of \$331,250.39. This will be increased in 1943 to \$872,821. The bulk of the cost of such advertising will be borne by the Federal Government because it has been treated as an expense of doing business before computing profits on which the Government would be entitled to receive excess-profits taxes at the highest rate.

The committee believes that this practice of self-praise at the expense of the Government is not salutary and recommends that the matter of advertising costs be investigated by the Bureau of Internal Revenue for the purpose of determining the amounts which should be paid to the Government as income taxes and by the agencies charged with obtaining through renegotiation the return of excessive profits.

The committee appreciates that some advertising is proper and that to some extent it should be recognized as a legitimate expense of doing business, but the committee believes that advertising expenditures, unless paid by the company out of its profits after income taxes and renegotiation instead of indirectly by the Government, should not be greater than those incurred by the company prior to the war, and even then the references to contributions to the war effort should be subject to scrutiny for the purpose of protecting the public interest against unfounded claims.

The committee particularly condemns advertising such as the Curtiss Helldiver advertising, which was intended to give the public the erroneous impression that the Curtiss Helldiver was the world's finest dive bomber and was making a substantial contribution to the war effort when the fact is that no usable plane has yet been produced and that the dive bombers in use by the Navy were produced by Douglas Aircraft Co. and not by Curtiss-Wright. The fact that such advertising was approved by the Navy and was based upon a speech of a Navy admiral does not justify it. The Navy's action was unfortunate and premature.

Conditions at Wright Aeronautical Corporation Lockland, Ohio, plant.

In January 1943, the committee received complaints from some of the Army inspectors at the Wright Aeronautical Corporation at Lockland, Ohio, alleging various improper practices in inspection resulting in faulty material and engines being produced and delivered to the Government. Wright Aeronautical Corporation is a wholly owned subsidiary of Curtiss-Wright Corporation.

The Lockland plant, located just outside Cincinnati, Ohio, and all the property and equipment utilized therein are wholly Government owned under a Defense Plant Corporation contract. Production, which was begun late in 1941, is confined to several variations of one model of air-cooled engine. This particular engine is not produced at any other plant. The product of the Lockland plant is sold to the Government under a fixed-price contract.

As production became substantial the company was awarded an A inspection rating by the Army Air Forces. Such a rating put prime responsibility for inspection on the company. The Army subsequently maintained only a comparatively small inspection staff which was engaged in spot checking. A rating of this type is warranted where a company has proven its ability to turn out a product of high quality. According to the testimony the rating was given at a time when an inspector of high caliber was in charge of company inspection. He left the company's employ shortly after the award was made. The rating was removed by the Board of Investigation of the Army almost immediately after it commenced its investigation.

A preliminary investigation disclosed that there was considerable basis for the complaints and that the alleged conditions were of such a nature that, if they existed, they should have been known by ranking company officials and the top Army supervision.

Accordingly, at the request of both the Army and the company, the committee agreed to withhold its investigation in order to allow both the Army and the company to look into the facts and report back to the committee any improper conditions they found to exist and any corrective measures which were being taken.

After allowing more than a week for this investigation, a subcommittee, appointed to investigate the situation, heard representatives of the Army Air Forces and the Wright Aeronautical Corporation in closed hearings at Washington, D. C., on March 30, 1943. At these hearings both the Army Air Forces and Wright Aeronautical Corporation stated that they had made separate investigations and that nothing irregular existed which required action by either.

Brig. Gen. Bennett E. Meyers, relying upon information furnished to him by Army officers and personnel later found by the committee to be obstructing the inquiry, stated to the committee—

I sent a man out from my Dayton office, a Major Little. * * * The verbal report indicated that in general everything was about on a par with other engine producers. He advised me that there was nothing in his written report that would indicate that any action would have to be taken by me.

The CHAIRMAN. So you really haven't anything to offer us today by way of informing us as to what you found wrong with inspection or management at Wright Aeronautical in Cincinnati?

General MEYERS. I haven't found anything like that to advise you on.

Mr. Harry W. Lake, chief administrative procurement inspector and chief of the engine and propeller unit of the technical center, materials center, Dayton, Ohio, testified—

We found nothing wrong.

The CHAIRMAN. Did you find anything there wrong with management in their inspection?

Mr. LAKE. No; we went over their inspection quite thoroughly and their inspection is based upon the procedure which has been built up over a period of 23 or 24 years.

The representatives of Wright Aeronautical Corporation were somewhat more cautious. They reported:

We know of various incidents and errors that have been corrected and we are very anxious to learn if there are others that we don't know about.

The Wright Aeronautical representatives then referred to one or two minor incidents which they characterized as follows:

The talk and incidents weren't of a character in relation to inspection. There was more petty bickering over privileges, authority, and rights.

Mr. C. G. Poehlmann, quality manager at the plant stated:

The CHAIRMAN. You have made a thorough investigation recently of your own inspection?

Mr. POEHLMANN. Yes, sir.

The CHAIRMAN. Have you found anything wrong?

Mr. POEHLMANN. Yes; there are details that are wrong.

Mr. William W. Finlay, manager of the plant stated:

The CHAIRMAN. Is there anything wrong?

Mr. FINLAY. I would say that there is nothing wrong in that sense of the word. We acknowledge that we can always do a better job.

Mr. RUDOLPH HALLEY (assistant counsel). Do you still feel that everything is in order and under control after your recent investigation?

Mr. FINLAY. Yes; I do.

Mr. HALLEY. Could you say that in no one of the matters that you have discovered have you found anybody to be culpable of any actual misconduct?

Mr. FINLAY. Absolutely not culpable.

Mr. HALLEY. You have found nobody to penalize?

Mr. FINLAY. Exactly.

Two days later, beginning April 1, and subsequently on the 2d and 3d, the committee held closed hearings at Cincinnati; on April 8th at Washington, D. C.; and on April 13 and 14 at Dayton, Ohio. In all 1,286 pages of *sworn* testimony were taken.

The committee found that the company was producing and causing the Government to accept defective and substandard material. This was accomplished in the following ways:

1. By the falsification of tests.
2. By destruction of records.
3. By improperly recording results of tests.
4. By forging inspection reports.
5. By failing to segregate substandard and defective material.
6. By failing to promptly destroy or mutilate such defective and substandard material.
7. By orally changing tolerances allowed on parts.
8. By circumventing the salvage committee set up to pass on the usability of parts outside tolerances.
9. By allowing production to override the inspection force, thereby destroying morale of both company and Army inspectors.
10. By skipping inspection operations.

It must be remembered that the company's inspection service had a personnel of approximately 2,400, whereas the Army's inspection personnel consisted of approximately 70 inspectors, who were distributed over three shifts. Nevertheless, the system as formally set up is adequate to insure the quality of the product produced if, and only if, both company and Air Force personnel are sincere and honest in their efforts to produce a quality product.

The committee found, however, that in this particular case certain Air Force officials exhibited an unduly cooperative spirit toward the company in matters pertaining to inspection.

Most of the representatives of the Army inspection section who appeared before the committee displayed an undue regard for the well-being of the Wright Aeronautical Corporation and too often seemed to be motivated by a desire to protect the company and its interests. It was found that the feeling was deliberately fostered among the Air Force inspectors that they must be cooperative with the company if they were to get along well in their jobs. This was evidenced by the following specific instances:

1. Inspectors were found to have been transferred because " * * * it has been quite difficult for this office to maintain a good feeling between subject inspectors and the contractor's personnel * * *". The committee found that the main reason it was difficult for these inspectors to get along well with the company personnel was that they absolutely refused to accept, for the Government, material which they knew to be faulty and which they were sure would fail in use.

2. Inspectors were threatened with transfer or other disciplinary action if they did not accept engines which were leaking gasoline and even during the committee's investigation one inspector was actually transferred for the sole reason that he refused to accept, for the Government, an engine which was leaking gasoline.

3. A supervising inspector of the Central Procurement District was prohibited from returning to any Wright plant after he had made an

investigation of conditions at the Lockland plant at the express direction of the Chief of the Inspection Section of the Army Air Forces, Matériel Command, located at Wright Field, Dayton, Ohio, and had rendered an honest report with respect to it. It is significant that the transcript of a meeting with a group of complaining inspectors, which was taken by this supervising inspector, contained the following statement by him: "I would like to say that this picture is being painted so black, and in accordance with your statements, I feel before this thing is over with, I am going to be forced to come into that plant and see some of the material." The above prohibition was invoked within a week after the transcript was delivered to the Chief of the Inspection Section.

4. Whenever an Army inspector attempted to reject material, he was always met with an argument where the matter involved was important to the company. His decisions were appealed to his supervisor, then, if necessary, to the assistant inspector in charge, then to the inspector in charge, then, if the inspector in charge would not accept the material, it was appealed to the technical adviser to the Air Forces on Wright engines, located at the company's parent plant in Paterson, N. J. Usually it was unnecessary to go further. In case even he would not approve it, however, there have been cases in which the company has gone to Wright Field. The committee found that the company, by following this procedure, was not only able to get almost anything past inspection, but also was able to convince the Army inspection force that it was futile to attempt to reject material over the objection of the company.

5. Army inspectors were refused access to precision instruments with which they might check suspected material. Their inspection was restricted to purely visual examination.

6. Army inspectors were denied rejection stamps of any kind and had no way to later identify or to follow up any material which they might have rejected.

The committee also found that the scale of wages paid Army inspectors was considerably below that of company personnel occupying equivalent positions. The low civil-service rating makes it difficult for the Army to build a large enough force of qualified men.

In addition to the situation existing in connection with Army personnel, the committee found cases in which the company inspectors had been subjected to pressure when they became insistent on rejecting material, and also cases in which inspectors had been reprimanded for calling defective material to the attention of Army Air Force inspectors.

It has been offered as a defense that although some rules were violated and some material accepted which did not meet specifications, they were harmless incidents, since they did not result in a defective end product. Evidence presented to the committee, however, indicates the following:

1. Engines were built and sold to the Government which were leaking gasoline. The Chief of the Army's Engine and Propeller Unit testified before the committee unequivocally that no engine with any kind of a gas leak should be passed.

2. Unsafe material has been discovered in completed engines ready for shipment.

3. The company's own reports from its field representatives indicate that these parts had failed in a substantial number of cases.

4. A substantial number of airplanes using this engine have had crashes in which engine failures were involved. This is also true of other engines, some of which have had higher accident records. But sound conclusions as to causes of air accidents cannot be drawn from the statistics available, (1) because in major accidents the planes are usually destroyed and the pilots killed and (2) because it is usually impossible to be certain whether an engine failure resulted from faulty engineering, materials, maintenance, or inspection. Moreover, the Army board of investigation has concluded that most of the derelictions and defective practices occurred during the several months immediately preceding the committee's investigation, so that accident statistics would not have been affected. Also, the Army is checking all engines produced during that period to prevent accidents from occurring.

5. More than 25 percent of the engines built at the plant have consistently failed in one or more major parts during a 3-hour test run.

6. Spare parts were shipped without proper inspection. In fact it was entirely possible to have parts go out as spares with no inspection at all. Since these parts came from the same stores as those which were built into engines, it is reasonable to assume that they would be defective in about the same proportion.

7. Records furnished the committee by the Army Air Forces as being complete show that while this plant has been producing engines since 1941, it has been impossible, so far, to complete successfully a required 150-hour quality test. Of three such tests run, one engine failed in less than 28 hours, the second in less than 33 hours, while the third completed the full run. The latter, however, was in such condition at that time that it was considered definitely unsatisfactory.

The above evidence that the Air Force personnel in charge of inspection at the plant in effect abetted the company in these practices is corroborated by the conduct of certain Air Force officials during the committee's investigation. These officials, apparently led by the Chief Inspector for the Army Air Forces, Lt. Col. Frank C. Greulich, made specific and material misrepresentations to the committee, attempted to intimidate witnesses, introduced evidence prepared specially for the purpose, designed to discredit witnesses, made misstatements under oath, and otherwise attempted to impede the committee's investigation.

Colonel Greulich specifically told the committee that one report had been made orally and not in writing, and that another report which he admitted was made in writing had never been seen by him. Both reports, in writing, had been seen by Colonel Greulich and bore very importantly on the conditions at the plant. Both referred to vigorous and detailed complaints which had been made by inspectors on duty there. Colonel Greulich specifically told the committee that the author of one of these reports, a Maj. Walter A. Ryan, would be found in Detroit at a time when Colonel Greulich well knew that Major Ryan was with him in Washington and immediately available to appear before the committee. Colonel Greulich intercepted the author of another of these reports when he came to see the committee at Cincinnati, and actually took the report from the person carrying it before it could be delivered to the committee. The committee witnessed the unpleasant spectacle of a lieutenant colonel, a

major, and several high civilian officials telling entirely different and contradictory stories about a meeting which all had attended. This meeting was one at which it was agreed to penalize an inspector who had made an honest report of an investigation of conditions at the plant. The committee had the further unpleasant experience of being handed an alleged personnel file concerning four inspectors who had been removed from their duties at the plant because they insisted on rejecting defective material. The file purported to be a record of their past employment, and was alleged to show that the men involved had been troublemakers. On inspection it appeared that the entire file had been prepared just a day or two before the hearing and was not a regular file of their employment at all.

On returning to Washington after its hearings in Cincinnati, the subcommittee reported to the full committee, which determined to turn the testimony over to the Army officials so that immediate corrective measures might be taken. Subsequently, the Army Air Forces conducted its own investigation at the direction and under the supervision of the Assistant Secretary of War for Air. At the request of the Army Air Forces, the committee agreed to take no further action until the Army Air Forces had had an opportunity to complete its investigation and institute such corrective measures as it found necessary. In the meanwhile Brig. Gen. Charles Branshaw was transferred from the western procurement district to take charge of the Air Forces Matériel Command.

The Army divided its investigation into two parts. Almost immediately a board was formed, headed by Lt. Gen. William S. Knudsen, to investigate conditions at the Wright Aeronautical Corporation's plant at Lockland. This board, however, was not authorized to investigate the misconduct of Army officers who attempted to deceive the committee, nor was it authorized to take such misconduct into consideration in determining the motives of the persons involved. The question of misconduct was referred to the Office of the Air Inspector. However, 2 months expired after the matter had been investigated by this committee before the Air Inspector commenced an investigation of the matter. His investigation is now under way and has not yet been completed. The committee believes that misconduct of this character should be investigated promptly and that appropriate disciplinary action should follow immediately.

The special board appointed to investigate the situation at the plant went to work promptly. A preliminary report was made on April 17 and a final report on June 28, 1943.

In the main, the Army's Board of Investigation made the same findings of fact as the committee. There is, however, some disagreement as to the interpretation of the facts, and particularly as to the seriousness of the acts committed and the culpability of the individuals involved. With such interpretation, the committee cannot agree.

The Army, for instance, in its final report has stated:

There is no question but that careless inspection existed throughout the plant. Added to this was the limited training and lack of experience of inspectors in general, and the efforts of the company to meet an ever-increasing production schedule. All these conditions, united, led to a very serious situation, which was the possibility of defective engines being shipped. Realizing this possibility, the

morale of both company and Government personnel became impaired. Government inspectors testified that there was a noticeable increase in the number of parts being accepted as usable and safe, although beyond tolerance limits, and the number of such parts steadily increased. During the investigation, and as a direct result of it, this trend was completely arrested and conditions improved to an extent which was amazing. Every effort should be made to insure that this improvement will be maintained.

But then the Army qualifies the findings by stating:

In spite of the feeling among some in the plant that many defective engines must necessarily be shipped because of poor inspection, this was not substantiated either by investigation or by the service records produced by the Army Air Forces. The record of engines in service which were assembled at Lockland, Ohio, prior to the period during which it is found that there was unsatisfactory inspection, compares favorably with the record of other types. It must be remembered that after parts are inspected, they are tested after assembly into engines and these tests reveal defects not discovered during inspection. Defects may appear during service which even the most rigid inspection and tests will fail to reveal.

This conclusion is primarily the result of wishful thinking. The evidence is clear that all defects are not found in the course of testing engines, even under the best of conditions, and at the Lockland plant the tests were not properly conducted and the check on parts after the test was frequently dishonest.

It is interesting to compare this final judgment of the Board that "careless inspection existed throughout the plant" but that "in spite of the feeling among some in the plant that many defective engines must necessarily have been shipped because of poor inspection, this was not substantiated" with the preliminary findings of the Board rendered on April 17 that—

Unsafe material has been discovered in completed engines ready for shipment. Whether this is deliberate or caused by a lack of knowledge has not yet been determined by this investigation. There is no testimony to the effect that the management has encouraged production of unsafe material. There is ample testimony that the company stresses quantity production.

The Board's tendency to minimize rather than see the broad implications of the situation is demonstrated by its handling of the charge that testing of the hardness of gears was faked. Such testing is made on a machine. Testimony before the committee indicated that readings within four points of minimum requirements were falsely brought up to the minimum and that all gears were reported as having the proper maximum.

The Board found that only one operator was doing this and that she had received—

incorrect instruction as to what to accept and what to reject as a result of the Rockwell tests from a coworker, who is no longer in the employ of the Wright Aeronautical Corporation. This operator is no longer in the gear department. This was a very unsatisfactory condition and emphasizes the need for competent instruction to inspectors.

The Board's findings ignored the fact that the practice of making false records of the Rockwell test readings was open and notorious. It was freely reported to the committee by witnesses who were willing and even anxious to bring this condition to light, yet no notice had been taken of it by either Army or company officials at the plant. With respect to the testimony before the committee that Government inspectors were neither furnished with precision instruments for inspecting parts nor allowed to use company instruments, the Board had the following to say:

It is true that Government inspectors are not equipped with precision instruments and measuring devices. The contractor is obliged to furnish all necessary equipment of this nature and such equipment may be used by either company or Army personnel. This practice has been followed by this contractor.

* * * * *

The Army Air Forces chief inspector, stationed at the plant, issued instructions to the Army Air Forces inspectors that they were not to use these machines. This action was taken because he did not consider them proficient in the use of the machines. As a result of the investigation this condition has been corrected.

* * * * *

The consensus of those interviewed indicates that no difficulty has been experienced in connection with the use of the various measuring devices used in the plant. Some misunderstanding arose over the order restricting Army Air Forces personnel from using instruments such as the Red-Liner and the Profilometer, and also from the order requiring the use of the form known as the blue order. However, it appears that good judgment was used in the issuance of both these orders, since trained personnel is required to operate these machines. It is desirable that only those individuals familiar with the operations of the machine be permitted to use it, and the use of the blue order provides for a more orderly system of operation and prevents repeated interruption of the operations of the individual working one of those machines by Army Air Forces inspectors desiring to have certain parts immediately checked.

It is obvious that the inspectors of the War Department were entirely unable to make proper inspections as a result of the order forbidding them to use the apparatus at hand. They were also forbidden even to watch company employees make tests on Red-Liners and other specialized machines. Nonetheless the Board has concluded that the chief inspector exercised good judgment in the issuance of these orders. Taken in connection with all the other evidence in this case, it is impossible to see how this conclusion could have been reached.

At one point of its report the Board, while admitting that the company repeatedly appeals from rejections by Army inspectors to their superiors and even to the Army's technical adviser on Wright engines who was stationed at Paterson, N. J., states that this procedure is expected and acceptable to the Army Air Forces.

But at another point in the report the Board agrees with the committee that:

there is prevalent among both Government and company inspectors, the feeling that considerably less difficulty will be encountered if they pass a questionable part than will be encountered if they reject a questionable part. It is reasonable to believe that the easier course was frequently followed.

This was an unhealthy situation and it is well the Truman committee brought it to light.

The Board agrees that one of the reasons for this condition is that Government inspectors are frequently overruled by their superiors, and frequently cautioned and threatened about the possibility of their being transferred if they reject too many parts.

The Board agrees with the committee that Government inspectors at the plant did not have stamps with which properly to identify rejected material. The Board promptly corrected this condition and ordered the use of such stamps. Nevertheless, despite the fact that the use of such stamps is commonly accepted as a proper inspection practice, the Board concluded as follows:

Sometime before the establishment of the plant in Lockland, Ohio, the chief Government inspector at the Paterson, N. J., plant abolished the use of rejection stamps by Government inspectors at that plant. This action was taken at the request of the company. The reason was that even though parts were rejected by the Government, they were still usable and could be sold and were sold to

commercial accounts and to foreign governments. The company naturally objected to a reject stamp being placed on these parts, because it was an obstacle in the sale of them to other parties than the United States Government. The reason did not appear to be clear in the minds of some company and Government inspectors and resulted in a feeling that the elimination of the use of rejection stamps was an effort to pass inferior material.

This investigation disclosed no basis for this assumption.

Despite all of the evidence in the case warranting a clear inference to the effect that the management did not encourage the production of safe material, but stressed only quantity production with the idea of "getting it by," the Board concluded:

There has been no testimony to the effect that management, or those responsible for management, encouraged production of unsafe material.

In general it may be stated that the Board's report is accurate in the matter of stating facts but assumes an unnecessarily defensive attitude. The committee calls attention to the fact that the inspection made by the Board of Investigation was made 1 week after the committee had conducted its investigation and taken the sworn testimony, and after the most flagrant derelictions had been called to the attention of Wright Aeronautical Corporation and had in part been corrected.

Thereafter, additional corrective measures of a procedural nature were put into effect. They should assure that the defects are caught before the lives of aircraft crews are imperilled. Engines in storage are being thoroughly checked before they are used. These were designed to provide additional guarantees of quality production. In addition, the Army Air Forces has undertaken to trace every engine which was shipped from the plant during the period in which the Army Air Forces believes the unsatisfactory conditions existed. The location and examination of these engines should go far to minimize the possibility of defective engines getting into service.

When the subcommittee completed its hearings at Cincinnati, it appeared that the record contained information which should be acted upon by the Department of Justice. Consequently the hearings and other material were made available to the War Frauds Division. Subsequently, the War Frauds Division was kept informed of developments. The complete files of the committee on the matter have now been referred to the War Frauds Division for such action as is deemed warranted.

The committee is of the opinion that the Lockland plant is a glaring example of the concentration of contracts in large plants with inexperienced management trying to get out a large production on a fixed-price contract and ruthlessly slashing quality to maintain production and schedules in the face of excessive production costs caused by poor management. The company has been furnished with the finest plant and machinery available at Government expense. By permitting defective materials to be passed and by permitting variations to be made from blueprint tolerances without changing the specification, the Government also maintained the myth of precision manufacture for the benefit of a company which was awarded its contracts because of the reputation for such precision it had earned as a result of its pre-war production record.

Curtiss-Wright cargo planes.

The committee is informed by the War Department that the Curtiss-Wright C-46 cargo plane, known as the Commando, is proving satisfactory in service. While to date, the Douglas C-47 (DC-3 type) has been the backbone of the Army's transport operations, it is expected that the future contribution of the C-46 will be very great.

The Curtiss-Wright Co. also has large contracts to produce the C 76 cargo plane, which is a medium-sized plane of wooden construction. Plans were to produce it at Louisville, Ky., by Curtiss-Wright and at New Orleans, La., by Higgins Industries, Inc. The committee understands that the prototype of this plane cracked up in May of this year due to difficulties with respect to the tail of the plane. Curtiss-Wright is behind schedule and will be until such difficulties can be eliminated. Until that is done Higgins Industries, Inc., will be forced to mark time. This is especially true as Curtiss-Wright refrained from delivering the drawings to Higgins Industries at the time scheduled, assigning as the reason that it did not want to deliver them until it had overcome the difficulties which it was having. The committee is informed that many of such drawings have recently been delivered.

Conclusion as to Curtiss-Wright.

The committee is disappointed at the over-all performance of Curtiss-Wright. It believes that through the excessive ability and zeal of its salesmen and the extent and nature of the relations which it has built up with the War and Navy Departments through the years preceding the war, it received too many contracts with the result that its engineering departments and skilled personnel were spread too thin. On several occasions contracts were awarded to it which even the officers of the Corporation believed would overload its facilities. The War and Navy Departments have shown a tendency, in other cases as well as this one, to multiply the proposed output of a plant instead of seeking additional sources of supply. In addition, the committee believes that Curtiss-Wright was guilty of gross negligence in not ascertaining and correcting the inspection difficulties at the Lockland engine plant, despite the fact that it knew that the safety of pilots and crews of aircraft were dependent thereon.

Members of Congress have been constantly advised by the Army and Navy that they and they alone were capable of procuring safe and satisfactory material for the fighting forces and that for that reason no civilian agency should ever have anything to say with reference to such matters.

Conditions at these plants therefore lead the committee to recommend that the Army and Navy officials interest themselves more earnestly in the procurement of quality material for our fighting services than in trying to bolster up the production at the expense of quality of plants that fail in this respect, regardless of the long past history of the parent corporation.

However, the committee desires to emphasize that extensive steps have been taken by Curtiss-Wright and by the Army to assure that proper inspection is made and that defective parts are not placed in engines where they would imperil the safety of those using the engines.

These steps were taken as a direct result of the committee's investigation and only after both Curtiss-Wright and the Army had conducted unsatisfactory preliminary investigations, since repudiated by them, in which they reached the conclusion, now admitted to be erroneous, that with minor exceptions inspection was properly conducted.

However, it must be borne in mind that despite its difficulties and failings Curtiss-Wright has, like all corporations, made signal contributions to the war effort. It has produced hundreds of millions of dollars of war goods. Its engines, airplanes and propellers, although not always of the best, have been usable and have been of great value at the fighting fronts. Some of its products have been exceptionally good, and its performance taken as a whole has been creditable. The company and those employed by it should continue the work which they have started to correct the defects referred to in this report so that the company may continue to merit the high reputation which it previously had obtained as a producer of fine airplanes and engines.

Because of the difficulties and defects which are referred to in this report, the committee recommends to the War Department that it take prompt and effective action to renegotiate the contracts of Curtiss-Wright. The fees and prices agreed to be paid by the Government were to be paid for management which was represented to the Government to be the finest in the world. As indicated by the above, in some cases such management was not in fact delivered to the Government and consequently should not be paid for by it.

HELICOPTERS

Very great progress has been made in the past 18 months in the development of the helicopter, a new type of aircraft. The first flights were made in 1940 and were limited to an altitude of just a few inches. Even as late as early 1942 the longest flight which had been made was less than 1 mile from the point of departure and the highest altitude which had been reached was 100 feet. The only successful American helicopters to date have been built under the direction of Igor Sikorsky, of United Aircraft Corporation, who deserves great credit for his work in this field.

Under the contract between the United Aircraft Corporation and the War Department the first helicopter built for military service, the XR-4, was manufactured at a cost of \$260,000, of which the War Department provided \$60,000. The XR-4 first flew on January 14, 1942, at Bridgeport, Conn., and was the first model capable of rising several thousand feet with a very respectable cruising radius and, for helicopters, a large load-carrying ability.

Subsequent tests of the XR-4 have established the practicability of the helicopter and opened the way for the utilization of its unusual advantages for many war purposes. Its great advantage is in its ability to take off and land vertically. This is due to the fact that helicopters, unlike autogyros with which it is frequently confused even by high naval officials, have no propeller, but rely on their rotor for their propulsion and control, as well as for their lift. Autogyros have a rotor also, but they are more like orthodox airplanes in that they use a propeller and the rotor serves in place of the conventional wing. They can take off vertically and climb for a very short distance,

but they cannot land vertically. Autogyros have been used for many years with some success in limited fields, but fundamentally they possess the disadvantages of both conventional airplanes and helicopters without fully achieving all of the advantages of either type.

It has been demonstrated that in addition to its ability to rise and descend vertically, the helicopter can hover in a stationary position at various distances from the ground. As a result, objects can be loaded and unloaded while the helicopter remains stationary just a few feet off the ground. Passengers have entered and left the machine under the same circumstances. The advantages of this performance are obvious in that it can perform many missions over land or water even under circumstances which would not allow a landing to be made. Because it needs no run for either take-off or landing, the helicopter equipped with pontoons can land on water, land, swamps, or on almost any conceivable surface. This makes even the most inaccessible locations easy to reach. The importance of this cannot be over-estimated. Using helicopters, it would be possible to reach wounded soldiers in almost any location, regardless of how inaccessible it might be to other forms of transportation. The hours and sometimes days saved in transporting them to where they can receive medical care would, in many instances, mean the difference between life and death. In addition, it seems entirely probable that the helicopter could be used to remove shipwrecked sailors from rafts under sea conditions which would not allow them to be reached by any other type of aircraft.

In addition to the humanitarian life-saving uses referred to above, the helicopter is considered to have many other important war uses. It is contemplated that ground forces will use it for communications, for carrying personnel, messages, and other articles, for artillery spotting, and for other observation purposes.

It has been demonstrated that the helicopter can be operated satisfactorily under most conditions from the deck of a ship. On May 6 and 7, 1943, through the cooperation of the War Shipping Administration, the Army Air Forces, and the Coast Guard, tests were conducted which proved the feasibility of operation from a platform on a ship. These tests were conducted in Long Island Sound on a tanker. The deck used was not specially built but was a deck which had been used for cargo-carrying purposes and which had a clear space only 14 feet greater than the whirling helicopter rotor. Under relatively calm water conditions 24 take-offs and landings were made while the ship was at anchor, while steaming up to 16 knots in a wind of more than 20 miles per hour, and while sailing with the wind and cross-wind.

The demonstrated ability of the helicopter to operate from a small deck points to the possibility of its successful use in conveying merchant vessels. At present, submarines are most dangerous to merchant ships in those areas where it is impossible to provide protection by aircraft—the centers of the oceans. Where aircraft protection is available, the sinkings are materially less. If the helicopter carried on merchant ships can bridge this gap, it will furnish a great contribution in the antisubmarine warfare.

In order that it may operate to the best advantage, it is necessary that the submarine be able to operate on the surface a portion of the time. This is necessary to enable it to make sufficient speed to overtake convoys, for the comfort of its crew, and in case of older models,

to charge the batteries. Even if the helicopter could not carry enough bombs actually to engage the submarine in combat, the helicopter would be performing a valuable service if it were able only to patrol for the purpose of spotting submarines and forcing them to remain submerged in the areas surrounding the convoy.

For the protection of convoys, the Navy has relied on its plans to provide escort carriers to protect the ships from submarines. When these carriers are available, they should make a substantial contribution to the defeat of the submarine. Planes from escort carriers will have a big advantage over helicopters in that they will be able to carry much larger quantities of depth bombs and be able to carry more detection and other equipment over greater distances.

On the other hand, helicopters would still have the great advantage of being able to hover, whereas the regular plane must operate at a speed at which it is more difficult to see a submarine and which often causes it to overshoot the target. The ability of a submarine to crash dive within a few seconds makes it difficult for the aircraft to return and bomb it before it has succeeded in escaping below the surface.

Because of the greater speed and weight-carrying capacity of the conventional carrier-based plane, the Navy in 1937 decided that it was not interested in the possibilities of developing rotary wing aircraft. The only successful rotary wing aircraft at that time was, of course, the autogyro. Although the helicopter was then not in existence, the factors which led the Navy to decide that it was not interested in autogyros would have applied as well to the helicopter, since the Navy in reaching this conclusion stated officially that in its consideration it had assumed perfection in rotary wing aircraft. In reaching this conclusion, it was decided that even if one were built with the ability to hover motionless and arise and descend vertically, it still would have no really worth-while advantages for the Navy.

The Navy's conclusion was based primarily upon a consideration of such aircraft as substitutes for existing naval planes used for combatant purposes. The Navy decided, therefore, that it not only would not finance any attempt to build autogyros or other rotary-wing aircraft, but that it was not even interested in such craft beyond the possibility of noting the progress made by others.

It is evident that the Navy gave little consideration to the possible use of rotary-wing aircraft for combating submarines. In an official memorandum dated January 14, 1938, the conclusion was stated that:

Rotoplanes might be of some use in antisubmarine work when operated from auxiliaries. *This appears to be a minor application which hardly justifies expenditure of experimental funds at present.* [Italics added.]

It appears that this opinion still exists to some extent, at least in the minds of some Navy officials.

In June 1938, Congress passed a statute, usually referred to as the Dorsey Act, which authorized the expenditure of \$2,000,000 for research and development of rotary-wing aircraft. Because the Navy Department officially took the position that it had no real interest in the matter, the Dorsey Act placed the administration of these funds under the control and direction of the Secretary of War. The act, however, specifically authorized and directed the Navy Department to prepare and submit to the Secretary of War their

plans and requirements for the development of rotary-wing aircraft. No such plans were submitted by the Navy Department, and its interest in the development has been passive at all times.

This attitude of official indifference on the part of the Navy Department continued, and an examination of the Navy files established that not only was the Navy not interested in experimentation in connection with rotary-wing aircraft, but that it resented what it regarded as external pressure to compel it to give the development consideration.

In sharp contrast to the lack of interest on the part of the Navy Department, the War Department took a very active interest in the development of the helicopter. Mr. Sikorsky ascribes a great deal of credit for the successful development of the helicopter to Col. H. F. Gregory of the Army Air Forces Matériel Command. Colonel Gregory has spent a large part of his time during the last several years working on the helicopter and is more familiar with it than anyone else outside of Sikorsky's own organization. Credit should also be given to Brig. Gen. F. O. Carroll, who, as Colonel Gregory's superior, encouraged him to continue his work with the helicopter.

Prior to the actual shipboard tests previously referred to under the direction of Colonel Gregory, landings and take-offs were made at Wright Field from a platform about 20 feet square, which was raised above the ground in simulation of a deck which might be available on a ship. These tests, plus the subsequent tests on Long Island Sound, have demonstrated the ability of the helicopter to operate from individual merchant ships. The Army Air Forces should be given credit for having gone outside its field to do experimental work in a field in which it should have been carried on by the Navy, but which due to its lack of interest in the helicopter the Navy failed to do. Had the Navy had any particular interest in the helicopter, there seems to have been no reason why the feasibility of deck landings could not have been tested at least 1 year earlier than they were. Even when such tests were finally made, there is no indication that the Navy had any part in the actual arrangements of the tests, nor that its representatives participated in any way except as spectators.

It is unfortunate that publicity stories have created the impression in the public mind that the Navy not only developed the helicopter, but even has helicopters in use as an antisubmarine weapon. The International Nickel Co., Inc., spent \$80,000 on Nation-wide advertising, approved by the Navy Public Relations Office, falsely stating that, "Today helicopters shadow subs." The fact is that the Navy today has no helicopters, nor until the last few weeks has any Navy officer flown one. The Navy is awaiting delivery of a helicopter procured by the Army and when it is delivered expects to make tests which were authorized by a directive dated February 15, 1943, which places the responsibility for such tests in the hands of the Coast Guard.

An examination of this directive indicates that the Navy required the helicopter to do the following:

- (a) Carry a one-man crew with parachute and life raft.
- (b) Carry transmitting and receiving radio capable of a minimum range of 100 miles.
- (c) Endurance of 4 hours.
- (d) Minimum instruments to be provided for instrument flight.

Previous to this directive the requirements of performance which the Navy indicated as an absolute minimum were in excess of what known helicopters could do. While this directive reduces the requirements somewhat, it is probable that they will be greater than the maximum which any helicopter yet constructed can perform.

Although it may be that the present helicopter cannot carry as great a load as is desired, Mr. Sikorsky has indicated that it can carry a 200-pound bomb in addition to necessary crew, fuel, and so forth. This should have some value and should be utilized. In the meantime, larger helicopters are under development, and such work should be continued.

The publicity previously referred to arose by reason of an alleged misquotation of statements made in a speech by the Navy's Director of Public Relations. Such statements were made between the time when the Navy received the committee's report on shipping, which contained a recommendation that the Navy take an active interest in helicopters, and the time when the report was made available to the public. The statements were based upon a reading of a brief article in the London Illustrated News and were in no sense based upon the official information of the Navy. The impression created upon the public minds was unfortunate.

The committee believes that the Navy Department should not only not be complimented for any development work on the helicopter, but on the contrary should be censured for not having shown more active interest in its development. Since the Navy has shown so little interest in its development, it seems desirable that consideration be given to placing the program for the development and procurement of helicopters for use in convoy protection in the hands of one of the agencies such as the Coast Guard or the War Shipping Administration, which are directly concerned with the protection of such shipping and which have shown a much greater interest in the use of the helicopter for this purpose.

AIRCRAFT ACCIDENTS

In addition to the foregoing the committee has been engaged in a study of military plane crashes and at a subsequent date will report on this subject. The committee is concerned about the large number of such casualties, particularly in noncombat operational flights in this country.

PUBLISHED REPORTS

The Special Committee Investigating the National Defense Program, United States Senate, pursuant to Senate Resolution 71 (77th Cong.), authorizing and directing an investigation of the national defense program.

Report No. 480 (77th Cong., 1st sess.):

Part 1—"Aluminum."

Part 2—"Camp and Cantonment Construction."

Part 3—"Priorities and the Utilization of Existing Manufacturing Facilities."

Part 4—"Statement of Committee Policy."

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Report No. 480 (77th Cong., 2d sess.):

Part 5—"Annual Report of Committee Investigations."

Part 6—"Light Metals, Aircraft, and Other Matters."

Part 7—"Rubber."

Part 8—"Conversion to War Production Program of War Production Board."

Part 9—"Conversion Program, War Production Board, Accompanies Part 8."

Part 10—"Investigation in Connection With Senator Albert B. Chandler's Swimming Pool in Kentucky."

Part 11—"Manpower."

Part 12—"Shipbuilding at the South Portland Shipbuilding Corporation."

Part 13—"Gasoline Rationing and the Fuel Oil Situation."

Part 14—"Lumber."

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Report No. 10 (78th Cong., 1st sess.):

Part 1—"Barges."

Part 2—"Farm Machinery and Equipment."

Part 3—"Interim Report on Steel."

Part 4—"Second Annual Report."

Part 5—"Renegotiation of War Contracts."

Part 6—"Labor."

Part 7—"Concerning Faking of Inspections of Steel Plate by Carnegie-Illinois Steel Corporation."

Part 8—"Shipbuilding and Shipping."

Part 9—"Conflicting War Programs."