

SURVIVAL IN THE AIR AGE



A Report by the President's
Air Policy Commission

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*A Report by the President's
Air Policy Commission*



Washington • January 1, 1948

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LETTER OF TRANSMITTAL

DECEMBER 30, 1947.

DEAR MR. PRESIDENT: We have the honor to transmit the report on national aviation policy as directed by your letter of July 18, 1947, establishing the undersigned Air Policy Commission.

During the 5-month period since the appointment of the Commission we have consulted on all phases of aviation with the best-qualified Government and private sources. The members of the Commission are in unanimous agreement on the conclusions expressed.

Respectfully,

THOMAS K. FINLETTER, *Chairman.*

GEORGE P. BAKER, *Vice Chairman.*

PALMER HOYT, *Member.*

JOHN A. McCONE, *Member.*

ARTHUR D. WHITESIDE, *Member.*

PRESIDENT'S LETTER APPOINTING THE COMMISSION

JULY 18, 1947.

DEAR MR. _____: The rapid development of aviation in recent years has made many of our former concepts out of date. At the same time, there exists a danger that our national security may be jeopardized and our economic welfare diminished through a lowered aircraft production and a failure of the aircraft industry to keep abreast of modern methods, with consequent retarding of the development of air transportation. There is an urgent need at this time for an evaluation of the course which the United States should follow in order to obtain, for itself and the world the greatest possible benefits from aviation.

It is for these reasons that, upon the recommendation of the Secretaries of State, War, Navy, and Commerce and of the Air Coordinating Committee, I am creating a temporary Air Policy Commission to make an objective inquiry into national aviation policies and problems, and to assist me in formulating an integrated national aviation policy. Because of your knowledge of our national needs and our industrial capabilities, as well as your public-spirited concern for the national welfare, I ask you to serve on this Commission.

The Air Policy Commission should study, among other pertinent aspects of the problem, such questions as the current and future needs of American aviation, including commercial air transportation and the utilization of aircraft by the armed services; the nature, type, and extent of aircraft and air transportation industries that are desirable or essential to our national security and welfare; methods of encouraging needed developments in the aviation and air transportation industry; and improved organization and procedures of the Government that will assist it in handling aviation matters efficiently and in the public interest.

The final recommendations of the Commission must, however, go beyond the limits of any one phase of aviation. They should be so broad in scope and purpose that they will assist in revising old policies and in framing new ones, and will serve as a guide for formulating a carefully considered national air policy.

Because of the urgency of the problem, I request the Commission to complete its studies in time to submit its final recommendations to me by January 1, 1948. In its work, the Commission will have the full cooperation of all agencies of the Government, including the Air Coordinating Committee, which has been making detailed studies of aviation policies and problems.

Although the Commission will organize its own regular staff and secretariat, the Secretary of Commerce will provide any special staff assistance which may be needed, as well as office headquarters and routine administrative services.

Sincerely yours,

HARRY S. TRUMAN.

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Section I

Air Power and the National Security

Air Power and the National Security

Foreign Policy—The United Nations, Disarmament, and Self-Defense

The letter of the President of July 18, 1947, establishing the Commission instructs it to make an "objective inquiry into national aviation policies and problems" and to assist the President in "formulating an integrated national aviation policy."

The Commission is directed to study, among other aspects of the problem, the "current and future needs of American aviation, including commercial air transportation, and the utilization of aircraft by the armed services; the nature, type, and extent of the aircraft and air transportation industries that are desirable or essential to our national security and welfare." The President states that there is a "danger that our national security may be jeopardized and our economic welfare diminished through a lowered aircraft production and a failure of the aircraft industry to keep abreast of modern methods, with consequent retarding of the development of air transportation."

We are instructed to make the broadest kind of survey. "The final recommendations of the Commission must, however, go beyond the limits of any one phase of aviation," the President's letter states. "They should be so broad in scope and purpose that they will assist in revising old policies and in framing new ones, and will serve as a guide for formulating a carefully considered national air policy."

* * * * *

The President's instructions thus require us to recommend an integrated national air policy which (1) will protect the Nation's security to the greatest extent practicable and (2) will foster its economic and social interests.

We take up first the problem of the national security.

We believe that the United States will be secure in an absolute sense only if the institution of war itself is abolished under a regime of law.

There was a time when the United States could tolerate with safety a world in which war was the final way of settling disputes among nations. For even if war came the United States could be reasonably sure not only of winning it but even of keeping enemy forces away from its shores. Our geographical position, our Navy, our industrial capacity, our manpower, and the armies, navies, and air forces of nations allied or associated with us, protected us against direct attack in the two World Wars through which we have just passed. But, with the recent revolution in applied science for destruction which is still going on, these safeguards are no longer enough.

Our national security must be redefined in relation to the facts of modern war. Our security includes, as always, winning any war we may get into; but now it includes more than that. It includes not losing the first campaign of the war if the loss would mean that the country would be invaded and occupied. It includes not having our cities destroyed and our population decimated in the process of our winning the first campaign. And it further includes not having our way of life, and particularly our civil liberties, taken from us in preparing for war. Our national security, when we define it in this way, can be assured only by the elimination of war itself.

World peace and the security of the United States thus are now the same thing. World peace, however, is not yet in sight. We will not be rid of war until the nations arrive at the great agreement to live together in peace and to this end give to the United Nations organization the legal and physical powers under a regime of law to keep the peace. As yet there is almost no sign that this agreement will be made within the future with which this Commission has to deal. Such an agreement would need a unanimity of peaceful purpose among the great powers which does not exist. It also would require a willingness on their part to break with the traditions of the past and to put their faith in a system of law rather than in their ability to take care of their own national selves with their own national armaments; and this apparently they are not yet ready to do.

The hope that the United Nations will be given the authority to prevent war is therefore not one on which we can base our policy of

security. The United Nations has solid achievements to its credit in the work of its specialized agencies and also, to a limited extent, in the settling of political disputes. But even the most optimistic view of the record and prospects of the United Nations does not assure us that the United Nations will develop in time the necessary authority and power to prevent another great war.

Throughout this report we have limited ourselves to those matters which, if they happen when we are reliably told they will, require the United States to do something about them immediately. There is, however, one long-term policy which we believe should be mentioned.

We believe that the United Nations can never develop as a permanent instrument of universal peace except on a foundation of free communication throughout the world. Such freedom of communication must include freedom of travel, freedom of intercourse by mail, telegraph, cable, and radio, and equal availability of news and public information.

At present there are fixed and impenetrable barriers to freedom of communication. The gathering and transmission of news is subservient to the purposes of state in a large part of the world, with the result that the peoples are not able to reach judgments based on common sets of facts. There is accordingly no common compulsion to eliminate war despite the development of weapons so deadly and efficient as to shock the imagination.

We believe that the understanding necessary for permanent world peace cannot be achieved except on the basis of freedom of travel and communication, the universal availability of news, and the elimination of censorship. In the long run only an informed world can be free and only a free world can be secure.

We urge the United Nations and the United States of America to take all possible steps to enlarge and strengthen the present international network of freedom as an essential basis for world peace and national disarmament.

* * * * *

The provisions of the United Nations Charter for the reduction and regulation of armaments have not been fulfilled, and unilateral dis-

armament by the United States is out of the question. There are those who believe that peace can never come about by force and that the United States should show the way to peace by disarming. This is not the opinion of this Commission. We believe that it is the policy of the people of this country—and that this policy is right—that before the United States will give up any of its weapons, it will insist that there be set up a foolproof system of security which will assure it that no nation can take advantage of it in its disarmed state. And since the only foolproof system which would give this protection is one which would make war impossible under a system of world law and since the nations have not yet been able to agree to set up this system, unilateral disarmament is not now a possible policy for the United States.

For these reasons the United States must have a double-barrelled policy abroad. It must work to achieve world peace through support and development of the United Nations. At the same time it must prepare to defend itself for the possibility that war may come. Not being able to count on the creation, within the future for which it now has to prepare, of a world settlement which would give it absolute security under law, it must seek the next best thing—that is, relative security under the protection of its own arms.

Where does relative security lie in a world in which all nations are free to arm as they please and in which war is the final resort for the settlement of international disputes? Reluctantly this Commission has come to the conclusion that this relative security is to be found only in a policy of arming the United States so strongly (1) that other nations will hesitate to attack us or our vital national interests because of the violence of the counterattack they would have to face, and (2) that if we are attacked we will be able to smash the assault at the earliest possible moment. The alternative policy—of having inadequate arms in a world in which war must be reckoned with as the final solution of international differences—would be foolhardy. Nothing would be more likely to provoke aggression than the spectacle of an unarmed or inadequately armed United States. This country, therefore, if it is to have even relative security, must be ready for war. Moreover, it must

be ready for modern war. It must be ready not for World War II but for a possible World War III.

To realize this double-barrelled policy will be as difficult a task as this country has ever taken on. Nothing less than a reversal of our traditional attitudes toward armaments and national sovereignty can make it succeed.

Our policy of relative security will compel us to maintain a force in being in peacetime greater than any self-governing people has ever kept. Our policy of seeking world order under law is even more difficult. If it is to be successful we will have to reverse all our notions of our sovereign independence and, equally difficult, persuade others to do likewise.

It may be that we shall not go all-out on either part of our double-purpose policy; that we shall compromise with both and achieve neither. If we do compromise in this way, we shall continue to live in a world in which war is an accepted institution and is therefore inevitable, and we shall be unprepared to defend ourselves in that war.

The Approach of the Commission to a Program of National Defense

Our report discusses in considerable detail the preparedness program which we believe is now required if we are to have the relative security to which we have referred. But before we deal with this program we will state our general approach to this matter of preparation in time of peace for the possibility of war.

1. The Commission does not subscribe to the proposition that armaments are a guarantee of peace. History does not assure us that a strong armament policy by a peacefully inclined nation is certain to frighten off aggressor governments. An authoritarian government bent on aggression may calculate that it can arm better and faster than the nations it has chosen as its victims, and that if it hits hard enough and with no warning, it can conquer. Indeed, an authoritarian government may seek war for war's sake or to divert attention from its internal troubles, even though it may not be certain that it will win.

Nevertheless, the Commission believes that a strong United States will be a force for peace. Our armaments will not guarantee that peace absolutely. But the chances of avoiding a war will be greatly increased if this country has the available force to strike back and to defeat anyone who breaks the peace. A strong United States will be welcomed by all peace-loving nations. The countries who want to live under regimes of freedom will see in our armaments not a threat but an assurance.

2. It is difficult for a representative democracy to keep up with an authoritarian state in an armament race in peacetime. It can, however, be done. We gained supremacy of the seas by the weight of our naval armament. We can be supreme in the air by the weight of our air power. The United States can build a Military Establishment which will keep up with any nation and be a powerful force for peace.

In our opinion this Military Establishment must be built around the air arm. Of course an adequate Navy and Ground Force must be maintained. But it is the Air Force and naval aviation on which we must mainly rely. Our military security must be based on air power.

3. Maintenance of a proper air establishment will require heavy appropriations. Not only must the equipment be of the finest quality that science can devise and money provide, but there must be enough of it, in being and ready for immediate use. Research and development must be increased. For a second-best air force, when war takes place, is almost as bad as none.

Already the payments which have to be made every year on account of past wars and current preparations for possible future wars are draining away a large part of the money and energy of the country that should be applied to better things—things that could add to the wealth of the country and the intellectual and physical well-being of its people. The taxpayer's money goes mainly for war. The Bureau of the Budget has informed us that about 80 percent of the budget for the current fiscal year ending June 30, 1948, is for payments for past wars or for our present Military Establishment. Indeed, the figures show that since 1915 about 85 percent of our total Federal budgets have been spent for war or preparation or payment for war.

And yet, as will be seen, this Commission has been compelled to report that the evidence is overwhelming that even this amount is not enough and that (1) the Federal Government should increase substantially its expenditures for the Air Force and naval aviation in the years 1948 and 1949, and (2) that expenditures may be needed in later fiscal years up to the end of 1952 substantially in excess of the 1948 and 1949 figures. The expenditures which we recommend, however, would be small in comparison with the cost of another war.

The Commission has reached its recommendations for increased military expenditures with the utmost reluctance. Every dollar spent for military establishments is a dollar to be grudged. Large military expenditures will help to keep taxes high and will drain away from the people a large part of the product of their labor. For these reasons we have not accepted military estimates without submitting them to critical analysis and we have required that all estimates meet the test of strict necessity under the broad principles as to the strategic needs of the country which are set out in this report.

On the other hand we believe that self-preservation comes ahead of economy. No concession should be made from the principle that our Military Establishment must be adequate for the defense of the country. Substantial savings within the Military Establishment are possible, and later in this report we make recommendations on this subject. But in making these savings the adequacy of our forces must not be impaired. Economies, desirable as they are, must not be made if making them would jeopardize our safety.

4. We believe that the recent unification of the services under the Secretary of Defense will result in greater efficiency in the spending of the security dollar.

The National Security Act of 1947 puts the duty squarely on the Joint Chiefs of Staff, subject to the President and the Secretary of Defense, (1) to prepare the over-all strategic and logistic plans to support the foreign policy of the United States and to protect the country, and (2) to review the major material and personnel requirements of the Services in accordance with these strategic and logistic plans.

By establishing constantly revised strategic and logistic plans and by relating expenditures strictly to these plans it should be possible to eliminate many expenses not sufficiently directly related to our strategic purposes, and consequently to have a force capable of carrying out those purposes without expenditures which would seriously strain the economy.

* * * * *

The New Strategic Concept of the Defense of the United States

We have said that we believe that the defense of the United States must be based on air power. We have reached this conclusion as a result of prolonged discussions with the Armed Services and with many private citizens who have appeared before us. We believe that it is the overwhelming view of those most qualified to know that the country must have a new strategic concept for its defense and that the core of this concept is air power.

We need a much stronger air establishment than we now have. The reason for this is that we can no longer follow our traditional procedure of relying entirely on the Navy as our force in being in peacetime. Heretofore the United States has been able to make most of its preparations for war after war began. In World Wars I and II the oceans lay between us and the enemy. Protected by the Navy, and by the land, sea, and air forces of our Allies, we were able to convert our great industrial machine and our manpower for war after war had begun. No enemy action interfered with us as we got our factories going. Our army was trained in peaceful areas. Our cities were untouched. In World Wars I and II not a single enemy weapon except a few Japanese balloons and a few shells from submarines touched the United States mainland, and sabotage was but a minor nuisance.

This will not be the case in a future war. Our surface fleet can have and does have a supremacy of the seas which is so nearly complete that it can guarantee the safety of our cities and our factories from surface attack by water. This supremacy should be maintained. To do so is possible in a world in which no challenging naval power exists today or can possibly exist for many years to come. The only immediate

naval danger—and against this we must always be on guard—is the development of new submarine techniques on the part of a possible enemy.



**AZIMUTHAL EQUIDISTANT PROJECTION
CENTERED NEAR
POINT BARROW, ALASKA**

But there is a new element through which this country may be attacked—the air. And the new weapons which can be delivered through the air make it vital that we protect ourselves from attack by way of this new element. An air attack could be so terrible that we must at once create the best conceivable defense against it. This means an air force in being, strong, well equipped and modern, not only

capable of meeting the attack when it comes but, even more important, capable of dealing a crushing counteroffensive blow on the aggressor.

Atomic weapons will not long remain our monopoly. And there are other weapons of comparable destructiveness. Mankind has not indulged in biological warfare on a large scale so far; but the biological sciences are evolving so rapidly that it is impossible to predict the future. The nations might be foolish enough to try it out. Biological warfare might become a serious factor in another war and we must be alert to every aspect of defense against this kind of attack. And sabotage—heretofore a relatively unimportant means of warfare—is in the process of becoming a serious menace. The preplacement of atomic and biological weapons may soon become a major military problem.

This means that the traditional peacetime strategy of the United States must be changed radically. We can no longer count on having our cities and the rest of our mainland untouched in a future war. On the contrary, we must count on our homeland becoming increasingly vulnerable as the weapons increase in destructiveness and the means of delivering them are improved. And we must assume that if future aggressors will have learned anything from World Wars I and II it will be that they must never let United States industrial power get under way; they must destroy it at the outset if they are to win.

The strategy to meet these new conditions is obviously that which we have described above—to have in peacetime a force in being which will protect to the greatest extent possible our air space as well as our water approaches and hold out to anyone who thinks of attacking us the prospect of a counterattack of the utmost violence. The hope, of course, is that the existence of such a force will do more than win a war; the hope is that by serving notice that war with the United States would be a most unprofitable business we may persuade the nations to work for peace instead of war.

* * * * *

Let us examine the premise inherent in this new strategy that we must not only have a strong Military Establishment immediately but also must start now to build the even stronger force which will come into full maturity at some date in the near future.

To have an opinion about this we must examine some preliminary questions. When must we assume that other nations will have atomic or other comparable weapons in quantity sufficient to make a sustained attack on the United States? When will other nations have the planes and missiles to deliver such weapons against the United States homeland? How long will it take us to build up the force which we must have when we have to live in a world in which other nations have these weapons and can deliver them against us? What force do we need immediately, even before other nations have atomic weapons and the means of delivering them?

First, as to atomic weapons. If present official estimates are right we have not yet reached the point where other nations have atomic weapons in quantity. On the other hand, according to these same estimates we must make our military plans on the assumption that they will reach this point soon. No one can forecast definitely the date, and therefore we must arrive at a time, for planning purposes, beyond which it would not be safe to assume that the United States will be immune from atomic attack. In dealing with a subject on which there is so much difference of opinion, and in which the stakes are so high, we must allow a margin of insurance for the certain error inherent in any estimate.

We emphasize the wide range of the opinions on this question. We have been told by highly qualified persons that other nations may have atomic weapons now. We have been told by equally qualified persons that they will not have them in quantity for 15 years. We cannot rely entirely, therefore, on any one opinion, no matter how expert. Our estimate is based on our composite appraisal of a large number of estimates and of the facts on which they are based. We also have had the benefit of a similar study made by the President's Advisory Commission on Universal Training which used the estimate that other powers would have atomic weapons sometime between 1951 and 1957.

Our conclusion is that we should make our strategic plans for the defense of the United States on the following assumptions:

(1) It is impossible to know certainly when other nations will have atomic weapons, but it is proper to assume, for our present planning

purposes, that other nations are not now producing such weapons in quantity. The Commission realizes the heavy responsibility of making this statement. We do it only after receiving much authoritative evidence in support of this view. We point out once more however the uncertainty of the whole subject and the fallibility of expert evidence in these matters. We emphasize the high importance of our continuing every effort possible to be fully informed on this subject.

(2) It is known that other nations are working diligently on the problem of atomic energy; that they have available to them some of the raw materials, the quantity naturally being indeterminate; and that they possess scientific minds capable of solving the many intricate and complex problems involved.

(3) If an effective system for reviews of the strategic situation and for the adapting of our procurement and research and development policies to our strategic needs is established, it would be safe to assume, in making our plans for the next 2 years, that possibly hostile powers will not be producing atomic weapons in substantial quantities before the end of 1952. We point out that this does not assume that such powers may not have a few atomic weapons prior to that date. We point out also that this estimate places this date more than a year and a half further into the future than the earliest date fixed by the President's Advisory Commission on Universal Training.

(4) It would be an unreasonable risk, and therefore, a reckless course, to rely on other nations not having atomic weapons in quantity by the end of 1952.

(5) It would be an unreasonable risk to assume that this country will surely have warning of the manufacture of atomic weapons by others. It may be that we will know when other nations have succeeded in manufacturing atomic weapons. But it would not be wise to rely on this. We may learn of the existence of atomic weapons in the hands of other countries only when they are used against us.

* * * * *

Biological weapons are undoubtedly being studied in all parts of the world. They differ from atomic and conventional weapons in that their most destructive effect is not on impact but by slow or epidemic

spreading. That extremely violent bacteria and viruses exist is common knowledge. The problem in their military use is effective dissemination. They may be delivered by the air, or by preplacement by enemy agents. So delivered or placed they would create great damage to humans, animals, and crops. In any all-out attack on the United States the possibility that they may be used should not be overlooked. The danger from these weapons is, however, not only in time of war. They can be distributed in our cities and among our crops and herds in advance, say a year or so, of a planned attack, or as part of a campaign to weaken us, without any intention of following up with a conventional military attack. Our plans to anticipate and prevent such sabotage, insofar as this can be done, must be intensified.

* * * * *

In focusing our attention on the weapons of mass destruction we must not minimize the other, more conventional weapons. These are comparable in destructive power, when used in large quantity, to atomic bombs, as the cities of Germany and Japan testify. And it is certain that conventional weapons will be developed in the next few years so that their destructive power will be even greater than in World War II.

Nevertheless, it is the mass-destruction weapons which now exist and almost surely will be developed within the next few years which radically change the strategic needs of the United States. An enemy has to have air superiority, a great industrial production and a very large fleet of aircraft if it is to overwhelm a country by using conventional weapons only. But an enemy can inflict enormous damage with the mass-destruction weapons even if he does not have air superiority. The possession by an enemy of these weapons, in quantity, changes all the rules and requires a different strategy by a nation which may be attacked.

* * * * *

The possession by a possible enemy of the mass-destruction weapons is, of course, not all that he must have before he attacks the United States. He must also be able to deliver these weapons against us. He must have the planes and missiles capable of making a sustained assault on our mainland.

At the moment no possible enemy could make such an assault. The United States has control of the surface area of the Atlantic and Pacific Oceans and therefore is not subject to surface attack by water. The only attacks of importance which could now be made on the United States mainland would be by air, by the preplacement of weapons by enemy agents, or by attack from submarines. We do not believe that such attacks now, equipped as they would be (we may assume) only with nonatomic weapons, could destroy our ability to retaliate and to gear ourselves up for an all-out counterattack on the enemy.

No other nation now has or is likely to have in the immediate future the piloted aircraft capable of getting air supremacy over the United States mainland. There are now in existence bombing planes (and other nations have them) capable of one-way raids from bases 4,000 miles away. And one-way raids must be reckoned with—as the Japanese suicide attacks show. These bombing planes are, however, relatively slow compared with the supersonic planes of the future. They are therefore subject to interception by the faster moving jet fighters, and in other ways. But they will not be intercepted except by an alert and ready force in being; and even then experience shows that the technique of interception takes a considerable time before it gets under way. The first attacks would show a much lower rate of interception than the later attacks.

An attack on the United States by piloted aircraft in the immediate future would not therefore give an enemy air superiority over our mainland; although it could inflict a serious damage on our industry and our cities before our defenses could be developed. But without such air supremacy and without atomic weapons, it is not likely that an enemy could so disrupt our country that we would be unable to repeat the formula of World Wars I and II and build up our war industry and our Army, Navy, and Air Force after war had begun.

Nor is it possible for an enemy now to deliver an assault on the United States mainland with guided missiles which would be so serious as to prevent our preparing to win after the fighting started. By the term "guided missiles" we mean any uninhabited airplane of the con-

ventional kind or any winged or unwinged projectile which is guided in its flight. At one extreme of guided missiles is the superatmospheric, supersonic missile (an improved German V-2) which balances itself by internal mechanisms and is guided by various internal and external devices. At the other extreme is an airplane of the conventional type loaded with bombs and directed electronically toward its target (the recent trans-Atlantic C-54 flight is an example). The guided winged missile moving through the atmosphere at subsonic speeds (of which the German buzz bomb was an early type with short range) is merely a specially designed uninhabited airplane.

Guided missiles of the German V-2 type travelling at supersonic speeds are now impossible to intercept; they are, however, as yet of relatively short range. Guided missiles of the subsonic type also are still of limited range. The problem of guidance, which is the obstacle to range, has not yet been solved.

Neither of these two means of delivery—the piloted aircraft or the guided missile—is a vital threat to this country in its present form. Nor is the only remaining possible method of delivery, sabotage—that is the preplacement of weapons by enemy agents in this country—a vital threat at this time. The Commission has been concerned about the possibility of the preplacement of certain of the mass destruction weapons—such as disease weapons located in city reservoirs—and there is no doubt that this form of sabotage is a possibility and could create serious damage. But if we are alert a sabotage campaign would probably not disrupt the country; and this is the point we are presently considering. The United States in the opinion of this Commission, could now undergo the ordeal of an attack delivered by the presently available piloted or unpiloted aircraft and by sabotage, and under the heavy handicaps which such an attack could create, still be able to follow our traditional course of building up our war machine after war has begun.

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So far we have spoken only of the means of delivery as they now are. The current scientific revolution is however working on the means of delivery at the same time as it is working to make the weapons

to be delivered more destructive. There is a race between the two. When either reaches its next stage of development, the threat to the United States will be great.

If other nations develop the means of direct assault on the United States by supersonic piloted aircraft, the threat to this country will be serious, even though these vehicles are not equipped with atomic or comparable weapons. Similarly, if other nations develop atomic weapons in quantity, or some other weapon of comparable destructiveness, the threat to this country will be great even though these nations have only the present means of delivery at their disposition. The addition of supersonic transpolar or transoceanic guided missiles would intensify the damage that could be done by an atomic attack. Should all these developments exist at the same time, the situation would be very grave indeed.

When will these things happen? If they are so remote that there is nothing we should do in relation to them now, they are not within the terms of reference of this Commission.

We see nothing in the present situation to justify fear that the development of supersonic transpolar or transoceanic piloted aircraft or guided missiles by any possible enemy will threaten our air supremacy and our homeland within the immediate future. Evidence has been given before this Commission that such supersonic aircraft will not be developed into the mass-production stage for several years and that long-range supersonic missiles will not be available in operational form for from 10 to 25 years. Evidence has also been given before this Commission that subsonic guided missiles with a 5,000-mile range and capable of being directed toward a sizable target such as a city can be developed into the mass-production stage within 5 years; but these subsonic missiles would be subject to a high rate of interception. All these estimates—both as to the supersonic aircraft and guided missiles and as to the subsonic guided missiles—are at best informed guesses. This is a fast-moving branch of science, and any estimate may be upset by some unforeseen development or by some unforeseen obstacle. The estimates of the best scientists must not be accepted as laying down an accurate timetable.

The conclusions which the Commission has reached as to the development by other nations of the means of delivering a direct attack on the United States by transpolar or transoceanic aircraft or missiles are these: (1) It is probable that other nations will develop atomic weapons before they develop supersonic bombers in quantity with a striking range of 5,000 miles, or supersonic, accurate, guided missiles with a 5,000-mile range. (2) Nevertheless, it would be unwise to assume, in the planning of our defense establishment, that other nations will not have the planes and missiles capable of delivering a sustained attack on the United States mainland by the same date we have assumed they may have atomic weapons in quantity—namely, by the end of 1952. If they want them enough they can surely have them at some date; just when will be determined by the amount of effort they put into getting them. (3) It is not certain that the United States will be the first to develop such aircraft or missiles. On the contrary, the Germans were ahead of us in these matters at the war's end and other nations may well be even with or ahead of us now. (4) The United States must press most energetically and immediately its basic and applied research and development programs in aerodynamics, power plants, electronics, and related fields with a view toward the development at the earliest possible date of the most effective piloted aircraft and guided missiles and the defenses against them.

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The conclusions of the Commission thus fix as the target date by which we should have an air arm in being capable of dealing with a possible atomic attack on this country at January 1, 1953. For convenience we will refer to this date as A-day.

We believe that A-day divides the future into two clear phases for strategic purposes. The first phase is that which begins now and extends to A-day. We call this Phase I. The second phase is that which will exist on and after A-day. We call this Phase II.

The next question is whether we must begin now to build the force we must have on and after A-day. How long will it take to build this force? Do we have to start building it now?

There is no doubt about it. The force we need by the end of 1952 must possess the complicated defensive equipment of modern electronics and modern defensive fighter planes and ground defensive weapons. A radar early warning system must be part of our defense; but such a system, if designed to give complete and continuous coverage, would be extraordinarily expensive. Worse yet, it might divert us—as the Maginot Line diverted France—from the best defense against atomic attack, the counteroffensive striking force in being.

We also must have in being and ready for immediate action a counteroffensive force built around a fleet of bombers, accompanying planes, and long-range missiles which will serve notice on any nation which may think of attacking us that if it does, it will see its factories and cities destroyed and its war machine crushed. The strength of the counteroffensive force must be such that it will be able to make an aggressor pay a devastating price for attacking us. It must, if possible, be so strong that it will be able to silence the attack on the United States mainland and give us the time again to build up our industrial machine and our manpower to go on to win the war.

Such a force does not grow overnight. It takes 4 to 7 years to develop a new plane from the engineering board to production. It takes longer than that to develop many of the weapons which will be used in any future war. No airplane was used by the United States in World War II which had not been designed before we entered the war. Only improvements were made after Pearl Harbor; there was no change in fundamental design in any plane which saw war service. An air force will probably fight a war which does not last a long time with the general types of equipment it has on hand when the war begins.

The method of gradual build-up, that is, a build-up in a line or curve of progression from the force we now have to the force we must have on A-day, is the most effective and cheapest way of getting the force we need. To delay beginning the construction of this force, to hope to make a sudden jump to the A-day force in a year or so is unrealistic. An air force cannot be built that quickly. Moreover, to delay in starting the build-up would leave us without the force we need

right now. We have no breathing space in which we do not need air power.

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We therefore consider the kind of air establishment we need during Phase I. What is the likelihood of war during this Phase? Can we say that during this Phase the chances of war are slight or that, if war does come, we can build up after hostilities begin and, therefore, do not need immediately a strong force?

On first impression it might seem that a major war during this Phase I is unlikely; and this opinion has been expressed to this Commission by high military authorities. The argument is persuasive. Our monopoly of the atomic bomb may make any aggression-minded nation wait until it also has the atomic bomb before it takes on the United States. Moreover, the unrepaired devastation and the fatigue from World War II is a powerful force working for a breathing period from war. There usually is such a breathing period in the unending procession of wars throughout history. Great wars usually happen after the nations have recovered from their wounds and a new generation has forgotten the horror of the previous battles.

However, we cannot be sure. The world situation is dangerous, and our foreign policy is not running away from the danger. This is not to criticize our foreign policy. A nation in the position in which the United States finds itself today has no choice but to follow policies which may lead to friction with other nations.

There is, moreover, such a thing as blundering into a war. World Wars I and II were planned by Germany and happened more or less when the Germans planned them. A persuasive case can be made that great wars are wars of aggression which take place when the aggressor wants them to. Sometimes, though, events get out of hand and war happens when neither side wants it. The present may be such a time. Unless the incompatibility of East and West can be overcome and the energy of the world turned toward the building of peace rather than toward preparing for destruction, a war may break out which neither side wants.

We must therefore be prepared for war during this Phase I. Moreover, we must not think that the atom bomb alone will win a war. If we get into war during Phase I we cannot drop atomic bombs and sit back. What we need during this Phase is an integrated Military Establishment, (1) capable of an atomic attack, (2) stronger in air power than that of any other country, and (3) capable of a sustained and powerful air counteroffensive, either directly or by the way of intermediate bases.

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What is the kind of force which we need during Phase II? We have reviewed this question carefully with the services.

The strategy for Phase II is determined largely by the kind of attack which is likely to be made if war occurs during that phase. The attack which we must anticipate determines the kind of force which will be needed to meet it. The first thing to consider therefore is the nature of the assault which could be made by an enemy equipped with atomic or comparable weapons, and possessing the aircraft and missiles capable of delivering them against the United States mainland. As to this, our conclusions are as follows:

1. We must assume, in making our plans, that there will be a direct attack on the United States mainland in any major war in which the United States will become engaged on and after January 1, 1953. It may be that the war will not open with this direct assault. It may be that the fighting will start at some point in the world where our forces will come in contact with those of other nations. It may be that the fighting will be localized at that point, on the model of the practice war between Germany and Russia in the Spanish Civil War. But this is not likely; and certainly we must not count on it. We must assume, in making our plans, that if the enemy can do it he will make a direct air assault on the United States mainland regardless how or where the first shooting starts.

2. It must be assumed that there may be no warning of the attack. We must assume that the force we will bring into being by the end of 1952 will be the force which will have to handle the attack. We will get no further warning than that which we already have.

3. An attack by an enemy equipped with atomic weapons would be of a violence which is difficult for us to imagine. The first bombardment assault by an enemy equipped with mass destruction weapons would probably have as its objective the destruction of our capacity for resistance and counterattack. No one who appeared before us has suggested that we could turn back completely such an attack. Indeed, if we were not fully prepared, a mass destruction attack might be followed by invasion by air-borne land troops for the purpose of taking advantage of the first confusion to seize strategic points in the United States and to destroy utterly the country's resistance. It might be that the attack would be less ambitious if the enemy again made the mistake of allowing us time to gear up our industrial capacity and our manpower. But in preparing our defenses and our counter measures we must anticipate the most violent assault of which the enemy is capable. We must not rely on his making major errors of strategy.

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It is apparent that the Air Establishment which we need is substantially different for the two phases. During Phase I we may assume that we will be free from an attack which would prevent our building up for war after war begins. But an attack during Phase II might be such as to cripple at the very outset our capacity to resist and to build up after hostilities start. For this reason, the force which is needed on and after the beginning of Phase II must be a force of considerably more power than during Phase I.

In neither phase can we have in being a counteroffensive force capable of winning the war outright in the first counterblow. We cannot support in peace a force capable of dominating the enemy's mainland. That would require a nation in arms—a nation as dedicated to war as the United States was at the peak of World War II. What we must have and can support is a reasonably strong defensive establishment to minimize the enemy's blow, but above all a counteroffensive air force in being which will be so powerful that if an aggressor does attack, we will be able to retaliate with the utmost violence and to seize and hold the advanced positions from which we can divert the destruction from our homeland to his.

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We now consider the recommendations of the armed services as to the air establishment which is needed during Phase I and Phase II.

The Requirements of the Air Establishment—Recommendations of the Commission

The Air Force

We have received from representatives of the Air Force and the Navy exhaustive presentations of the war missions to be carried out by each of the services and of the requirements of the services for the conduct of their missions. We have analyzed these strategic plans and requirements and have reached the following conclusions:

The Air Force as presently composed is inadequate. It is inadequate not only at the present time when we are relatively free of the dangers of sustained attack on our homeland, but is hopelessly wanting in respect of the future Phase II period when a serious danger of atomic attack will exist.

The present Air Force consists of 337,000 uniformed and about 125,000 civilian personnel. It is equipped with a total of 10,800 aircraft in active status, including about 580 heavy bombers and 2,300 fighters. Backing up this force is a reserve of about 12,800 World War II aircraft usable at any time during the next 2 or 3 years to replace losses of planes due to current peacetime attrition or, in the event of war, caused by combat losses.

Our present Air Force is divided into 55 groups. Each group is trained for specific missions such as strategic bombing, tactical reconnaissance, fighter escort, interception, and troop carrier and transport.

From evidence received from the Secretary of the Air Force, its Chief of Staff, and many of its ranking generals as well as informed authorities outside of the military establishment, we conclude that the 55-group force, if engaged in action in this present Phase I, could not carry out the missions assigned to it because it is lacking in the essential air units for effective combat action. It would be even less capable of carrying out the missions which would face it in Phase II conditions. Even more alarming is the statement by the Air Force that the funds presently available will not permit the maintenance of the present inade-

quate Air Force and that if appropriations are not increased the establishment must be cut back to approximately 40 groups with reductions starting in July 1948.

None of this must be permitted. There is a minimum force in being below which we must not go if we are to protect our country and its vital interests.

We have concluded that the minimum force necessary at the present time is an Air Force composed of 12,400 modern planes, organized into 70 combat groups, and 22 special squadrons, supplemented by 27 National Guard groups and 34 groups of Air Reserve. All these forces, with the exception of the Air Reserve, must be equipped, trained, and ready for immediate action in the event of war. We should build to this force as rapidly as possible and once it is achieved, never permit it to drop below this level. Nor should we permit it to become impotent and ineffective because of failure to keep it modernized with the very best planes and equipment available.

At first we seriously questioned the need of an Air Force of these proportions because it was obvious that building it and supporting it would involve a substantial increase in expenditures. However, as we studied the strategic and tactical needs of the Air Force we came to the conclusion that:

(1) The 70 groups would include the very minimum number of interceptor fighters necessary for our home defenses; and their effectiveness would be almost entirely dependent upon having a satisfactory radar early-warning system and adequate ground and air defensive missiles. We emphasize again, however, that no plans for defense should be made in derogation of the striking counter offensive air arm in being.

(2) The 70 groups would provide only 700 very heavy bombers for the strategic bombing of enemy targets. This force of bombers seems minute as compared with the 14,000 bombers of the United States Air Force and the Royal Air Force committed to combat in the European theater during the war. Only by using the very best equipment and the latest techniques will so small a force be able to carry an effective war to the enemy.

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Once committed to combat, losses of planes and personnel are very high. From experience in the European and Pacific theaters, we know that many operating groups lose 25 percent of their equipment every month of actual combat. Losses must be replaced immediately. At the outbreak of a war, industry cannot expand in time to make up combat losses in the first year. Unless, therefore, there are planes in reserve, combat forces would diminish rapidly after the beginning of hostilities and we would be left without a fighting Air Force after a few months of war.

The solution of this problem is one of the most serious tasks faced by the Air Force and the aircraft industry. Plans for the rapid expansion of industry will help, but no evidence presented to us indicates that any plan can be devised which will insure the production of planes by industry in time to replace combat losses in the first year of a war. Moreover there is the grave danger that enemy attack may so disrupt our industrial production that all forecasts of plane manufacture after war begins will prove to be unrealistic. Therefore, a reserve of aircraft in storage must always be maintained. This reserve is expensive to procure and costly to keep modernized. Planes in storage become obsolescent and must be replaced.

At the present time, we are reasonably well off because World War II surplus planes are still usable. Fortunately the Air Force retained a substantial number of planes as a reserve and sold or otherwise disposed of only those planes considered unusable. This reserve is gradually being used up. It must be replenished before the end of 1952. Estimates by the Air Force show that 8,100 new planes must be procured for this reserve between January 1, 1950, and January 1, 1953. The 8,100 figure for reserve planes is reached by establishing the deficiency between losses, computed on the basis of past experience, and replacement forecast under a theoretical mobilization plan. Since both losses and replacements are estimates, later studies may cause a revision in the recommended 8,100 plane reserve.

In summary, the problems of the Air Force are threefold: (1) The force in being must be increased from its present level to a minimum regular establishment of 70 groups (6,869 front line aircraft), an Air National Guard of 27 groups (3,212 front line aircraft) and an ade-

quately equipped 34 group Air Reserve. (2) The level of procurement of new aircraft must be high enough to keep this force modern at all times. And (3) an adequate reserve, now estimated at 8,100 aircraft, must be created and maintained in a proper state of modernization.

We must start now on such a program and complete it before the end of 1952.

The Navy Air Arm

We also have examined and analyzed the requirements of the Navy and its plans for the performance of its war missions both now and in the future. In one important regard the role of the Navy will differ in the future from that of the past. It will not be called upon to engage an enemy surface Navy since none exists and it is questionable whether any will be built by a foreign power within the next decade. This changed condition alters the mission of the Navy and the type of equipment it must use in the future, but it does not eliminate the need for a Navy.

In case of war the Air Force and the Ground Forces now could not operate effectively from the continental United States in a sustained attack against distant enemy centers. Rather they would have to occupy and conduct their offensive action from advanced bases strategically located and sufficiently close to the enemy's homeland. In addition they would have to prevent the enemy from occupying bases from which to conduct offensive operations against us. Only in this way could we carry the war to the enemy during Phase I. If we were to try to operate from our homeland without seizing advanced bases the enemy would carry the war to us, and our cities and people would suffer as England and Germany and Japan did in World War II.

Furthermore, it must be recognized that while the means of waging transoceanic warfare will some day certainly be perfected, the long-range aircraft and guided missiles needed for sustained operations are not yet here, and until they are transoceanic warfare will be limited to the occasional rather than the continuous effort.

The task of securing advanced bases rests on all three services, with the Navy having a large share of the responsibility for establishing

the troops and air forces on shore. Until the shore based establishment can become effective, carrier aviation must be relied upon. The problem of keeping open the supply lines to these bases through submarine-infested waters also is one of the important missions of the Navy. Moreover, this country, rich as it is in natural resources, is dependent on many distant sources of essential materials without which our ability to produce in wartime and to fight would be seriously affected. Most of these materials are transported over the seas, and securing and defending these sources of supply and maintaining the vital overseas supply lines is a Navy task.

The active Navy is now organized into two fleets—the Pacific Fleet and the Atlantic Fleet. Each is composed of several carriers and its supporting ships. The new strategy of the Navy is air power. The carrier has become the major ship—the battleship now is of only secondary importance.

In order to equip properly the carriers in operation and to conduct other air activities considered the responsibility of the Navy, one of the most important of which is protection against modern submarines, the Navy requires 5,793 front-line planes, plus about 5,100 in support.

The Navy now has the planes necessary to equip its active carriers and its supporting air operations. The Navy, however, needs funds for the procurement of new replacement aircraft. Like the Air Force, the Navy wisely placed a large number of World War II planes in reserve and since VJ-day has been replacing its operational losses of active planes by withdrawals from this storage. Knowing the reserve would be of value for only a few years because planes in storage become obsolescent, the Navy has followed the commendable policy of limiting procurement of new planes and making maximum withdrawals from reserves. This policy will soon exhaust the storage planes, and therefore we must increase our rate of procurement of new planes or face the danger of seeing our great carriers tied to the docks because of lack of planes.

The Unification Act and the Joint Chiefs of Staff

The strategic plans and requirements which we have been discussing were received by us from representatives of the Air Force and the Navy.

These are independent statements of each of the services and give no effect to the consolidation of functions and savings which must be made to result from the National Security Act of 1947.

It is the responsibility of the Secretary of Defense acting under the President to see to it that the Joint Chiefs of Staff prepare integrated strategic plans for the defense of the country and consolidate the functions of the services in such a way that the plans can be carried out with the minimum of personnel and equipment and a maximum of effectiveness.

We requested the Secretary of Defense to furnish us the requirements of the Air Force and the Naval Air Establishment as they should be now and at various specified future periods. The Secretary of Defense has been unable to comply with this request. The completion of the necessary studies and the integration of the three services without which our strategic plans will not be efficient and economical will require much time. Figures, of course, can be prepared quickly but they would be little more than a verification of the independent and separate requirements of the Air Force and the naval air arm as presented to us by the respective services. The real task—which cannot be done quickly—is to consolidate and integrate the functions of our total military establishment and to increase the dollar efficiency of every segment of it.

The Joint Chiefs of Staff are carrying on their analyses of requirements and their work to create an integrated and economical peacetime force in both Phase I and Phase II. In addition, of course, they must develop the wartime requirements of our consolidated military establishment. These requirements must be worked out with two clear objectives in mind. We must have a military establishment capable of defending the country: any recommendation that comes from the Joint Chiefs of Staff should never go below this minimum requirement. And the cost of such an establishment must be built on the most economical basis possible.

The military establishment we must have will put a heavy strain on the economy of the country. The recommendations of the Joint Chiefs of Staff must require the most rigorous efficiency in opera-

tions and in the consolidation of strategic functions. The Unification Act was passed to achieve these two purposes.

Most of the witnesses who appeared before us have pointed out the need for stronger military forces, with particular emphasis on the Air Establishment. But little has been said as to the cost.

The cost of the Military Establishment as reflected in this report shows beyond any doubt the critical need of carrying out the intent of the Unification Act to the greatest extent possible and at the earliest possible moment. We believe that there is an enormous opportunity for savings, and that as these savings are effected, the forces essential for our security can be maintained in being within the safe limits of our financial resources.

But to attain these economies vested interests must be set aside, traditional divisions of appropriations must be ignored, and every unnecessary activity must be abandoned if the war of the future no longer requires them. We are concerned by the fact that a majority of the Joint Chiefs of Staff, who represent three separate Services, may find it difficult to achieve these results. A heavy responsibility rests upon the Secretary of Defense to exercise fearless and independent judgment to see to it that integration means more than a mere consolidation of the requirements of each of the individual branches of the services.

We view with great anxiety the pressures from many sides directed towards the maintenance of yesterday's establishment to fight tomorrow's war; of unwillingness to discard the old and take on the new; of a determination to advance the interest of a segment at the sacrifice of the body as a whole. All this is understandable. For it comes in large part from loyalty of each Service to its traditions. But we can no longer afford the waste it involves. Hope rests only with the ability of the Secretary of Defense under the President to discharge effectively the authority vested in him with one objective in mind—the maximum in security for the minimum cost. It is imperative that this be done; for unless it is we will not have a military establishment capable of defending the country.

Recommendations of the Commission for Immediate Appropriations for the Air Establishment

We are informed by the Bureau of the Budget that for the current year the Military Establishment is supported by budget expenditures of \$10,098,000,000 (exclusive of terminal leave, stock piling and certain miscellaneous items). Of this amount, according to Budget figures, \$4,037,000,000 are for the Navy including naval air, \$2,850,000,000 are for the Air Force and \$3,211,000,000 for the Army. Out of the total budget of \$10,098,000,000, \$4,050,000,000 is for the Air Force and naval aviation (exclusive of the cost of construction and operation of carriers).

We are impressed with the need for a proper balance between the three services and have concluded that such a balance does not exist now because of the relative and absolute inadequacy of the Air Force Establishment. As we have said, the Air Force is inadequate for current conditions and is hopelessly deficient for Phase II conditions; and the Navy air arm will soon be lacking in equipment.

We make no recommendations for change in the appropriations for the Army and the surface Navy, but confine ourselves to recommendations for the maintenance of naval aviation and an immediate build up beginning January 1, 1948, of the Air Force. The appropriations which should be made for the Army and the surface Navy of the future, whether higher or lower than the present levels, should be determined by Congress after it has received from the President his recommendations as to the total integrated Military Establishment the country needs, based on analyses by the Joint Chiefs of Staff as to this integrated Military Establishment prepared by them under the direction of the Secretary of Defense.

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The increase in the Air Force must be started at once and be completed by the end of the year 1952. The 70 groups should be organized, equipped, and ready for service by January 1, 1950. An adequate reserve of planes, now estimated at 8,100, should be in being by the end of 1952. Uniformed personnel must be brought to the 401,000 figure now planned by the Air Force.

The chart shows the rate of build up of the 70 group force during the calendar years 1948 and 1949, as well as an indication of the trend of increase in the Air Force which should be made during the years 1950, 1951, and 1952 if the 70 group force plus the 8,100 plane reserve is to be in being by the end of 1952.

Our recommendations are for the calendar years 1948 and 1949 only. For the calendar year 1948 we recommend an increase in appropriations for the Air Force in the amount of \$1,300,000,000 and a further increase of \$1,300,000,000 for the calendar year 1949. We call especial attention to our recommendation later in this report that there be a complete review of the Military Establishment as of January 1, 1950. This review (which is marked on the chart with the words "Review Point") should control the direction of expenditures for the years 1950 and subsequently.

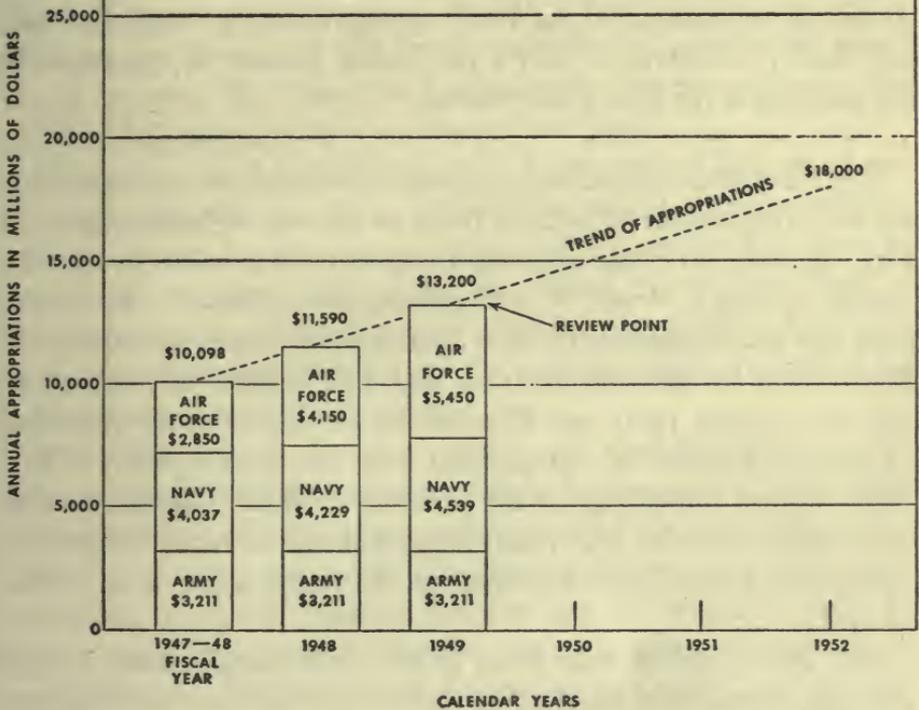
We recommend that, as part of the appropriations for the Air Force for 1948 and 1949, there be included \$350,000,000 more for the procurement of aircraft in the calendar year 1948 than the present rate of such procurement (\$550,000,000 for the current fiscal year); and that there be included for the calendar year 1949 \$660,000,000 more for the procurement of aircraft than would be procured in 1948 under our recommendation. These dollar figures would require the purchase of about 9,000,000 pounds of air frame more in 1948 than the present rate of Air Force procurement; and about 16,000,000 pounds of air frame more in 1949 than in 1948.

The building of the reserve of new planes, now estimated at 8,100, need not begin until January 1, 1950. Reserves of World War II planes in substantially adequate amounts are available for the years 1948 and 1949. We recommend however that in the calendar year 1949 there be allocated, out of the appropriation for that year, \$300,000,000 of contracts to begin the build-up of the 8,100 plane reserve. These contracts, placed in 1949, would produce planes only in the years subsequent to 1949.

Because of this deferring of the build-up of the 8,100 plane reserve program, it is likely that the increase in expenditures for the Air Force

Estimated Appropriations For National Defense Program

(IN MILLIONS OF DOLLARS)



in 1948 and 1949 will be less than in the third, fourth, and fifth years. The power of the Air Force will progressively increase, reaching the full 70 group strength with modernized reserves only at the end of 1952. We believe that this is the most economical way of building the Air Force we need and at the same time satisfies, within the limits of a calculated risk, the strategic requirements of the country for the present and the future with which we are dealing.

This procedure will have the added advantage of permitting a review as of January 1, 1950, of the reserve plane requirement by the Joint Chiefs of Staff and by the Commissions suggested later in this report.

Some savings through internal economies in the Air Force may be expected in 1948 and 1949. If we assume that such savings may be as much as 10 percent of the total cost of the Air Force, they would be of the order of \$285,000,000, based on the expenditures for the current fiscal year. Such savings, in our opinion, should not be used to cut our recommended Air Force appropriations for 1948 and 1949 but should be converted into a like dollar amount of contracts for the building of the 8,100 plane reserve.

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The Navy must immediately increase the annual rate of contracting for the procurement of aircraft (now at the rate of \$338,000,000 per year) in order to equip properly the present fleet with the modern aircraft needed as World War II reserves are exhausted. To accomplish this result contracts for new aircraft should be in the amount of \$530,000,000 for the calendar year 1948 (an increase of \$192,000,000 over the current rate) and \$840,000,000 for the calendar year 1949 (a further increase of \$310,000,000 over the 1948 figure). These dollar figures would require the purchase of about 4,000,000 pounds of air frame more in 1948 than the present rate of naval air procurement; and about 6,000,000 pounds of air frame more in 1949 than in 1948.

Any savings which may occur in the naval establishment in 1948 and 1949 should be applied to the reduction of the total naval budget, and should not affect our recommendation for the increased purchase of aircraft during these years.

We have received strong arguments that the air arm of the Navy should be increased from its present level to 8,000 first-line planes in being and 6,500 planes in support. Since any such increase would be part of a program of expansion of the Navy as a whole, we feel that a decision on this subject should be deferred until the Joint Chiefs of Staff have completed their strategic plans and their statement of

integrated requirements and then should be made only if the security of the country demands the expansion of the naval establishment.

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As appears from the above chart the present budget of the Air Force is at the rate of \$2,850,000,000. The recommendations of the Commission call for Air Force appropriations in the calendar year 1948 of \$4,150,000,000 and for Air Force appropriations in 1949 of \$5,450,000,000.

The present budget of the Navy is at the rate of \$4,037,000,000. The additional procurement of aircraft (assuming that the appropriations for the rest of the naval establishment remain the same) would increase this figure to \$4,229,000,000 for the calendar year 1948 and \$4,539,000,000 for the calendar year 1949.

The present total military budget is at the rate of \$10,098,000,000. The recommendations of the Commission would increase the total military budget for the calendar year 1948 (assuming that there are no changes in appropriations for the Army, the surface Navy, or the expenses of naval aviation other than for the purchase of aircraft) to \$11,590,000,000 and would call for a total military budget in the calendar year 1949 of \$13,200,000,000.

There will be, it is hoped, savings in our total Military Establishment resulting from the unification of the services under the direction of the Secretary of Defense as contemplated by the National Security Act of 1947. But we do not believe that any integration of our military operations under the National Security Act will lessen the need for the 70 group Air Force in being or for the replacement of existing naval aircraft. The likelihood of these savings should not therefore be considered as a reason for reducing the appropriations recommended in this report for the years 1948 and 1949.

The estimated trend of expenditures for the air establishment for the years 1950, 1951, and 1952, is shown in the above chart. This estimate is only an indication of the cost of the air establishment towards which we may have to build. It is likely that the reviews which we recommend later in this report will change the direction of these estimates, either increasing them or decreasing them. We believe that

unless conditions change substantially for the better, the 1950 review will increase the size of the establishment rather than decrease it.

But in any case, until the world situation improves, substantial expenditures for the military establishment must be considered a fixed item in the Federal budget. It is regrettable that these expenditures have to be made, especially at a time when we must make heavy commitments for economic rehabilitation abroad. But we cannot escape the clearly demonstrated necessity for a military establishment adequate to protect the country and its vital interests.

Military and Commercial Transport Services

The Air Force and the Navy each has its own transport service which was organized in World War II. The Air Force service is the Air Transport Command (ATC); the Navy service is the Naval Air Transport Service, referred to as NATS. In addition, the Marine Corps has a combat air transport service which is occasionally used as an auxiliary to NATS. The position of NATS was recognized in the National Security Act of 1947, which states that naval aviation shall consist in part of air transport essential for naval operations.

Each of these transport services is a sizeable operation. ATC has a fleet of 366 aircraft with about 22,000 military and civilian personnel and has flown an average of about 10,000,000 ton-miles per month this year. NATS has a fleet of 84 aircraft with about 6,300 military and civilian personnel and has flown an average of about 8,000,000 ton-miles per month this year. For the fiscal year 1947 the two services together carried about the same amount of freight as all United States certificated commercial carriers combined, and about one-eighth as much passenger traffic. The cost of NATS for the fiscal year 1947 has been estimated as about \$45,000,000; that of the ATC has not been estimated but it is undoubtedly much higher.

ATC now conducts regularly scheduled operations over 66,138 miles of routes; NATS over 41,918 miles. Many of these services are duplicating.

A directive has recently been issued which prevents NATS and ATC from carrying any but military traffic on routes where commercial services are available.

The purpose of the ATC and NATS services is to have in being in the event of war a personnel and cargo lift to the rear areas of the war theaters. Service into the areas of combat is provided by the Troop Carrier Command and the Marine Transport Command. ATC and NATS take over where the Troop Carrier Command leaves off.

ATC and NATS appropriations are handled within the regular Air Force and Navy budgets.

ATC and NATS cannot handle all the personnel and cargo lift to the rear areas in case of war. They plan to take over, as they did in World War II, as much of the civilian lines, domestic and international, as circumstances permit. The question thus is whether the present ATC-NATS planes and personnel plus the commercial line planes and personnel are sufficient for the future strategic needs of the country in case of war.

In any war within the future with which we are dealing the logistic supply to our advanced combat area must be largely by water. There are not enough planes to handle more than a fraction of the huge supplies which must be transported. However, certain personnel and cargo, especially in the early days of a war, must be transported quickly by air. Tentative estimates by the Military Establishment show that ATC and NATS at their present size plus the present commercial aircraft would be far short of what will be needed. For this we must increase our commercial fleet. We recommend later in this report certain policies for this purpose.

We also recommend the consolidation of ATC and NATS into one Military Air Transport Service to handle all scheduled military transport services for the Army, the Navy, and the Air Force.

We make one further recommendation on this subject. Advantage should be taken of our World War II experience in working out in advance the required coordination between the armed services and the commercial air lines. Contract arrangements specifying the equipment and services to be furnished to the Military Air Transport Service by the air lines should be made now with the commercial carriers.

Mobilization Planning

It is not enough to have an Air Force in being on the day war begins. Mobilization plans must be made in peacetime to enable us to expand our production of airplanes and other equipment as rapidly as possible after war begins. This subject is dealt with in section II below, in our discussion of the aircraft industry.

Plans must also be made in peacetime for the rapid mobilization of our manpower in event of war. In the case of our Air Establishment this problem centers on the so-called civilian "components" of the Air Force and naval aviation. In the case of the Air Force the civilian components are the National Guard and the Air Force Reserve. In the case of the Navy, they are the Organized Reserve and the Volunteer Reserve.

The problem is to have enough trained personnel to man and handle the planes which are in storage and those which will be built after war begins.

We have examined this question but are not prepared to make specific recommendations with respect to the air components. There is no point in developing a training program until the plans to provide the planes are farther advanced. If the recommendations of the Commission for the increase in the Air Establishment are put into effect, it will be necessary to develop corresponding plans for the training of pilots and ground crews to man these planes. When the Industrial Mobilization Plan has been farther advanced, estimates must be made as to the number of planes to become available under this plan; and corresponding plans for the training of personnel must be developed.

The Secretary of Defense has appointed a committee within the Military Establishment to study this question which presents problems of long historical background and great difficulty. The problem assumes importance because the Air Force is depending upon 27 National Guard groups as part of its first line forces. The report of the committee established by the Secretary of Defense and the necessary action to insure satisfactory and economical functioning of the civilian components are therefore of the highest importance.

Periodic Reviews of the Military Establishment

We recommend that there be periodic reviews of the Military Establishment of the United States in the light of the then international situation and the military strength of other nations.

We must at all costs avoid a hit or miss armaments program. We must not believe that any program which may be adopted now will solve once and for all the problem of national defense. Our plans for the Military Establishment must be constantly revised. The strength and techniques of other nations are changing rapidly in the current scientific revolution. Our Military Establishment must change with them—not behind them but ahead of them. Moreover, we can get the integrated fighting force we need only if continual reviews see to it that this force is produced at the least possible cost to the taxpayer. Unless there are such reviews, duplications and ineffective use of the security dollar are inevitable.

There now are arrangements for such reviews by the highest officials of government.

The National Security Act of 1947 places the responsibility for the maintenance of our defense forces on the Secretary of Defense, under the President and within the limits of the funds made available by Congress. The Secretary of Defense has available to him a structure for the manufacture of the over-all strategic plan. The National Security Council, composed of the Secretary of State, the Secretary of Defense, the Secretaries of the Army, Navy, and Air Force, has the duty, under the President, of integrating our foreign policy and our military power—that is of seeing to it that we have a military force strong enough in the light of our international policies and of international conditions. With this top-level advice the Secretary of Defense has the responsibility for arranging that the Joint Chiefs of Staff prepare and keep constantly revised the strategic plans of the country. The Secretary of Defense relates the plans of the Joint Chiefs of Staff to the possible by checking their proposals with the National Security Resources Board to see if the material and human resources of the country are enough to fulfill the plans which the Joint Chiefs of Staff

propose—and adjustments are made accordingly. The plans are then referred back to the National Security Council through the Secretary of Defense for further checking and instructions; and this process starts all over again in order that the strategic plans will be always up to date.

This is a sound procedure. We believe, however, that the arrangement lacks an essential element—the direct participation by the people of the country in the preparation of the plans.

Some national policies touch the people so intimately and so seriously that the ordinary processes of government are inadequate. Under our system of representative government, national policies usually are made by the Executive and the Congress, with the role of the public an indirect one. Some policies, however, cannot be made by the elected representatives alone. The making of war is one such policy. The preparation in peace for the defense of the country in the atomic age is another.

This Commission does not believe that we will ever have an adequate Military Establishment unless the people of the country know fully what the international military and political situation is, what kind of a military force is necessary if we are to be ready for that situation, and how much it will cost to have this force. With these facts before them they may choose, with full knowledge of what they are doing, whether they will or will not pay the bill. We believe they will want to pay it—provided they feel sure that what they are getting is as free as possible from duplicating or other useless expenditures and is absolutely necessary for their safety.

We make the following recommendations:

1. That the National Security Act of 1947 be amended to provide that the President appoint on June 15th in each second year, or more frequently if he sees fit, and subject to confirmation by the Senate, a commission of five citizens with no connection with government who shall review the Military Establishment of the country and its adequacy in the light of the then international military and political situation and shall submit a report of their findings and recommendations to the President by the following January.

This commission should be composed of different persons on each occasion. Their report should deal among other things with the efficiency with which the procurement and other policies of the Military Establishment are being carried on. The purpose must be not only to have what is necessary but also to have it at the minimum cost to the United States taxpayer.

2. That the report of this commission of citizens be made public by the President. Military security does not require secrecy in this matter. It may require secrecy in some details. But it does not require secrecy as to the broad outlines of the military strength of foreign powers and the steps which should be taken to be ready to meet that strength if it is used against us. Not to tell the people the military facts they are facing would not only deny to them what they are entitled to know, but also would make it impossible to have an adequate preparedness program.

We believe that our policies as to military secrecy in relation to our Military Establishment require overhauling. Details of our new air equipment and technical information as to our applied research and development which should be kept secret are often released to the press. This detailed information as to our airplanes and other air equipment is of no interest to the American public but it is of interest to nations competing with us in the current race for air power. On the other hand the people of the country are not kept fully informed of the dangers of the military situation they are facing and of the preparation they ought to make to defend themselves against these dangers. These facts are known by all foreign governments, but there is now no procedure in our Government for systematically informing our people about them.

We recommend a reversal of both present policies. Less information should be given out as to the technical facts of our air establishment. More information should be given out as to the broad lines of the military situation which confronts the country and of the Military Establishment needed to handle this situation. The best way to give the people this information is to have these reviews of the state of our Military Establishment made public.

Section II

Aircraft Manufacturing Industry

Aircraft Manufacturing Industry

Basic Considerations for National Security

A strong aircraft industry is an essential element in the Nation's air power. Our air establishment would be useless unless backed by a manufacturing industry skillful in technological application, efficient in production, capable of rapid expansion, and strong in basic financial structure.

On the basis of the evidence, the over-all aircraft industry of the United States now meets only the first of these specifications. A parade of witnesses has testified as to its current productive weakness as an industry, its general lack of preparation for rapid expansion, and its general financial instability. How to remedy those deficiencies is a matter that has engaged the Commission's close attention.

As a point of departure, it is necessary to calculate the minimum level at which the industry must be held to provide a safe base for expansion in an emergency. Our own studies, together with figures supplied by the industry and the military services, tend to confirm the general range of requirements set by the Air Coordinating Committee in its report of October 22, 1945.

Two levels were set by the Air Coordinating Committee. The lower level was an estimate that the aircraft industry required military purchases in the amount of 30,000,000 pounds of airframe weight annually. This was considered "as a minimum which could be reached only after maintenance of world peace is well assured and a substantial degree of disarmament has taken place." The Air Coordinating Committee also proposed an alternate level of about 60,000,000 pounds of airframe for the event that world conditions were such that * * * "we have * * * need for a substantial striking force ready at all times to cooperate in the maintenance of world peace." The military requirements listed in section I would lead to a steady build-up throughout this range over the next few years.

This Commission believes that military requirements for 30,000,000 to 40,000,000 pounds annually, in addition to demands for commercial and private planes, would provide a sound basis for expansion in an emergency.

No artificial stimulation to achieve this result appears to be necessary. If the program outlined in section I is carried out, the necessary base for expansion of the aircraft industry will exist. The rate of procurement recommended in section I would increase the present military procurement (which is now at the rate of about 21,000,000 pounds annually) by contracts for an additional 13,000,000 pounds during the calendar year 1948, and for 22,000,000 pounds in 1949 more than in 1948.

This, of course, is not a permanent solution. It satisfies only the demands of the immediately foreseeable future. If the threat of war diminishes, or if war becomes imminent, new levels of military demand (lower or higher) must be calculated and maintained. As is recommended throughout this report, periodic reviews of the military needs must be made, and plans and programs adjusted to fit conditions as they change.

It was widely predicted before the end of World War II that rising demand for commercial aircraft, both transport and personal, would tide a number of companies over the postwar adjustments of 1946 and 1947. For various reasons, some of which are dealt with elsewhere in this report, these hopes have not been justified. Although conditions may change in the future, it is certain that current commercial demands alone will not carry us through the present crisis. Whether we like it or not, the health of the aircraft industry, for the next few years, at least, is dependent largely upon financial support from Government in the form of orders for military aircraft.

* * * * *

To justify that support, the aircraft industry of the United States must be capable of turning out superior war weapons. The importance of adequate aeronautical research programs cannot be over-emphasized. This phase of the problem is discussed in section III of this report.

At the time the Morrow Board convened (1925) the design of a successful military aircraft depended largely upon the efforts of a single man—the final product was almost wholly a reflection of one individual's ideas. Today, every design is the end point of many contributions by many individuals. The concept of the engineering team is almost universally accepted. Group engineering know-how is one of the most valuable assets carried forward by aircraft manufacturers out of the World War II period. If, for any reason, too many of the war-trained teams are dispersed, we are in danger of losing this hard-won knowledge and experience.

But the aircraft industry must do more than design aircraft of top performance. It must also design them for efficient production in quantities to meet the needs of the armed services. Since World War II, military aircraft have become much more complicated. The net result has been to increase the number of their component parts and to complicate their final assembly. The most efficient aircraft in the world, no matter how brilliant its performance, is of little value to the national defense unless it can be manufactured quickly in large quantities.

The team concept is not limited to research and design. Production planning and production control groups are equally necessary, but it is more difficult to keep such teams together in peacetime. When production drops off to mere jobbing levels, their functions simply disappear. Means must be found to keep alive the special skills that have been evolved in these particular fields during the war years. If they are allowed to be dissipated, time and effort will be needed to replace them in a future emergency.

The techniques of aircraft manufacture vary widely with changes in the volume of orders. It is uneconomical to do extensive special tooling, either for manufacture or assembly, to turn out a few units. If, on the other hand, thousands of similar airplanes are required, the expenditure of relatively large sums for special jigs, fixtures, and tools is justified. Between the two extremes are wide areas in which the exercise of good judgment is the only controlling factor. The only way such judgment can be generated is through actual production

experience. How to provide the aircraft manufacturer with orders in sufficient quantity in peacetime to develop that kind of experience and to justify planning and tooling to a reasonable level for emergency expansion is one of the most important questions facing the services.

In a freely competitive economy the number of companies manufacturing a particular product levels off at a point determined by the ordinary laws of economics. In the case of the aircraft industry, however, it would be dangerous to rely only on the operation of these laws. The demand factor fluctuates too violently from peace to war. If a reasonable degree of expansibility is to be maintained for periods of emergency, it is necessary to exercise some industry-wide control in the interests of national security. It may even be desirable to keep a few marginal manufacturers in business who might be forced out if the normal laws of supply and demand were allowed to operate.

Based on considerations of maximum security, it is essential to maintain at least two sources of supply for similar products. It has long been the practice for the procurement agencies of the Army and Navy to keep alive at least two separate producers of each type of aircraft, as well as two or more separate sources for each of the major components. We believe that this policy is sound and should be continued. It develops automatically a degree of manufacturing dispersal which might otherwise not exist. In a field in which the technology is changing rapidly, competition between design and development groups results in continuously improved products, and price competition between suppliers results in lower unit costs.

* * * * *

The financial difficulties which harass the aircraft industry today stem from many causes. Uncertain Government policies account for many of them. Some reflect faulty judgment by management. Others have come about from particular circumstances which have surrounded this peculiar industry in the postwar period of readjustment. Some of them are:

(1) A product that is, almost indivisibly, a weapon of war and a carrier of commerce;

(2) A market with but one major customer, the Government, which purchases 80 to 90 percent of its entire output;

(3) A violently fluctuating demand, due to uncertainty of requirements of its major customer;

(4) A lack of the production continuity which is vitally important in sustaining a trained work force and in keeping production costs to a minimum;

(5) A rapidly changing technology which causes a high rate of design obsolescence and abnormally high engineering costs;

(6) An extremely long design-manufacturing cycle;

(7) An organization in excess of present requirements.

The financial strength of any individual company or of the industry cannot be measured by the amount of sales, the extent of working capital, or the total floor space of its plants. It depends upon profitable operation. A profitable organization will attract capital and credit. It will be able to employ and retain the most capable engineers and craftsmen. The concern which consistently loses money will deteriorate, its financial position will weaken, and the quality of its product will suffer as its best employees drift away in search of better opportunities.

The Government cannot guarantee profits. Government can and should, however, create an atmosphere as conducive as possible to profitable operations in the aircraft manufacturing business. This can be done by longer-range planning, adequate volume, and the abandonment of uneconomic procurement practices. Under these circumstances, it will be the task of each manufacturing company to work out its own salvation.

The State of the Aircraft Manufacturing Industry

The aircraft manufacturing industry covers all those manufacturers whose products are included in finished aircraft, military or civil. The normal airplane consists of the airframe (fuselage, wings, tail surfaces, landing gear); the propulsion system (engines, turbo-jet units, rocket motors, propellers); instruments (control, navigational, recording); communication equipment; accessories (pumps, generators, landing lights); and furnishings (seats, fire-extinguishers, and miscellaneous fixtures).

The airframe manufacturer is responsible for the final product. He designs and builds the basic structure and installs the numerous components. He also test-flies the airplane before delivery to the customer and is responsible for its satisfactory performance.

The price of the airplane to the commercial customer usually includes the cost of all components. The aircraft manufacturer purchases them from their producers just as he does his raw materials. In aircraft for the military services, however, the airframe manufacturer bases his price on the cost of the airframe and of installing in it the various components. The Government usually buys the engines, propellers, instruments, and accessories separately. These are delivered to the airframe manufacturer as Government furnished equipment (GFE).

About half of the cost of the finished military aircraft is represented by the cost of the airframe and its assembly plus the cost of installing the GFE. The other half is the cost of the GFE. Thus, of a billion-dollar aircraft procurement program, about \$500,000,000 goes to the airframe companies and the balance is spread among the hundreds of companies that build engines, propellers, radios, instruments, lights, heaters, and other gear.

Patent cross licensing.—All the principal manufacturers of aircraft are members of the Manufacturers Aircraft Association, through which they license each other and the Government on all their aircraft patents. Over 90 percent of such patents are licensed without fee. On others, small royalties per airplane are paid. There is, accordingly, complete freedom among the MAA membership to adopt, and incorporate in new aircraft, features developed by other companies. Design patents are offered for license on a percentage royalty basis.

Composition of the industry.—The aircraft manufacturing industry may be roughly divided into (a) the 15 major companies or groups which produce the majority of the airframes, engines, and propellers for the military services and for the airlines and other users of transport aircraft; (b) the nine major manufacturers of personal and small commercial aircraft; (c) and numerous additional small companies making personal and other aircraft. The divisions are not sharply

defined as some personal airplanes and helicopters are made by certain of the 15 major companies, while some of the personal plane manufacturers also make transports and military liaison airplanes.

The 15 major airframe companies are:

1. Bell Aircraft Corp.
2. Boeing Airplane Co.
3. Consolidated Vultee Aircraft Corp.¹
4. Curtiss-Wright Corp.²
5. Douglas Aircraft Co., Inc.
6. Fairchild Engine & Airplane Corp.
7. Grumman Aircraft Engineering Corp.
8. Lockheed Aircraft Corp.
9. The Glenn L. Martin Co.
10. McDonnell Aircraft Corp.
11. North American Aviation, Inc.
12. Northrop Aircraft, Inc.
13. Republic Aviation Corp.
14. Ryan Aeronautical Co.
15. United Aircraft Corp.³

The nine major makers of personal and small commercial planes, most of whom were important producers of small military aircraft and aircraft components during the war, are:

1. Aeronca Aircraft Corp.
2. Beech Aircraft Corp.
3. Bellanca Aircraft Corp.
4. Cessna Aircraft Co.
5. Engineering & Research Corp.
6. Luscombe Airplane Corp.
7. Piper Aircraft Corp.
8. Taylorcraft, Inc.
9. Texas Engineering & Manufacturing Co.

During the war many of the major aircraft companies operated branch plants remote from their main factories. Other airframe and engine plants were operated by companies not traditionally a

¹ Includes the Stinson Division (personal airplanes).

² The Curtiss-Wright group includes the Curtiss Airplane Division, Curtiss Propeller Division, and the Wright Aeronautical Corp. (engines).

³ The United Aircraft Corp. group includes the Chance Vought (aircraft), Sikorsky (helicopters), Hamilton Standard (propellers), and Pratt & Whitney (engines) divisions.

part of the aircraft industry. The wartime aviation industry occupied the plants shown on the accompanying map. It will be noted that plants were widely dispersed. Now, nearly all of the branch plants have been relinquished and most of the companies which were temporarily in aviation activities during the war have withdrawn from aviation with the exception of the Allison Division of General Motors, General Electric Co., and the Westinghouse Co., all of whom are active in the turbo-jet engine field.

Facilities and output.—The accompanying table shows the floor areas, number of employees, and airframe production of the major

	1939	War peak	1946	1947
Floor area (covered) (in millions of sq. ft.)				
Total for all manufacturers of military and large civil airframes, engines and propellers.	13 (Jan. '40)	175	54 (Dec.) ⁴	53 (June). ⁴
Airframe prime contractors	10 (Jan. '40)	111	41 (Dec.) ⁴	40 (June). ⁴
Engine prime contractors	3 (Jan. '40)	55	11 (Dec.) ⁴	11 (June). ⁴
Propeller prime contractors	(¹)	9	2 (Dec.) ⁴	2 (June). ⁴
Employees ² (in thousands)				
Industry total for both military and civil airframes and engines.	76 (Dec.)	1,708	221 (Dec.)	200 (Oct.).
Industry total for military and civil airframes.	63 (Dec.)	1,257	184 (Dec.)	164 (Oct.).
Production—Yearly ³ (in millions of airframe pounds)				1947 (1st 10 Mos.)
Total military and large civil ⁵	13	1,101	24	23.
Total military	11	1,101	15	10.
Total large civil ⁵	2*	0	9	13.

*Estimated.

¹ Less than 0.5 million sq. ft. (492,000 sq. ft.).

² Includes prime contractors and sub-contractors.

³ Includes spares.

⁴ In the 1946 and 1947 year columns, the floor areas shown are for those companies contracting with the military services during these periods, although some of these companies also make commercial aircraft.

⁵ Four-place and over.

companies for 1939, at the war peak, for 1946 and for the first 10 months of 1947. Included in the figures for airframe weight of large civil airplanes are aircraft of 4-place and over, some of which are the products of the personal plane manufacturers.

Financial condition.—Pertinent financial data on the 15 major companies are presented in the table below. Total sales are shown for the calendar years 1939, 1944, and 1946, and for the first 6 months of 1947. Net profit or loss and the ratio of profit or loss to sales are shown for the years 1939, 1944, and 1946. Net worth, working capital, investment in plant and equipment, and the ratio of sales to each of these, is shown for the years ending on December 31, 1939, 1944, and 1946.

	1939	1944	1946	1947 (1st 6 mos.)
Sales millions of \$. .	244	8, 204	711	375
Net profit (or loss) do	30	133	(13)
Net worth do	138	596	640
Working capital do	64	424	541
Plant and equipment do	62	105	89
Ratio—net profit (or loss) to sales percent . .	12. 4	1. 6	(1. 9)
Ratio—sales to net worth do	1. 8	13. 8	1. 1
Ratio—sales to working capital do	3. 8	19. 4	1. 3
Ratio—sales to plant and equipment do	3. 9	77. 8	8. 0

NOTE.—Value figures are rounded to nearest million; ratios were computed on actual figures.

The \$13,000,000 net loss in 1946 was after application of nearly \$72,000,000 in tax-refund credits. A substantial portion of the loss was attributable to development costs of commercial aircraft and other nonmilitary activities. Other losses resulted from difficulties in curtailing expenses as rapidly as sales declined, expense of rearranging plants for decreased postwar volume and for new models, delays in obtaining raw materials due to postwar shortages, acceleration of production schedules to meet airline demands for new transports in some companies, and heavy development costs and losses on nonaeronautical commercial ventures by other companies.

Not shown in the table, but worthy of comment, is the decrease in working capital of nearly \$83,000,000 in 1946. Of this amount, \$45,000,000 was used to purchase plant and equipment.

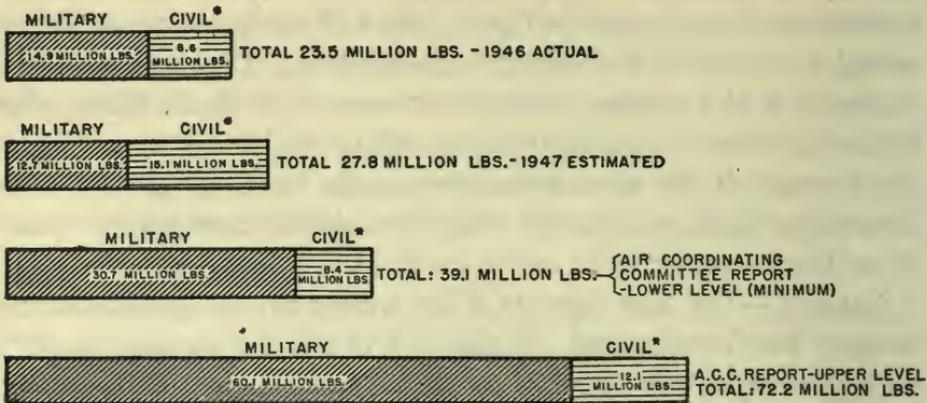
Backlogs.—In compiling the backlog figures submitted to us by the 15 major aircraft manufacturing companies, it was apparent that a statement of any composite figure, even with the explanations given, would be confusing and might be misleading. This is largely due to the lack of a uniform basis of accounting methods within the industry, particularly in this respect. While we have recognized and given weight in our recommendations to the backlog figures, it was deemed advisable to omit the publication of the exact total amount of contracts reported to be on the books of the aircraft industry.

Capacity.—The peak capacity of the present aircraft manufacturing industry may be estimated. At the peak of war production, "on-site" air frame output was 9 pounds per square foot per year. The present covered floor area of the major airframe manufacturers now contracting with the military measures 41,000,000 square feet. At 9 pounds per square foot per year, this area should support a peak output (under full wartime conditions) of 369,000,000 air frame pounds per year.

Plants now held in reserve have a total area of 21,200,000 square feet. Applying the same ratio, they should support an additional 191,000,000 air frame pounds per year at peak utilization. The potential industry peak capacity under the best conditions attained in 1944, and without allowance for the possible contribution of the companies specializing in personal plane production, is approximately 560,000,000 pounds of air frame (including spares) per year. Available space, even under normal peacetime rates of output is thus more than adequate for the production of the aircraft for which procurement is recommended in section I. Testimony has indicated that plants now producing airplanes are readily convertible to the pro-

duction of guided missiles. Their capacity to produce poundage of such missiles should be equal to or greater than their capacity in terms of air frame pounds.

Civil aircraft production.—The relative importance of civil aircraft manufacture is illustrated graphically in the accompanying chart.

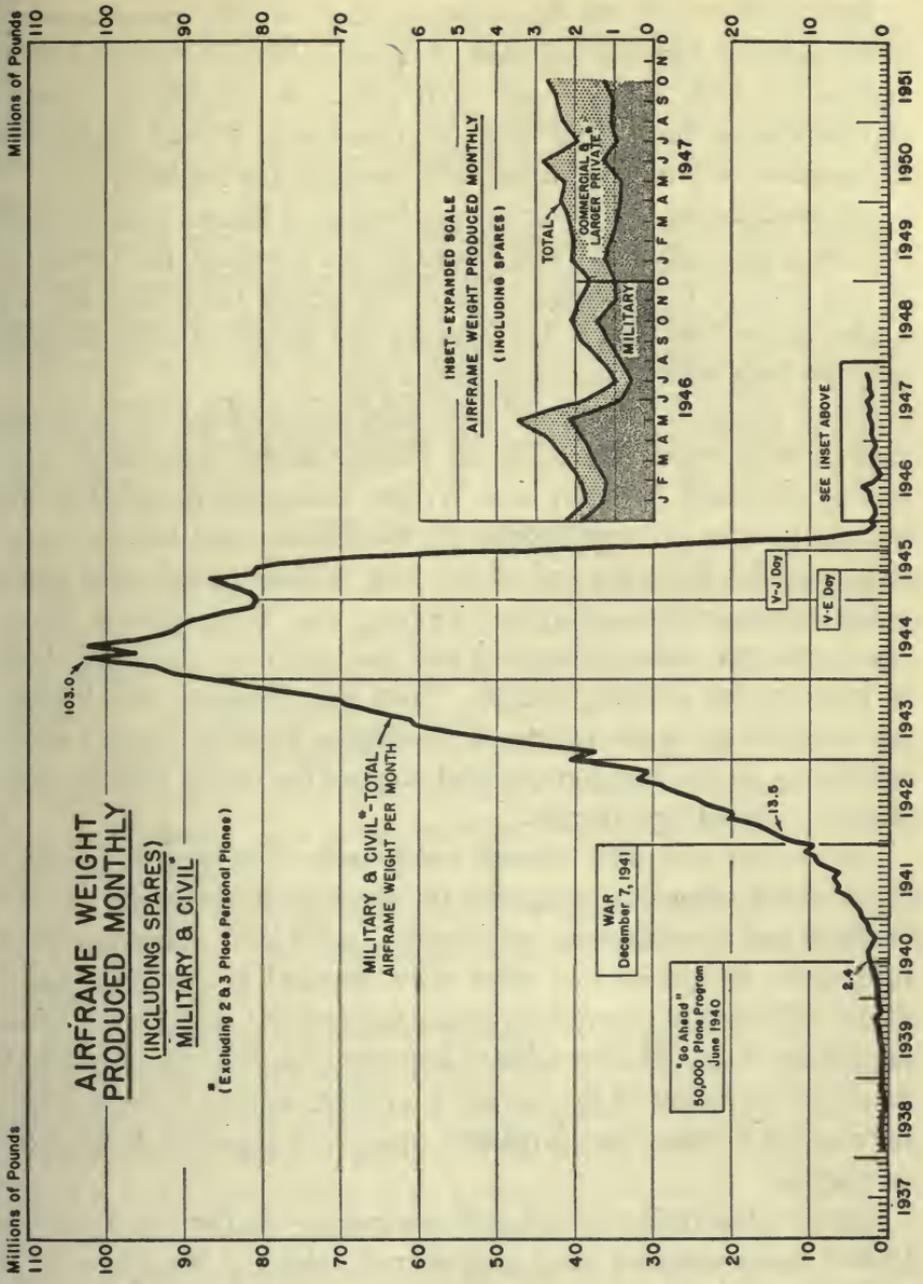


AIRFRAME PRODUCTION

(*EXCLUDING SMALL PRIVATE PLANES)

This shows (1) the 1946 output, in air frame pounds, of military airplanes and of large (4-place and over) civil airplanes, (2) the estimated 1947 output figures, (3) the corresponding figures for the lower level of the Air Coordinating Committee report of October 22, 1945, and (4) the upper level figures of the ACC report. All weights include spares (estimated for 1946-47) and excluding experimental production. Although the production of small personal aircraft has fallen off sharply, the output of larger civil aircraft continues in substantial volume.

An additional chart has been included to show the total military and civil (4 place and large) airframe weight produced monthly from 1938 to late 1947. For the postwar period, the inset shows the total production divided between the military and the large civil aircraft.



Helicopters.—Two of the major military aircraft manufacturers (Bell and the Sikorsky Division of United Aircraft) produce helicopters for both military and civil users. A number of smaller companies are developing helicopters and one, Piaseki Helicopter Corporation, is producing transport helicopters for the Navy.

Lighter-than-air.—Little or no production of lighter-than-air craft has taken place since the war, although one company, the Goodyear Tire & Rubber Co., remains a source of supply for blimps for the United States Navy and is also fostering new designs of large dirigible types for both military and commercial uses.

Power plants.—Prior to the war, only conventional reciprocating engines were manufactured in the United States. Two large companies, Pratt and Whitney and Wright Aeronautical, supplied the greatest number of large engines for the military and for the larger civil aircraft. Near the end of the war, Allison (which also made reciprocating engines), General Electric, and Westinghouse developed new type turbo-jet engines and are currently supplying them in quantity for military aircraft. Pratt and Whitney and Wright Aeronautical are in the process of developing turbo-jet engines while continuing to produce conventional engines for use in current commercial and civil type aircraft.

Instruments and other aircraft equipment.—The aircraft industry also includes numerous companies (or divisions of companies) which develop and manufacture instruments, radio and communication equipment, accessories, and other items required in the modern airplane. This group generally produces for both the military and commercial markets. Their combined importance is indicated by the fact that over 17 percent of the cost of an average military aircraft is represented by Government furnished equipment procured from these companies.

Exports of aircraft, engines, and equipment.—In the year 1946, the United States exported 2,243 civil aircraft valued at \$64,206,000 and 59 military aircraft valued at \$1,057,000. In numbers, the markets for the civil aircraft were: South America 827, the rest of North America (chiefly Canada and Mexico) 791, Central America and the Carib-

bean Area 169, Europe 195, and the rest of the world, 261. By value, the markets for these civil aircraft were: South America, \$15,200,000, the rest of North America, \$7,200,000; Central America and the Caribbean area \$3,100,000, Europe \$29,300,000, and to the rest of the world, \$9,400,000.

The value of the 2,490 aircraft engines exported in 1946 reached \$11,900,000, while exported propellers accounted for \$1,000,000. The markets for the exported engines were: South America 718, valued at \$2,200,000; Central America and the Caribbean area 217, valued at \$1,000,000; the rest of North America 602, valued at \$1,900,000; Europe 780, valued at \$5,800,000; and to the rest of the world 173, valued at \$1,100,000.

Recommendations

Most of the problems which beset the aircraft-manufacturing industry in 1946 and 1947 resulted from (a) over optimistic development and production of commercial aircraft; (b) low-level military procurement and (c) the absence of long-range military planning. As we have said, military procurement in accordance with our recommendations in section I of this report will provide sufficient business to maintain the industry in a sound condition—but such business must be wisely distributed.

The services must undertake more extensive planning and control of procurement. We recommend that they be given the legislative authority to do so.

We have pointed out that the industry comprises a number of separate companies. Although competition between these units should be utilized to provide incentive to low costs and low prices, the aircraft-manufacturing industry, being essential to the national defense, cannot be freely competitive to such an extent that vital design teams or production organizations are liquidated. Means must be devised to avoid undue concentration of business in a few companies. This, it is recognized, implies a greater degree of planning and control than the services have heretofore undertaken, or is, in fact, permitted by the peacetime procurement legislation which will again become ef-

fective on the expiration of the War Powers Act. Some continuation of those special powers must be allowed if we are to achieve a balanced aircraft industry.

Such planning must be directed toward avoidance of discontinuities in production. As has been stated repeatedly in testimony, such breaks in production result in high costs. Not only do many expenses continue while production is interrupted, but the training of a new labor force on resumption of operations involves a great increase in unit costs.

Long-range planning.—Year-to-year planning of aircraft production, which has been forced upon the services by current budgeting practice, must give way to long-term planning. Evidence submitted to us indicates that the savings on the uninterrupted production of airplanes over a 5-year period, as compared to five annual procurements of the same total number of planes, could run as high as 20 to 25 percent. Such savings result in part from the ordering of materials and parts in larger quantities and to the more extensive tooling warranted by the larger number of airplanes on the single order, but even more from the more effective use of tools and manpower.

Long-range planning does not imply a single frozen procurement program for a period of years, but rather the integration of several concurrent plans, the duration of each of which will depend on its particular character. While many projects can be planned for 5 years, others are of such a nature that they cannot be planned for more than 2, 3, or 4 years ahead. The aggregate of such 2-, 3-, 4-, and 5-year plans will constitute the "plan" for which a budget must be prepared. All of these plans should be reviewed at least annually.

Forward contract authorization.—We recommend that the services plan their aircraft procurement as far in advance as possible and that the Congress provide the legislative base for such planning. We recommend the placing of orders for planes for delivery over a 5-year period whenever possible. We propose that the budget be charged each year with the necessary progress payments and the funds needed to pay for the airplanes accepted in that year. Congress might provide funds for such planned procurement by appropriating funds

disbursable in the current year and for 5 or more years ahead. To do so, however, would commit current funds needlessly. We propose, instead, that the Congress make appropriations only of the moneys to be disbursed in the current fiscal year, and provide for the additional years of the procurement program by forward contract authorization, permitting the services to contract for deliveries over the following 5 fiscal years. We recommend that the Congress retain complete control over such procurement through its subsequent annual appropriation of funds to liquidate the forward contract authorizations.

Industrial mobilization planning.—The ability of the aircraft manufacturing industry to expand will control, to a large extent, the magnitude of our strength in a future war. In section I of this report we have concluded that the Air Force will need a storage reserve of 8,100 airplanes to replace combat losses in the early months of war, because industry will not be able to supply the needed planes in time. This reserve would cost, at present standards and prices, from \$6 billion to \$7 billion and, in addition, would require about \$2 billion a year to keep modern. An industrial mobilization plan which can be depended upon to speed production after war starts may reduce the size of the reserve which will be required.

According to the National Security Act of 1947, the coordination of military, industrial and civilian mobilization is the responsibility of the National Security Resources Board. Based on the advice of the Board, the President may direct the Secretary of Defense and the heads of the appropriate civil departments to undertake the planning of military and industrial mobilization. On the military side the Secretary of Defense holds the Secretaries of the Army, the Navy and the Air Force responsible for military and industrial mobilization planning within their respective services. On the civilian side, it is our recommendation outlined in section V of this report that the Secretary of Commerce and the Secretary of Civil Aviation take an active part in mobilization planning.

We urge that the Under Secretaries of the Army, the Navy, and the Air Force give special attention to effecting such planning. We recommend that, at the administrative level, industrial mobilization plan-

ning receive attention comparable with that given to research, development, and procurement.

It was urged on the Commission that all procurement and mobilization planning functions of the Air Force should be carried out by civilian personnel rather than by pilot officers whose tours of duty in such activities are likely to be interspersed with other assignments. We believe that it would be extremely difficult, because of Government pay levels and civil service restrictions, to recruit and hold the quality of civilians necessary for this type of work in numbers sufficient to do the job adequately. We recommend, however, that the practice of passing combat officers through such assignments on the assumption that a well-trained officer must have had experience in all branches of the Air Force should be discarded. With its maturity as a full-fledged service under the National Security Act, the Air Force should accept the fact that procurement and mobilization planning call for officers with specialized industrial training who wish to make a lifelong career in those fields. Such officers should have the same opportunity for advancement in rank as those in other commands.

We recommend that, in the industrial mobilization planning program, studies be made for all planning necessary to place one model of each basic type of aircraft in production in a reserve plant in an emergency, such planning to include the preparation of shop drawings, operation sheets, bills of material, work orders, and the design of all jigs, fixtures, and special tooling. This planning must also include continual revisions to keep all material up to date.

We believe that top level attention should be given in each aircraft manufacturing organization to industrial mobilization planning in peacetime. Subcontract arrangements should be worked out in advance outside the aircraft industry. Licenses or other agreements for the production of aircraft, power plants, propellers, instruments and accessories by nonaeronautical firms should be entered into, ready for activation in an emergency. The peacetime integration of such companies within the air industrial mobilization plan should expedite any expansion greatly.

We have heard a great deal of criticism of the current condition of industrial mobilization planning. We believe, however, that with the establishment of the responsibilities and procedures above outlined this important work should go forward satisfactorily.

Mobilization authority.—Industrial mobilization planning is futile if the mobilization cannot be carried out according to plan when the emergency comes. To give value to such planning it is essential (a) that the National Military Establishment reflect such plans annually in a mobilization budget showing the appropriations and forward contract authorization necessary to put this budget into effect should mobilization be initiated in the then current fiscal year; (b) that the Congress authorize (but not appropriate for) such mobilization budget annually; (c) that the National Security Resources Board set up an Office of War Mobilization, with the necessary subsidiary offices for the control of materials, production facilities, machine tools, and other capital goods, to be held ready for activation upon declaration of a national emergency and mobilization by the President; and (d) that in the event of such mobilization the Congress immediately vote the necessary forward contract authorization and appropriation to support the authorized mobilization budget. These first three actions, taken by the National Military Establishment and by the Congress in peacetime, when they can be considered calmly and carefully, will avoid the necessity for a repetition of the hasty and costly improvisations of World War II. We emphasize the importance of this preparation. It is essential, in any future emergency, that all controls and all planned procurement be initiated immediately upon the declaration of an emergency by the President.

Strategic materials.—No mobilization planning can be carried out in the absence of the materials from which the aircraft and other aeronautical equipment are to be constructed. The Strategic and Critical Materials Stock Piling Act (Public Law 520, 79th Cong.) and the National Security Act of 1947 establish the authority and responsibilities of the National Security Resources Board, the Munitions Board, and of the Secretaries of Defense and of the Treasury, in respect to the stock piling of strategic and critical materials. Attention

is directed to the importance of maintaining domestic sources of critical and strategic materials as an effective and advantageous alternative to the stock piling of certain imported items and materials.

Procurement policies.—We point out that the procurement policies of the services must be directed to the provision of incentives to (a) the design and development of aircraft which are both technically superior and readily producible, (b) the production of such aircraft at the lowest possible cost, and (c) maintenance of expansibility.

Design and development.—Aircraft are initially designed and developed on contracts which provide for the reimbursement of cost, plus a fixed fee for administration. We believe this type of contract is desirable for such initial procurement because the cost of developing a new airplane cannot be ascertained in advance, and because the contractor should have the greatest possible freedom in making changes both to increase performance and, by improving producibility, to develop an airplane which will be cheaper to build in quantity production.

Under present contracts, all rights for reproduction of a new design become Government property although the success of the airplane may be due largely to the contractor's particular knowledge and special skills. The retention of some rights by the developing contractor would provide an incentive to superior effort. We recommend that some consideration be given to this point in drafting future legislation.

Producibility.—The importance of superior performance is so obvious that the attention given it has, in the past, tended to obscure the equally important factor of producibility. An airplane must be superior both in performance and in producibility if it is to be an effective military weapon. Of only slightly less importance is the ease of maintenance which, in general, is related to producibility. An aircraft easy to produce is also usually easy to maintain. We recommend that the services put heavy emphasis on producibility in all future aircraft-development contracts.

Low cost production.—The aircraft procurement program we have recommended will cost the American taxpayer a great deal of money. Every effort must be made by the procurement agencies to see that the most effective use is made of that money. All possible incentives

must be provided for production at low unit costs and at low prices.

Expansibility.—Lowest cost production will sometimes be incompatible with expansibility, which would be increased by a greater degree of tooling than is economical for the number of articles being produced. Such additional tooling should be regarded as a part of industrial mobilization planning and its added cost should not be a charge against the production contract.

Design, development, and production continuity.—To be able to plan for reasonable continuity of production, each company should, at any given time, have at least one type in production, one in development, and one in the design-study stage. The type or type of planes to be developed and produced by each company should be determined (a) by the needs of the service, and (b) by the interest and special skills of the manufacturer. Companies which fail to develop successful aircraft or which fail to produce at competitive cost levels will, of course, eliminate themselves from military business. Conversely, a new group submitting a promising design should be encouraged and given the opportunity to become a producer upon demonstration of its capabilities.

In as far as possible aircraft should be produced by the developing company. More often than not the production airplane differs materially in detail from the original design. Engineering changes resulting from the changing requirements of the services are frequent during all stages of production. They may be complicated, and may exert an important influence on the ultimate performance and the final cost of the aircraft. It is considered essential, therefore, that the company which initiated the design should be responsible for all design changes during the course of production. It is accordingly recommended that as a normal procedure, production contracts be given to the organization which made the original design.

Where such a production order would overload that manufacturer's facilities however, the contracting service should require him to subcontract a certain percentage of the new contract (or the equivalent man-hours on a prior contract) elsewhere in the industry. Such a subcontract could involve complete aircraft, or any parts or subas-

semblies thereof. If the placing of such an order with the developing company would concentrate too much production in a single area, the service should place it elsewhere, arranging with the developing company for any necessary engineering assistance to enable the producing company to build the aircraft economically, and to keep up with any design changes.

Accessory development.—In the procurement of equipment from companies which do not operate exclusively in the aircraft field, it is important to provide incentives for military development. The Attorney General has recently proposed that all rights to patentable inventions made in the course of performing a Government-financed contract be assigned to the Government. The adoption of such a policy would turn research and development brains from Government developments to commercial and industrial developments. Unless instrument and accessory companies are permitted to retain design rights commensurate with the risks taken, they will tend to avoid Government development contracts.

Legislation.—To provide authority for the procurement policies and procedures above recommended, we urge the enactment by Congress of H. R. 1366 and H. R. 5031, both Eightieth Congress.

H. R. 1366. ARMED SERVICES PROCUREMENT ACT

This bill, which was passed by the House of Representatives at the last session of Congress, provides for purchases by negotiation: (a) When it is impracticable to secure competition, (b) where secrecy should be maintained, (c) under other stated conditions and safeguards, and (d) of research and development work. The Secretary of Defense is required to report negotiated contracts to Congress.

H. R. 5031. VINSON-TRAMMELL REPEALER

This bill, which repeals part of the provisions of the Vinson-Trammell Act of 1934, as amended, was passed by the House of Representatives at the last session of Congress. It removes the requirement that 10 percent of naval aircraft and engines be made in Government plants, and substitutes the *authorization* that the President or the Sec-

retary of the Navy may use Government aircraft factories for the manufacture of naval aircraft and engines whenever private manufacturing proposals indicate that the Government is being deprived of unrestricted competition, or when private quotations appear unreasonable, or when such use of Government factories appears to be in the public interest. The 10-percent requirement of Government manufacture of aircraft has in fact never been completely operative, due to suspensions both legislative and executive. Should it become fully operative it would work to the disadvantage of the Government, and we believe that it should be repealed.

H. R. 5031 also removes the profit limitation of 10 percent placed on Navy contracts for the construction of ships and the profit limitation of 12 percent placed upon Navy and Air Force contracts for the construction of aircraft. It must be noted, however, that if H. R. 5031 were enacted and the statutory profit limitation on Navy and Air Force contracts adopted, the Services would be required in all cases to assure themselves of the reality of competition, that contracts are entered into at reasonable prices, and that expenditures of Government funds are effectively controlled. It will be difficult, however, to obtain this assurance because of the practice of awarding production contracts to the designing contractor without competition.

We do not recommend the repeal of this statutory profit limitation until a substitute is enacted which, by provision for renegotiation or otherwise, will protect the Government against excessive profits and prices.

Plant dispersion.—At the end of World War II, the aircraft and aircraft engine plants were well dispersed, as shown on the map elsewhere in this section. A large part of our total production of military aircraft is now concentrated in the Los Angeles area, on Long Island, and at Seattle.

It is regrettable that the wartime-plant dispersion was not maintained. Our reserve plants (i. e., Government-owned plants not now in operation) are still well dispersed. If, in response to a mobilization order, reserve plants are brought into production, the total aircraft manufacturing plant pattern would represent an effective geographical

dispersal. If, on the other hand, an attack should precede activation of the reserve plants, the industry will offer highly concentrated targets. We recommend that, in future plant expansion, the services avoid further concentration in these areas as far as possible.

Plant reserve.—The Air Coordinating Committee proposed that a reserve of industrial plant be established and maintained, consisting of 16,000,000 square feet of specialized airframe plant area (19,000,000 square feet if plant dispersion were not maintained) and 10,000,000 square feet of specialized engine plant area. The program for a reserve of specialized plant has been modified to the extent that certain plants have been sold or leased, or are being offered for sale or lease, subject to recapture on 90 days' notice in event of an emergency. Two plants (5,800,000 square feet) have been set aside for the storage of machine tools under the program discussed below. Including these two plants a total of 21,200,000 square feet of specialized airframe plane and 11,700,000 square feet of specialized aircraft engine plant are now available. We recommend that this program be maintained to assure the continuing availability of these plants.

Machine tool reserve.—It was proposed by the Air Coordinating Committee that a reserve of general purpose machine tools be established and maintained, with 65,000 machine tools as a minimum. These reserve tools are being acquired and placed in storage by the Air Force and Navy under Public Law 364 (80th Cong.). We recommend that this program be completed.

Contract overhaul.—A number of substantial civilian organizations are engaged in the overhaul of transport aircraft. This is a specialized type of business quite separate from the manufacture of airplanes. Testimony before us has indicated the economy and other advantages of having modification and overhaul of military aircraft done by such civilian organizations under contract. This is particularly true when the same types of cargo or transport aircraft can be overhauled in the same shops for both the military services and the civil airlines. The services are not in agreement and stress the need for training their own overhaul personnel in their own shops. We recognize the validity of the argument but recommend that the services weigh care-

fully the savings possible through contract overhaul, and the possible long-term advantages of building up civilian staffs trained in such work for use in an emergency.

Federal regulation of personal aircraft.—The present detailed requirements for certificating light aircraft of new design are complex, and tend to retard experimental design. The Commission agrees with the Administrator of Civil Aeronautics that it is time to recognize and encourage the moral and legal responsibility of the light aircraft manufacturers for the safety and integrity of their products. The Federal Government should continue to promulgate aircraft design standards in collaboration with established technical groups, research agencies and safety organizations, but compliance with these standards should be the primary responsibility of the manufacturer. After careful initial checking for competence, each should be required to certify to the airworthiness, the proper flight characteristics and operational limitations of the production type and to the fact that the airplane has been submitted to an exhaustive performance and service test. The present testing procedure now executed by the CAA should be conducted and sworn to by the manufacturer.

To discourage the entrance of irresponsible or technically ill-equipped firms into the private aircraft industry and to prevent the deterioration of standards among established firms, we recommend that the Government establish simplified but adequate standards of fitness and ability to be met and maintained by each company selling personal aircraft. A manufacturer's certificate based on proven ability should be issued by the Department of Commerce. Periodic spot checks should be made, and the Department should have the power of revocation for just cause. By thus certifying qualified manufacturers they could, in turn, certify all personal airplanes.

Export assistance.—The export of aircraft and aeronautical material provides a volume of business which, by helping to sustain the industry, contributes to the national defense potential and to our economic welfare. The Export-Import Bank should, we believe, be utilized as a financing medium to aid in making sales of aircraft and aeronautical equipment in foreign countries. The Export-Import Bank

now requires that the manufacturer assume up to 25 percent of the credit risk. This is beyond the financial means of most of the American aircraft manufacturers at the present time. In view of the national defense advantage, we believe the Bank should be authorized to assume a larger share of the credit risk on export sales of aircraft and aircraft equipment.

Conclusion.—Setting up the National Military Establishment was one of the most important moves in the long struggle to provide the United States with adequate air power. As it settles down into a smooth running organization it can, and must, deal with the many policy problems that have long plagued our aircraft manufacturing industry in peacetime.

A number of those problems have been laid before the Commission in testimony. Our consultants have called our attention to others. We have seen some for ourselves in visiting aircraft and engine factories, and a few of our great research and development centers.

The above recommendations embody our opinion of the minimum requirements of the aircraft industry at the present time. The needs of this important element of our national defense must be dealt with sympathetically by those charged with the future security of the United States.

Section III
Aeronautical Research and Development

Aeronautical Research and Development¹

Summary

There is little need to stress the point that intensive research and development in aeronautics are essential to the national defense and to the national welfare. No witness before the Commission presented a contrary view. All agreed that whatever money is spent for the purpose can be looked upon as a vital form of national insurance, a direct contribution toward maintaining our leadership in the air.

Evidence placed before the Commission, however, indicated some need for reappraisal of certain phases of our research programs and policies. During World War II we concentrated on the development of existing types of aircraft for production, and practically abandoned fundamental research in the aeronautical sciences. By VJ-day our reserve of research information was largely exhausted. If we are to have an air establishment of the first quality, we will have to concentrate, as other nations are doing, on our fundamental aeronautical research. Development, that is the making of new aeronautical devices, cannot move ahead faster than our fundamental research.¹

The established governmental agencies for the conduct and coordination of aeronautical research appear to be doing a good job with the funds at their disposal. Care must constantly be exercised, however, that our research and development programs produce completed articles at frequent intervals that would be immediately useful for a war at any time.

Most witnesses urged the necessity of increased appropriations for the purpose of expanding research activities. In this we concur. We have been convinced that there is urgent need for extending our fundamental knowledge of aerodynamic phenomena in all speed ranges,

¹The distinction between the terms "research" and "development" as here used is not always sharp. In general, however, *research* is the seeking for new basic knowledge from which better aircraft, missiles, or other aeronautic devices may be *developed*.

particularly in the supersonic (above 760 m. p. h. at sea level), as such speeds are of particular importance in the design of high-speed piloted aircraft and of long-range guided missiles. Also, we are seriously deficient in our knowledge of theory and its application in the matter of accurate guidance of missiles to selected targets. Evidence is in the record that we lack the minimum facilities necessary to do an adequate research job in those new areas.

The provision of additional funds, however, will not of itself solve the problem. The most serious shortage is in personnel. Due to the hiatus of the war years in the output of young engineers and scientists, we are short of qualified people. Recognizing this need, the Commission is unanimous in its belief that every possible encouragement should be given to our universities and scientific institutions to train more, and better aeronautical scientists. Undergraduate courses should be strengthened and exceptional students encouraged to continue in advanced work. The proposed establishment of a National Science Foundation with its program of grants and fellowships would help materially. Government contracts for supplemental research granted to educational institutions offer one of the most effective means of providing funds for the purpose. The Commission recommends that this method be developed as far and as fast as is consistent with the results obtained.

International Competition

For national security, second best military aircraft are simply not good enough. On the commercial side, inefficient or unsafe aircraft and unreliable or inadequate navigational aids cannot be tolerated.

We must keep ahead in the race for military supremacy. And it is a race. Although the great aeronautical laboratories of Germany, Italy, and Japan have been dismantled and destroyed, other strong contenders are now in the field. Britain, France, and Russia are vigorously pushing new aeronautical research programs. The British, in spite of a generally strained economy, have made drastic sacrifices to make available this year some 30,000,000 pounds sterling (\$120,000,000) for air research. They are modernizing war-worn equipment and are installing extensive new facilities, among them a National

Gas Turbine Establishment at Whetstone, the new Aeronautical Research Center at Bedford, and the new Telecommunications Establishment at Malvern.

The French, although seriously hampered by postwar fiscal and social problems, are reported to be building a large group of high-speed wind tunnels somewhere in the French Alps. A huge hydroelectric station, developing some 100,000 horsepower, is being installed at the site to provide the necessary power. Other prewar research facilities are being reactivated as fast as general economic conditions permit.

There is published evidence that aeronautical research and development programs on a very large scale are under way in Russia.

Although we have difficulty in obtaining aeronautical information from other countries, they have almost complete access to our own data. We spread our latest advances in the aeronautical arts on the pages of our newspapers and magazines. The Air Force and the Navy appear to be competing publicly for recognition of their individual progress. When a new speed record is set, or a new model of advanced design is pushed out of the shop, its physical dimensions and its performance figures are quoted, and clear photographs showing the general configuration and the details of the new plane are broadcast. Admittedly, there are practical difficulties in keeping a B-36 or a B-47 hidden from public view. Also, it is argued, the taxpayer has a right to know what he is getting for his money. But, whatever the difficulties or objections, the Commission believes that continuing and rigid enforcement of wartime security measures with regard to advanced aeronautical development is necessary now. For reasons outlined earlier in this report, it is desirable that our military readiness and our potential strength be known to the world. But we cannot now afford to show all the cards in our hand. The stakes are too high.

Status of U. S. Aeronautical Research and Development

Military aviation in the United States had its beginning with the establishment of the Aviation Section, Signal Corps, in 1907. A few years later (1911) the Navy set up an Aeronautics Group in the

Bureau of Navigation, which later became the Bureau of Aeronautics. By 1915 it had become obvious that neither branch of the service could cope adequately with the problem of satisfying a growing need for basic research in aeronautics. To meet that need, Congress authorized (1915) the formation of the National Advisory Committee for Aeronautics, an independent Federal agency. Since that time, the NACA has produced most of the basic aerodynamic and structural data from which the Navy and the Air Force and the aviation industry have developed practically all commercial and military aircraft. It now operates three of the world's largest aeronautical laboratories, (1) at Langley Field, Va.; (2) at Moffett Field, Calif.; and (3) at Cleveland, Ohio. The first two cover aerodynamic, hydrodynamic, structural, and flight research. The latter engages chiefly in power plant studies of all kinds.

On March 21, 1946, a National Aeronautical Research Policy was formulated by the Army Air Forces, the Navy's Bureau of Aeronautics, the Civil Aeronautics Administration, the NACA and the aircraft industry. It was promulgated largely to clarify the relationships of the NACA with the other research and development agencies. Under this policy, the NACA is charged with the responsibility for "research in the aeronautical sciences"; the military services with the responsibility for the "evaluation of military aircraft and equipment and the exploration of possible military applications of research results"; the Civil Aeronautics Administration with the responsibility of "expediting the practical use in civil aeronautics of newly developed aircraft and equipment"; and the aircraft industry with the responsibility for the "application of research results in the design and development of improved aircraft equipment, both civil and military." In addition, the policy statement sets forth the conditions under which the research facilities of the NACA are to be available to the other groups.

Work done by the Air Force (at Wright Field, Dayton, Muroc Air Base, Calif., and Eglin Field, Fla.) and by the Navy (at Philadelphia Navy Yard, Patuxent River, Md., and at Point Mugu, Calif.) consists largely of the evaluation and testing of aircraft, power plants and their components, and guided missiles. These laboratories draw on the NACA for fundamental data. They collaborate with the aircraft industry in developing practical weapons for military use.

Certain other Government agencies conduct research in fields related to aeronautics. The Civil Aeronautics Administration operates a Technical Development Center at Indianapolis, Ind., for the testing and evaluating of airways equipment and miscellaneous aircraft auxiliaries for commercial use. The United States Weather Bureau and the United States Bureau of Standards are actively engaged in research and development projects with aviation application.

In order to increase research capacity during the war, many universities and engineering schools were awarded aeronautical research projects under Government contract. The results have been excellent. Not only do such projects yield answers to specific research problems, but they have developed a nucleus of trained research personnel that is definitely a national asset. They also provide a needed element of competition on fundamental research problems.

Many of the companies in the aircraft manufacturing industries have installed elaborate facilities for the development and testing of aircraft and components. These laboratories, however, are generally operated for the improvement of particular products, and their findings contribute more than a little to the generally available pool of information.

Since our national security is keyed directly to the state of our aeronautical knowledge, it is only logical that the responsibility for planning and guiding of the Government's over-all development programs (as distinct from research) should be vested in the military. The recently established Research and Development Board within the new National Military Establishment, is charged with this responsibility. Through its several technical committees and subcommittees it coordinates the aeronautical programs of the Air Force, Navy, and other agencies with activities in other related scientific fields, authoritatively within the National Military Establishment and on a voluntary basis with respect to external agencies. The establishment of this Board, is, in the opinion of the Commission, a proper and sound means of advancing and coordinating this very important work.

The financial support of aeronautical research in the United States has been accepted as a proper responsibility of Government. The work contributes directly to the national defense, and the scale of operations is now so great that no civilian organization could foot the bill. Ex-

penditures for the purposes actually increased in the first postwar year (fiscal 1946) to approximately \$450,000,000, roughly \$100,000,000 over the wartime peak. The following fiscal year (1947), appropriations dropped back to some \$240,000,000.

For fiscal 1948, the Government is spending about \$312,000,000 for aeronautical research and development. This figure represents the total direct effort toward the solution of problems in the aeronautical sciences. Other branches of the physical sciences, however, are making increasing contributions to the field of aeronautics. For example, research in the ceramic industry may lead to improvements in the design of jet turbine blading, or physiological research may yield results that may change the design of pressurized cockpits for high altitude fighters. It is difficult to evaluate the worth of such contributions in dollars, but it is evident that the total amount of money going into aeronautical research is considerably greater than the figures specifically earmarked in the budgets.

The 1948 appropriations for aeronautical research and development in the several agencies is shown in the following table:

Aeronautical Research and Development Expenditures Fiscal Year 1948

Agency	Expenditures	
	Amount	Percent of total
Air Force	\$145,316,000	46.6
Bureau of Aeronautics—Navy	75,000,000	24.0
National Advisory Committee for Aeronautics	43,449,000	13.9
Bureau of Ordnance—Navy	30,000,000	9.7
Ordnance Department—Army	11,000,000	3.5
Office of Naval Research	4,952,000	1.6
Civil Aeronautics Administration	1,670,000	.5
Weather Bureau	521,000	.2
Bureau of Standards ¹	¹ (838,200)
Total	\$311,908,000	100.0

¹ Aeronautical research and development projects conducted by the Bureau of Standards are financed by contributions from other agencies of the Government. The amount shown is included in the above items.

The military services, together with the NACA, absorb approximately 99 percent of the entire program. The Air Force alone takes about half.

Aeronautical research and development programs within the aircraft industry are almost entirely supported by the armed forces. Although some very important research is carried out by industry at its own expense, the cost is small when compared with that financed by the Government. The work carried on by the aircraft companies is chiefly development of particular items under contract with the services. If, for example, the services need a ground-to-air missile with certain characteristics, contracts may be let to several aircraft companies to provide a number of design studies. The development—that is, the attaining of the desired result is left to the ingenuity of the companies.

The armed forces will allocate approximately \$168,000,000 for research and development contracts with the aircraft industry during the fiscal year 1948. In the main, the work performed under such contracts is prototype development—the experimental construction of new aircraft, propulsion units or allied equipment for test purposes only. In some cases, of which the RAND project is an example, the studies are more academic in nature, and no physical article, except a report, is called for under the contract.

Aeronautical research work in educational and scientific institutions is almost entirely supported by the Government. Few universities could sponsor extensive aeronautical projects with their own funds. The total to be allocated by all Government agencies for such work in universities, during the year 1948, is \$31,000,000. The NACA's share is \$800,000.

Thus, of the total appropriations to the services, approximately \$200,000,000 goes for research and development work carried on by the aircraft industry and in educational and scientific institutions under contract to the services. The balance is spent in planning and evaluation by the services in their own facilities.

Suggested Areas for Continued Research

This Commission does not consider it within its province to evaluate specific research projects, nor to recommend detailed programs to be followed by research laboratories. Such matters are clearly within the scope of the National Research and Development Board, the NACA, and the Armed Services. During the course of the testimony, however, a number of suggestions were made concerning additional research projects or desirable changes in specific current programs. They are listed below. Doubtless there are many others which did not come to the Commission's attention. The arrangement is alphabetical, and does not in any way reflect an order of relative importance.

Atomic propulsion.—The possibility of employing atomic energy for the propulsion of aircraft and guided missiles is sufficiently important to warrant vigorous action by the Atomic Energy Commission, the Air Force, the Navy, and the NACA. Some work of a preliminary nature has already been done in this field by the AEC, the Air Force and its NEPA project. Immediate steps should be taken to intensify research effort in this field under a plan which would be supported by all of the above agencies and under which the project would be given the benefit of all the background information in the atomic field actually needed by the recipients for the appropriate performance of their respective functions.

Electronics.—The science of electronics contributes to almost every segment of modern industry. It is an essential tool for aeronautical research. The safe functioning of all commercial and military aircraft depends upon it. It makes a vital contribution to our national security.

At least three very important phases of current aeronautical development involve extensive use of complicated electronic devices—(1) the detection of the approach of enemy aircraft or missiles; (2) the guidance of our own missiles and pilotless aircraft to targets, and (3) the navigational and blind landing requirements of all aircraft. As a result, the Air Force is expending approximately 12 percent of

all research and development funds for the current year on electronics—and the Navy's Bureau of Aeronautics, 18 percent.

The funds allocated in fiscal 1948 for electronics development for aeronautics by the two services are as follows:

	Research	Development	Total
Air Force.....	3, 300, 000	10, 780, 000	14, 080, 000
Bureau of Aeronautics.....	1, 700, 000	10, 800, 000	12, 500, 000
Total.....	5, 000, 000	21, 580, 000	26, 580, 000

The Air Force electronics facilities consist chiefly of the Electronics Subdivision at Wright Field; the Watson Laboratories at Eatontown, N. J., the Cambridge Field Station at Cambridge, Mass.; and the Flight Research Units at Middletown, Pa., and at Boca Raton, Fla. The Navy's electronic work, conducted principally under the Bureau of Aeronautics and the Office of Naval Research, is carried on at the Naval Research Laboratory at Anacostia. The Bureau of Standards operates the Central Radio Propagation Laboratory at Washington. A committee on electronics of the Research and Development Board is charged with the coordination of these activities.

In addition to the above, the Civil Aeronautics Administration conducts its investigations and evaluations of electronic navigational equipment at its own station at Indianapolis Airport. Also a number of other laboratories throughout the country are conducting a wide range of electronic research. Extensive work is being done in the aeronautical industry, in universities, and in the large electric equipment manufacturing companies such as General Electric, Westinghouse, Bell Telephone Laboratories, RCA, and many others.

It has been suggested to the Commission that the extent and diversity of electronic research calls for better means of coordination than now exist. The question has been raised as to whether or not the results obtained in the various laboratories are being made available in full to researchers in guided missiles, and in the more highly specialized

fields of aeronautics. To resolve these problems, the establishment of a new Government agency, a National Advisory Committee for Electronics paralleling the NACA, has been suggested. Its primary function would be coordination, but the plan, as proposed, contemplates also the establishment of research laboratories, including an extensive firing range for free-flight tests of guided missiles.

After studying plans submitted by existing research agencies for new laboratories and new flight test stations and missile firing ranges, it would appear that adequate facilities to handle the electronic requirements for aeronautical research for the foreseeable future will be forthcoming. The injection of an entirely new organization into the field would tend to complicate rather than simplify the problems. It will be difficult enough to find technically qualified people to man the presently projected facilities without considering another one.

Further, whatever coordination is required, as to the armed services, falls properly within the purview of the Research and Development Board. It should extend its Committee activities to cover all governmental and private agencies engaged in electronic research. The Commission feels that the coordination problem can well be left in the hands of the Board, and that the formation of an NACE although possibly desirable at some future date, is not necessary at the present time.

Guided missiles.—During the latter phases of World War II, Germany, after a great amount of basic research and experimentation, evolved two forms of guided missiles—the subsonic airborne “buzz bomb,” V-1, and the supersonic, high altitude rocket, V-2. Both were reasonably successful at ranges up to 200 miles. In intercontinental warfare of the future, both types may prove to be useful, but their characteristics must be greatly improved and their range must be greatly extended.

The German techniques are now well known, but the development of successful missiles for extremely long ranges is still a tremendous problem. It will require the most intensive application of our best

research talent, coupled with the expenditure of very large amounts of money for experimentation, before we can hope to produce a pilotless weapon of either class that will have a reasonable chance of hitting a distant selected target.

We must also consider the defense against missiles launched against us, an even more difficult problem. Nothing was developed during the war that could cope with the V-2, yet we must be prepared to intercept and to destroy invisible missiles that will plunge toward our cities out of the stratosphere at speeds of over a mile per second. The practical difficulties involved in detecting, tracking, intercepting, and destroying them with other missiles miles above the earth are enormous. Whether or not this can ever be done is not clear.

The rapid development of long-range missiles for offense, and of accurate, high-altitude target-seeking missiles for defense are of great importance to our national security. Research in these areas must be given the highest priority. Further, research effort must not be limited by failure to provide adequate funds. What may appear to be overgenerosity in appropriations now may easily prove most economical in the long run.

The funds being spent this year on guided-missiles research are not insignificant. Some \$75,000,000—almost one-quarter of the total research and development appropriation—are earmarked for the purpose. This work also benefits indirectly from appropriations for research in many other fields.

The figures which have been furnished us indicate some disparity of effort in the subsonic and in the supersonic, pointing up a trend toward the abandonment of the slower, more vulnerable, missiles. The Commission has been advised, however, that the subsonic missile offers the most practical means of testing and developing the intricate guidance mechanisms for the supersonic types, and it suggests, therefore, that the technique be fully exploited before funds for subsonic research are entirely eliminated.

The Commission has noted that at least four agencies of the Na-

tional Defense Establishment are concerned with research on guided missiles. It understands that their activities are coordinated through a very active committee of the Research and Development Board. In view of the extremely high cost of this work, such coordination should be given high priority.

From the evidence submitted, it appears that there may be some danger of overrunning our basic knowledge in an effort to develop production articles too soon in order to justify the optimistic predictions of the "push-button warfare" protagonists. We must first be certain that we are on the right track, and not permit ourselves to be led up blind alleys by too great impatience for results.

Here is a case where making haste slowly will certainly pay. A modern long-range military missile is an exceedingly complicated device built of the finest materials to watchmaker's standards. It depends for its proper functioning on the solution of the most complex problems in aerodynamics, ballistics, electronics, and metallurgy. It is extremely expensive. Time and money will be wasted unless a reasonable balance can be maintained between research progress and development demand.

Helicopters.—The direct-lift, rotary-wing type of aircraft appears so promising that continuous research and development effort is warranted. It has many possible military and commercial uses. Its capabilities for rescue work at sea and in isolated areas has been well demonstrated by the United States Coast Guard. There are many other applications that should be thoroughly explored. The direction of the research and the priorities to be assigned to helicopter investigations are matters to be decided by the NACA. There are several young and vigorous companies in the field that may be counted upon to push helicopter development as fast as the basic data become available to them.

Lighter-than-air.—We have been advised that nonrigid airships (blimps) of the type used during World War II will be useful in the future for carrying radar and other devices for the detection of submarines. The Commission has no comment to offer in this connection except that the Navy should continue whatever research and devel-

opment effort may be necessary to insure the provision of lighter-than-air equipment most suitable for its special purposes.

Regarding the large rigid airship, the decision made by the Army and the Navy some years ago that it had little military use appears to have been sound. The armed services must decide such matters on the basis of their special requirements for carrying out their missions. A case has been presented for the large airship as an economical means of long-range transport for commercial passengers and cargo. If the argument is sound, private capital will no doubt be attracted to the project—and there should be little need for Government subsidy.

Personal aircraft.—Elsewhere in this report the economics of personal flying have been discussed. The assistance given to the private owner by the Government in providing and in maintaining airports and airways has also been noted.

Another way in which Government may properly encourage the development of aircraft suitable for private use is by the NACA continuing some research directly applicable to small aircraft. Any device that would make possible lower landing speeds coupled with higher top speeds would be significant from the standpoint of the private pilot and would have useful military implications. Slotted wings and trailing-edge flaps have been the subject of NACA investigations for many years, but further research on boundary-layer control would appear to be useful. Unconventional configurations (possibly combining the principles of the helicopter and the fixed-wing airplane) should be fully explored, as such studies might open new fields for designers in their search for the ideal aircraft for the private owner.

The NACA effort in these areas should be limited strictly to basic research, and not be applied to the development of any commercial article. In such fields of activity, the normal laws of economics should control the direction and rate of development.

The military services cannot offer much in the way of direct financial assistance to the individual experimenter who may have a new idea for the development of a new type of personal aircraft. They

should lend what encouragement they can, however, in the form of loans of surplus or semiobsolete equipment for experimental purposes. The prewar practice of lending engines, instruments, propellers, etc., should be pursued whenever occasion offers. When such equipment is thus loaned, the services should be given first information on any new inventions or developments which may result.

Power plants.—The Commission has been advised by witnesses that gas turbines and rocket engines will ultimately replace reciprocating engines in future military aircraft. There is no doubt that these new and powerful power plants hold great promise for the future and research and development on them must be pursued diligently. The jet engine is applicable to high-speed fighters and fast bombers. It is the power plant that will make possible routine flights in the supersonic-speed range. Its development, therefore, is of prime importance. The present limitation of the jet engine is its high fuel consumption, which reduces the range of the plane. Its service life is also relatively short. Research must be directed toward overcoming both handicaps. The turbine-propeller combination offers possibilities for range improvement at somewhat lower aircraft speeds. Continued research and development on this type is also important.

The suggestion has been made that all research and development on piston-type engines should be abandoned to permit full concentration on the newer types. In this we cannot agree. The conventional combination of the piston engine and propeller will be useful for many years for both long-range bombers and transports and, therefore, any suggestion of the abandonment of research and development in this field seems premature. Moreover, it is not impossible that new applications of ducted fan or compressor jet designs may actually open up new uses for the piston engine. These potentials should be completely exhausted before the conventional engine is discarded.

Transport equipment.—The design of transport and cargo aircraft benefits directly from research and development on military types. As far as basic theory is concerned, laboratory data secured for one class applies equally well to the other. For this reason there appears to be little need for specialized basic research (apart from develop-

ment) on the airplanes themselves. It is obvious, however, that there is an urgent need for improvement in equipment and methods required to increase the safety and regularity of transport operations, civil or military. The most important single item for intensified research is in the field of navigation, particularly the problem of making safe landings on airfields where visibility is limited because of bad weather conditions.

The Army, Navy, and CAA are conducting research and development in all-weather flying techniques. During the past 10 years, some progress has been made, but the surface of the problem has only been scratched. We are still a long way from the goal of 100 percent safety and 100 percent schedule regularity.

The Commission has heard a great deal of testimony regarding the several systems that have been devised for making blind landings with aircraft. Whether Ground Controlled Approach (GCA) or Instrument Landing System (ILS) or any combination thereof is proper for any particular site is a matter that must be decided on a purely technical basis. The systems are not competitive. One supplements the other, but the combination is extremely expensive. There may be more effective and more economical ways of doing the job.

The Government is now making installations of one or both systems at some major airports in the United States. This is certainly a long step in the right direction. At best, however, these installations do not permit full operation under all weather conditions. Their capacity for the safe handling of traffic is far below requirements at many air terminals. Although they are far better than anything that has heretofore been available, they do not yet permit the degree of safety and regularity of operations that must be attained before our air transportation system can be fully acceptable. More money and more research effort must be put on the problem immediately. The public interest demands a solution at the earliest possible moment.

Since the blind landing of military aircraft in wartime may be even more important than the handling of commercial aircraft in peacetime, the Research and Development Board of the National Military Es-

tablishment should take the matters under immediate advisement in its Air Navigation Committee.

The Air Coordinating Committee has set up a subcommittee with members from airlines, Department of Commerce, military services, and the manufacturers to pull together all the existing facts and to recommend a course of action to be followed. The responsibility for future development should be clarified—whether it should be in the hands of the military or of the civil air authorities. The ACC should also advise the Congress as to the appropriations which should be made annually to implement its recommendations.

Since the problem of weather is so intimately involved, the recommendation should be extended to cover whatever research appears necessary in that field. The work so far carried out by the Armed Services and the Weather Bureau on the structure of thunderstorms, the behavior of cyclones and hurricanes, and on other natural phenomena has opened the door to better understanding of the weather. The possibility of inducing precipitation or of dispersing fogs around airports by artificial means has important civil and military implications. Vigorous research should be continued in such fields.

Recommendations—Research Policy

The Commission has, of necessity, limited itself in the preceding paragraphs to outlining certain suggestions for particular avenues of research. Paradoxically, it can be more specific in the broader areas of policy.

Budgetary policy.—The ordinary procedures laid down by the Bureau of the Budget for the procurement of specific articles are inadequate when applied to research projects. When a particular object is the end-point of a purchase order, a specification may be written, a definite delivery date agreed upon, and an estimate of cost may be made. A research project, on the other hand, particularly in a field which is as fluid as that of the aeronautical sciences, does not lend itself to this approach. It is practically impossible to forecast the outcome of a pure research project, to say nothing of detailing the procedures that must be followed, the inventions that may be necessary,

or the wastage that may develop in the course of the work. To try to satisfy a formula which involves a detailed description of the proposed research and its expected results approximately a year in advance of the beginning of the work is a sheer waste of effort for the research agency and for the Bureau of the Budget alike.

To simplify procedures and to eliminate restrictive budgeting limitations on urgent research programs, the Commission recommends that each aeronautical research agency be allocated a lump sum annually. The appropriation should be based on its estimated over-all operating requirements, modified by its performance record, the importance of the objective toward which the project is aimed, and the then-current over-all budget situation. No fixed amount should be allocated to any particular piece of research. The agency should have blanket permission to distribute funds to meet the needs of the several projects on its program. At the end of each fiscal year it would be required to present a detailed accounting of the utilization of its funds to the Bureau of the Budget and to the Congress. The Commission feels that by annual review, research funds could be reasonably controlled without imposing limitations which now tend to retard progress.

The above applies to funds required for the conduct of research. Frequently an agency is hampered because an unexpected need arises within a fiscal period for the construction of a new facility or for the installation of some equipment urgently required to carry out a particular project. To meet such emergencies the Commission further recommends that each agency be allotted annually a revolving fund for the construction of new facilities. Expenditures from this fund should be approved by the Director of the Budget and should be reviewed annually by the Congress.

One of the most serious limitations on research at the present time is the inability on the part of a research agency or a contractor to commit funds for a period greater than 2 years beyond the fiscal year for which the funds are appropriated. Research is inherently a long-term matter. Few projects can yield satisfactory results if rushed to completion to meet a short-term contractual deadline. Adequate

planning cannot be carried out on such a basis. It is difficult to secure and to retain the type of personnel required unless some continuity of employment is guaranteed. The Commission recommends, therefore, that appropriate legislation be passed so that research agencies may be granted contracting authorization to cover a 5-year period, and that research contracts covering work in universities and outside laboratories be drawn on a 5-year, rather than a 1- or 2-year basis. It urges the enactment by Congress of H. R. 4035 (80th Cong.). This bill facilitates research and development by and for the Air Force and Navy. It authorizes the Secretaries to establish Research Advisory Committees and to employ experts, and provides for the availability of appropriations for four fiscal years following the year of obligation.

Some safeguards must be provided. A limit must be put on the current rate of expenditure to insure that the large volume of contract carry-over will not be used up at an improper rate and run out too soon. Also some provision should be made to recover funds that may become frozen in contracts that prove to be impracticable of completion, and should be terminated.

It would appear worthwhile to encourage manufacturers to accept research and development contracts more readily by liberalizing policies regarding cost allowances. It is now the practice to disallow most of the items that would usually be included as normal overhead in negotiating commercial contracts. Fees for management are trimmed down or eliminated entirely. As a result, manufacturers tend to shy away from taking contracts on projects that may be inherently worthwhile, but on which they stand to lose money, or, at least, break even.

Items for research are generally disallowed in aircraft contracts, unless it can be shown that the research involved applies directly to a particular contract. Pure research can seldom be so specific. The net result has been to discourage general research on the part of aircraft manufacturers. They have been forced to rely almost entirely on the output of the NACA for their fundamental information.

The Commission would not argue that research effort by the NACA be reduced in any degree, but it does recommend that Government auditors be allowed more leeway in accepting reasonable costs for

research by manufacturers as legitimate charges against development contracts. By thus encouraging manufacturers to increase their own research effort, the aeronautic art will move ahead faster. More research facilities, well dispersed, will come into being—and, most important of all, the roster of aeronautical research workers will tend to expand.

Coordination of research effort.—Under the Policy Statement of March 21, 1946, it is clearly the duty and the responsibility of the NACA to coordinate Government aeronautical research with civilian, industrial, and university programs. Coordination is carried on largely through the NACA technical committees and subcommittees. These groups are made up of representatives of the military, civil aeronautical agencies of Government, the aircraft industrial and educational and scientific institutions. It has been stated that the present coordination is not adequate due mainly to shortages of personnel within the NACA staff.

The Commission recommends that the NACA be granted funds to strengthen its organization where necessary for the proper coordination of all aeronautical research. The heads of all Government agencies involved in aeronautics are urged to establish and enforce a policy of seeking the advice of the NACA in the planning and execution of any of their own aeronautical research projects.

It has been suggested that the NACA should expand its program of research outside of its own laboratories in order to bring to bear as much of the Nation's air research potential as possible on the urgent problems in the field. We agree. The NACA should take the leading role in sponsoring supplementary aeronautical research in educational and scientific institutions. There is a limit, of course, to the rate at which Government funds can be expended efficiently in such institutions. The availability of qualified personnel is usually the controlling factor, but it is unlikely that the capacity of our educational institutions to absorb additional research in aeronautics has yet been reached. It should be expanded to its fullest extent.

It would appear to be profitable for all Government agencies dealing in aeronautics to have a limited program of this nature, coordi-

nated, of course, through the NACA. The benefit to be derived from direct association of military and civil government personnel with scientists has been clearly demonstrated by the wartime and postwar contract research programs of the Office of Naval Research and by the work already done in the universities by the NACA. Also, as has been mentioned earlier, such contracts offer the best available means of training the additional personnel needed for our expanding aeronautical requirements.

Research carried on in this manner should be closely correlated with Government-sponsored research in the basic physical sciences outside of the strict aeronautical field (as covered by the NACA). The machinery for such coordination already exists in part in the newly formed Research and Development Board of the National Military Establishment. It would be further facilitated and broadened by the proposed establishment of a National Science Foundation.

As far as research is concerned, a clear distinction should always be made between *coordination* and *control*. Research of all kinds welcomes coordination, but resists control. Researchers must be kept informed of the work of others in their own and in related fields in order to avoid duplication of effort, but it is fatal to try to steer their thinking toward any predetermined goal. Development may be kept within planned limits, but research must be unrestricted to be of value.

Continuity of research programs.—Research by its very nature is unpredictable. No one can forecast with accuracy the time at which the end result will be available. In a development project, however, the end product is definitely foreseen at the outset and a time table for completion can be set up. Every orderly program for development must be backed by a series of research projects which will permit step-by-step advances as new knowledge becomes available when each intermediate stage of research is completed. All development projects must be consistently reviewed and brought up to date. Only by keeping them in a fluid state can the armed forces be continuously supplied with modern aircraft.

On the other hand, the current international situation requires that behind our air forces in being we have a backlog of fully developed advanced projects ready to be put into production at a moment's notice.

We must not become so concerned with long-range "out in the blue" thinking that we overlook the possibility that we may stumble into a war in the immediate future which will require something better than the equipment with which we ended World War II. Research must be continuous and forward-looking, but development projects must go ahead on a step-by-step basis. There must be frequent and definite points at which production of useful articles could be started if necessary. We must never be caught in an emergency with nothing but partially completed projects in our lockers.

New facilities.—A growing need for intensified research in transonic and supersonic aerodynamics has led recently to many proposals for new supersonic wind tunnels. Various Government departments and a number of aircraft manufacturers have drawn up plans and have sought funds for such equipment. Because high-speed tunnels are expensive and supersonic research is costly, some coordination seemed necessary to avoid waste and duplication of effort. The NACA, quite properly, within the scope of its directive, undertook the job in midsummer of 1945. With the help of the industries and the services, it evolved "A National Program of Transonic and Supersonic Wind Tunnels," now known as the "Unitary Plan."

The Plan provides for 16 small tunnels to be located in universities and other educational institutions throughout the United States; several new supersonic tunnels at existing Government laboratories; and the establishment of two new research centers, (1) the National Supersonic Research Center (NSRC), and (2) the Wind Tunnel Division of the United States Air Forces' Air Engineering Development Center (AEDC). The function of NSRC is to conduct transonic and supersonic *research*. The function of AEDC is to *test and evaluate* transonic and supersonic air vehicles.

The NSRC, as planned, is to be an entirely new installation operated under the NACA. It will eventually include a number of supersonic wind tunnels, somewhat larger than those already in existence. The site has not yet been selected. Because of extremely high power required to operate supersonic wind tunnels, it must be located in a section of the country where electric power is cheap and abundant.

The AEDC is designed to perform much the same functions as are now handled by Wright Field, but on a greatly expanded scale. The installation will include facilities for testing and evaluating airframes, engines, propellers, electrical equipment, armament, and other accessories of much larger size than can be handled with the present equipment at Dayton. The most expensive single item is a 40-foot square, transsonic wind tunnel. The estimated cost of the tunnel is \$140,000,000, and 500,000 horsepower will be required to operate it. A firing range for the launching and testing of guided missiles is also projected. The site for AEDC has not been determined. It obviously must be located in an area where large quantities of electric power are available.

We are thoroughly convinced, however, that the United States is dangerously short of equipment for research in the transsonic and supersonic speed ranges. This deficiency should be remedied as quickly as possible. We recommend that the 16 supersonic tunnels projected for the universities be authorized and installed as quickly as possible. This will not only expand our available facilities, but will tend to alleviate the present personnel shortage by training more students in aeronautical research techniques. We recommend also that we proceed without delay in supplementing existing laboratory equipment with the new tunnels projected under the Unitary Plan in whatever order of priority and at whatever rate as will be recommended by the Research and Development Board. The Board will provide the necessary coordination to keep the programs in balance, and insure that our research establishments will get the equipment they need.

Personnel.—The most serious bottleneck in the research and development picture as laid before the Commission, is not money nor facilities—but men. During the course of the war, the output of engineering and scientific graduates from our schools and universities suffered a serious decline. We are short-handed now, so there is real danger that we may find ourselves without qualified personnel to man the new wind tunnels and test centers that are being planned. The problem is acute in all scientific fields. It has been dealt with in de-

tail by Dr. John R. Steelman in the report of the President's Scientific Research Board on "Science and Public Policy."

The Commission recommends that education in the aeronautical sciences be given high priority in research policy discussions. The fact that the problem was not covered in the drafting of the Policy Statement of March 21, 1946, is a defect in that document which should be corrected. To insure uniformity of relationships and continuity of effort, some national program must be set up on a permanent basis, under a National Science Foundation.

The placing of supplemental research contracts in universities and other educational institutions is one way of improving the situation, but that in itself is not enough. Without further encouragement, the demands for scientific personnel of all kinds will cut into the available supply of those who might normally tend toward specialization in the aeronautical sciences.

One way to attract capable men for aeronautical research, particularly in Government, would be to lift the current limitation on salaries. Under the present Classification Act, the limit is \$10,000 a year, unless raised in individual cases by special act of Congress, or under certain limited powers within the National Military Establishment. In view of the impossibility of attracting top-calibre scientists at such a figure, with industry also bidding for their services, we recommend that the Congress remove the salary ceiling for such categories.

Once having induced good civilian research workers to enter Government service, they must not be driven out by poor working conditions and bad housing for themselves and their families. This is particularly true where their jobs are in arid or remote localities. The Air Force Air Base at Muroc Dry Lake in California is one case in point which we happen to have seen. It is an ideal place for high-speed testing of rocket motors and piloted aircraft, but living quarters for the staff are substandard, and along with other similar installations, should be improved immediately.

Continuity of leadership in research is highly desirable, particularly in view of the long-range nature of aeronautical problems. The research and development work of the armed services has suffered

because of frequent transfers of officer personnel from engineering to operations or from shore to sea duty. Such rapid turn-over in personnel puts a serious handicap on research projects because of the loss of individual experience and the break-up of long-range thinking it entails. Continuity is important at policy-forming levels, but it is also necessary down through the lower echelons. Any research organization that does not encourage specialization of its personnel, and that suffers frequent changes in its research staff, is destined to mediocrity.

The Commission recommends, therefore, that the Services offer every possible inducement for capable officers to enter aeronautical research and development work. They should be given opportunity to take graduate work in their specialty in the best civilian schools in the country at Government expense. They should be assured that they will be allowed to work in their special fields without interruption, and that their opportunities for advancement in rank will not be prejudiced as a result. Only by so doing will we be assured of the continuity of research leadership that we require.

Section IV
Civil Aviation

Civil Aviation

The air lines, the most important element of civil aviation, are passing through one of the most serious crises of their history. The domestic trunk lines of the country suffered an operating loss of approximately \$22,000,000 in the fiscal year ending June 30, 1947.

This situation is significant for two reasons. If not relieved it will contribute to the rapid deterioration of air-line service to the public. A second reason is now of even greater importance. The air lines have a fleet of aircraft of great value to the military services as a reserve in time of war. As a potential military auxiliary, the air lines must be kept strong and healthy. They are not in such a condition at the present time.

Most of the air lines are in financial difficulties for a number of reasons. Both their management and Government aviation officials were overoptimistic as to the volume of postwar passenger traffic. Starved for both airplanes and personnel during the war, the lines hired large numbers of new people when the war ended, ordered many new airplanes and in several instances made what may prove to have been unwise route extensions.

Losses for a number of lines began in the latter half of 1946. There were high expenditures due to the changeover from war to peacetime conditions. These included costs from the expansion of routes, services, and organizations; the introduction of new types of airplanes; rapid and unforeseeable cost increases; a reduction in passenger fares and mail rates coupled with a decline in mail volume; the reappearance of seasonal declines in passenger traffic; a series of dramatic accidents; and public dissatisfaction resulting from lack of dependability. Strikes and the grounding of airplanes have added additional heavy financial burdens on some lines. To a large extent the causes of these losses are temporary, but only if the air lines and the Government profit by the recent experience.

We have heard much testimony on what to do to rectify the present situation. We will discuss the major problems under the headings of Air Mail Payments and Subsidy, Safety and Regularity, Economic Regulation, Taxation, and International Transport Problems.

Air Mail Payments and Subsidy

The Government has had a policy of encouraging the development of an air transport system in this country ever since 1918. In 1925 the Kelly Act provided for financial assistance to private air line operators. The most important promotional legislation was the Civil Aeronautics Act of 1938. Throughout the prewar years, the air transport system which we had in this country could not have existed without subsidies by the Government. The Congress recognized that a strong air transport industry was necessary for national defense, for American commerce and for the postal service, and accordingly enacted the policy of governmental financial aid to the air lines.

By the end of 1942, several of the largest air transport companies which had grown up with the aid of subsidy had reached a point where they could earn a profit without depending on subsidy mail pay. Their receipts from passenger service, express service, and a mail payment based on a rate roughly equal to the passenger rate, more than offset their total expenses. This was an important milestone in the history of air transportation, for it indicated a successful policy on the part of the Government and successful management by those companies which had reached the much desired point of relative self-sufficiency.

Throughout the war the air lines were financially strengthened by military contract work plus abnormally high load factors. In both the CAB and the air lines it was believed that a greatly increased demand for air transportation in the postwar years would continue this trend toward self-sufficiency. The difficulties in which the air transport industry now finds itself can be traced primarily to over-expansion based on the mistaken assumptions of postwar traffic.

Although some air line problems of 1947 may differ from those of the prewar period, the over-all situation is the same: The revenue from

passengers and cargo, plus a revenue for the carriage of the mail roughly equal to the passenger rate, will not support the operations of many of the companies. If they are to continue in operation and start again up the ladder toward self-sufficiency the Government will have to increase the mail rates.

There is no need to change the law in this respect. It already is drawn to cover exactly such a situation.

The method of determining mail payment for subsidized carriers under the Civil Aeronautics Act of 1938 was developed by the Civil Aeronautics Board as follows: On the basis of estimates made by an air line and by the Board's staff, the Civil Aeronautics Board determined the probable future income to the line from the carriage of passengers and property. It likewise determined the probable over-all cost of the operations. Such a cost figure invariably exceeded the estimated nonmail revenues. The mail rate then was set at a figure which provided enough additional income to close the gap between nonmail revenues and expenses incurred under honest, economic and efficient management and to leave something over as a profit.

By "subsidy" is meant the payment to an air line for the carriage of mail of a sum greater than that to which the carrier would be entitled for the simple performance of this function at a service rate on a strictly business basis. The excess of payments above the "service" rate is a subsidy, or as described in the Civil Aeronautics Act, a "need" payment, based on the need of the air line for financial assistance to balance its expenses with its revenues and earn a reasonable profit.

As noted above in the early days of the war certain lines reached a stage where mail payments could be based on a rate roughly equivalent to the passenger rate. Since that time there have been two principal ways of paying for the carriage of the mail. Ton-mile payments have been made to relatively self-sufficient carriers; plane-mile payments have been made to other carriers considered to be in the "need" class and therefore requiring higher mail rates. In either case, if the carrier has found that the rate does not in fact enable it to cover its expenses, it may petition the Board to increase the rate. When the Board has examined the new facts it may fix a new future rate. The Board may

and usually does then also set a retroactive rate back to the date on which the carrier petitioned for a rate increase.

In the case of the international carriers, the Board has followed a slightly different practice. It usually fixes an avowedly temporary, experimental rate and then, in the light of experience, adjusts this rate to meet the actual needs of the carrier over a past period of a year or more. The rate continues to be a temporary one until such time as the Board feels experience is sufficient to enable it to fix a permanent rate, if necessary retroactive to the date of the original petition.

Recently the Board has modified somewhat the usual forms of domestic mail payment for certain carriers in special distress. In grave emergencies such as existed during the winter of 1946-47, the Board sets an emergency rate without taking its usual careful consideration and then starts a careful scrutiny of the justification of the expenses of the companies to make sure that the gap between nonmail revenues and expenses is not due to uneconomical, inefficient, or dishonest management.

The task of making the estimates necessary to setting a mail rate is a difficult one almost always involving disagreement between the claims of the interested air line and the Government officials who must be concerned about the public expenditure of funds.

We consider that direct Government financial aid to commercial air lines is fully justified on grounds of national security and economic welfare. We believe the air transport system of this country can, with such aid now, become self-supporting in the future. We are convinced that any impartial investigators of air transport would endorse the use of public funds to obtain such a sound air transport system. This means the continued granting of subsidies to air lines for an additional period.

* * * * *

Means must be found to decrease the time necessary for the Civil Aeronautics Board to process rate cases. We believe that the transfer of safety functions out of the Board, an increase in the Board's staff, and an increase in the number of members in order to make possible a special division of the members focusing their attention primarily

on rate cases are therefore desirable. These are recommendations in Section V of the report.

It is not only necessary that the Board act quickly in determining air mail rates but that it grant enough mail pay to keep all the lines in business to the extent required by the public interest, provided their difficulties are not due to dishonest, uneconomical or inefficient management. This can be done at a total cost that appears reasonable compared with other Federal expenditures for aviation purposes.

It has been suggested to us that a division in the air mail pay be made to show how much of the pay is for service rendered by the air line and how much is for subsidy. We see no advantage now in disturbing a practical working situation. It is desirable, however, for the Civil Aeronautics Board, in cooperation with the Post Office Department, to study the cost of air mail service with a view to the future when most air lines will be able to operate without subsidy payments. It is to be expected that, as the Civil Aeronautics Board develops new methods of cost accounting in determining fair and reasonable rates for the carriage of passengers and property, it also will develop cost standards applicable to mail carriage.

When the Civil Aeronautics Board made temporary upward adjustments in mail payments for certain carriers in financial difficulties in the spring of 1947, at the same time it wisely initiated field investigations into the efficiency and economy of those carriers. It is admittedly difficult for any Government regulatory agency to determine whether the management of a particular company in any field is in fact efficient and economical. Yet such a requirement is imposed upon the Board by the mail rate provisions of the Civil Aeronautics Act.

It has therefore been suggested to us that standard operating costs for various types of services be developed by the Board. These standard costs would be kept current with changes in the general price level by frequent adjustments to conform to an industry cost index. Components making up the index would be the major items which enter into air-line costs. The standard operating costs could then be used as yardsticks on which "need" air-mail payments could be based. With

such yardsticks, "need" mail payments could be made more quickly and bear a closer relation to efficient and economic operation.

We have considered this proposal and believe that it might have substantial advantage to all air lines. The Board might well be able to keep a closer check on efficiency and economy of air-line operation. We realize that the Civil Aeronautics Board has considered similar proposals. We recommend that the Board give this problem further study and investigation.

A suggested financial aid to the air lines would be the carriage of first-class mail by air where delivery would be expedited. Domestic air-mail volume for fiscal 1947 amounted to an estimated 33,000,000 ton-miles. The Post Office Department has estimated an additional 146,000,000 ton-miles of domestic first-class mail which movement by air would expedite. The institution of a policy of moving first-class mail by air whenever the postal service would benefit thereby would increase the volume of air mail by something over eight times in pounds and over five times in ton-miles. The benefits to the air lines by giving them this traffic, even if a large amount were carried at "service" mail rates, are obvious. For during the same period, total mail revenue to the domestic carriers amounted to a little over \$21,000,000.

We do not believe however that provision of traffic to the air lines is the major criterion in advocating the movement of first-class mail by air without surcharge. Rather, the test as to what first-class mail shall move by air should be the best mail service to the public. And it is obvious that long-haul mail can often be handled faster by the air lines than by surface carriers.

The Post Office Department estimates a loss of approximately \$5,000,000 to domestic surface carriers if first-class mail were to be carried by the air lines whenever such handling gives faster service. The taking of a large volume of first-class mail now handled by surface carriers and giving it to the air lines would not be discriminating against the surface carriers if the service to the public were better. The question raises, however, the over-all problem of the dependence of a war effort on all forms of transportation. We have not gone into that problem but anticipate that the Congress will do so.

The Congress will undoubtedly also consider the fact that carrying first-class mail by air without surcharge, whenever delivery can be expedited thereby, will involve, according to the Post Office figures, an additional cost to the Government of some \$96,000,000. This loss would come from a decrease in the present profit made on first-class, 3-cent mail, a profit which now subsidizes the carriage of other classes of mail.

We understand that the Post Office Department has now under way studies of the cost of inaugurating air parcel post on both domestic and international air routes. Our recommendation is that the step of carrying by air all first-class mail which can be expedited thereby and the step to parcel post service by air not be taken until the air lines achieve a satisfactory regularity status. At that time we recommend that the Congress should give most serious consideration to these proposals.

Safety and Regularity

We have not gone into the technical aspects of safety because the President's Board of Inquiry on Air Safety, appointed June 15, 1947, has been intensively studying the problem. We do, however, wish to make a few comments on this important subject.

In section V of this report, we recommend the establishment of an Air Safety Board.

The question of safety in commercial aviation is of prime importance, not only because of the importance of human life but because of its psychological effect on traffic and the effect of traffic upon the self-sufficiency of the air lines. Air line travel is, in fact, far safer than the public believes. The increasing size of planes, with the resultant increase in number of passengers killed in any one accident, has increased public anxiety out of all proportion to the actual conditions of safety. The disproportionate amount of publicity inevitably given air line crashes gives an unwarranted impression that air line travel is basically unsafe. Statistics on scheduled air-line operations compiled by the Civil Aeronautics Board show that the chances of fatality in terms of passenger miles flown are very slight.

Normal competitive business factors, between manufacturers and between air lines, as well as the pressures of traffic upon equipment, result in a strong tendency to put new planes into service as quickly as possible. In spite of this, new planes have been put through long and careful test periods. It is our belief, however, that events have proved that these periods have not been long enough.

We recommend that new types of transport planes be operated regularly on nonpassenger schedules for a specified mileage before passengers are carried. The period should be sufficiently long to permit mechanical or design weaknesses to become apparent under normal operating conditions. We suggest that the test airplanes be operated day by day on cargo and air-mail runs over approximately the same routes and using the same airports as they will later be flown in passenger use. We realize that both the manufacturer and the air line buying a new type of plane have flown the aircraft for long periods prior to its use in passenger service. But such flights are usually made with special crews, under special conditions, and with special maintenance. We are aware that it may be expensive to follow our recommended practice. The test planes may be operated at a relatively low load factor and income will necessarily be less than if the airplane is carrying passengers.

We are also concerned over the lack of consideration for safety that has been shown by some contract carriers.

The fact that the Civil Aeronautics Board does not have economic regulatory control of contract carriers means that the Board has no official record of their activities. Often the Board's first consciousness of the existence of a charter operation over which its safety regulations do apply is when such accidents as that of the Bermuda Sky Queen or of Page Airways call public attention to the operations. We are confident that the Civil Aeronautics Board is endeavoring to take all possible steps to eliminate hazardous accidents among contract operations. Its effectiveness in this regard will be greatly increased if it is given the economic control of such carriers we recommend below.

Next in importance to increased safety on the air lines is an increase in regularity of service.

Air travel will never be mass transportation until people are reasonably certain that they can depart and arrive on schedule. An illustration of unreliability in good weather is afforded by the figures from an air line flying in and out of New York City in June 1947, which was a good-weather month. This air line offers over-all service considered to be among the best in the country, yet of planes arriving in New York, 89 percent were late and 46 percent of all airplanes were delayed more than 1 hour. Forty-one percent of all airplane departures from New York were late, and 16 percent were over 1 hour late. The steady traveler, most often a business man with appointments to maintain, has learned from bitter experience that his plane will arrive on time about once in ten trips and will depart on time even less often.

Delayed departures are often as irritating as late arrivals. It is irksome to passengers to make a great effort to get to the airport 20 or 30 minutes before scheduled departure, a practice recommended by the air lines, only to wait an hour or more for the take-off. This is especially true on early morning flights.

It is equally irritating for the passengers not only to arrive at their destination hours late but sometimes to arrive at alternate airports which are often miles away from the intended destination of the particular flight. Problems of cancelled flights or the using of alternate airports, however, will not be solved until safe all-weather flying has been achieved.

For safety and regularity on the air lines a basic requirement is a Nation-wide system of air traffic control, navigation, and landing aids. The Federal Government has, for many years, built and operated navigational facilities and emergency landing fields.

We consider that adequate airways and airports coupled with ground aids for traffic control, navigation and landing are so important to the preservation of our air transport system that the Government must continue to be responsible for developing, installing and maintaining a thoroughly adequate network. The Federal Government must accept the financial burden until the users of these aids are in a financial position to pay their fair share of the costs.

All-weather flying will not be achieved until adequate instrument

landing systems are installed and operating at a majority of air line stops. Technical knowledge in the field of electronic aids for aviation is far ahead of actual practice. Systems have been developed which would go far toward increasing reliability and safety.

The Civil Aeronautics Administration has already installed improved-type radio and high intensity lighting facilities at a considerable number of air fields. But the program has only been started. The CAA estimates the cost of new construction of air navigation aids, air traffic control and landing aids over the next 5 fiscal years as \$190,000,000. The estimated annual cost of maintenance and operation for an integrated network of aids will cost \$100,000,000 per year, beginning with 1953.

Before the Congress can be expected to appropriate these large sums, the various interested private groups and responsible Government agencies must reach agreement on a common system of landing aids for immediate installation which will adequately serve both civil and military needs. Such agreement is now being sought by a technical group of experts, the Radio Technical Commission for Aeronautics, at the special request of the Air Coordinating Committee. As soon as agreement has been reached, the Executive Branch of the Government should request the Congress for funds to carry out the necessary air traffic control, navigation and landing aids programs.

Equally important is early agreement on research and development programs in the field of electronic aids to aviation, which will insure that the means of handling traffic will keep pace with the steadily increasing traffic. The Research and Development Board is now engaged in exploring the types of research and development in electronic aids which will have application to both military and civil aviation. The work of this Board should be expedited and should be coordinated with the long-range program on electronic aids, now being developed by the Radio Technical Commission for Aeronautics under the policy direction of the Air Coordinating Committee.

Larger expenditures for electronic aids to air traffic control, navigation, and landing will do more than anything else foreseeable today to build the air lines toward economic self-sufficiency. They will also

materially bolster certain phases of the national defense. A carefully worked out program for these aids together with its rapid implementation has become a top priority for civil air transportation.

We believe that Government money can be spent more productively on the means for increased regularity of operation than by increasing subsidy payments to support additional competition in the present air-line system.

The question of dependability with safety is not exclusively a domestic matter. It affects the international operations of our air carriers as well. Testimony has been submitted which shows that aviation communications and electronic aids are in a very unsatisfactory state on most of the international routes now in operation. We have investigated the "joint support" program of the International Civil Aviation Organization. Under this program each nation whose air lines expect to use a facility outside its own territory which is not being constructed by the state where the facility is found to be required, contributes to the cost of its establishment and operation in proportion to the use made of the facility. It was under this program that the nations flying the North Atlantic agreed on the Ocean Weather Stations Program for that area of the World. We believe that the "joint support" program of ICAO provides the best and fairest means of insuring the installation of adequate aviation aids along the routes of the world, and accordingly recommend that the Congress appropriate funds necessary to permit the United States to participate fully.

Airplanes are often late in clear weather due to congested airports. Airports at large centers of population are not adequate for handling air traffic at peak periods. Although the Civil Aeronautics Board might be blamed in part for authorizing more air lines into these airports than can be handled, the solution for this phase of the problem lies in the hands of the local governments. In cities where existing airport facilities are inadequate to handle growing traffic, local government action, plus Federal aid under the Airport Act, can and must remedy the situation. It is obvious that the Nation's airport system must be improved if we are to have a larger fleet of commercial

airplanes in daily operation. Specific recommendations on the Federal Airport program are made below.

As discussed above the Government can and should do much to improve regularity of service on the air lines. But the air lines themselves have control of a large share of their own destiny. They can improve their operations to make air travel more attractive to the public. They are now carrying many empty seats that could be filled if their service were better.

In the investigations of the Commission an interesting fact came to light. It developed that neither the Civil Aeronautics Administration nor the Civil Aeronautics Board keep records of air line regularity, nor were they, on request, able to supply them. Nor do many of the air lines themselves keep more than fragmentary statistics on this subject.

Now that air travel is accepted as a standard form of transportation, passengers are deeply critical of delays and the whole matter of public dissatisfaction and lack of confidence in the air lines touches everyone's pocketbook because it can directly affect subsidy. We have been given estimates of millions of dollars which the air lines have lost because of flight cancellations and irregularity in general.

Economic Regulation

Domestic route pattern.—The problem whether there is too much or too little competition in our domestic, air-transport system involves not only the question of new entries into the field and competitive extensions of the routes of existing companies, but also the important question whether combination of existing companies should be encouraged or prevented by the Board.

We recommend that the Civil Aeronautics Board defer for a short time decisions in new route certification cases. This should not be confused with a freezing of the present route pattern, which would certainly be undesirable. There is, however, a widespread confusion as to the principles which guide the Civil Aeronautics Board in its route determinations. A body which is under the constant pressure of daily decisions of case after case cannot accomplish the careful planning which the development of a national route pattern demands. The present air transportation system has not developed as expected before and during the war. There is need for a comprehensive survey of the

present situation and the development of a more cohesive philosophy. The resulting clarification of policy should bring about acceleration of subsequent route decisions.

As a part of such review, if the Board should find any routes no longer now required by public convenience and necessity, it should use any present legal powers such as suspension or reduction of "need" payments to reduce the effect of any errors in the present system. This appears preferable to causing instability in the industry through granting to the Board the right of outright revocation of routes.

If it is found that the Board is unwilling or unable to develop a more clear-cut plan for an over-all domestic air transport pattern, the Congress should give serious thought to giving over-all planning functions of route development to the Secretary of Civil Aviation recommended in Section V. We have had testimony from some of those interested in Government organization and procedure that such a step is now desirable, but we are much impressed with the difficulty, both practical and theoretical, in breaking apart this function from other Board functions, and propose that the Board be given ample opportunity to develop a thoughtful, over-all approach to the problem before such action be taken.

Contract carrier regulation.—A contract carrier in any form of transport can operate when he wishes and renders his service by specific contract with a shipper or group of shippers. The contract carrier has less responsibility than a common carrier and is normally subject to more competition. A common carrier of goods or people holds himself out to serve the public at large and has many responsibilities to the public. In return for undertaking these obligations it has been customary for the Government to grant to the common carrier a limitation on the amount of competition from other common carriers in his field. The Congress found it necessary to give the Interstate Commerce Commission control of both common and contract motor carriers. In contrast, although the Civil Aeronautics Board has economic control over common carriers, it has no such control over contract carriers. This is true in spite of the fact that competition between the two types is often intense.

When the Civil Aeronautics Act was passed the volume of business done by contract carriers was small and few carriers were engaged in contract operations except those who had qualified for common carriers status before the Civil Aeronautics Board.

Much of the development of air cargo over the past 2 years is due to the aggressive and capable management of certain contract cargo carriers. Unfortunately, some passenger contract carriers have misrepresented their services, and have operated illegally as common carriers. Disregard by some of these contract carriers of the responsibility and duty owed to the public by any carrier for hire tends to discredit all carriers in the eyes of the traveling and shipping public.

We believe that the economic regulation of contract carriers is necessary to prevent unstable conditions in the air transport field similar to those in the motor carrier field prior to the Motor Carrier Act of 1935. The difficulties encountered by the Civil Aeronautics Board during the past 2 years as regards contract carriers is adequate evidence that the Board should be given the authority to regulate all types of air carriers for hire. There should of course be adequate provision in any new legislation to protect legitimate contract carrier rights of currently operating contract air carriers, including those now operating under CAB regulation 292.1 and those operating under regulation 292.5 if their present request for full common carrier status is denied, just as was done for contract motor carriers on adoption of the Motor Carrier Act of 1935.

Furthermore, until the Civil Aeronautics Board is given the authority to promulgate and enforce economic regulations over contract carriers, the Board will constantly be placed in the embarrassing position of having little or no information on the services performed by such operators.

Air cargo development.—The question of air cargo development has been widely discussed. The issues appear to be two: (1) Should the potential market for air cargo by common carriers be spread among more lines than now exist in the category, and (2) should there be subsidy stimulation of cargo carriage by common or contract carriers, or both?

Property carried by air has increased strikingly since the end of the war although there has been some carriage of property by air as long as there has been air transportation. It was slowly and steadily growing in the period just before the war. Several factors account for the fact that since the war more air cargo has been carried by noncertificated carriers than by certificated carriers.

One was the necessary concentration of the certificated lines on handling passenger traffic which was overwhelming their equipment. This required the concentration of management upon that problem and the use of available financing for the building up of the passenger-fleet. Another factor was the existence of large numbers of military surplus cargo planes available at low cost and on easy terms from the War Assets Administration.

A third factor was the large number of men who started and operated air cargo lines and developed traffic; but at rates too low to cover their costs of operation. Their activity created an increasing consciousness in the shippers' minds of the possibilities of air cargo service. Yet another factor was the aggressiveness and lasting power of a few of the more rugged organizations which entered the air cargo field.

Cargo operations by noncertificated lines were carried on as contract carrier operations. The certificated carriers gave only their secondary attention to the increase of air cargo. With the realization that postwar passenger business was not going to be as great as had been expected, and with the striking results of aggressive management on the part of some of the contract operators becoming evident, the certificated air-line managements, while bedeviled with organization and safety problems, nevertheless began to turn with more and more energy to the development of the cargo business.

In regard to the first issue (spreading air cargo among more lines than now exist as common carriers) as we have said above, most common carrier air lines certificated for the carriage of passengers, property, and mail, after a steady progression toward self-sufficiency from 1938 to 1946 have suffered a serious set-back. Our major problem is to get them started once again up the ladder toward self-sufficiency. To advocate at this time the entry into this field of a large number of

new carriers would certainly seem to postpone rather than hasten the attainment of such a state.

The Civil Aeronautics Board has faced this problem of the economic number of companies since 1938, in regard to the carriage of both passengers and property, although the problem has only recently been focused in the direction of property. The basic question to be decided by the Board is whether the public convenience and necessity require that additional service be supplied and if so whether it should be supplied by expanding the service of existing lines or by letting in additional carriers. This is exactly the kind of problem for which the act of 1938 has provided a Civil Aeronautics Board and it is certainly not for this Commission to recommend the decision.

We do express our belief, however, that in deciding on certificates for new cargo operations, the Board should avoid impairing the soundness of the existing air-transport system by spreading the present and potential traffic among too many separate carriers. If the Board finds that the public convenience and necessity does require some additional common carrier operators, we hope that it will give weight to the records built up by any of those contract operators that have proven their ability to operate economically and efficiently and now desire common carrier status. The Board will also undoubtedly give serious consideration to the suggestion that certification for cargo operations should apply between and within specified areas rather than between fixed termini.

In regard to the second issue raised above (a subsidy stimulation of cargo carriage), we feel that the only excuse for the subsidization of cargo carriage by air at this time would be to develop a fleet of cargo planes to act as a military pool for emergency use. One way to meet the military need would be for the services to buy the air transports they need in the same way that they buy combat aircraft. Congress may decide not to appropriate money for this purpose and may prefer to obtain replacements and additions to the present military transport fleet reserve, through subsidizing the carriage of cargo by air. If it chooses the latter method, it will undoubtedly weigh the effect

such a course would have on other forms of transport since it might well raise the possibility of a subsidy or reduction in taxes to these forms to make possible the readiness for war loads on such transportation. The problem of building up a pool of military transport planes in commercial use seems to warrant a more coordinated study of the number of transports needed, the potential commercial cargo traffic, and the possible subsidy cost to the Government than has been carried on by the armed services, the Department of Commerce, and the Civil Aeronautics Board. We recommend that the problem receive the immediate attention of the Air Coordinating Committee.

Witness after witness has testified to the difficulty of obtaining the amounts of private capital that are needed to develop new and advanced types of airplanes.

The soundest way to build up a pool of cargo planes for an emergency is to develop a cargo plane that can operate on a profitable basis. We are recommending the creation of an Aircraft Development Corporation whose initial and primary task could be the development of an all-cargo transport airplane. Such a plane would of course have to be useful to the military; but it should be designed primarily with a view to economic commercial operation. A description of the proposed corporation is given in section V of this report.

Feeder air lines.—A complicated problem facing the Civil Aeronautics Board is that of the feeder air lines, a term popularly used to apply to an air line operating a local service with frequent stops at intermediate centers of population.

The chief objection to these local service air lines is their potentially high cost to the Federal Government. Their costs vary widely with different regions, depending upon the adequacy of surface transportation. Some regions have topographical features which make the surface connections between cities unsatisfactory. In these areas there appears to be a need for local service air transportation and we believe that feeder air lines in such places are desirable for the full development of the national air line network.

There is a real need on such routes for proper navigation and landing

aids, and adequate airport facilities. In carrying out its airport and electronic aids programs, the Federal Government will undoubtedly pay adequate attention to the needs of population centers served only by local service air lines.

In granting feeder air-line franchises, the Civil Aeronautics Board has done so on a 3-year experimental basis. Feeder-line officials appearing before us have pointed out that the 3-year period does not give them enough stability to permit sound financial and other planning.

We recommend that the experimental period for existing feeder air lines remain for the present at 3 years, unless it becomes evident that this period can be extended without burdensome cost in mail pay. Then, and only in that case, it should be extended, even if the initial testing period has not been completed. We also recommend that new certifications, if any are found to be required by the public convenience and necessity, be made for 5 years.

Surface carriers in air transportation.—The question of whether or not surface carriers, such as railroads, busses, and steamship lines, should be permitted to enter the air transport business is an important policy matter. There are differences of opinion as to the intent of the 1938 act.

We recommend that the Civil Aeronautics Board prevent the control by surface carriers of the United States air transport system or any important segment thereof. We believe, however, that individual progressive surface carriers, desirous of developing air transport as a part of a coordinated service, should not be automatically prevented from such action simply on the grounds that they are surface carriers—as now appears from the record to be the case. We recommend that the Congress enact legislation clarifying these two points.

Air line finance.—The air lines have traditionally operated on low working capital. Moreover, current assets accumulated during the war years were depleted by the purchase of new airplanes and by operating losses.

Loans secured by equipment are difficult to obtain in the air transport field. Railroads are able to secure financial aid to buy new equipment through the sale of equipment trust certificates at low interest

rates without restrictions on their operations or finances. It would be desirable if the equipment-trust method of financing, so successful with railroads, could be used for the purchase of air transport equipment.

Three legal obstacles, however, must be overcome before this method can be made effective. These are: (1) Federal recordation of engines, propellers and major spare parts, similar to the present recordation of aircraft; (2) clarification of the liability of the trustees of equipment trusts for damage done by aircraft; and (3) assurance that creditors having equipment liens can obtain immediate possession of the equipment in event of reorganization, similar to that now applicable to railroad equipment under section 77 (j) of the Bankruptcy Act.

In addition United States air lines operating the international routes are faced with the difficulty that in many cases foreign laws are not uniform either among themselves or with American law concerning the rights of lien holders on aircraft used in international operations.

These legal obstacles should be removed as soon as possible. It may be that the private market for aircraft equipment-trusts will never reach the high credit standing now enjoyed by rail equipment trusts. Every effort should be made, however, to make aircraft equipment-trusts salable in the private investment market. The elimination of these obstacles would hasten that accomplishment.

Studies are now being made with a view to making recommendations for legislative action by the Federal Government and the states to eliminate these domestic legal obstacles. It is recommended that the Department of Commerce take the lead through the Air Coordinating Committee in developing an agreed legislative program to eliminate these domestic impediments to the sale of aircraft equipment trusts.

For aircraft engaged in operations abroad, an international convention to make uniform the rights of lien holders has been drafted for presentation to the next assembly of the International Civil Aviation Organization. We recommend that the United States Government press for adoption of the convention and promptly ratify it thereafter.

It has been suggested by members of the Civil Aeronautics Board

that they be given authority to pass upon air-line financing. The Interstate Commerce Commission now has the duty of approving or disapproving security issues of railroads as does the Maritime Commission for subsidized shipping lines. The public utilities commissions of the States in many cases have similar authority as to the security issues of public utilities. The Securities Acts of 1933 and 1934 give to the Securities and Exchange Commission the duty of considering security issues in the interest of the investing public.

It has been argued before us that unsound financial planning has played a part in contributing to the difficulties of the air lines today. It may be that the absence of legal control over air-line financing is a gap in our regulatory system which should be filled.

However, any authority which the Board might be given over air-line financing would have to be applied with great expedition. In another part of this report we have made recommendations aimed at facilitating a speed-up in Board procedures. If, as a result of the carrying out of these recommendations or for any other reason, the Board does reach a point where it is in a position to handle its present duties expeditiously, consideration should then be given to the question of conferring the desired authority upon the Board.

International Air Transport

Competition vs. monopoly.—We agree with the present Civil Aeronautics Board policy which favors limited competition among American operators on international routes. We have studied the testimony before the Interstate and Foreign Commerce Committee of the House of Representatives in the spring of 1947, in which both sides of the issue were exhaustively presented. The Commission has also heard testimony from those advocating one international air line instead of a number of lines operating abroad.

Some forecast that we shall carry less and less international traffic through inability to compete with low-cost, heavily-subsidized, foreign air lines and that we shall be driven from the skies, as our Merchant Marine was once driven from the sea. We do not agree with this pessimism. We believe that our international operators should receive

such Government aid as will permit them to compete effectively with their foreign rivals. American technical and managerial ability, plus the spur of competitive effort, should win for them a substantial share of the world's traffic. The policy of regulated competition that has assured the development of our domestic air lines should be followed in our international system. Present competition seems only adequate to provide the desired incentive to management and a yardstick for comparison between American carriers.

Several of the most important certificates granted by the Civil Aeronautics Board for international operations are temporary and will expire in 1952. At that time there should be a complete review of the entire international competitive picture. There is no evidence now that an earlier reappraisal is either necessary or desirable.

Restrictions on travel.—International air travel can reach its fullest development only when governments have taken steps to do away with or improve the restrictive conditions which now exasperate the passenger. Requirements for the issuance of passports and visas; customs rules, and public health and quarantine regulations must be greatly simplified subject to proper security regulations. Our own Government is and has been one of the chief offenders in imposing burdensome regulations. Full support should be given to the efforts of the Air Coordinating Committee to eliminate obstacles to international trade and travel by air created by our own laws and regulations, and to the work which the International Civil Aviation Organization is attempting in the same field.

Executive agreements vs. treaties.—Past experience has proven that executive agreements are better than treaties for covering international air transport rights. It is only because the Department of State, working closely with the Civil Aeronautics Board, effectively negotiated bilateral agreements with some 34 nations that we have a world-wide pattern of operating rights. These agreements came into effect upon signature, thus permitting immediate inauguration of services. Treaties would have required ratification in most instances by the legislative bodies of the two signatory states. The inevitable delay in getting the ratification of 34 treaties would have kept our air lines

out of action so long that foreign competitors would have had a commanding leadership from the start. Due to prompt action on our part, that leadership is now ours.

Because of changing conditions, it will almost certainly be necessary to amend the existing agreements with various countries from time to time. We should not incur the risks we would run from delay if these agreements were in treaty form and could be amended only by the treaty process.

International rights of operation.—The Commission has seen with regret the failure of the International Civil Aviation Conference at Geneva to agree on a multilateral treaty covering rights and obligations in international air operations. We feel, however, that agreements should not be sought at the cost of abandoning the so-called Bermuda-type provision in regard to the right to carry passengers between any two foreign countries on a route.

This right, known as the Fifth Freedom, appears essential not only for the economic operation of our international carriers, but also for the widest development of air transportation. Unreasonable restrictions on traffic would adversely affect all long-haul international carriers, and would hamper that full expansion of world-wide air commerce which modern aviation can do so much to promote. While for a few nations such restrictions may appear temporarily advantageous to their national air lines, in the long run these restrictions will react against the best interests of those nations along with the rest of the world.

We feel that there should be no change in our present policy of exchanging operating routes through executive bilateral agreements, and fixing universal standards of practice and procedure through multilateral treaties.

Economic Control Needed.—The Civil Aeronautics Act of 1938 gives the Civil Aeronautics Board control over all types of domestic traffic rates. Similar control over international rates is conspicuous by its absence from the act. The volume of traffic and the number of United States flag carriers employed in carrying that traffic have increased greatly. With the present lack of specific authority over international rates the Civil Aeronautics Board cannot control the rates set by foreign

air carriers permitted into this country under reciprocal agreements as effectively as is desirable. We see no valid reason why rate control is not just as necessary in international operations as in domestic operations. The Executive Branch of the Government has committed itself, under the Bermuda and other bilateral air transport agreements, to use its best efforts to obtain direct authority over international rates from the Congress. We recommend that the Congress comply with the Civil Aeronautics Board request that it be given authority over all international rates.

The control of contract carriers operating internationally poses especially difficult problems. At the present time, the Civil Aeronautics Board has no control over nonscheduled and contract foreign carriers entering this country. The only requirement for the entry of these carriers is a permit issued by the Civil Aeronautics Administration under the reciprocal provisions of Section 6 (c) of the 1926 Air Commerce Act.

The extension of Civil Aeronautics Board economic regulation to cover all carriers for hire as recommended above would permit the economic regulation of all types of carriers by air operating into or out of this country to be centered in the Civil Aeronautics Board. However, the status of nonscheduled and contract carriers operating internationally still needs clarification. Article 5 of the Convention on International Civil Aviation states that aircraft not engaged in scheduled international air services and carrying passengers, cargo, or mail for hire, shall have complete traffic rights subject only to regulations, conditions, or limitations as any State may consider desirable. At the present time, no agreement has been reached among the countries adhering to the convention on the meaning of this article. We recommend that our Government urge an early clarification with respect to the interpretation of Article 5 of the Convention on International Civil Aviation so that there shall be clearly established legal status for nonscheduled and charter flights, operating internationally.

Taxation

Air lines engaged in interstate commerce operate in many taxing jurisdictions. They are thus subject to multiple taxation which may

well result in burdens on interstate commerce. The Congress, realizing this situation, adopted Public Law 416, Seventy-eighth Congress, second session, pursuant to which an investigation was made by the Civil Aeronautics Board resulting in a report to the Congress.

On the basis of the facts disclosed in this report, it appeared that an undue burden may be imposed on interstate commerce by (1) the multiple taxation by the States and their subdivisions of air carriers engaged in interstate commerce; (2) the absence of adequate judicial protection against multiple taxation; and (3) the absence of statutory standards or administrative procedures for accomplishing the avoidance of such multiple tax burdens on interstate commerce.

Taxation of aviation fuel by the States is an anomaly caused by the fact that State taxes on gasoline were intended to be paid by operators of automobiles. Taxes collected on gasoline for aviation uses were not, in any significant amount, used for aviation needs. The injustice of such taxation is attested by the fact that 27 States and the District of Columbia grant either total exemption or a full refund of such taxes, and 12 States grant a partial refund. However, there is no assurance that these exemptions and refunds will not be rescinded, or taxes increased, by State legislation at any time.

It is true that the States are making substantial contributions to airport development. On the other hand the air lines make user contributions to airports in the landing fees and rentals and other charges. Any additional contributions through a tax on fuel in the case of the subsidized carriers often constitute an additional levy on the Federal Treasury since these payments will have to be balanced by higher mail payments.

To meet these problems, a bill, H. R. 1241, has been introduced in the Eightieth Congress. This bill provides formulae for the equitable allocation of the taxable base between different jurisdictions measured by (a) value of operating property, operating revenues, or capital stock representing investments in operating properties, and (b) net income. The bill makes unlawful any tax imposed on the air carrier on a tax base in excess of the allocation provided by the authorized formulae. The

allocation formulae do not apply to real property and tangible personal property permanently located in a particular taxing jurisdiction. The Civil Aeronautics Board is named as the agency to administer the provisions of the bill, including the allocation of the tax base to be used by the several taxing jurisdictions. Provision is also made in this bill for judicial review of such allocations on the petition of an air carrier or an interested taxing jurisdiction.

With respect to the taxation of aviation fuel, section 6 of the bill directs the Secretary of the Treasury to consult with the State authorities and recommend within 12 months a program which will remove impediments to a balanced and normal development of civil aviation.

The Federal Government establishes, operates, and maintains the Federal airways, and a reasonable Federal tax on aviation fuel is a means of making aviation generally and the air lines in particular contribute to the Government a portion of this expense. It is hoped that as a result of the consultation provided in section 6 of the bill, an equitable reallocation of aviation fuel taxes can be arranged.

We therefore recommend that hearings be held on this bill at an early date, and that it be enacted into law with such amendments as the hearings may show to be desirable.

Personal Aviation

The term "personal aviation" is meant to include all flying activities not classifiable as either military or as the carrying of persons or property for hire. It includes "private carriers," that is, the flying of executives and other personnel in company-owned planes, and "industrial flying." The latter consists of crop dusting, aerial advertising, and other activities using the airplane as a tool. The term also includes most of the activities of "fixed-base operators" such as the sale, renting, repairing, and servicing of personal aircraft, and flight instruction. "Private flying" is the ownership and operation of aircraft for personal business or pleasure.

Federal Support.—A number of witnesses representing these varied activities came before the Commission. Most of them pleaded for

Government subsidies for flight training, airport development, navigation aids, research on personal planes, or for other services that would benefit personal aviation. Many arguments were based on claims that the stimulation of personal aviation would be of military benefit.

Personal aviation clearly proved its value to the military services in the last war. The fact that the Nation was air-minded was a national asset. Without pilots and mechanics drawn from personal aviation, and the use of civil airports and ground facilities, the Air Force and the Navy would have been retarded. The Civilian Pilot Training Program was especially successful. Light aircraft, developed originally for private fliers, were of value as artillery spotters, for personnel transports and for other uses. Private pilots of the Civil Air Patrol made an admirable contribution. In any future conflict there is little doubt that an air-minded Nation, with hundreds of thousands of civilian pilots and mechanics, and a network of airports and navigation aids is better prepared for an air war than a nation with undeveloped civil air facilities.

Although instruction skills have historically been valuable to the military, testimony of the armed services indicates that this will not be as true in the future. The usefulness of civilian instructors in military training is constantly being diminished by the advancement and refinement of military techniques and equipment. But most important is the fact that according to evidence submitted to the Commission civilian instructors are unlikely to be required for any emergency within the next 15 years because of the availability of World War II pilots. This 15-year availability of World War II pilots for instructor, patrol, and transport duties ensures personnel for these three important emergency functions which were largely performed by private pilots in the early years of World War II.

The taxpayer has contributed generously in the past to personal aviation. Considerable help was given throughout the prewar years, but the greatest benefits were in the Government-sponsored civilian pilot training in the American colleges. Airport operators in all parts of the country were able to hire new instructors, refurnish and reequip their buildings, improve their airports and in general put themselves on a

businesslike basis. The greatest help to the private plane industry was the demand for new airplanes for instruction, purchases of which reached a new peak in 1940 and 1941.

During the war nearly all manufacturers of personal planes produced aircraft for military purposes, or had subcontracts from other plane manufacturers. They were able to modernize their factories and buy new equipment that they could not previously afford.

Many airports built or improved by the Government during the war are now being used by civilian pilots. In addition, other new airports are being built under the Federal Airport Act of 1946. This is a program now going on which will be of considerable help to pilots.

Greatest postwar windfall to the personal aviation industry has been the decision of thousands of veterans to learn to fly, or to improve their flying, under the GI bill of rights. The Veterans' Administration estimates that \$125,000,000 was spent for flight training in 1946 and it is likely that veterans will continue to take flight training until the program terminates.

As was true with the Civilian Pilot Training Program before the war, Government money under the GI bill filters down to nearly all phases of the personal aviation industry. A considerable amount goes to manufacturers for new airplanes. Other Government money spent for airports, control tower operation, navigation facilities, and other purposes is also a direct help to private flyers.

In the past 10 years the Government has paid for the training of hundreds of thousands of military and civilian pilots who compose the largest ready-made market for personal planes and for airport facilities that has ever existed. This great mass of pilots will decide the near future of personal aviation. If enough of them do not continue flying to support the personal plane industry, their neglect should be an unmistakable sign to airplane designers that a new airplane is needed which will provide more utility at a lower operating cost. If, in fact, private aircraft do possess a significant economic potential, the Commission is confident that private enterprise will seize the opportunity as it already appears to be doing in the development of light planes for executive transportation.

This Commission, trying to judge personal aviation impartially, believes that a healthy, personal plane industry is of value to the Nation. We believe that it should be encouraged by the continuation of funds for airports, for navigation and landing facilities, and for basic improvement in personal plane design (discussed in Sec. III of this report). We believe that the appropriations to personal aviation for these purposes, plus the very substantial financial assistance provided for veterans' flight training, are sufficient.

Federal Regulation of Personal Aviation.—We recommend that every effort be made by Government aviation agencies to simplify and reduce the air and ground regulations affecting the personal flyer as a further step toward the development of personal aviation. In Section II of this report we have made recommendations aimed at lightening the regulatory burden on the light plane manufacturer.

State Enforcement and Participation in Federal Aviation Policy.—The postwar expansion of personal aviation has made impossible the direct Federal enforcement of Civil Air Regulations without the creation of a large and cumbersome Federal policing agency. Rather than expanding the Federal pay roll, the Commission recommends that the Civil Aeronautics Act be amended to authorize State aviation officials or courts to enforce the noncarrier safety regulations of the Federal Government. We emphasize, however, our belief that the Government should retain its power to promulgate Civil Air Regulations in order to preserve national uniformity.

State aviation activities have grown rapidly in both extent and function, and the States will have an increasing concern with Federal policies. At present, the States have no formal representation or participation in any Federal aviation agency. Section 205 (b) of the Civil Aeronautics Act empowers the Civil Aeronautics Authority to confer with or to hold joint hearings with State aeronautical agencies. We believe that more extensive use of this provision by the constituent Federal agencies is desirable.

To give official recognition to State and local aviation organizations at the Federal level, we recommend the establishment of a State-local aviation panel, advisory to the Air Coordinating Committee. The

panel should be organized along lines parallel to the ACC industry advisory panel and should include representation from nationally recognized State and municipal aviation associations. This panel would provide Government agencies other than Federal agencies with a formal medium wherein they can work closely with Federal aviation agencies. The panel will permit responsible State and local aviation officials to express their views on the larger issues of national air policy and will guarantee their associations official status in consulting with departments and agencies represented on the Air Coordinating Committee.

Airports

An adequate domestic airport system can best be achieved through the combined efforts of the Federal and local governments. By enactment of the Federal Airport Act in 1946, which provides for Federal participation with local governments in building new airports or improving old ones, Congress has reaffirmed its long-established policy of furthering such cooperation.

As a general rule, military fields were not built close enough to cities for air-line or personal-plane use, and there is still need for more commercial airports. Traffic congestion in large metropolitan areas is so great that additional airports are badly needed. Many smaller communities must also have new fields if they are to attract air lines and get the benefit of civil aviation.

The Federal Airport Act authorizes financial grants totaling \$500,000,000 within the United States over a 7-year period and an additional \$20,000,000 for Hawaii, Alaska, and Puerto Rico, and placed a limit of \$100,000,000 in any one year. The act did not appropriate any funds. The 1947 appropriation was \$45,000,000. Although the President requested \$65,000,000 for 1948, Congress appropriated only half that amount. We recommend that Congress appropriate each year the full amount of Federal aid permissible under the law.

Representatives of local governments and the aviation industry testified that the airport construction program has been delayed by complicated and confusing CAA regulations. While we believe there

is some merit in these complaints, we recognize that much of the delay is due to difficulties of hiring a staff and carrying out the new act. The CAA is now taking steps for future simplification of regulations which are expected to result in the desired acceleration of this program.

Whether a public airport should grant exclusive rights to any fixed-base operator or other person to engage in an aviation or a nonaviation business is at best a difficult question and one which is ordinarily best answered on the merits of each individual airport situation.

Due to the relatively small business potential at many airports, some local communities find it difficult to assume the financial burden of airport maintenance and operation without the power to grant exclusive rights. In these circumstances, there may be some cases where exclusivity is justified.

On the other hand, fixed-base operators and others prevented from establishing themselves at public airports argue that they are built with public funds and should be open to all desiring to engage in business.

We feel there is no question but that the landing area should be available for the use of all aircraft on a nonexclusive basis. At the other extreme, we feel there is no objection to exclusive contracts for such services as a restaurant at an airport. The difficult question to decide is whether exclusivity should apply to such services as gasoline and maintenance facilities. The Civil Aeronautics Administration is now in the process of working out regulations to cover these questions. In doing so, it has the advice and cooperation of interested airport officials. We believe that experience under the new regulations should be watched carefully with an eye to amendment in the light of results over the next few years.

It is charged that certain overseas facilities were constructed in whole or in large part with Government funds made available to the owner air line through mail pay or otherwise, and therefore that these facilities should be available on reasonable and equal terms to all United States civil aircraft. Otherwise there must be a wasteful

duplication of facilities the cost of which the American taxpayer will be called upon to defray through air-mail payments.

The Commission believes that where a question arises as to whether airport facilities were constructed with the aid of Government funds or through the use of private capital, an investigation should be made by the Civil Aeronautics Board, with the cooperation of the other pertinent Government agencies through the Air Coordinating Committee. In the event it is found that Government funds were used, steps should be taken to make these facilities available to other United States civil aircraft at reasonable rates.

Section V
Government Organization

Government Organization

Never before in our history have we maintained a large military organization in peacetime. After each war, we have demobilized most of our ground and air forces, keeping as our only force in being the Navy. In the immediate years to come, however, we will face a new situation. We must also keep a strong air force in being, and our ground Army, because of occupation duties and the need for a skeleton force capable of rapid expansion, must be larger and more mobile than in the past. This degree of preparedness—new in American life—calls for a new concept for the organization of the civilian branches of the Government whose activities directly relate to military plans.

The creation of a Military Establishment capable of defending the country will put a disproportionate share of the power of Government in the hands of the military, and at the same time will place new and heavy burdens on the civilian agencies of Government in matters contributing to the national security. This will require the strengthening of the civilian departments in those areas which are of common concern to the Military Establishment and the civilian agencies of the Government.

As we are not an aggressor nation, and as attack upon us may be delayed for years, our will to continue to carry the financial burden, which will increase from year to year for several years, may weaken, especially if we should have a period of depression combined with calculated changes for the better in the public attitude of a possible enemy.

That is our gravest danger.

For a potential enemy is apt to be contentious and threatening when getting ready and reverse his attitude when preparing to strike.

While we believe that a planned war will not start until other countries have the atomic bomb or other comparable weapons in quantities, the possibility that constant friction may cause war will compel us to

continue in a state of partial mobilization of our productive resources to be adequately prepared for war.

Our people will look to the military agencies to formulate the programs for their requirements and to civilian agencies to organize industry and foreign and domestic commerce to be prepared to furnish those requirements.

During this entire period commerce and industry must be maintained on the highest possible productive level to yield earnings which will enable business, and the public sharing the profits distributed, to meet the mobilization costs without unbearable taxes.

We accordingly have been influenced in our recommendations for changes in the organization and procedures of the Government dealing with aviation by the need to make the civilian agencies having to do with aviation more efficient in themselves and to strengthen them in relation to the growing military establishment.

* * * * *

In the Federal Government there are now three agencies which are primarily concerned with civil aviation. The Civil Aeronautics Board (now within the Department of Commerce for housekeeping purposes only) grants or denies air routes, fixes rates, prescribes systems of accounts, promulgates safety regulations and investigates aircraft accidents. The Civil Aeronautics Administration, now a part of the Department of Commerce, enforces safety regulations, operates the Federal Airways System, and directs the Federal Aid Airport Program. The National Advisory Committee for Aeronautics supervises and directs the scientific study of the problems of flight and propulsion and conducts research in aeronautics and power plants. Several other agencies participate in governmental civil aviation activities, such as the Weather Bureau and the Coast and Geodetic Survey (both of which are part of the Department of Commerce), the Post Office Department, the Coast Guard (now a part of the Treasury Department), the Federal Communications Commission and the Department of State. The Air Coordinating Committee examines aviation problems affecting more than one governmental agency, develops and recommends integrated policies, and coordinates the aviation activities of the Govern-

ment. A description of certain other governmental agencies dealing with aviation is in the appendix which follows.

A Department of Civil Aviation

We recommend that the Government's executive functions relating to civil aviation remain under the direction of the Secretary of Commerce, who shall have immediately under him a Secretary of Civil Aviation in charge of a Department of Civil Aviation. The position of Administrator of Civil Aeronautics should be abolished and the functions, activities, and duties of the Civil Aeronautics Administration transferred to the newly formed Department.

We believe that when and if all executive transportation functions of the Government are centralized within the Department of Commerce (as discussed below), the title of Secretary of Civil Aviation should be changed to Secretary of Transportation and the organization reporting to the Secretary of Transportation should be set up to conform with the change.

A Department of Civil Aviation would have all the functions of the present Civil Aeronautics Administration as well as the responsibility for safety regulations now in the Civil Aeronautics Board. The Department of Civil Aviation would also have certain duties in connection with the Aircraft Development Corporation which is discussed below. In addition it would perform administrative housekeeping functions for the Civil Aeronautics Board and the Air Safety Board referred to below.

The Secretary of Civil Aviation would have the responsibility of initiating our broad domestic and foreign civil aviation policy, subject to the direction of his superior officer, the Secretary of Commerce, who in turn would consult with the Secretary of State on matters of foreign policy. The Secretary of Civil Aviation also would have the responsibility of making recommendations with respect to the mobilization of our aircraft and air transport industries resources as part of the industrial mobilization plan of the country. We also recommend below that the Secretary of Civil Aviation be Chairman of the Air Coordinating Committee.

We do not recommend the inclusion of the Weather Bureau or the

Coast and Geodetic Survey in the Department of Civil Aviation as these agencies have only specialized interests in aviation and serve numerous non-aviation departments and agencies.

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With this responsibility and authority, the Secretary of Civil Aviation would become the recognized spokesman in executive matters for civil aviation in the Government.

We lay special emphasis on the duties of the Secretary of Civil Aviation in connection with the Industrial Mobilization Plan. Of the many important tasks which American industry performed during the last war as part of our industrial mobilization, the building of aircraft was of major importance. In any future war aircraft production would form an even greater part of our industrial mobilization. We must therefore have a close and smoothly coordinated relationship between the civilian and military departments of the Government in the development of our future Industrial Mobilization Plan. The Secretary of Civil Aviation can perform a highly useful service in its development. At present the responsibility within the Department of Commerce for intimate knowledge of conditions in the aircraft industry, the air lines and other phases of aviation is not concentrated in one point. The planning of industrial mobilization of our air establishment will necessitate arrangements in peacetime for the assembly of the production of literally thousands of manufacturers of primary components, instruments and other items required in aircraft production. The civilian agencies should have a leading role in this planning. This role is appropriately that of the Secretary of Commerce and as to aviation matters, the Secretary of Civil Aviation.

The Department of Commerce could effectively act as the chief representative of the Government as to civil aviation and related matters, serving as a balance to the Military Establishment.

The Department of Commerce would be organized on a pattern comparable to the Military Establishment. The Secretary of Commerce would have under him the Secretary of Civil Aviation and the Secretary of Industry and Trade which we recommend below. The National Security Act of 1947 injected a new form of organization into our governmental structure: that of three non-Cabinet Secre-

taries reporting to the Secretary of National Defense. Civil aviation and commercial matters would be represented by the Secretary of Civil Aviation and the Secretary of Industry and Trade under the Secretary of Commerce.

The combination of the various civil aviation functions in the Department of Civil Aviation would have additional advantages, particularly in relation to safety regulation. There is some confusion in this regard at the moment. Now the Civil Aeronautics Board formulates safety regulations while the Civil Aeronautics Administration has the responsibility for enforcing them. The concentration of the responsibility for safety regulations in the Department of Civil Aviation would relieve the hard-pressed Civil Aeronautics Board members from the kind of work which takes much of their time. The Civil Aeronautics Board members would be given more time for their principal work—that of making decisions on route and rate cases.

A Government Corporation to Finance Aircraft Development

In the preceding section, we have discussed the importance of air-cargo development as a means of building a fleet of commercial planes that could be used by the military services in war. From testimony presented to us, we have concluded that a major handicap to such a development is the lack of a suitable cargo aircraft.

We propose that a Government Aircraft Development Corporation be set up within the Department of Civil Aviation. The Board of Directors would consist of five members, with the Secretary of Civil Aviation as Chairman. The Secretary of the Air Force would be a member, and one other member appointed by the Secretary of National Defense. The Secretary of Commerce would appoint a fourth member and these four would choose the fifth. The Corporation would be authorized to pay all or a portion of the development cost of cargo or other non-military planes, components, navigational aids and safety appliances, which the Board of Directors would decide should be developed in the national interest and could not be developed by private enterprise. The Corporation also would be authorized to make loans to manufacturers for the development costs when such financing could

not be obtained from private sources. We believe that a specialized Government corporation directed by the Departments could do this work better than if the Reconstruction Finance Corporation, operating in a much broader and varied field, were assigned the responsibility.

The Aircraft Development Corporation should finance the development of planes, components, navigational aids and safety appliances only when there is a proven need for the product. There is nothing new about this method of developing commercial airplanes. Many of our transports have been created in this way. Many transports are commercial developments of military planes, the developmental cost of which was paid in major part by the Military Establishment. The purpose of our recommendation for an Aircraft Development Corporation is to provide an orderly specialized medium to carry out this method for the development of commercial aircraft and components.

At the outset we believe that the Aircraft Development Corporation will be concerned with the development of an efficient and economical cargo plane. Its authority, however, would not be limited to this type of plane. It would finance the development of such types of planes, components, navigational aids or safety appliances as would be shown to be necessary from time to time in the judgment of its Board of Directors.

Air Safety Board

There is no phase of commercial aviation that is more important than safety. We believe that an Air Safety Board should be established within the Department of Civil Aviation. We recommend that it consist of three members appointed by the President, subject to confirmation by the Senate. The Air Safety Board would be responsible for the investigation and analysis of air accidents and for submitting reports to the Secretary of Civil Aviation to be made public by him. The Air Safety Board could, in its discretion, delegate to the Department of Civil Aviation, the investigation and analysis of minor accidents, as the Civil Aeronautics Board now delegates to the Civil Aeronautics Administration in the great majority of accidents. The Air Safety Board should be provided with sufficient staff to enable it to carry out its assigned functions, but the Secretary of Commerce should

determine that there is no unnecessary duplication or overlapping of activities between the Air Safety Board and the Department of Civil Aviation. We believe that the Air Safety Board should have the same relationship to the Department of Civil Aviation that the Civil Aeronautics Board now has to the Department of Commerce. It thus would not be a separate agency within the Government but would be within the Department of Civil Aviation for housekeeping purposes only.

We realize that the success of an Air Safety Board will depend upon two factors: the quality of its members and their independence of judgment. If these factors are assured, the Board should be able to make a valuable contribution to air safety.

The Civil Aeronautics Board has done commendable work in connection with safety. We recommend the transfer of these safety functions from it principally because we believe that it should be as free as possible for the performance of its economic functions.

We are aware of the difficulties that surrounded the earlier Safety Board, and realize that our proposal has a striking similarity to it. We believe, however, that the logic of the situation compels the establishment of such a Board. The function of accident investigation and analysis should not, we believe, be in the Department of Civil Aviation; for such an arrangement would not provide the desired independence of the investigators. We believe that it should be in a Board with an independence analogous to that of the Civil Aeronautics Board. But since we believe that the Civil Aeronautics Board should not have this function for the reasons we have just given there is no alternative other than to create a new body.

The Civil Aeronautics Board

We believe that the Civil Aeronautics Board should continue to be an independent agency, located within the Department of Civil Aviation for housekeeping purposes only, for granting or denying air routes; fixing rates of air carriers and mail rate computation; approving or disapproving consolidations, mergers, interlocking relationships, and so forth, affecting airline carriers; and prescribing the accounts and records to be kept by air carriers and the reports required

from them. All of these functions are broadly classified as Air Carrier Economic Regulation in the Civil Aeronautics Act of 1938.

We have heard considerable criticism of delays by the Civil Aeronautics Board in the processing of cases before them and of the resultant high cost to the carriers in these cases.

The route and rate functions of the CAB are judicial functions. The procedures for the determination of these cases are judicial. These procedures therefore are subject to the delays that are inherent in the judicial process; for the theory of this process is that where the rights of individuals are affected, these individuals shall have the fullest opportunity to present their case and defend their interests.

It may be argued that because of the high national interest in the domestic and international route pattern, the determination of routes and possibly of the rates to be charged should be decided by an administrative process rather than by a judicial process. If this were done, it would be possible to speed up substantially the decisions to be made. But if this were done, the guarantee of a full hearing which the judicial process provides might well be lost. We are not prepared to make a recommendation that the determination of routes and rates be determined otherwise than by judicial forms.

For these reasons, then, we must anticipate some delay in the processing of route and rate cases. Nevertheless, we believe some improvements in speeding up this work can be made.

We believe that the membership of the Civil Aeronautics Board should be increased from five to seven in order that the practice of the Interstate Commerce Commission of operating by divisions may be adopted.

We also recommend that the salaries of the Board members be established at \$15,000 a year. The Civil Aeronautics Act of 1938 provided that the members of the Civil Aeronautics Authority, the predecessor of the Civil Aeronautics Board, should receive \$12,000 a year, but Congress has not appropriated sufficient funds to pay Board members more than \$10,000.

The Civil Aeronautics Board also recommends that its staff be increased. From the evidence submitted to us, we believe that this demand is justified.

The recommended increase in the membership of the Civil Aeronautics Board brings up the important point of the calibre of men to form its membership. We recommend that experienced career men within the Government, as well as qualified persons from private life, be considered in selecting members of the Board.

A Department of Transportation

We believe that sometime within the near future all executive transportation functions of the Government should be centered in a single executive department, in order effectively to coordinate the development of all forms of transportation. The establishment of a Department of Civil Aviation within the Department of Commerce will provide the structure that can later be used to combine all transportation functions within one department.

The Department of Commerce presently contains a nucleus of transportation agencies, namely, the Civil Aeronautics Administration, the Inland Waterways Corporation, and the transportation activities of the Bureau of Foreign and Domestic Commerce. The Weather Bureau and the Coast and Geodetic Survey, both of which provide services for transportation, are also a part of the Department of Commerce. And it should be noted that the President's Advisory Committee on the Merchant Marine has just recommended that all functions of the Maritime Commission, other than quasi-legislative and quasi-judicial, be transferred to the Department of Commerce. Although the Weather Bureau and the Coast and Geodetic Survey would not be included in the Department of Civil Aviation, these two organizations could be included in the Department of Transportation.

There is an evident need of executive coordination in the over-all field of transportation. At present there is no official in the administration who has responsibility for such coordination. We believe that bringing the various executive functions in regard to transportation within one department will satisfactorily fill the present requirements. One of the most notable examples of the need for the establishment of such clear-cut responsibility is the recent Sea-Air issue dealing with the control of air carriers by surface carriers in which the Civil Aero-

navitics Board and the Maritime Commission took opposing views. There should be some executive official responsible for bringing the two Commissions together to work out a common policy. Lacking success in this, he should advise the President as to recommendations to the Congress for clarifying action. Moreover, another war may involve the disruption of transportation facilities within the United States, and Government planning should be now going forward on an over-all transportation basis with this fact in mind.

The independent, semijudicial bodies in the transportation field should be brought into the Department of Transportation for administrative housekeeping purposes only. These independent regulatory agencies should maintain full independence in the way the Civil Aeronautics Board has maintained its complete freedom of action in all policy matters. This is not a recommendation to consolidate all regulatory agencies dealing with transportation into one regulatory body. We doubt that one judicial body could handle the many and diverse cases which are presented in the whole transportation field.

A Department of Industry and Trade Within the Department of Commerce

We recommend the establishment within the Department of Commerce of a separate Department of Industry and Trade. All activities of the Department of Commerce would be divided at the outset between civil aviation on the one hand and industry and trade on the other and later between transportation (including aviation) and industry and trade.

We would not have recommended the establishment of a Department of Civil Aviation unless we believed that it was also necessary to have a parallel department within the Department of Commerce dealing with trade and industry. The need for this latter department is, we believe, clear.

To support the military establishment we need a strong industry. It should be the responsibility of the Department of Industry and Trade to take the leadership in all matters in which Government is concerned for the development of this strong industry.

The Department of Industry and Trade would have the further responsibility of organizing all pertinent industrial information for the benefit of our businessmen and for the Government. This information could be a guide to business and the Government to a much greater extent than ever before.

Periodic reports showing the flow of merchandise, by key products, from raw materials to finished goods, by price lines, would be invaluable to every businessman and banker in the country.

This information would serve as a basis for ascertaining industrial and trading trends and would serve the needs of all branches of the Government and particularly of Congress, the Council of Economic Advisers to the President, the Treasury Department, the Bureau of the Budget, and other agencies. Data on foreign and domestic commerce, properly analyzed, interpreted, and presented by the Departments of the Government representing business, would clarify many of our domestic and international policies.

These activities should not conflict with the functions of the Departments of Agriculture, Interior, and Labor, as the Department of Commerce is the authorized agency to obtain essential information on all transactions after resources and agricultural products enter the processing or trading stage.

Secretary of Commerce as Member of the National Security Council

The function of the National Security Council is to advise the President on all phases of national defense. The Secretary of Commerce is the chief governmental representative for two important activities which must be coordinated with national-defense planning: Civil aviation, and major segments of commerce, industry, and some phases of transportation other than aviation. It is appropriate that the Secretary of Commerce be a member of the National Security Council to insure the representation of these important activities in national-defense planning. The Secretary of Commerce is already a member of the National Security Resources Board. Making him a member of the National Security Council would round out the utilization of his Department,

and give proper recognition to the indispensable part which industry plays in both war and peace.

Chairman of the Air Coordinating Committee

The Secretary of Civil Aviation should be the Chairman of the Air Coordinating Committee. The ACC is an interdepartmental advisory and coordinating group responsible for examining aviation problems and developments affecting more than one participating agency, and for developing and recommending integrated policies to be carried out by the governmental agencies affected. The membership of the Air Coordinating Committee consists of one representative each from the Departments of State, Commerce, Air Force, Navy, and Post Office, and the Civil Aeronautics Board, with a representative of the Bureau of the Budget serving as a nonvoting member.

The Air Coordinating Committee, as is evident from all the testimony presented to us, has served a useful and effective purpose. It should continue as the over-all coordinating agency in aviation matters of the Government.

The Secretary of Civil Aviation, in his individual capacity and as Chairman of the Air Coordinating Committee, should be recognized as the governmental spokesman on civil aviation matters except for those activities which are the responsibility of other agencies, such as the Department of State and the Civil Aeronautics Board. He should be able to give adequate time and attention to ACC problems, most of which will have common factors with those facing him within his Department.

It has been forceably presented to us that the Air Coordinating Committee should have a permanent full-time Chairman appointed by the President, subject to confirmation by the Senate. It has also been suggested that there should be an administrative assistant to the President to advise on civil aviation matters. Our basic concept is that the President should look on military matters to the Secretary of Defense and on civil aviation matters to the Secretary of Commerce except where these matters lie primarily within the responsibility of the Secretary of State or the Civil Aeronautics Board. Where the Air

DEPARTMENT OF COMMERCE

Business, Industry, and Commerce in the United States

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WASHINGTON, D. C.
OFFICE OF THE SECRETARY
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AIR AERONAUTICS BOARD

The Air Aeronautics Board is a Federal agency established by the Department of Commerce to regulate and supervise the operations of aircraft and air navigation. It is composed of representatives from the Department of Commerce, the Department of War, and the Department of the Navy. The Board's primary function is to ensure the safety and efficiency of air travel.

DEPARTMENT OF COMMERCE
WASHINGTON, D. C.
OFFICE OF THE SECRETARY
Room 1000
14th Street, N. W.

REGULATIONS OF THE AIR AERONAUTICS BOARD
The Board has the honor to acknowledge the receipt of your letter of the 10th instant regarding the proposed regulations for the operation of aircraft. The Board is currently reviewing the matter and will issue a final decision as soon as possible.

REGULATIONS OF THE AIR AERONAUTICS BOARD
The Board has the honor to acknowledge the receipt of your letter of the 10th instant regarding the proposed regulations for the operation of aircraft. The Board is currently reviewing the matter and will issue a final decision as soon as possible.

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NATIONAL BUREAU OF STANDARDS
The National Bureau of Standards is a Federal agency established by the Department of Commerce to provide a national system of measurement and standards. It is responsible for the development and maintenance of the National Standard System, which includes the International System of Units (SI).

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Coordinating Committee cannot resolve differences, the Secretary of Civil Aviation as Chairman of the Air Coordinating Committee should have the responsibility of referring the matter to his superior, the Secretary of Commerce. It would then devolve upon the Secretary of Commerce to work out a solution at the Cabinet level. Failing in this the matter should be referred to the President. We do not therefore subscribe to either of the recommendations above.

Appendices

Appendix I

Government Organization and Procedures

The information in this appendix contains a brief description of the functions, as of January 1, 1948, of those organizations of the Executive branch of the Federal Government which are primarily responsible for civil aviation activities and a history of Federal Government organization for civil aviation since 1926.

Civil Aeronautics Authority.—The Civil Aeronautics Authority, as originally established by the Civil Aeronautics Act of 1938, was an independent agency composed of three parts—a five-member group confusingly also called the Civil Aeronautics Authority, an Administrator, and a three-member Air Safety Board. By Reorganization Plans Nos. III and IV of 1940 the five-man group was renamed the Civil Aeronautics Board. Certain of its functions were transferred to the Administrator, who was renamed the Administrator of Civil Aeronautics; the three-member Air Safety Board was abolished and its functions transferred to the Civil Aeronautics Board. Reorganization Plans Nos. III and IV further provided that together the Civil Aeronautics Board and the Administrator of Civil Aeronautics would constitute the Civil Aeronautics Authority within the Department of Commerce. The Civil Aeronautics Authority as such performs no functions and has no significance.

The Board is established within the framework of the Department for “administrative housekeeping” purposes and reports to the Congress and the President through the Secretary of Commerce but exercises its functions independently of the Secretary.

The Administrator performs his functions under the direction and supervision of the Secretary of Commerce.

Civil Aeronautics Board.—The Civil Aeronautics Board is an independent quasi-judicial agency composed of five members appointed by the President by and with the advice and consent of the Senate.

The five-man body is directed by the Civil Aeronautics Act of 1938 to encourage the development of an air transportation system properly adapted to the present and future needs of the foreign and domestic commerce of the United States, of the Postal Service, and of the national defense; to regulate air transportation so as to best promote its development and safety and preserve its inherent advantages; to consider in the public interest competition to the extent necessary to assure the sound development of the air transportation system described.

In general, the Board grants or denies applications for air routes both domestic and international; fixes rates of domestic air carriers; fixes mail rate compensation;

approves or disapproves consolidations, mergers, interlocking relationships, etc., affecting air carriers; prescribes accounts, records, and memoranda to be kept by air carriers and reports required from them. The Board cooperates with the Department of State in the negotiation of any agreements with foreign governments for the establishment and development of international air routes and services. The Board prescribes safety rules and regulations including standards covering the issuance of airman, aircraft type, production, airworthiness, and air carrier operating certificates. The Board investigates aircraft accidents and analyses them in order to ascertain the facts, circumstances, and probable causes.

Department of Commerce.—The Assistant Secretary of Commerce for Aeronautics supervises the activities of the Civil Aeronautics Administration, the Weather Bureau, and the Coast and Geodetic Survey.

Civil Aeronautics Administration.—The Civil Aeronautics Administration is headed by the Administrator of Civil Aeronautics who is appointed by the President by and with the advice and consent of the Senate and is directed by the Civil Aeronautics Act of 1938 to encourage and foster the development of civil aeronautics and air commerce in the United States and abroad and to encourage the establishment of civil airways, landing areas, and other air navigation facilities.

The Civil Aeronautics Administration applies and enforces the safety standards, rules, and regulations established by the Civil Aeronautics Board; plans, constructs, maintains, and operates the Federal Airways System; maintains and operates the Washington National Airport; develops, directs, and fosters the coordination of a national system of airports, and directs the Federal-Aid Airport Program; performs developmental work, evaluation and service testing of devices and systems required for the safety and development of civil aeronautics; fosters and encourages the development of civil aviation education and training; collects and disseminates civil aviation information; regulates for purposes of safety United States-flag air carriers operating internationally; promotes United States air commerce abroad through technical assistance to foreign governments, training of foreign nationals, and the provisions of technical aviation experts to represent the United States at international conferences.

Weather Bureau.—The Weather Bureau was created in the Department of Agriculture in 1890 and transferred to the Department of Commerce by Reorganization Plan IV of 1940. Prior to 1890 its functions were performed in part by the Signal Corps of the Army beginning in 1870.

The basic purpose of the Weather Bureau is to collect, process, and disseminate weather information required for the public safety and national welfare. More specifically, the Weather Bureau disseminates forecasts, warnings, and advices for public and private uses; and organizes and operates special weather services required for safe and efficient air transport. In addition to its general public

services it also operates special services for agriculture (including forest resources) and for several other fields of business, industry and transportation (including maritime commerce). The Bureau publishes information on climatic conditions in the United States and elsewhere as it affects the national interest; and promotes the development of meteorological science through research.

The Weather Bureau maintains close liaison with the Army and Navy to coordinate civil and military meteorological operations, and cooperates closely with the Civil Aeronautics Administration, the Coast Guard, the National Advisory Committee for Aeronautics, the Department of Agriculture, the United States Engineers, and Reclamation Service, etc., in the performance of its functions. With ships provided by the Coast Guard, it participates with the meteorological services of foreign countries in the maintenance of ocean weather stations.

Coast and Geodetic Survey.—The Congress authorized a survey of the coast of the United States in 1807 and in 1871 provided for the extension of the geodetic work across the country.

Included among the functions of the Coast and Geodetic Survey are the surveying and charting of the coasts of the United States and its possessions and the study of tides and currents to insure the safe navigation of coastal and intracoastal waters; the establishment of geodetic control, including gravitational and astronomical observations, to provide a framework of positions and elevations necessary to coordinate all surveying and mapping of the country, and the observation and analyses of the earth's magnetic data essential to the land surveyor and to the navigator of the air and sea.

The Air Commerce Act of 1926 made it the responsibility of the Department of Commerce to provide aeronautical charts for civil aviation. The production of these charts was delegated by the Secretary of Commerce to the Coast and Geodetic Survey.

By Act of Congress approved August 6, 1947, the Coast and Geodetic Survey was further authorized (1) to conduct field surveys for aeronautical charts; (2) to compile and print aeronautical charts of the United States, its territories and possessions, and charts covering international airways required primarily by United States civil aviation; and (3) to distribute these aeronautical charts and related navigational publications.

State Department.—The State Department has responsibility for assisting the President in the determination of United States foreign policy. The Secretary of State, who is the highest ranking member of the Cabinet, directs the home establishment in Washington and the Foreign Service abroad.

One of the six Assistant Secretaries of State, the Assistant Secretary—Transportation and Communications Affairs, is responsible for the initiation and coordination of policy and action concerning the international aspects of trans-

port and communications; and is currently serving as Chairman of the Air Coordinating Committee, the Shipping Coordinating Committee, and the Telecommunications Coordinating Committee, which are interdepartmental advisory groups composed of representatives from the various governmental agencies concerned. The Office of Transport and Communications, which is under the direction of the Assistant Secretary, is divided into three divisions: the Aviation, Shipping, and Telecommunications Divisions.

With specific reference to the development of international air transport services, the Department of State conducts negotiations with foreign governments for new or additional rights determined to be desirable as a result of collaboration between the Department and the Civil Aeronautics Board and with the advice of the Air Coordinating Committee. Applications of foreign air carriers for permits to operate into United States territory are forwarded through diplomatic channels and, upon receipt by the State Department, are transmitted to the Board for appropriate action. The Department also has responsibility for liaison with and representation on ICAO and the coordination of this government's policies with that organization.

Post Office Department.—The Postmaster General superintends generally the business of the Department; executes all laws relative to the Postal Service; and, subject to the approval of the President, negotiates postal treaties with foreign governments.

The second of the four Assistant Postmasters General is charged with authority and responsibility for administering all matters relating to the transportation of the domestic and international mails by any and all media of transportation, and the management of the international postal service. He is assisted in the execution of these duties by an under Second Assistant Postmaster General and four deputy Second Assistant Postmasters General. One of these deputies supervises all domestic and foreign air mail routes flying the American flag and is responsible for research and analysis with respect to proposed new air services, and for the development, improvement, and expansion of transportation of mail by air. Another deputy is responsible for the establishment and maintenance of postal relations with foreign postal administrations and for the preparation of agreements and formal conventions with foreign countries covering all phases of international postal operations.

Air Coordinating Committee.—The Air Coordinating Committee was originally established on March 27, 1945, by agreement of the Secretaries of State, War, Navy, and Commerce which was adhered to shortly thereafter by the Civil Aeronautics Board subject to certain reservations. It was formalized by Executive Order 9781 of September 19, 1946, in which provision is made for submission to the President of important matters upon which the Committee cannot reach a unanimous decision.

The functions of the Committee are to examine aviation problems and developments affecting more than one participating agency; to develop and recommend integrated policies to be carried out and actions to be taken by the participating agencies or by any other government agency charged with responsibility in the aviation field; and, to the extent permitted by law, to coordinate the aviation activities of such agencies except those relating to the exercise of quasi-judicial functions.

The Executive order provided that the Committee shall have as members one representative from each of the following-named agencies: the State, War, Post Office, Navy, and Commerce Departments and the Civil Aeronautics Board. The members are designated by the respective heads of the participating agencies. The President names one of the members as the Chairman of the Committee. The Director of the Bureau of the Budget designates a representative of the Bureau as a nonvoting member of the Committee.

At the present time the following are members of the Air Coordinating Committee: an Assistant Secretary of State who serves as chairman, the Chairman of the Civil Aeronautics Board, who serves as co-chairman, the Under Secretary of Commerce, the Assistant Secretary of the Navy for Air, an Assistant Secretary of the Air Force, and the Second Assistant Postmaster General, with an Assistant Director of the Bureau of the Budget as a nonvoting member.

The Committee, after obtaining the views of the head of each agency concerned, submits to the President, together with the said views, (*a*) such of the Committee's recommendations on aviation policies as require the attention of the President by reason of their character or importance, (*b*) those important aviation questions the disposition of which is prevented by the inability of the agencies concerned to agree, (*c*) an annual report of the Committee's activities during each calendar year, which is submitted not later than January 31 of the next succeeding year, and (*d*) such interim reports as may be necessary or desirable.

The Committee has a Technical Division concerned with technical questions affecting techniques of flight, an Economic Division for economic and political problems affecting air transportation, and an Industrial Division for problems relating to the aircraft manufacturing industry. It also has an Aviation Industry advisory panel composed of representatives of the Aircraft Industries Association, the Air Transport Association, the Institute of the Aeronautical Sciences, the National Aeronautic Association, the American Federation of Labor, and the Congress of Industrial Organizations; an ICAO (International Civil Aviation Organization) panel which plans and coordinates the work performed by the Committee's divisions and subcommittees; and a legal subcommittee which among other things coordinates agency views with respect to legislation.

National Advisory Committee for Aeronautics.—The National Advisory Committee for Aeronautics was established by the Congress on March 3, 1915, to

supervise and direct the scientific study of the problems of flight with a view to their practical solution, and to direct and conduct research and experiment in aeronautics in laboratories placed in whole or in part under its direction.

In general, the Committee coordinates the research needs of private, commercial, and military aviation; and conducts fundamental and applied research with a view to increasing the performance, economy, and safety of aircraft.

The Committee is composed of 15 members serving without compensation appointed by the President: two representatives each of the Navy and the Air Force Departments and the Civil Aeronautics Authority; one representative each of the Smithsonian Institution, the United States Weather Bureau, and the National Bureau of Standards; together with six additional persons who are "acquainted with the needs of aeronautical science, either civil or military, or skilled in aeronautical engineering or its allied sciences." To assist the main committee in the formulation of programs of scientific research and in the coordination of aeronautical research generally there are 6 major and 20 subordinate technical committees comprising members serving without compensation and drawn from the military, industrial, and scientific aeronautical organizations.

Within the NACA are two subsidiary organizations: the Office of Aeronautical Intelligence, which serves as a depository and distributing agency for scientific and technical data on aeronautics; and the Office of Aeronautical Inventions which gives preliminary consideration to, and analyses and prepares reports on, the merits of aeronautical inventions and designs submitted to the Government through any agency.

The Committee operates the Langley Memorial Aeronautical Laboratory at Langley Field, Va., the Ames Aeronautical Laboratory at Moffett Field, Calif., and the Aircraft Engine Research Laboratory at Cleveland, Ohio, which are the principal aeronautical research laboratories of the Government.

National Security.—The National Security Act of 1947 provides for coordination for national security through the establishment of the National Security Council (with the Central Intelligence Agency under it) and the National Security Resources Board; and establishes the National Military Establishment, headed by the Secretary of Defense.

The function of the National Security Council is to advise the President with respect to the integration of domestic, foreign, and military policies relating to the national security so as to enable the military services and the other departments and agencies of the Government to cooperate more effectively in matters involving the national security. Membership includes the President, who presides over meetings of the Council or designates a member to preside in his place; the Secretary of State; the Secretary of Defense; the Secretaries of the Army, the Navy, and the Air Force; the Chairman of the National

Security Resources Board; and any of the following whom the President may designate from time to time: the Secretaries of the executive departments, the Chairman of the Munitions Board; and the Chairman of the Research and Development Board.

The function of the National Security Resources Board is to advise the President concerning the coordination of military, industrial, and civilian mobilization. Membership includes the Chairman, appointed from civil life by the President with the advice and consent of the Senate, and such heads or representatives of the various executive departments and independent agencies as the President may designate from time to time. On November 13 last the President appointed the Secretaries of the Treasury, Defense, Interior, Agriculture, Commerce, and Labor as members of the Board.

The National Military Establishment consists of the Department of the Army, the Department of the Navy, and the Department of the Air Force; the War Council, the Joint Chiefs of Staff (including the Joint Staff), the Munitions Board, and the Research and Development Board.

HISTORY OF FEDERAL GOVERNMENTAL ORGANIZATION FOR CIVIL AVIATION

AIR COMMERCE ACT OF 1926

Promotion of Air Commerce.—The act made it the duty of the Secretary of Commerce to foster air commerce by encouraging the establishment of airports, civil airways, and other air navigation facilities; by making recommendations to the Secretary of Agriculture as to necessary meteorological service; by studying the possibilities for the development of air commerce and the aeronautical industry and trade in the United States and by collecting and disseminating aviation information; by cooperating with other executive agencies of the Government in research and development for the improvement of air navigation facilities; by investigating and publishing the causes of accidents in civil air navigation in the United States, etc.

Regulatory Powers.—The Secretary was authorized to provide for the registration of civil aircraft; for the certification of civil aircraft as to their airworthiness; for the rating of airmen and air navigation facilities; for the issuance, suspension, and revocation of registration, aircraft, and airman certificates; and for the establishment of air traffic rules for the navigation, protection, and identification of aircraft.

Aids to Air Navigation.—All airways, together with all emergency landing fields and other air navigation facilities except airports and terminal landing fields, used in connection with the air-mail service were transferred from the jurisdiction of the Postmaster General to that of the Secretary of Commerce.

The Secretary was authorized to designate and establish civil airways; to establish, operate, and maintain along such airways all necessary air navigation fa-

cilities except airports; to chart and arrange for the publication of maps of such airways.

The Chief of the Weather Bureau, under the direction of the Secretary of Agriculture, was directed to furnish weather reports, forecasts, warnings, and advices required to promote the safety and efficiency of air navigation in the United States and above the high seas.

Assistant Secretary of Commerce.—Provision was made for an additional Assistant Secretary of Commerce, to be appointed by the President with the advice and consent of the Senate, to assist the Secretary in performing his duties under the act. (The Aeronautics Branch of the Department of Commerce was created to administer the act; name changed to Bureau of Air Commerce by administrative order of the Secretary of Commerce, July 1, 1934.)

Air Mail Act of 1934.—The act authorized the Postmaster General to award air-mail contracts and to determine the routes for the transportation of air mail. Holders of air-mail contracts were required to keep their books, records, and accounts in the manner prescribed by the Postmaster General; and were restricted as to maximum remuneration, aviation stockholdings, directorships, etc.

The Interstate Commerce Commission was required, after notice and hearing, to fix fair and reasonable rates of compensation for the carriage of air mail over each route, not to exceed the maximum established by the legislation. (The Bureau of Air Mail was created in the Interstate Commerce Commission to carry out the provisions of the act.)

The Secretary of Commerce, administering the Air Commerce Act of 1926, was ordered to certify to the Postmaster General the nature of the equipment to be required with respect to speed, load, and safety. The Secretary prescribed maximum flying hours for pilots and operational techniques for mail carriers.

The Air Mail Act of 1934 also called for the President to appoint a five-man Federal Aviation Commission to study the country's air transportation system, and to report to Congress "its recommendations of a broad policy covering all phases of aviation and the relation of the United States thereto."

Civil Aeronautics Act of 1938.—The act created an independent agency for civil aviation—the Civil Aeronautics Authority—composed of the Civil Aeronautics Authority of five members which exercised broad adjudicative and rule-making functions classified as economic and safety regulation; the Administrator who was responsible for the designation of airways and the construction, operation, and maintenance of air-navigation facilities; the Air Safety Board of three members which investigated aircraft accidents. All such appointments were made by the President with the advice and consent of the Senate.

The personnel and property of the Bureau of Air Commerce of the Department of Commerce and of the Bureau of Air Mail of the Interstate Commerce Commission were transferred to the Civil Aeronautics Authority.

The Secretary of State was directed to advise the Authority concerning the negotiation of air agreements with foreign governments.

The Chief of the Weather Bureau, under the direction of the Secretary of Agriculture, was directed to furnish the required meteorological services.

Reorganization Plan III of 1940.—The intent of plan III was to clarify the relations of the Administrator and the five-member Board of the Civil Aeronautics Authority. The administrator, renamed the Administrator of Civil Aeronautics, was made the chief administrative officer of the Authority with respect to all functions other than those relating to economic regulation and certain other activities primarily of a rule-making and adjudicative character entrusted to the Board.

To this end certain functions were transferred to the Administrator of Civil Aeronautics, including the functions vested in the Authority by the Civilian Pilot Training Act of 1939; the functions of aircraft registration and of safety regulation (except the prescription of safety standards, rules, and regulations) and the function of suspending and revoking certificates after hearing, etc.

Reorganization Plan IV of 1940.—By this plan the Civil Aeronautics Authority was brought within the framework of the Department of Commerce. The Weather Bureau was transferred from the Department of Agriculture to the Department of Commerce to permit better coordination of government activities relating to aviation and to commerce generally.

The Air Safety Board was abolished and its functions transferred to the five-member Civil Aeronautics Authority, renamed the Civil Aeronautics Board.

The plan further provided that the Administrator of Civil Aeronautics and the Civil Aeronautics Board would constitute the Civil Aeronautics Authority within the Department of Commerce; the Administrator exercising his functions under the direction and supervision of the Secretary of Commerce; the Board reporting to Congress and the President through the Secretary of Commerce and performing its budgeting, accounting, personnel, procurement, and related routine management functions under the direction and supervision of the Secretary but exercising its functions of rule-making (including the prescription of rules, regulations, and standards), adjudication, and investigation independently of the Secretary.

Appendix II

History and Organization—President's Air Policy Commission

Immediately following the appointment of the Commission by the President's letter of July 18, 1947, the Chairman and the Vice Chairman met in Washington to discuss plans, programs, and policies. Much of the procedural groundwork was laid before the first formal meeting of the entire group on July 29. On that day, the five commissioners were sworn in, and the nucleus of the staff was assembled. The Executive Director was appointed on July 30, and was sworn in on August 11.

By mid-August, the recruitment and organization of the working staff was virtually complete. Before the end of the month, an outline for the final report and the procedures for the conduct of the entire program had been agreed upon and were in effect.

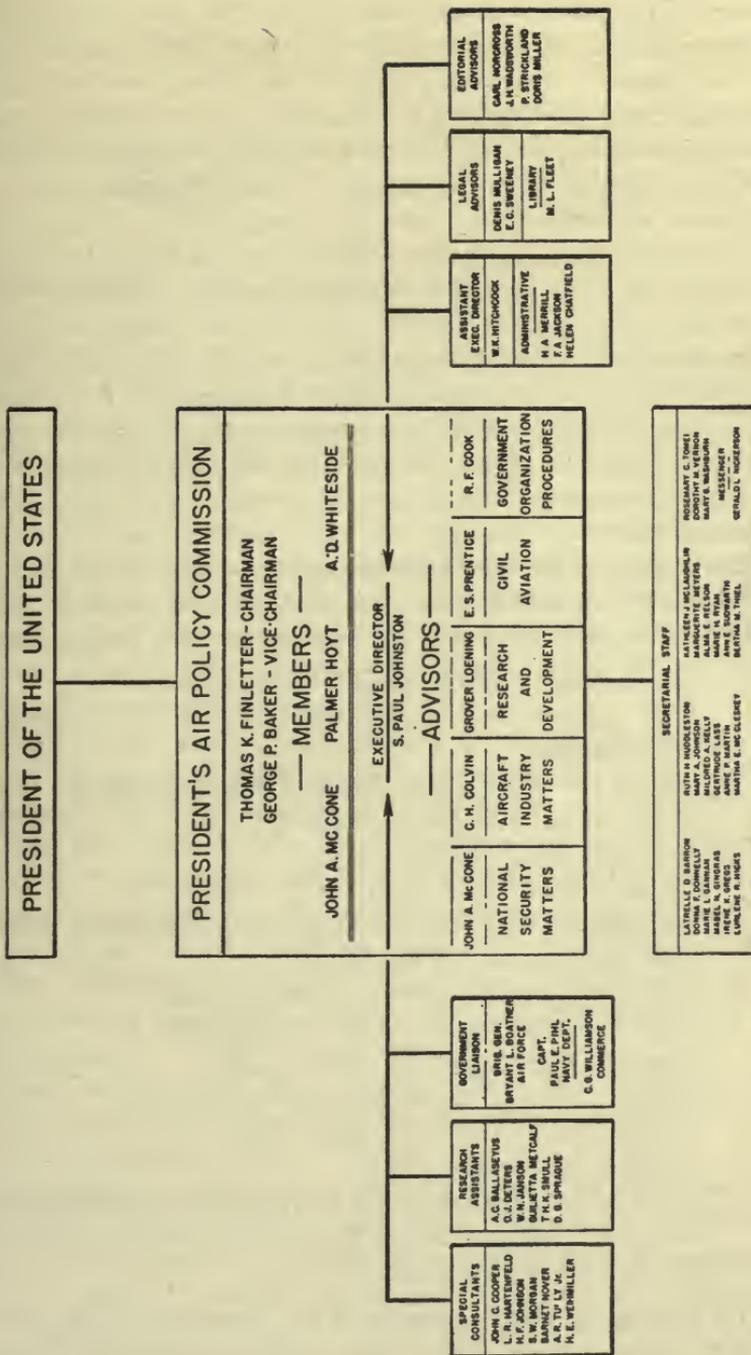
An accompanying chart shows the organization of the Commission and its staff. Some changes in staff personnel and functions took place in the course of the work but they were of a minor character. The chart shows accurately the duties and responsibilities of the members of the organization during its active life.

One major change occurred in Commission membership. For reasons stated in his letter to President Truman of September 16, Mr. Henry Ford tendered his resignation. It was accepted by the President on September 27, and on the same day, Mr. John A. McCone, the Commission's advisor on national security matters, was appointed to replace Mr. Ford. Subsequent to his appointment Mr. McCone continued to carry the specific responsibility for the national security phase of the study.

The Commission opened its formal hearings on September 8 and closed them on December 3, 1947. Both public and executive sessions were held, interspersed by many less formal conferences and meetings with civilian and governmental representatives and agencies. The National Military Establishment, the Department of State, the Department of Commerce, the Civil Aeronautics Board, and the Bureau of the Budget were particularly cooperative in arranging presentations of their problems at the Commission's convenience. The total number of formal Commission meetings was 206, distributed as follows:

Open hearings.....	96
Executive sessions.....	65
Luncheon meetings.....	33
Dinner meetings.....	5
Miscellaneous.....	7

ORGANIZATION - PRESIDENT'S AIR POLICY COMMISSION



Witnesses before the Commission were requested to file statements in advance. The formal hearings consisted mainly of questioning by the Commission to elaborate upon or to clarify the information submitted by the witness in his statement. Full stenographic records were kept of all public hearings. Abstracts were made of both the statements and the testimony as taken. For convenience, these abstracts have been compiled both alphabetically by witnesses and also classified by subject matter. These documents form a part of the records of the Commission.

An accompanying list shows all those who gave formal testimony before the Commission, either in public or executive session. Many others, not listed, gave the benefit of their views on many subjects, either orally or in writing. The Commission takes this opportunity to make acknowledgement of the invaluable assistance rendered by all those who appeared, or who contributed of their time and experience during the course of the investigation.

It was impossible, within the time available, for the Commission to visit all centers of aeronautical activity in the United States. It did, however, make several field trips.

On August 26, the NACA laboratories at Langley Field were inspected.

During the week of October 5-12 the Commission visited aircraft establishments in the midwestern and Pacific regions of the United States including:

Air Matériel Command, Wright Field, Dayton.

Civil Aeronautics Administration Technical Development Center, Indianapolis.

Allison Division, General Motors Corp., Indianapolis.

Beech Aircraft Corporation, Wichita.

Boeing Airplane Co., Wichita.

Cessna Aircraft Co., Wichita.

Consolidated-Vultee Aircraft Corporation, Fort Worth, San Diego.

Ryan Aeronautical Co., San Diego.

Lockheed Aircraft Corporation, Glendale, Calif.

Douglas Aircraft Co., Inc., Santa Monica, Calif.

Northrop Aircraft, Inc., Hawthorne, Calif.

North American Aviation, Inc., Inglewood, Calif.

Hughes Aircraft Co., Culver City, Calif.

Muroc Army Air Base, Calif.

National Advisory Committee for Aeronautics, Moffat Field, Calif.

Naval Air Transport Service Headquarters, Moffat Field, Calif.

Boeing Airplane Co., Seattle.

On October 21, at the invitation of the Department of the Navy, members of the Commission and staff, together with members of the Congressional Air

Policy Board, went aboard the aircraft carrier *Midway* for a day's demonstration of aerial tactics at sea.

On November 6, members of the Commission visited the following eastern aircraft plants:

Grumman Aircraft Co., Bethpage, N. Y.; Republic Aviation Corp., Farmingdale, N. Y.; United Aircraft Corp., East Hartford, Conn. On December 10 the groups inspected the Glenn L. Martin Co.'s plant at Baltimore.

For the western tour, and the trip of November 6, the President made his personal airplane, the *Independence* available to the Commission, a fact which added greatly to the speed and comfort of both trips, and which was much appreciated by all those aboard.

Many Government departments contributed in many ways to the Commission's work. The temporary release of needed personnel for transfer to the staff was of great assistance. A willingness everywhere to consult with Commission staff at any time on any subject was also very helpful.

Special mention should be made of the untiring work of the military liaison officers, Brig. Gen. Bryant L. Boatner, United States Air Force, and Capt. Paul E. Pihl, United States Navy. As the designated channels through which all military material flowed to the Commission, these officers were called upon to handle extraordinary loads under conditions that were often far from ideal. Their work did much to pave the way for the Commission in its research in matters pertaining to the armed services.

The responsibility for housing and servicing the Commission during its entire existence has been in the hands of the Department of Commerce. Special acknowledgment is due to its administrative officers for the high degree of cooperation that has been accorded to the Commission and its staff. The personnel, fiscal, and housekeeping problems that inevitably arise in conjunction with a temporary organization working under high pressure require extraordinary tact and patience in the handling. The efficiency and dispatch with which all our problems were handled by our hosts in the Department of Commerce contributed in no small degree to the successful operation of the Air Policy Commission.

The Commission expresses its especial appreciation to S. Paul Johnston, the Executive Director, for his efficient organization and direction of the staff and his invaluable and informed advice.

Final acknowledgment is due to the loyal and untiring work of the members of the Commission staff. From beginning to end, they have worked long hours under extreme pressure to provide the necessary background material, to prepare for hearings, to analyze testimony, and to assemble the facts and figures on which this report is based. Without their help, it would have been impossible for the Commission to carry out the President's directive within the time limit that was set.

List of Witnesses Heard by the President's Air Policy Commission in Formal Public and Executive Sessions

- Aiken, Paul—Second Assistant Postmaster General.
- Aitchison, Clyde—Chairman, Interstate Commerce Commission.
- Akerman, John D.—Professor of Engineering, University of Minnesota.
- Alison, John R.—Assistant Secretary of Commerce for Aeronautics.
- Allen, C. B.—Washington correspondent, New York Herald Tribune (formerly member, Air Safety Board).
- Allen, William M.—President, Boeing Aircraft Co.
- Anderson, William L.—National Association of State Aviation Officials.
- Appleby, Paul—Dean, Maxwell School, Syracuse University.
- Baldwin, Hanson—The New York Times.
- Balfour, Maxwell W.—Aeronautical Training Society.
- Bassett, Preston R.—President, Sperry Gyroscope Co., Inc.
- Batchelor, James W.—Aviation Attorney, United Pilots and Mechanics Association.
- Behncke, David—President, Airline Pilots Association.
- Bell, Lawrence D.—President, Bell Aircraft Corp.
- Berle, Adolph—Columbia University (formerly Assistant Secretary of State).
- Berliner, Henry A.—Chairman of the Board, Engineering and Research Corporation of America.
- Bertrandias, Victor C.—Vice President, Douglas Aircraft.
- Betts, Alan—Consultant, Aircraft Industries Association.
- Branch, Harlee—Member, Civil Aeronautics Board.
- Braniff, T. E.—President, Braniff Airways.
- Brent, J. L.—President, Pacific Overseas Airlines.
- Brophy, Gerald—Aviation Attorney, Chadbourne, Wallace, Parke & White-side.
- Brown, John Nicholas—Assistant Secretary of the Navy for Air.
- Brownell, George A.—Davis, Polk, Wardwell, Sunderland and Krenal.
- Brownlow, Louis—Public Administration Clearing House.
- Buckley, Charles B.—Manager, Aircraft Division of Weber Showcase & Fixture Co.
- Buckley, James—Director of Airport Development, New York Port Authority.
- Burden, William A. M.—Former Assistant Secretary of Commerce for Aeronautics.

Burgess, Robert S.—Deputy Second Assistant Postmaster General, Air Postal Transport, Post Office Department.

Bush, Dr. Vannevar—Chairman, Research and Development Board.

Callery, Francis—Victor Emanuel & Co.

Clevering, Richard B.—Allison Division, General Motors Corp.

Cohu, LaMotte—President, Transcontinental & Western Airlines, Inc.

Compton, Dr. Karl T.—President, Massachusetts Institute of Technology.

Coy, Wayne—Vice President, Radio Station WINX and WINX-FM.

Damon, Ralph—President, American Airlines, Inc.

Darr, Harold S.—President, Monarch Airlines.

Davison, General F. Trubee—Former Assistant Secretary of War for Air; Director, Museum of National History.

de Florez, Dr. Luis—Independent Consultant, Doubleday Publishing Co.

de Seversky, Major Alexander—Aviation Author.

Dean, Allen—President, Air Freight Forwarder Association (since dissolved).

Dinu, Madeline C.—National Association of State Aviation Officials.

Douglas, Donald—President, Douglas Aircraft Corp.

Dryden, Hugh L.—Director of Research, National Advisory Committee for Aeronautics.

Dyer, J.—President, Florida Airways.

Echols, Maj. Gen. Oliver P.—President, Aircraft Industries Association of America.

Eisenhower, General Dwight D.—Chief of Staff, U. S. Army.

Emmerich, Herbert—Director, Public Administration Clearing House.

Ferguson, Malcolm P.—President, Bendix Aviation.

Flavin, Thomas A.—Judicial Officer, Department of Agriculture.

Fletcher, R. V.—Special Counsel, Association of American Railroads.

Ford, Tirey L.—Chairman, Sea-Air Committee.

Forrestal, James—Secretary of National Defense.

Foster, William C.—Under Secretary of Commerce.

Garside, Joseph—President, E. W. Wiggins Airways, Inc.; Chairman, Council of Local Airlines.

Gates, Artemus—Formerly Assistant Secretary of the Navy for Air.

Gillen, John J.—Deputy Assistant Postmaster General, International Postal Transport, Post Office Department.

Glacy, G. F.—Comptroller, Boston & Maine Railroad.

Glass, Fred M.—President, Air Cargo, Inc.

Gross, Robert E.—President, Lockheed Aircraft Corp.

Gurley, F. G.—President, The Atchison, Topeka & Santa Fe Railway Co.

Hardin, Col. Thomas O.—Air Transport Command (formerly Chairman, Air Safety Board).

- Harriman, W. Averell—Secretary of Commerce.
- Hartranft, J. B.—President, Aircraft Owners and Pilots Association.
- Hazen, R. M.—Director of Engineering, Allison Division of General Motors.
- Hensel, H. Struve—Counsel, The Air Freight Association (formerly Assistant Secretary of the Navy for Air).
- Hicks, Gwin—Vice President, Empire Airlines.
- Hinckley, Robert H.—American Broadcasting Co.
- Hoffman, Clifford—National Flying Farmers Association.
- Horner, H. M.—President, United Aircraft Corp.
- Howard, Beverly—President, Hawthorne Flying Service; President, National Aviation Trades Association.
- Hunsaker, Jerome C.—Chairman, National Advisory Committee for Aeronautics.
- Hunt, Ralph V.—Vice President, Douglas Aircraft Co.
- James, R. B.—Attorney, Chicago, Burlington & Quincy Railroad.
- Kennan, George F.—Director, Policy Planning Staff, Department of State.
- Kindelberger, J. H.—President, North American Aviation.
- Klak, John J.—General Counsel, Independent Air Carriers Conference.
- Kline, Robert E.—Counsel, Sea-Air Committee.
- Kuter, Maj. Gen. Laurence S.—United States Representative, International Civil Aviation Organization.
- Laddon, I. M.—Executive Vice President, Consolidated-Vultee Aircraft.
- Land, Vice Adm. Emory S., U. S. N. (Ret.)—President, Air Transport Association of America.
- Landis, James M.—Chairman, Civil Aeronautics Board.
- Law, Hervey—General Superintendent of Airports, New York Port Authority.
- Lee, Josh—Member, Civil Aeronautics Board.
- Lewis, William C.—Director, Air Reserve Association of the United States.
- Litchfield, Paul W.—Chairman of the Board, Goodyear Tire & Rubber Co.
- Lombard, Dr. Albert E.—Consolidated-Vultee Aircraft.
- Lovett, Robert—Under Secretary of State.
- McDonald, David J.—Secretary-Treasurer, United Steel Workers of America.
- Mahoney, E. J.—Director, International Postal Transport, Post Office Department.
- Marshall, George C.—Secretary of State.
- Martin, Glenn L.—President, Glenn L. Martin Co.
- Martin, Roy—Under Second Assistant Postmaster General.
- Merriam, Lewis—Vice President, The Brookings Institution.
- Merritt, K. N.—Vice President, Railway Express Agency.
- Mooney, James—President, Willys-Overland Motors, Inc.
- Moseley, C. C.—Cal Aero Technical Institute.

- Munro, C. Bedell—Former President, Capital Airlines, Inc.
 Munter, Herbert—Vice President, West Coast Airlines.
 Murray, Roger—Vice President, Bankers Trust Co.
 Nelson, Donald—President, Society of Motion Picture Producers of America (formerly Chairman, War Production Board).
 Nimitz, Fleet Admiral Chester W., U. S. N.
 Northrop, John K.—President, Northrop Aircraft, Inc.
 Norton, Garrison—Assistant Secretary of State; Chairman, Air Coordinating Committee.
 Patterson, Robert—Patterson, Belknap and Webb (formerly Secretary of War).
 Patterson, W. A.—President, United Air Lines.
 Peale, Mundy I.—President, Republic Aircraft Corp.
 Phillips, Mallory—Director, Domestic Air Postal Transport, Post Office Department.
 Piasecki, Frank N.—President, Piasecki Helicopter Co.
 Pogue, L. Welch—Chairman of the Board, National Aeronautics Association.
 Pois, Joseph—Assistant to the President, Signode Steel Strapping Co.
 Putnam, Carleton—President, Chicago and Southern Airlines.
 Ray, James C.—Vice President, Southwest Airways.
 Raymond, A. E.—Vice President-Engineering, Douglas Aircraft Corp.
 Rentzel, D. W.—President, Aeronautical Radio, Inc.
 Richardson, Rear Admiral, L. B., U. S. N. (Ret.)—Vice President, Curtiss-Wright Corp., Airplane Division.
 Rickenbacker, E. V.—President, Eastern Airlines, Inc.
 Robinson, R. G.—Assistant Director of Research, National Advisory Committee for Aeronautics.
 Roig, Harold J.—President, Pan American Grace Airways.
 Rosendahl, Rear Admiral C. E., U. S. N., (Ret.).
 Rosenheim, Howard H.—International Register Co.
 Royall, Kenneth—Secretary of the Army.
 Schildhauer, C. H.—Captain, U. S. N. (Ret.); U. S. Flying Boats, Inc.
 Schroeder, Lester—National Association of State Aviation Officials.
 Sikorsky, Igor I.—Director of Engineering, Sikorsky Division of United Aircraft.
 Slater, John—Chairman of the Board, American Overseas Airlines, Inc.
 Slick, Earl F.—President, The Air Freight Association.
 Smith, C. R.—Chairman of the Board and Chief Executive Officer, American Airlines, Inc.
 Smith, William W.—Chairman, Maritime Commission.
 Snyder, George W., Jr.—President, Challenger Airlines.
 Solomon, S. J.—President, Atlantic Airlines.

Spaatz, General Carl—Chief of Staff, U. S. Army Air Force.
Stunkel, Regan C.—President, Aviation Maintenance Corp.
Sullivan, John Dwight—Secretary, National Air Council.
Sullivan, John L.—Secretary of the Navy.
Swirbul, Leon A.—President, Grumman Aircraft Corp.
Symington, W. Stuart—Secretary of the Air Force.
Tibbets, Kenneth W.—President, National Credit Corp.
Trippe, Juan T.—President, Pan American Airways System.
Van Zandt, Parker—Aviation Consultant.
Victory, John F.—Executive Secretary, National Advisory Committee for
Aeronautics.
Wallace, Dwane L.—President, Cessna Aircraft Company.
Ward, J. Carlton, Jr.—President, Fairchild Engine & Airplane Corp.
Webb, James E.—Director, The Bureau of the Budget.
Webb, R. A.—General Agent, Illinois Central Railroad.
Webster, Edward M.—Commissioner, Federal Communications Commission.
Wetmore, Alexander M.—Chairman, National Air Museum.
Willis, Charles F., Jr.—President, Willis Air Service.
Wright, Burdette—Vice President, Curtiss-Wright Corp.
Wright, T. P.—Administrator, Civil Aeronautics Administration.

