AIRCRAFT YEAR BOOK, 1927
"WINGS"
AIRCRAFT YEAR BOOK

1927

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INTRODUCTION

THE year 1926 has brought distinct and solid progress to aviation in this country and throughout the World.

Everyone who has followed the history of our aviation through previous editions of the Aircraft Year Book, realizes the amount of courage and determination that has been required to sustain the efforts of all those seriously interested and concerned in its progressive development.

To go back a few years. At the end of 1922 it was generally recognized that aviation had become the pivot of the military policy of many important countries of the world, and of great potentiality in their economic welfare. With the gradual retirement of former military and naval leaders, there was a relaxation of resistance toward a more complete recognition of aviation as the key to success in future wars. At the same time progressive business men, particularly those interested in transportation, began to regard aircraft as useful vehicles, offering distinct and constructive services in peace through the improvement of social and economic conditions.

These facts sustained our faith and challenged our courage. While not immediately able to transmute these favorable conditions into manufacturing orders for proper equipment of the Services, nor to put aircraft to work, recognition of the facts did justify the continuation of efforts on the part of the Industry and it carried on.

As a result, at the close of 1923 the United States found itself possessed of practically all of the world’s sporting records for aircraft performance contests. These records were made possible by the engineers and designers of the American aircraft industry-inspired and assisted by the Air Services. In the development of the science and art, we stood supreme, but as an industry we were very much attenuated. We presented the interesting paradox of leading and at the same time following the world in aviation. We led in engineering and design, while we followed in production volume, and in the application of aircraft to aerial transportation.

A year later, at the close of 1924, it was generally apparent that those in aviation had a feeling of greater achievement and less disappointment than at any previous time since the close of the War. This was due primarily to signs of a distinct general awakening to a real sense of responsibility on the part of Congress toward our legislative need, and to a more widely diffused understanding of
publicists, editors and business men. of the actual and practical
utility of aircraft in transportation.

Previous to this time, aviation publicity had generally empha-
sized aircraft in War or in spectacular stunting, with the natural
sequence of accidents. The changes above noted were brought about
very largely through events culminating in the successful termina-
tion of the “Around the World” and “Dawn to Dusk” flights of
that year.

The year 1925 again recorded hopes deferred in legislative
action, but a further and more general recognition of the utility of
aerial transportation. The delay in legislative action was inevitable,
but the very causes of delay inspired confidence, for at last Congress
and the Administration were vying with each other in business-
lake aircraft investigations. Following the report of the Special
Committee of the House, known as the Lampert Committee, and
the President’s Aircraft Board, known as the Morrow Committee,
all the essential facts were collected, and for the first time Congress
was placed in a position for prompt constructive action based upon
true knowledge and understanding of all the facts, and without the
handicap of mischievous or malicious untruth, with which the past
had been encumbered. At the same time a number of important
air transport companies, under the control and direction of business
men of recognized ability and responsibility, were organized. Con-
gress, (the 69th), convened in December, 1925, and at the beginning
of 1926 the stage was set for important developments.

President Coolidge signed the Air Commerce Act of 1926, on
May 20th, bringing commercial air operations within the law. Thus,
the foundation for a new and vital business was established with
authority from Congress for its direction and guidance through a
new Assistant Secretary of Commerce for Aviation.

This was promptly followed by two other Acts, establishing the
Air Corps of the Army and the Bureau of Aeronautics of the Navy
upon progressive continuing five year programs. These also created
new Assistant Secretaries for Aviation in the War and Navy
Departments.

Simultaneously, legislation permitting the Post Office Depart-
ment greater latitude in contracting for the carrying of mail by air
was enacted, followed by the wise decision of the Postmaster Gen-
eral to turn over all of the Government-operated air lines to private
contractors at the earliest date practicable.

Thus, American aviation received from Congress and this
Administration during 1926 more actual substance in the way of
legislative and administrative action than ever before. It now awaits
the further and final action of suitable appropriations to carry out the prescribed programs and the adherence on the part of everyone to the principle of sustaining and strengthening the aircraft industry as the essential element in our aeronautical development, both military and civil.

At the end of 1926, the Aeronautical Chamber of Commerce submitted a report to President Coolidge, summarizing conditions within the industry. This report, reflecting the conservative opinions of more than a hundred responsible leaders in the aircraft industry, from all sections of the country, was regarded and accepted as a most accurate picture of the status of American aviation at the close of 1926.

A reprint of the above report in its entirety will be found in the Appendix. Those who read it will note a reference of regret at the passing of practically all of the International Sporting Records formerly held by American machines operated by American pilots. With the winning by the Italian Government of the seaplane race for the Jacques Schneider Trophy at Norfolk, at the end of 1926, the last of the important records formerly held by us was lost.

As a result, three years after the paradox noted at the end of 1923, the situation has been reversed. We now have lost the records, but we have the foundations, at least, of real aviation in all of its phases. The Air Services, under continuing progressive programs, are now about to be properly equipped. The manufacturers of aeronautical equipment have an opportunity if the authority under the statutes is properly administered, to secure a satisfactory volume of business. Operators of aircraft are increasing in number, and with the expansion of the contract air mail, aerial transportation companies operating upon a large scale are increasing in number and size.

As noted elsewhere in this volume the steady increase of civilian aviation operations shows truly impressive growth, and indicates a decidedly favorable outlook. While forecasts would seem scarcely to be possible, and in any event, would probably be unwise, it is safe to hope that the status of aviation in this country is now fairly stable, and that its condition will gradually improve. With the elimination of many of the handicaps that have been so conspicuous in the past, it seems fitting at this time, in viewing the situation in retrospect and in prospect, to express sincere satisfaction with conditions as they now exist.

The editors of the Aircraft Year Book are indebted to the officers and personnel of the Air Corps of the Army, the Navy Bureau of Aeronautics, the Air Mail Division of the Post Office, and the
Aeronautics Branch and Bureau of Foreign and Domestic Commerce of the Department of Commerce and the Department of Agriculture; also to the National Advisory Committee for Aeronautics, for their cooperation in making the Aircraft Year Book 1927 the most comprehensive and authoritative that has been issued. In preparing the review of activities in foreign countries, invaluable help was provided by the American Air, Military, Naval and Commercial Attachés abroad, as well as by the Foreign Air Attachés accredited to the United States at Washington. Grateful acknowledgment is expressed to Mr. R. C. Wood for foreign data.

AERONAUTICAL CHAMBER OF COMMERCE OF AMERICA, INC.
New York City, January 31st, 1927.
CHAPTER I

AIR COMMERCE AUTHORIZED BY CONGRESS AND RECOGNIZED AS KEY TO NATIONAL DEFENSE

THE progress in Aviation during 1926 in the United States was characterized by notable evidences of permanent growth. There was no spectacular increase in its physical and material aspects; the number of aircraft manufactured was not greatly increased; and the development in the field of air transportation, while considerable, was but a normal expansion, in line with projects that had been developing over a period of several years. So it may be said that the industrial growth of aviation, and its expansion in transportation, was substantial and permanent. Over-expansion in either of these fields might give occasion for a word of caution. Fortunately, none appears to be needed.

Looking at the year's progress from another angle, however—that of the imponderable thing called political recognition through legal enactment—we find the expansion has been phenomenal. The year 1926 will go down in history as the year when aviation became permanently established in the United States, upon a sound program of constructive legislation, giving civil aviation a legal status, and the Air Services of the Army and Navy legal authority for greatly improved conditions upon a basis of permanent progressive growth.

As this chapter is being written (January, 1927), there appears in the current issue of the "Atlantic Monthly" a comprehensive review by Henry W. Bunn, of the outstanding events of the world during the past year. The first paragraph of this review is as follows:

"The appointment of the Morrow Air Board was the most statesmanlike act of the present Administration. That board submitted its report in December, 1925. Its recommendations, based on exhaustive investigation by disinterested experts of first ability, furnished out a fairly complete guide for Congress in legislating for the needs of Army, Navy and commercial aviation. I make no doubt that the future historian will find that its aviation legislation (following, in a general way, recommendations of the Board) was the most important achievement of the late Session. Commercial aviation has not yet found its stride, but it will ere long; suddenly, amazingly. Aviation will soon be in the very forefront of the nation's activities."

This statement, of an experienced, trained student of world affairs, indicates briefly the great progress, in a political sense, that has been made during the past year.
The legislative program of the year included the enactment of the following:

1. The Air Commerce Act of 1926 (Public No. 254, 69th Congress), approved May 20th, 1926.
2. The Navy Five-year Aircraft Program Act (Public No. 422, 69th Congress), approved June 24th, 1926.
3. The Army Five-year Aircraft Program Act (Public No. 446, 69th Congress), approved July 2nd, 1926.

The above, with the previous contract air mail legislation (The Kelly Act, Public No. 359, 68th Congress, approved February 2, 1925), as amended June 3rd, 1926, authorizing the Postmaster General to contract for the transportation of the air mail, upon a basis permitting successful commercial operation, coupled with the announcement of the wise policy of the Administration of turning over, under contract, to private operators, all of the Government's air mail lines, including the Trans-Continental, establishes a basis of genuine hope for real continued progress.

The passage of these legislative measures was the direct result of the investigations of the aircraft situation, which marked the latter part of 1925.

As reported in the Aircraft Year Book for 1926, at least twenty aircraft investigations had been opened since the beginning of the war, and Congress, in March, 1924, by the creation of the Select Committee of Inquiry into the Operations of the United States Air Services, authorized yet another, with instructions to report on the organization and operation of the Air Services, and the needs of the National Defense in the air. The Lampert-Perkins Committee, by which name this body became known, filed its report at the opening session of the 69th Congress.

Shortly thereafter, the President's Aircraft Board, known variously as the Morrow Committee or Morrow Board, in honor of its chairman, Hon. Dwight W. Morrow, which had been appointed by the President in September, 1925, filed its report. The scope of this committee was considerably wider than was that of the Lampert-Perkins Committee. The Morrow Committee had instructions from the President to report to him on the best means of developing and applying aircraft to National Defense, covering all phases of the aircraft problem.

While these two reports differed in some respects, they were in agreement on all essential points. Therefore, Congress for the first time had an opportunity to consider a constructive legislative pro-
gram based upon reports reflecting the sincere opinions of competent
men. Freed from the destructive and false notions that had per-
sistently beclouded and characterized other investigations, these
reports permitted Congress to consider this subject on its merits.
In line with the recommendations contained in the reports, the
legislative program naturally divided itself in accordance with the
needs of civil, military and naval use of aircraft. Bills were promptly
introduced; hearings were held and the entire subject was again
reviewed in its various phases by the several committees on Com-
merce, Military and Naval Affairs, until, as above noted, the complete
program was finally enacted.

The Air Commerce Act of 1926

The Air Commerce Act of 1926 became a law on May 20th. It
was the result of many years of agitation throughout the country
for Federal action in the encouragement and control of civil aeronau-
tics. Informal consideration of the subject had been initiated prior
to the war. In 1919 the aircraft industry inaugurated a serious
study of the matter, based upon careful research and practical
knowledge of the problems involved. The work of this committee
was followed up by the Committee On the Law of Aeronautics of the
American Bar Association and other bodies.
As outlined in previous editions of the Year Book, many bills
have been introduced in Congress in former sessions, designed to
give recognition and encouragement to civil aviation, in accordance
with the long-established governmental policy in connection with
encouragement of the Merchant Marine. The desired objective was
the stabilization of civil operation of aircraft upon a basis that would
invite capital into a new business, surrounded by the appropriate
and usual safeguards of insurance and legal authority.
While the delay in securing enactment of a competent Federal
Law was costly in many ways, it must be acknowledged that com-
plete freedom from all legal restraint on civil aviation in this country
undoubtedly contributed to the lead that we have assumed over all
other countries in the civil ownership and operation of aircraft.
While this represents an important item on the credit side, the fact
remains that a continuation of undirected and uncontrolled opera-
tions would ultimately have led to complete chaos. An idea of the
chaos which might have resulted, may be gained from the statement
that at the beginning of 1926, twenty-one individual states had
passed legislation of some sort concerning civil aviation. In no case
was this legislation of a constructive nature, nor did it provide any
Navy Curtiss 1926 Schneider Cup Racer (R3C-4) Curtiss V-1550 engine.
assurance of safety to the general public. In very few cases were these legislative measures in conformity with each other.

Therefore, if these laws had been observed, the situation would have been serious, and at the same time, comical. Fortunately, however, many of the state laws provided for their own nullification on the enactment of Federal legislation.

In its final form, the Air Commerce Act was due in a very large measure to the untiring energies of Senator Hiram Bingham (Conn.) and Congressman James S. Parker (N. Y.), Schuyler Merritt (Conn.), and Clarence F. Lea (Cal.). Senator Bingham and Congressman Parker had served on the President's Aircraft Board, and Congressman Merritt was chairman of the Aviation Sub-committee of the House Committee on Interstate and Foreign Commerce of which Congressman Parker is chairman. Congressman Lea, in addition to his notable service to aviation during and since the War as a member of the Military Affairs Committee, was a member of the Lampert-Perkins Committee and also of the Merritt Sub-committee. They assumed the leadership in Congress that the circumstances required, and were ably supported by other members, notably by all of the members of the Committees on Interstate and Foreign Commerce, Appropriations, and Military and Naval Affairs.

A Summary of the Act

It should be pointed out that the term "Air Commerce" as used in this Act, means transportation by aircraft of persons or property for hire, and the navigation of aircraft in the conduct and furtherance of a business.

The National Advisory Committee for Aeronautics summarizes the Act in its 12th Annual Report, as follows:

"This Act provides the legislative cornerstone for the development of commercial aviation in America. It establishes certain fundamental principles to govern the relation of the Federal Government to the whole problem of aiding the development of commercial aviation in America on a sound basis. The Act asserts the doctrine of Federal sovereignty in the air over the lands and waters of the United States to the exclusion of foreign nations. It asserts under the commerce clause of the Constitution the right of the Federal Government to regulate interstate air commerce. It authorizes the designation of airways by the Federal Government and compels adherence to a single set of Federal flying rules on the part of all who use such airways, regardless of whether they are engaged in interstate or intrastate air commerce or private flying. It authorizes Federal lighting systems along airways and the Federal establishment and maintenance of emergency landing fields. It authorizes the transfer of the postal airways, including emergency landing fields,
to the jurisdiction of the Department of Commerce and the transfer of the postal air ports or terminal facilities to the jurisdiction of the municipalities concerned under arrangements subject to approval by the President. It contemplates the establishment and maintenance of air ports by the municipalities or by private industries. It provides for the compulsory registration of aircraft engaged in interstate commerce and for the optional registration of other aircraft. It provides for the periodic examination and rating of airmen serving in connection with registered aircraft. It provides for the emergency use of existing governmental facilities, extends the application of existing laws to foreign air traffic, and, in short, imposes upon the administrative officer concerned—the Secretary of Commerce—the duty of fostering the development of air commerce in the United States."

By some strange oversight, the above summary failed to mention one of the most important, and in certain respects, the outstanding provision of the bill—authority for the appointment of an Assistant Secretary of Commerce for Aeronautics.

On August 11th, 1926, President Coolidge nominated William P. MacCracken, Jr., as Assistant Secretary of Commerce for Aeronautics. Mr. MacCracken, a prominent Chicago lawyer, had taken a very active interest in aviation for many years, as Chairman of the Committee on the Law of Aeronautics of the American Bar Association. Previously, he had served during the war as pilot and flying instructor in the Army Air Service. Prior to his nomination, however, the Department of Commerce, one of the most efficient organizations of the Government, under Secretary Hoover, started to organize itself under the personal direction of Assistant Secretary of Commerce, Hon. J. Walter Drake, to carry out the provisions of the Act.

Mr. MacCracken's selection for this most important position, met with instant and complete approval by everyone interested in aeronautics. Upon assuming his duties Mr. MacCracken promptly organized the Aeronautics Branch of the Department of Commerce to include three divisions; namely, the Air Regulations Division, Air-
ways Division and the Air Information Division. Congress, in the Deficiency Bill, had included in the appropriation for the fiscal year ending June 30th, 1927, $300,000 for aids to air navigation, and $250,000 for administration, research, and regulatory purposes of the Act.

In the Appendix, the Air Commerce Act is printed in full, together with a more detailed summary.

The Aeronautics Branch—Department of Commerce

In carrying out the twofold object of the Air Commerce Act of 1926 there was organized in the Department of Commerce, as above indicated, the "Aeronautics Branch." It was not the intention of Congress to create a new bureau for this purpose, and therefore, much of the administrative work was allocated to already existing bureaus. The work of establishing and maintaining "Aids to Navigation" was assigned to the Lighthouse Service, already operating in nineteen districts covering the entire country, and well equipped in organization and experience to assume charge of the establishment, maintenance, repair and operation of light beacons, lighted emergency landing fields, radio and other communication facilities, and all other air navigational aids. Accordingly, in the Lighthouse Service, there has been designated the "Airways Division," to supervise this work.

The mapping of airways has been assigned to the Coast and Geodetic Survey Division, which is already in possession of plant and equipment, readily adaptable to the production of airway maps and charts.

To consolidate its air research work, a special Aeronautics Division was created in the Bureau of Standards. This was natural and appropriate, as work of a similar character has been carried on by the bureau for a number of years for various departments of the Government and the industry.

Appropriations for the Commerce Act

Of the $300,000 appropriated last year for "Aids to Navigation," approximately $260,000 was spent in the installation of beacons and lighted emergency landing fields, along five of the existing contract air mail routes. Unfortunately this sum did not provide for the maintenance or upkeep of this night flying equipment throughout the fiscal year, but necessary funds have been requested in budget estimates for 1928, a portion of the amount to be immediately available.
Of the $250,000 appropriated last year for the administration, research and regulatory purposes of the Act, under the official heading “Aircraft in Commerce,” there will have been spent at the conclusion of the fiscal year, about $40,000 for general purpose of organization or administration; $25,000 for information service; $0,000 for mapping; $80,000 for research; $15,000 to the Bureau of Lighthouses; and $84,000 for beginning the work of inspecting and licensing aircraft and airmen.

Immediately upon organization of the Aeronautics Branch, estimates were prepared for inclusion in the Department of Commerce Budget for the next fiscal year. These were submitted to the Director of the Budget, and as finally approved, included $2,769,000 for “Aids to Air Navigation,” and $796,250 under the designation “Aircraft in Commerce.”

Of the $2,769,000 requested for “Aids to Air Navigation,” $450,000 was requested to be made immediately available, in order that the deficiencies of the 1927 appropriation might be made good. In addition, there was included in this total, approximately $400,000 for the upkeep of beacon lights and lighted emergency fields on the Trans-Continental Air Mail Route, the maintenance of which in all probability will be taken over by the Department of Commerce on July 1st, 1927. In addition, about $210,000 is to be used for lighting the remainder of the Trans-Continental Airway from Salt Lake to San Francisco, and about $1,140,000 for completing the airway equipment of contract air mail routes; the total also includes approximately $710,000 to cover the cost of maintaining “Aids to Navigation” along the airways. In addition, for the establishment and maintenance of radio beacon and direction finding equipment along all of the airways, the sum of $260,000 was requested.

Of the sum of $796,250 asked for in the 1928 appropriation for “Aircraft in Commerce,” it was requested that $168,000 be made immediately available for use during the fiscal year 1927. In addition a considerable sum will be used in the purchase of airplanes for official use in transportation, to expedite the work of the Air Regulation Division. Other expenditures proposed are $74,000 for general administration, $40,000 for information, $12,000 for mapping, $125,000 for research, $377,250 for inspecting aircraft, licensing pilots, and other work of the air regulations.

These estimates are now being considered by the Appropriations Committee of Congress, and it is assumed that by the time this book appears in print authorization for the expenditure of the money for carrying on this important work will have been made.
Boeing Navy Fighter with Pratt & Whitney "Wasp" 425 h.p. air-cooled radial engine.
Aircraft Year Book

Rules and Regulations

Shortly after the passage of the Air Commerce Act, the Department of Commerce began to give attention to the question of air regulations. This most important feature had been the subject of considerable controversy due to the fear expressed by many practical fliers and some of the operating companies and manufacturers of aeronautical equipment, that by over-regulation progressive development would be hampered instead of encouraged. Accordingly, a close study was made of the International Air Navigation Convention, which governs all civil flying in the countries of Europe and elsewhere. Consideration was given to the mistakes of other countries, and the whole problem of the favorable development of aviation in the United States was included in the scope of the survey made by Secretary MacCracken and his assistants prior to drafting the proposed rules and sending them to the industry.

A Special Committee of the Aeronautical Chamber of Commerce was promptly appointed to study the proposed rules, as soon as they were submitted. This Committee, numbering eight members, was composed principally of representatives of companies engaged in civil aircraft operations. The Committee promptly convened, and, following a series of meetings, submitted a written report to the Department of Commerce suggesting modifications and changes in the proposed Rules and Regulations, with a view of securing more satisfactory and equitable provisions from the point of view of private operators, and at the same time, strengthening and improving the rules from the point of view of the Government, through simplification in interpretation and in administration. A series of conferences were then held in Washington during the month of October, for the purpose of giving manufacturers, operators, pilots, engineers, and all others interested, an opportunity to assist in perfecting the Rules and Regulations, so that the greatest service to all might be obtained. The report of the Special Committee of the Aeronautical Chamber of Commerce was used as an index for the guidance of the conferences, and was most helpful in the progress and consummation of the work.

A second draft was then prepared and was also submitted for consideration, and the Special Committee of the Chamber met with a representative of the Aeronautics Branch to consider the revised rules which resulted in the acceptance of additional modifications.

The Rules and Regulations governing civil aviation in the United States were then published to become effective December 31st, 1926. Chapters 1, 3 and 4, dealing with the licensing of aircraft, the requirements and operation of aircraft, and the licensing of pilots...
and mechanics, apply only to interstate air commerce as defined by
the Act, and such aircraft operators as voluntarily apply for a license
under these provisions. Chapters 2, 5 and 6 apply to all civilian
flying, whether intra- or inter-state, and whether for commercial
or non-commercial purposes. The air traffic rules must be observed
by military pilots as well as by civilians.

Fortunately, the Rules and Regulations, while they have the
force of law, may be promptly changed within the discretion of the
Secretary of Commerce, should experience suggest a need for modi-
fication. Under the Aeronautics Branch, as led and directed by
Assistant Secretary MacCracken, American aviation will surely be
greatly benefited by a wise and constructive administration of law
and the rules.

The Five-Year Programs

The Aviation Five-Year Program Acts were passed by the 69th
Congress to strengthen our National Defense by increasing the Air
Services of the Army and Navy, providing them with adequate
equipment, and establishing greater resources and reservoirs of aero-
nautical reserves.

Naval Five-Year Aviation Program

The Navy Five-Year Aviation Program Act (H. R. 9696, Public
No. 422, printed in full in the Appendix), provides legislative
authority for an Assistant Secretary of the Navy for Aeronautics,
to aid the Secretary of the Navy in fostering Naval Aeronautics.

It provides authority for the procurement for a five-year period
starting June 30th, 1927, of not to exceed 1,614 airplanes to cost,
including spare parts and equipment, not to exceed $85,078,750.
The yearly increments together with the authorized appropriations
are:

<table>
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<th>Year</th>
<th>Increment</th>
<th>Total</th>
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<td>1927</td>
<td>235</td>
<td>$12,285,000</td>
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<tr>
<td>1928</td>
<td>313</td>
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<td>1929</td>
<td>335</td>
<td>17,582,500</td>
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<tr>
<td>1930</td>
<td>337</td>
<td>18,941,250</td>
</tr>
<tr>
<td>1931</td>
<td>374</td>
<td>20,046,250</td>
</tr>
</tbody>
</table>

During the fiscal year 1932, and each succeeding year, the Act
authorizes the construction of not to exceed 333 airplanes at a maxi-
mum cost of $17,476,250. In accordance with the above, it is
planned that the Navy shall maintain a total of 1,000 serviceable
airplanes, which is to be the future air equipment of the Navy.

The Act further authorizes the construction of two rigid air-
ships of approximately 6,000,000 cubic-feet volume each, at a cost
not exceeding $8,000,000 for both; it also authorizes purchase of
an experimental metal-clad airship of approximately 200,000 cubic
feet volume, at a cost not to exceed $300,000.
The Act clarifies the status of air personnel in the Navy and provides that all Naval Marine Corps activities including the operation of aircraft carriers and tenders, shall be commanded respectively by Naval and Marine Corps flying personnel.

The selection of Professor Edward P. Warner, of the Massachusetts Institute of Technology, to fill the position of Assistant Secretary of the Navy for Aeronautics, promptly met with wide-spread approval. Professor Warner has been recognized for a number of years as one of our leading aeronautical engineers. Through many contacts with the Air Services and the Industry, his special qualifications for carrying on this work were at once apparent to everyone familiar with our aeronautical development.

**The Army Five-Year Aviation Program**

The Army Five-Year Aviation Program Act (H. R. 10827, Public No. 446, printed in full in the Appendix), creates an additional Assistant Secretary of War, primarily to aid in fostering military aeronautics.

The act provides for the reorganization of the Army Air Service into an Air Corps, increasing its strength to 1,650 officers and 15,000 enlisted men.

It provides temporary advanced rank to commanding officers under certain limitations, and for an investigation and a study by the Secretary of War of the promotion list of the Army with a view to correcting certain unsatisfactory conditions. It creates for a period of three years, an Air Section in each of the Divisions of the General Staff, and clarifies the situation regarding flying pay.

The Act authorizes a five-year air personnel expansion, and the Aircraft Procurement Program is limited to the maintenance of 1,600 serviceable airplanes providing for replacement at a rate of about 400 planes a year, and such free and active balloons as may be necessary for training purposes.
Of the three Assistant Secretaries for Aeronautics, Hon. F. Trubee Davison, as Assistant Secretary of War, was the first to be appointed. Having been trained as a war pilot, Mr. Davison throughout the ensuing years, in connection with a very active and notable public career as a lawyer and member of the New York State Assembly, had maintained constant contact with the development of aviation. His appointment was at once recognized and heralded as most appropriate. His ability and outstanding personality created in the public mind an appreciation of the importance and dignity now placed upon aviation by the Congress and the Administration.

As outlined in the 1926 Aircraft Year Book, the War and Navy Departments and the Industry had made an intensive study of their mutual problems. The primary motive in making this study had been to secure a better understanding regarding fundamental conditions as a basis for improving contractual relations in the procurement of aircraft.

After the general deflation of all aeronautical activities following the Armistice, the aircraft industry proceeded to reconstruct itself upon a peace-time basis. As an inheritance from the War period, the Industry found itself surrounded by a number of conditions in conflict with its sound growth. It took time to analyze the situation and to determine just what was necessary in order to improve conditions, and it was not until 1925 that definite conclusions were reached. These conclusions, representing the mature opinions of the Secretary of War and Secretary of the Navy, as well as the responsible officers of the Services and the Industry, and later endorsed by the Lampert and Morrow Committees, became an essential part of the legislative program.

Procurement

As previously recorded, there was complete accord between the Morrow Report and the findings of the Lampert-Perkins Committee
as to the need of improvement in the Government's methods of procurement of Aircraft. Their recommendations echoed the established views of the Services and of the Industry. This provided a most favorable basis for joint consideration by the Military and Naval Committees of Congress of this phase of the problem.

Therefore, as the Air Commerce Act and the Navy Program had been agreed to without consideration of this vital matter it was most appropriate, in fact necessary from the point of view of the needs of both Services, that this question be included in the Hearings on the Army Program Bill. Accordingly, a Special Joint Committee was appointed, composed of Representatives Vinson of Kentucky, Vinson of Georgia, McSwain of South Carolina, Woodruff of Michigan, Wainwright of New York, Stephens of Ohio, and Miller of Washington. Under the able leadership of Hon. W. Frank James of Michigan, Acting Chairman of the Military Affairs Committee, and Hon. Thomas S. Butler, Chairman of the Naval Affairs Committee, this most important work was completed in time to be included in the Army Program Bill shortly before adjournment.

The successful termination of this work was a remarkable accomplishment. Though there was no divergence of opinion as to the results to be obtained, everyone being in complete agreement as to objectives, there was a lack of precedent, and, at first, some confusion as to how these objectives might be most effectively reached.

During the period of the Hearings before the Joint Committee, covering several weeks, the entire subject was reviewed in detail. The result, as embodied in Section 10 of the Army Program Bill, establishes a formula in great detail, reflecting the recommendations of all previous groups.

Congress, in passing this legislation, clearly indicated its determination that, in the future, procurement of aeronautical equipment shall be relieved of the difficulties which heretofore have interfered with satisfactory progress in this field. Their determination to provide adequate authority for carrying on this work in a constructive and business-like manner is clearly apparent, and may be briefly summarized as follows:

(1) All existing safeguards for the protection of the Government against unreasonable prices, the creation of monopolies, and the possible elimination of sources of supply, are retained and strengthened.

(2) Provision is made for encouragement and stimulation of invention and original creative design and engineering work on the
Air Commerce Authorized

part of all concerns or individuals, whether possessed of manufac-
turing facilities or not, upon a basis that will bring all possible
sources of talent for the upbuilding of improved aeronautical equip-
ment into close contact with the War and Navy Departments.

(3) The War and Navy Departments are invested with com-
plete authority through their respective secretaries, to obtain aero-
nautical equipment either of standard service types or new design,
by any method of procurement which, in the opinion of the secre-
taries will produce the most satisfactory equipment for the Services.

(4) Provision is made for the broadest form of competitive pro-
curement, based upon all of the essential elements of quality, per-
formance and price.

As will be noted by studying the complete text of the Act or the
summary in this chapter, all of the above is covered in great detail.
Under this Act there is now provided by law, four methods by which
the Government on the one side and the Industry on the other, may
initiate and conclude contracts for aeronautical equipment, as
follows:

The first provides the terms under which the Service shall solicit
all engineers and designers to submit new designs of aeronautical
equipment for purchase by the Government, following advertisement
and formal design competition.

The second provides for the procurement of new experimental
equipment by an initial open market purchase in this or any other
country, and the subsequent procurement in quantity by negotiated
contracts from the American manufacturers, of any such new equip-
ment found to be useful and desirable for the Services.

The third provides for the negotiation of contracts with manu-
facturers of standard equipment which had been reduced to practice
by them prior to the passage of the Act.

The fourth provides for the submission by any one at any time
of new designs or invention for purchase by the Government.

Of the above methods, the first and last are of very great interest
and value to individual inventors and designers as differentiated
from manufacturers maintaining designing and engineering staffs.
The latter developing new equipment, and desiring to retain their
proprietary rights, will carry on negotiations through the provisions
of the second and third methods, as will be noted in the following
paragraphs.

Design Competition: Paragraphs (a) to (i) define the relation-
ship which shall obtain between the Services on the one hand and
individual inventors and designers on the other, in design competi-
tions. The initiation by the Government of transactions under these
paragraphs is limited to formal advertisement and competitive bids. The manner in which the Government shall request competitive designs is here indicated in great detail. All bids received are to be appraised by a Board of Award which shall report its findings to the Secretaries. After such appraisal the Secretaries are authorized to enter into contracts for the procurement of designs or for the purchase of equipment constructed in accordance therewith, at prices not in excess of the bids. Future quantity purchases of such equipment are limited to competitive bidding following formal advertisement, based upon the designs thus held by the Government. In the event of inability to effect a contract for the design, the owner of the design may file a suit in the Court of Claims covering his compensation.

In all of the other provisions of the Law, the Secretaries are given full discretionary authority covering procurement in the manner deemed by them to be in the best interests of the Government.

Government Orders Reserved for American Manufacturers: Paragraph (j) limits procurement to American manufacturers, except for purposes of experimentation. While the administrative officers of the War and Navy Departments have always recognized the policy of limiting manufacturing orders to American constructors, the action of Congress in placing this limitation in the law again clearly indicates their determination that the American Aircraft Industry shall be strengthened and fortified by the Government in every way practicable.

Purchase of New Experimental Types and Procurement in Quantity of New Equipment: Paragraph (k) very wisely provides that the Secretaries may purchase without competition, in any part of the world, aeronautical equipment for experimental purposes. It further provides that if, as a result of such procurement, new and suitable designs, considered to be the best kind for the Army and Navy, are developed, the Secretaries may enter into contracts (subject only to the requirements of paragraph (j), reserving manufacturing orders for American concerns), without regard to any of the limitations included in paragraphs (a) to (e).

The wide latitude of the authority established under paragraph (k) is indicative of the further determination of Congress to place the Air Services in a position, in procurement, that will enable them to maintain a quality of equipment equal to the best in the world. The War and Navy Departments are now able to exercise complete discretion in initiating the procurement of experimental types. Furthermore, they are given specific authority to negotiate contracts
with American manufacturers for quantity production of new equipment as the Secretaries may in their judgment determine to be best suited for their needs. By this law, Congress has provided authority to proceed with contracts for quantity production in a most business-like and effective manner, reserving to the producer of new and successful types, proprietary rights of design; and to the Government, all the advantages of progressive evolution in the perfection of such types.

Preserving in the Aircraft Industry proprietary rights in designs, is perhaps the most constructive and forward-looking provision in the entire Act. The distinction is clearly drawn between equipment of newly designed material, the further evolution of which must be carried forward with and paralleling production, as differentiated from fully developed equipment.

It has long been recognized that only through the original designer may evolution constantly advance toward perfection in performance. The designer, retaining with his design rights his pride and personal interest in the perfection of his product, is constantly spurred to maximum effort. In addition, by the adoption of this principle, Congress has secured the advantages of reduced costs of manufacture, coexisting with improved product.

Procurement of Existing Service Equipment: Under paragraph (q) the Secretaries are authorized to exercise complete discretion in the procurement of any standard aeronautical equipment according to designs which had been reduced to practice, prior to the passage of the Act, and found to be suitable for the purposes intended, or according to such designs with minor modifications. In this, Congress again asserted its determination to place the Secretaries in a position to respect all existing propriety rights of manufacturers, and at the same time, to secure for the Government the advantages of continuity of production, through the progressive improvements that may be obtained by such a policy.

Purchase of Patents and Designs: Under paragraph (r), provision is made for inventors or designers to submit for purchase by the War and Navy Departments, designs of any new equipment, whether patented or unpatentable, with full authority, following survey and report by a special Patents and Design Board, to negotiate contracts up to $75,000 for any single improvement.

In the past, inventors and designers, without manufacturing and other necessary facilities for production, have found it difficult to secure compensation for designs covering new equipment, due to the fact that no one in the Government was specifically authorized to consider the practicability and worth of such designs; and, what
Curtiss Hawk (Model P-1-D) Curtiss D-12 engine.
is more important, no one was authorized to pay for such designs if proved to be practicable and of value to the Government.

Action of Secretaries Not Reviewable: Paragraph (t) authorizes the Secretaries of War and the Navy to award contracts to the lowest responsible bidders who can satisfactorily perform the work or service required. to the best advantage of the Government. This paragraph further provides that the decisions of the Secretaries in awarding such contracts, as well as the interpretation, application and administration by them, shall not be reviewable by any officer or tribunal of the United States except the President and the Federal Courts. Here again as throughout the entire Section, Congress emphatically asserts, as its determined policy, that in the future, the Secretary of War and the Secretary of the Navy shall be clothed with complete, final and absolute authority and responsibility in the procurement of all aeronautical equipment.

Other Provisions of Section 10: The other paragraphs of Section 10 give necessary and proper protection to the Government, through provisions requiring: (t) that the plants and books of contractors shall be subject to Governmental inspection and audit; (m) that audits and reports shall be preserved for ten years, subject to inspection by Congress: (n) that contractors shall, when required, give release to the Government in such form as prescribed by the Secretaries, covering claims for damages. and; (p) that contractors shall be subject to penalties for collusion or other agreements depriving the Government of full and free competition in negotiating contracts.

The Services are now able to protect the best interests of the Government. based upon sound business principles and broad intelligent understanding of the special problems involved in the development of this new and highly technical industry. During the period of rapid development of the art, through the application of scientific engineering and experimentation, the best interests of the Government are protected and advanced. The several phases of the entire procurement problem, as determined by the Government’s experience to be best suited to its needs, are clearly and adequately covered. At the same time, broad, liberal avenues of approach are opened up and established, through which inventors, designers, and constructors may contract with the Government for its needs. This Section of the Act alone justly deserves the comment, previously referred to, of the authoritative critic, writing recently in the “Atlantic Monthly,” who rightly declared the aviation legislation of the 69th Congress as the greatest accomplishment of constructive statecraft during the year 1926.
CHAPTER II
CIVIL AVIATION IN THE UNITED STATES

Civil aviation may be divided, for the purpose of discussion, under two general headings, the first being purely commercial flying, carried on as a business, and the second, flying for pleasure or personal purposes and in scientific experiment and exploration. Under the former heading comes air transportation, as a class by itself; and aerial service, as a form of commercial aviation presenting entirely different problems from those which attach to air transportation. Under the latter heading there is by far too little to be said of actual accomplishments. The wonderful resources of this field, particularly in flying boats, have not been sufficiently appreciated. On the other hand aircraft are being used to an increasing extent all over the world by sportsmen in exploration and scientific study of one kind and another.

Air Transport

The year 1926, the first year of organized air transport in the United States, when viewed as a whole, presents elements both of discouragement and of promise; the former, because with few exceptions all the commercial air transport operations in this country are still not sufficiently self-supporting; and the latter, because of the great wealth of experience which, through practical operations, has been and is being daily amassed. This experience and its lessons will have a vital influence upon the future success of civil aviation in general and aerial transportation in particular.

With few exceptions, all of the air transport efforts in the United States have placed dependence principally upon revenues to be derived from contract air mail operations, supplemented in certain cases by the carriage of passengers and express. Typical of such exceptions are the following:

(a) A large motor car builder operating aircraft daily over two comparatively short routes totalling a few hundred miles in length, transporting his own freight in the shape of automobile parts and supplies.

(b) The experiment of a large, well organized transportation company covering a program of limited operations over two short lines for the carriage of passengers, express and mail.

(c) A similar experiment, by another extremely responsible group of men especially qualified and experienced in aeronautical activities, operating a short line for the carriage of passengers, mail and express.
The automobile manufacturer’s operations (a) are continuing. Of the other lines featuring passenger traffic, experiment (b) was discontinued at the end of a predetermined summer schedule, with figures of income showing deficits over total cost of operations. However, the published figures of actual cost of flying were so low as to be exceedingly encouraging. Added to this should be noted the fact that the planes carried capacity loads most of the time, giving a clear indication that the American public is ready to adopt air transportation as soon as adequate facilities are available. In this experiment, great attention was given to all details, including the comfort of the passengers both in transportation to and from fields and in flight: and to the perfection of flying equipment, navigational aids, and ground facilities. Advertising and solicitation of traffic were adequately handled, but one essential element was missing—saving of time. The distance of the route from Washington to Philadelphia was short, and the facilities for rapid surface transportation between these cities are extremely good. It is unfortunate that this most important operation could not have been carried out over a line of sufficient length to have permitted a real saving of time for passengers between two of our larger industrial centers such as Philadelphia or New York and Chicago. The other experiment (c) has continued with gratifying success. With similar attention to all details affecting the comfort and safety of passengers, this company is also demonstrating by practical operating experience that passenger traffic may be secured and properly handled when adequate services are established and advertised. It is hoped soon to show that it can be made profitable.

Of the Air Mail contractors, two have suspended as each found it impossible to stretch income to equal costs. It is encouraging to note, however, that each has announced the intention of resuming operations again during 1927. Other contractors, able to meet losses out of capital, are continuing. One line is actually making expenses and a fair return for capital, after allowances for depreciation, while one or two others have developed revenue equal to operating costs. All of these companies firmly believe that with a fuller realization on the part of the public of the very great advantages offered by the extension of the Air Mail, that their lines may be made profitable, if all of the administrative officers of the Government dealing with or controlling these activities, maintain a constructive and encouraging attitude during this formative or pioneer period.

Therefore, it may be said that hope and a firm resolve to succeed dominate this entire field. It is realized that pioneer work is necessary before ultimate success in new modes of transportation may
Colonial Air Transport Trimotor and Universal Wright Whirlwind Engines
be achieved. It is through this strenuous pioneer period that these companies are now passing, and air transportation will undoubtedly soon be healthier as the result.

The present situation may be promptly improved by the application of a few simple remedies. What, however, are these remedies?

First: A more general and extensive use of the Air Mail facilities by the public. The present deficiencies in this respect are due to lack of public appreciation of the advantages to be gained by the use of Air Mail. This phase of the problem will disappear with time; and this time can be very greatly shortened by a vigorous combined effort of traffic solicitation on the part of the operating companies.

Second: Operators need at once a combination of mail and express and as soon as practicable, passenger traffic, to increase the poundage and reduce the ratio of overhead expenses.

Third: A more accurate conception of the actual cost of operation and maintenance, and traffic solicitation, is needed on the part of some of the operating companies themselves.

Fourth, and most important: A more sympathetic understanding and helpful cooperation, as above suggested, on the part of all officers of the Government. New things call for unusual treatment. American air transportation will wane and fade unless all the officers of the Government sponsor it, encourage it, and protect it from its own mistakes, as well as from the possible errors of individual officers of the Government. Failure by anyone to interpret affirmatively and constructively the authority and mandate of Congress, that commercial air transportation in this country shall be supported, fortified and advanced, must be avoided. Congress expects and the public demands the most constructive and helpful co-operation from all. Congress realizes the Government's need of air transport, and demands the rapid, vigorous and permanent development of aviation as the basis of our future political and economic independence.

There were, during 1926, sixteen air transport operators holding air mail contracts. The operations of each will be discussed individually later in this chapter.

Colonial Air Transport

Contract Air Mail Route No. 1, Boston to New York via Hartford, a distance of 192 miles, is operated by the Colonial Air Transport, Inc. This company was organized late in 1925 as an amalgamation of Eastern Air Transport and Colonial Air Lines. Operations were started on June 18th, 1926, using as operating fields, Hadley Field, New Brunswick, N. J.; Brainard Field, Hartford, Conn.; and Boston Airport, Boston, Mass. Hangar accommodation is rented at each of these fields, and at the two terminals facilities are available for minor repairs and overhauls. Flying equipment of the Colonial Air Transport consists of:
Aircraft Year Book

(1) One Curtiss Lark single-engine plane with Wright Whirlwind engine, capable of carrying two passengers or 500 pounds of cargo in the open cockpit, in addition to the pilot.

(2) Two Fokker Universals with single Wright Whirlwind engine, capable of carrying four passengers or 800 pounds of mail and express, in addition to the pilot.

(3) Two Fokker Tri-motor three-engine monoplanes equipped with Wright Whirlwind engines, capable of carrying eight passengers or 1,500 pounds of mail and express, in addition to one pilot and a mechanic.

During the six months of last year in which the mail was carried, Colonial Air Transport experienced no accidents whatsoever, in spite of the very poor weather conditions prevailing, especially during the winter months, along the Atlantic coast. The scheduled mileage was 69,300 miles, of which 60,867 miles were actually flown. Including 8,433 miles of ferry flying and 6,248 miles of special trips without mail, the total mileage amounted to 75,548 (between June 18th and December 31st). The C. A. T. planes experienced 110 forced landings, of which 109 were caused by weather conditions and darkness, for the route has only this year (1927) been lighted. One forced landing is attributed to "other causes." Of these forced landings, however, only 42 resulted in the trip not being completed. The fact that there were no forced landings due to mechanical trouble spells a striking degree of reliability for the Wright "Whirlwind" engines used exclusively by the Company.

No freight or passengers other than members of the company staff, were carried during the period under review, the pay loads being confined entirely to mail. For the six months’ period the mail load reached a total of 6,632 pounds.

The details of the operations of the Colonial Air Transport last year are best portrayed in the following statistics which relate to the period July 1st to Dec. 31st, 1926:

<table>
<thead>
<tr>
<th>Month</th>
<th>Trips Scheduled</th>
<th>Trips Attempted</th>
<th>Trips Not Completed</th>
<th>Miles Flown</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>52</td>
<td>52</td>
<td>5</td>
<td>12,898</td>
</tr>
<tr>
<td>August</td>
<td>52</td>
<td>44</td>
<td>4</td>
<td>10,959</td>
</tr>
<tr>
<td>September</td>
<td>50</td>
<td>46</td>
<td>6</td>
<td>11,929</td>
</tr>
<tr>
<td>October</td>
<td>52</td>
<td>48</td>
<td>*20</td>
<td>12,752</td>
</tr>
<tr>
<td>November</td>
<td>50</td>
<td>46</td>
<td>4</td>
<td>12,618</td>
</tr>
<tr>
<td>December</td>
<td>52</td>
<td>48</td>
<td>3</td>
<td>12,191</td>
</tr>
<tr>
<td>Totals</td>
<td>308</td>
<td>284</td>
<td>42</td>
<td>73,347</td>
</tr>
<tr>
<td>Special trips in June</td>
<td>30</td>
<td>26</td>
<td>9</td>
<td>2,201</td>
</tr>
</tbody>
</table>

*Due to darkness—schedule advanced Nov. 1st, route still being unlighted.
The operating schedule of the line follows:

<table>
<thead>
<tr>
<th>Eastbound</th>
<th>Westbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leave Hadley Field</td>
<td>Leave Boston...</td>
</tr>
<tr>
<td>Leave Hartford</td>
<td>Leave Hartford</td>
</tr>
<tr>
<td>Arrive Boston</td>
<td>Arrive Hadley Field</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From this schedule it will be seen that, in all except the midsummer months, the route has to be flown in dusk or darkness daily on the westbound trip. This, together with the extremely bad foggy weather which prevails along the Atlantic Coast, especially during the autumn and winter, has been responsible for the somewhat high percentage of forced landings. Lights are now installed along this route and the service at the time of this writing is maintaining regular schedules despite the weather or shortness of the days.

Late in 1926 Governor John H. Trumbull, of Connecticut, resigned from the presidency of Colonial Air Transport and Major General John F. O’Ryan became president of the company. The officers of the company now are: Hon. John H. Trumbull, chairman of the board; Maj. Gen. John F. O’Ryan, president; J. T. Trippe, vice-president; L. L. Odell, secretary; Talbot O. Freeman, treasurer.

Flying operations are under the direction of Capt. C. H. Biddlecombe, formerly of the Civil Aviation Department, of the British Air Ministry. The flying personnel consists of: Leroy H. Thomson, Hugh I. Wells, L. Ponton de Arce, pilots, and four mechanics.

**The Robertson Aircraft Corporation**

The Robertson Aircraft Corporation of Anglum, St. Louis Co., Mo., which has an enviable reputation in the aeronautical field, holds the contract for the operation of C.A.M. No. 2, St. Louis to Chicago, via Springfield and Peoria, a distance of 278 miles. The service, which essentially provides a St. Louis to New York linkage in view of the connection with the overnight line between Chicago and the latter city, started operations on April 15th, 1926. The company itself dates back to 1921 since which time it has operated a general aerial service and manufacturing business with very considerable success. It is incorporated under the laws of the State of Missouri for $500,000, one half of which amount has been paid in.

The officers of the company are: Major William B. Robertson, president; Frank H. Robertson, vice-president; Harry C. Willson, secretary; James D. Livingston and J. M. Robertson, directors.

The Robertson Aircraft Corporation originally standardized on flying equipment similar to that which has carried the mail on the
(Top) Robertson Aircraft Corp.'s fleet of de Havillands on St. Louis-Chicago Air Mail Route. (Bottom) Ryan monoplane (Wright “Whirlwind” engine). Used by Pacific Air Transport from Seattle to Los Angeles.
Trans-Continental route for so many years. Fourteen remodeled DH mail planes have been in use, but they will be replaced with more modern machines when the time seems opportune. In addition to these machines, the company owns about 100 Standard J-1's, which, while primarily for sale, are for use in the many other spheres of activity of the firm and serve as valuable emergency equipment.

During the period from April 15th, the date of inauguration of the service, to December 31st, 376 trips over the route have been made, totaling 104,528 miles and only twenty-five trips have been delayed by any cause whatsoever. According to reports received from the company, only seven scheduled trips were defaulted and all these were the result of impossible weather conditions. The details of each of these seven are interesting: Sept. 3rd, bad weather; Nov. 3rd, pilot jumped from plane due to low ceiling and fog; Nov. 8th, forced to entrain mail at Springfield due to fog; Nov. 17th, defaulted at St. Louis, owing to a severe blizzard; Dec. 21st, entrained mail at Springfield owing to fog; December 23rd, entrained mail at Springfield owing to fog; December 27th, entrained mail at Peoria owing to fog.

As will be seen from the schedule of the service, this route, like the Boston-New York service, operates only in the early morning and late evening so that, especially during the winter months, much flying is done in the darkness. Accordingly, the Robertson Aircraft Corporation has found it necessary to light the route for night flying. This lighting equipment and its operation is, of course, being taken over by the Department of Commerce. The schedule is as follows:

<table>
<thead>
<tr>
<th>Northbound</th>
<th>Southbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leave St. Louis</td>
<td>Leave Chicago</td>
</tr>
<tr>
<td>4:15 p.m.</td>
<td>5:30 a.m.</td>
</tr>
<tr>
<td>Arrive Springfield</td>
<td>Arrive Peoria</td>
</tr>
<tr>
<td>5:10 p.m.</td>
<td>7:15 a.m.</td>
</tr>
<tr>
<td>Leave Springfield</td>
<td>Leave Peoria</td>
</tr>
<tr>
<td>5:20 p.m.</td>
<td>7:25 a.m.</td>
</tr>
<tr>
<td>Arrive Peoria</td>
<td>Arrive Springfield</td>
</tr>
<tr>
<td>6:00 p.m.</td>
<td>8:05 a.m.</td>
</tr>
<tr>
<td>Leave Peoria</td>
<td>Leave Springfield</td>
</tr>
<tr>
<td>6:10 p.m.</td>
<td>8:15 a.m.</td>
</tr>
<tr>
<td>Arrive Chicago</td>
<td>Arrive St. Louis</td>
</tr>
<tr>
<td>7:30 p.m.</td>
<td>9:15 a.m.</td>
</tr>
</tbody>
</table>

The company operates from the Lambert-St. Louis flying field, owned by the St. Louis Aero Corporation, and situated about seven miles from the city limits; and uses the Maywood Air Mail Field at the Chicago end of the route.

The pilots in the employ of the Robertson Aircraft Corporation who operate the mail service are all men who have had actual flying service in the United States Army and have collected a great deal of experience. They are: Charles Lindbergh, Mr. Smith, Mr. Minick, and Clyde Clevenger. The records show each one of these men to have had more than 500 hours actual flying time.
National Air Transport

The first large air transportation company to be organized in this country, National Air Transport, Inc., operators of Contract Air Mail Route No. 3, Chicago to Dallas, via Moline, Rock Island, Davenport, St. Joseph, Kansas City, Wichita, Oklahoma City and Fort Worth, a distance of 995 miles, maintained a high standard of air operations during their first active year. The company was organized early in 1925 with a capitalization of $10,000,000 of which $2,000,000 was paid in, and later received the contract for the operation of the air mail service through the Southwest. The officers of the company remain as originally, Howard E. Coffin, vice-president of the Hudson Motor Car Co., being president; C. M. Keys, president of the Curtiss Aeroplane and Motor Company, chairman of the Executive Committee; Charles L. Lawrance, president of the Wright Aeronautical Corporation, first vice-president; Wayne C. Taylor, of Chicago, second vice-president; Eugene W. Lewis, president, Dime Bank of Detroit, third vice-president; John J. Mitchell, Jr., Illinois Merchants Trust Co., treasurer; and Carl B. Fritsche, general manager, Aircraft Development Corporation, secretary. Col. Paul Henderson, formerly Second Assistant Postmaster General is general manager, with Donald Bartlett, assistant to the general manager; Lester D. Seymour, chief engineer; E. P. Lott, manager of operations (who has nine pilots under his charge); Franklin D. Myers, auditor; and R. W. Ireland, general traffic manager.

Actual operations carrying mail along the route between Chicago and Dallas started on May 12th, 1926, although N.A.T. planes had already been flying the route since early February of that year, during which time 39,382 miles had been covered. During this preliminary period extensive preparations in the building up of ground organization were made. At each of the points along the route, including Dallas but with the exception of Chicago, where Maywood Air Mail Field is employed, flying fields supplied by the municipalities or Chambers of Commerce are used without charge by the operating company. Hangars have also been constructed by the municipalities or Chambers of Commerce at Moline, St. Joseph, Kansas City, Wichita, Oklahoma City, and Dallas; and the National Air Transport has been given free use of these for at least one year. In Chicago a hangar is rented at Checkerboard Field, adjacent to the Government mail field, and at the close of the year, work had been started on a new hangar at the Chicago municipal airport, 63rd Street and Cicero Avenue.

Operating headquarters for the line are located at Kansas City.
(Top) Travel Air Monoplane of new type to be used by National Air Transport. (Bottom) Lighting equipment, Moline Field, Neon Beacon at the right.
which is also the headquarters for airplane overhaul and the parachute repair shop. Shops for the complete overhaul of engines are located at St. Joseph, with facilities which include hand and machine tools and engine test stands. Spare parts for engines and tools for emergency repairs are kept at all fields.

Each station is provided with facilities for refueling, those at Moline, St. Joseph, Wichita and Oklahoma City being of the overhead gravity type, and at all fields facilities are available for heating oil and water. Each field is supplied with an automobile, and one and one-half ton trucks are also maintained at Chicago, St. Joseph, Kansas City and Dallas. Offices for handling mail are located on each flying field and the necessary force of clerks, mechanics, etc., are employed for servicing and repairing aircraft. Traffic solicitation headquarters are located at Chicago, Kansas City and Dallas.

Owing to the fact that the schedule which is daily in each direction, calls for departure from Chicago at 5:45 a.m. and from Dallas at 7:45 a.m. it was found necessary for the company, at its own expense, to light certain sections of the route. This involved the installation of five revolving beacons and thirty-five gas blinkers. which, however, will eventually be taken over by the Aeronautics Branch, Department of Commerce. Work on lighting this route permanently is, at the time of writing, already under way by the Department and by the time this appears in print, it is expected that lights will have been installed on the northern end as far south as Unionville, Iowa, and from Dallas as far north as Wichita, including the 24-inch routing beacons and lights at intermediate fields. At Moline, a Neon beacon has been installed for test purposes to determine its fog-piercing qualities.

National Air Transport owns a total of fourteen planes, ten of which are Curtiss Carrier Pigeons (Liberty XII engines), one is a remodelled DeHavilland (Liberty), another an Aerial Mercury (Liberty), in addition to a Travel Air, and the fourteenth, a three-engine (Whirlwind) Ford-Stout all-metal monoplane capable of carrying passengers, mail and express. The Curtiss Carrier Pigeons are used in the regular scheduled flying with mail. They have a pay-load capacity of 1,000 pounds. The DH, Aerial Mercury and Travel Air are held in reserve for emergencies. The three-engine plane was purchased for experimental passenger carrying. It has a capacity of eight passengers in addition to mail and express, to the extent of a total pay-load of about 2,500 pounds.

In addition to these planes, orders have been placed with the Travel Air Manufacturing Company for eight of the new cabin type Travel Air monoplanes with Wright "Whirlwind" engines. These
margines will have a cruising speed of 105 m.p.h., a landing speed of 50 m.p.h., with a pay-load capacity of 750 pounds of mail or four passengers.

With equipment already available and in use on the service, namely, the ten Carrier Pigeons and the three emergency planes, 456,911 miles were covered during 1926, (May 12th-Dec. 31st) carrying mail. In addition to this mileage, 51,684 miles were covered in ferry and test flying. This flying represented the carriage of 58,025 pounds of mail with the average performance for the seven and one-half months of 87.6% on schedule time and 90.8% on trips completed, no trip being in any case entirely defaulted. In addition to the scheduled flying of 456,911 miles and the ferry and test flying of 39,382 miles totaling 508,595. N.A.T. operations included approximately 5,000 miles covered during November, 1926, with the Ford-Stout three-engine machine, representing approximately 25,000 passenger miles. No paying passengers were, however, carried by N.A.T. during 1926.

N.A.T. planes experienced a total of 72 forced landings, of which by far the larger proportion was due to weather conditions, this cause accounting for no fewer than 65 of the total.

No clearer picture of the operations of National Air Transport during 1926 can be had than that gained from a review of the actual statistical figures. The following tables cover the entire operations:

**Mileage Scheduled, Etc.**

(2,000 miles per day, seven days a week)

| Total miles flown to December 31st—547,977. |
| Total mail carried (including bags, etc.)—58,025 pounds. |
| Percentage of adherence to scheduled time—Average for the period 87.6. |
| Percentage of scheduled trips which were completed—90.8. |

During this period there were a total of 72 forced landings; 65 because of bad weather, 6 mechanical causes, and 1 out of gas. In every forced landing except one the plane was able to proceed under its own power.

**SCHEDULE**

**Southbound**

- Leave Chicago 5:45 a.m.—or upon arrival of the overnight from N. Y.
- Leave Moline ............ 7:20 a.m.
- Leave St. Joseph ........ 10:20 a.m.
- Leave Kansas City ...... 11:18 a.m.
- Leave Wichita ............ 1:18 p.m.
- Leave Ponca ............... 2:05 p.m.
- Leave Oklahoma City ... 3:05 p.m.
- Leave Fort Worth ........ 5:15 p.m.
- Arrive Dallas ............. 5:35 p.m.

**Northbound**

- Leave Dallas ............. 7:45 a.m.
- Leave Fort Worth ......... 8:00 a.m.
- Leave Oklahoma City .... 10:10 a.m.
- Leave Ponca ............... 11:10 a.m.
- Leave Wichita ............ 11:57 a.m.
- Leave Kansas City ...... 1:57 p.m.
- Leave St. Joseph ......... 2:40 p.m.
- Leave Moline ............. 5:15 p.m.
- Arrive Chicago .......... 7:20 p.m.
(Top) New Swallow used by Walter T. Varney on C.A.M. No. 5. (Center) Buhl-Verville Airster in flight. (Bottom) Stinson Detrolter used by Florida Airways on C.A.M. No. 10. "Whirlwind" engines used on all three planes.
Among the primary reasons for the organization of National Air Transport, Inc., was the operation of an express service between New York and Chicago. With this end in view a number of conferences were held during the early days of its organization in which Robert E. M. Cowie, president of the American Railway Express Company, and Daniel M. Sheaffer, manager of Mail and Express Traffic, the Pennsylvania Lines, participated. The conferences were primarily for the purposes of arranging a contract for the carriage of express by air whereby the American Railway Express would supply solicitation, pick up and delivery service for a common carrier by air. Owing to the fact that such an arrangement involved entirely new transportation policies, the negotiations were extended over a comparatively long period. However, late in the year National Air Transport, Inc., signed a contract with the American Railway Express for the carrying on of such a service, although no actual operations under this contract had started or were immediately contemplated at the time of this writing.

**Western Air Express**

Contract Ail Mail Route, No. 4, which extends from Los Angeles to Salt Lake City, a distance of 660 miles, has been operated since April 17th, by Western Air Express, Inc. The service has proved one of the most fruitful in point of business and successful in point of operations of all the contract lines. This has been very largely due, in the first place, to the fact that there is a large volume of mail leaving Los Angeles for the East for which express carriage is demanded, which could not be met when the only connection with the Trans-Continental Service was by train to San Francisco; and, secondly, because of the excellence of the prevailing weather in Southern California and the careful ground organization and modern equipment of the operating company. Connecting with the Trans-Continental service as it does at Salt Lake City, the Western Air Express service effects a saving in transit time of from one to two days on the Eastern mail of the whole of Southern California.

Flying equipment of the company consists of seven Douglas M-2 mail planes equipped with Liberty engines and three DH mail planes also with Liberty's. The former have a capacity of 1000 pounds of mail and accommodation for two passengers in open cockpit, to be carried in lieu of a certain quantity of mail.

Headquarters are maintained at Los Angeles where a large field is leased, and ample hangar accommodation is available. At the Los Angeles end, the company maintains complete shops for overhaul
and repair work on the equipment. A field is also maintained at Las Vegas, a regular stopping place on the route. At Salt Lake City, the regular air mail field is used. All along the 660 mile airway, the operating company has located and maintains 75 intermediate landing fields. Owing to the very poor telephone and telegraph facilities along the route, complete inter-field radio communication is maintained, with receiving and transmitting sets at Los Angeles, Las Vegas, and Salt Lake City. Short-wave radio is employed.

The flying schedule on this service is daily in both directions, as is common in most of the contract routes. Departure from Los Angeles is made at 7:35 a.m. (Pacific Time), with arrival at Salt Lake City at 3:20 p.m. Westbound, the plane leaves Salt Lake City at 9:10 a.m. and arrives at Los Angeles at 5:25 p.m. Actual flying time has been well within schedule and averages slightly in excess of six hours, with the record time for the route of 4 hours 12 minutes. This flying schedule is maintained by four regular pilots, two reserve pilots, eight mechanics and the three radio operators at the fields.

The service, as already stated, started on April 17th, and by the close of business on December 31st, the Western Air Express had completed 259 days of flying as follows:

<table>
<thead>
<tr>
<th>Miles Flown</th>
<th>Pounds of Mail</th>
<th>Passengers</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 17</td>
<td>17,400</td>
<td>7</td>
</tr>
<tr>
<td>May</td>
<td>39,127</td>
<td>7438</td>
</tr>
<tr>
<td>June</td>
<td>37,999</td>
<td>7725</td>
</tr>
<tr>
<td>July</td>
<td>41,245</td>
<td>7916</td>
</tr>
<tr>
<td>Aug.</td>
<td>40,610</td>
<td>8373</td>
</tr>
<tr>
<td>Sept.</td>
<td>37,872</td>
<td>8628</td>
</tr>
<tr>
<td>Oct.</td>
<td>38,703</td>
<td>9668</td>
</tr>
<tr>
<td>Nov.</td>
<td>37,853</td>
<td>8817</td>
</tr>
<tr>
<td>Dec.</td>
<td>38,083</td>
<td>11,665</td>
</tr>
</tbody>
</table>

| Total       | 328,892        | 70,230     |

In addition to the above, 310 pounds of excess baggage and express matter were transported over the line.

The percentage of performance was over 99 per cent, the company being ready and able to attempt every one of the 518 scheduled trips, and there were no trips defaulted. Delayed departures occurred at times at the Salt Lake City end, due to the late arrival of the westbound planes of the Trans-Continental service. When such arrivals were too late for daylight flight all the way to Los Angeles, the Western Air Express planes flew as far as Las Vegas, Nev. and there, having overtaken trains proceeding west, entrained the mail for arrival in Los Angeles by first post the next morning. On oc-
casions when the arrival of the Trans-Continental mail at Salt Lake City was delayed until evening, Western Air Express machines left that city for Los Angeles early next morning, delivering the mail at its destination by noon that day. The route is now being partially lighted which will overcome even this comparatively small delay.

Throughout the period of operation under review, only two trips were interrupted owing to mechanical trouble and five as a result of bad weather conditions. Of the total mileage of 328,892 miles, already itemized by months, 310,800 miles were scheduled as regular flights, the balance being made up of approximately 10,000 miles on special service trips and the remainder on test flights. There were no accidents of any kind, or loss or damage to any mail or express. As will be seen from the above table, the company carried 258 regular passengers, excluding officials. The Western Air Express has definitely invited passenger traffic.

The officers of the Western Air Express are: Harris M. Hanshue, president and general manager; Major C. C. Moseley, vice-president and general superintendent; Byron L. Graves, treasurer; H. M. Wright, secretary, all of whom are members of the Board of Directors, in addition to Harry Chandler, Wm. M. Garland; G. E. Noll, James A. Talbott, and James G. Woolley, traffic manager.

Walter T. Varney

Walter T. Varney, of San Francisco, who has been well-known in the aeronautical field for a number of years as an aerial service operator, holds the contract on Contract Air Mail Route No. 5, which nominally extends 435 miles between Elko, Nev. and Pasco, Wash., via Boise, Ida., but which Mr. Varney has extended southeast to Salt Lake City. Having been previously engaged in operating an aerial taxi service out of San Francisco in conjunction with the Checker Cab Company, which provided transportation to and from fields, Mr. Varney gained experience which has proved of value in carrying on the air mail service over the peculiarly difficult route which he operates.

The Varney line uses six Swallow planes equipped with Wright Whirlwind engines and having a mail load carrying capacity of 500 pounds and a cruising speed of around 90 m.p.h. Headquarters and shops are maintained at Boise, Ida., with the traffic office at Seattle, Wash. The Boise field is but one mile from the center of the city and is a large, well arranged field 2400 ft. by 1800 ft., provided with a six-plane hangar in addition to overhaul shops. The Pasco field is one and a half miles from the center of the city and is but
A trifle smaller than the Boise field, at Salt Lake City and Elko, the fields of the Trans-Continental service are employed.

The service started operations on April 6th, 1926 but was not in full swing until June 1st. During the period June 1st-Dec. 31st (seven months), approximately 200,000 miles were flown carrying the mail, and the total flying time was 2200 hours. On a mileage basis, namely, the ratio of miles flown to miles scheduled, the service has maintained an efficiency of 93.4 per cent.

During this period of operation, there were but three accidents sustained. In one case a plane nosed over in a soft field and was repaired on the spot and the flight continued. On two other occasions, machines flew into the ground while flying in thick snow storms, in each case doing severe damage to the machine, but neither injuring the pilot nor losing the mail. Incidentally, both machines were in the air again within ten days of the respective accidents. There have been no injuries whatsoever to personnel. In addition to the above three accidents, there were, during the seven months of operation under review, three occasions on which engine trouble prevented the completion of flights.

The schedule of the service is as follows:

<table>
<thead>
<tr>
<th>Northwest Bound</th>
<th>Southeast Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leave Salt Lake City..... 10:15 a.m.</td>
<td>Leave Pasco ............ 6:00 a.m.</td>
</tr>
<tr>
<td>Arrive Boise .......... 2:15 p.m.</td>
<td>Arrive Boise ............ 9:00 a.m.</td>
</tr>
<tr>
<td>Leave Boise .......... 2:30 p.m.</td>
<td>Leave Boise ............ 9:15 a.m.</td>
</tr>
<tr>
<td>Arrive Pasco .......... 5:30 p.m.</td>
<td>Arrive Salt Lake City .... 1:30 p.m.</td>
</tr>
</tbody>
</table>

With Mr. Varney in the organization are: Charles T. Wrightson, business manager; Leon Cuddeback, operations manager and chief pilot; Frank P. Bell, traffic manager; Paul P. Scott, Paul A. Andert, George H. Buck, Joseph W. Taff, and William E. Sanborn, pilots. In addition, there are seven regular mechanics and field managers.

**Ford Air Transport**

As explained in the Aircraft Year Book, 1926, the Ford interest in aeronautics began when William B. Stout enlisted the personal and financial aid of Edsel B. Ford and William B. Mayo, chief engineer of the Ford Motor Company. This led to the eventual purchase of the Stout Metal Airplane Company by the Ford Company, and the erection of a large factory and flying field at Dearborn, Mich., the former fully equipped for the manufacture of airplanes and the latter for the handling of airplanes and airships, one of the finest airship mooring masts in the world having been put up at the Ford Airport.
Fokker “Universal” and “Trimotor” “Whirlwind” Engines.
On April 13th, 1925, the Ford airlines were inaugurated, single-engine Stout monoplanes being used in the regular carriage of business documents and automobile parts between the factory at Dearborn and distributing stations at Chicago and Cleveland. From this nucleus grew a regular air transportation service which, during the first twelve months of operation completed no less than 1000 trips, machines carrying on each trip from 1000 to 1500 pounds of pay load.

Being already in permanent operation along these routes, it was of course natural to expect the Ford Company to secure the U. S. Mail contracts between Detroit and Cleveland and Detroit and Chicago, thus placing the Michigan city directly in contact with the Trans-Continental air mail service, via Chicago to the west and Cleveland to the east. Mail carrying operations on these two routes, C.A.M. Nos. 6 and 7, started on February 15th, 1926. No. 6, from Detroit to Cleveland, is 91 miles in length, and No. 7, to Chicago, 237 miles.

The company operates four Ford-Stout all-metal monoplanes equipped with single Liberty XII engines and capable of carrying 1400 pounds of freight, and two Ford-Stout three engine machines equipped with Wright "Whirlwind" engines and capable of carrying 2500 pounds of freight. At the Detroit end, Ford Airport is used, while the air mail fields at Chicago and Cleveland are the termini at these points.

During 1926, the company made 2508 flights of an average duration of 1 hour 15 minutes and covered 272,798 miles carrying the automobile company's emergency express and the mail. As far as the air mail operations are concerned the schedule is as follows:

<table>
<thead>
<tr>
<th>Except Sunday and Holidays</th>
<th>Except Sunday and Holidays</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:40 a.m. ...............</td>
<td>Leave Detroit, Mich ........</td>
</tr>
<tr>
<td>12:15 p.m. ...............</td>
<td>Arrive Cleveland, Ohio ....</td>
</tr>
<tr>
<td>3:15 p.m. ...............</td>
<td>Leave Detroit, Mich .......</td>
</tr>
<tr>
<td>5:00 p.m. ...............</td>
<td>Arrive Chicago, Ill .......</td>
</tr>
</tbody>
</table>

Pacific Air Transport

The Pacific Air Transport, Inc., with head office at Portland, Ore., is the holder of the contract for the carriage of mail by air over Route No. 8, extending from Seattle to Los Angeles, a distance of 1099 miles and, barring the Trans-Continental route, the longest single airway in the country. The company was created by Vern C. Gorst, himself a motor bus operator of considerable experience, who had watched the development of aviation since fourteen years ago when he purchased a seaplane, necessarily of a most primitive type,
and began from then to figure out the possibilities which lay in store for the development of the airplane as a commercial transportation vehicle. The advertisement of the contract air mail bids by the Post Office Department in 1925 attracted Mr. Gorst's attention, and he at once began to investigate closely the feasibility of making air transportation pay its way with a mail contract as a basis.

On Jan. 1st, 1926, Mr. Gorst was awarded the contract for the carriage of mail by air over C. A. M. No. 8, and on Jan. 7th the Pacific Air Transport, Inc., was created to operate under the contract. With Vern C. Gorst as president, the other officers of the company are: C. N. Comstock, vice-president; C. H. Greene, secretary, and Frank A. Flynn, treasurer. The following are the directors of the company: Vern C. Gorst, C. X. Comstock, Howard B. Weaver, R. W. Lemen, E. V. Littlefield, C. H. Greene, and Seely V. Hall.

The company immediately set out to thoroughly survey the route and to standardize upon equipment. It was decided that the Ryan M-1 monoplane equipped with the Wright "Whirlwind" engine was most suited to the needs of the service, and accordingly, seven of these machines were purchased. In addition and at a later date, these planes were augmented by two DH mail planes with Liberty engines, one Travel air ("Whirlwind" engine), one Travel Air (Curtiss C-6), one Swallow (Curtiss OX-5), and one Waco (Curtiss OX-5). The latter two machines are employed for the most part in short distance service and survey flying.

Since the schedule of the service, as laid down by the Post Office Department, entailed leaving Los Angeles at midnight and Seattle before daybreak, the company found it necessary to light the airway. Accordingly, upon the stretches between Los Angeles and San Francisco going North and between Seattle and Portland going South, ten revolving beacons of 7,500,000 candle-power each, were installed in addition to twenty intermediate beacons of 400,000 candle-power each. The approximate cost of this lighting installation was $20,000.00.

P. A. T. built its own hangars at Los Angeles, Medford, Vancouver, and Seattle and rents hangars and shops at Crissy Field, San Francisco, where all major overhaul of equipment is carried out. In addition, hangar and shop space is rented at Concord.

At 12:01 (midnight), on Sept. 15th, 1926, the first northbound P. A. T. mail plane left Los Angeles. Stops were made at Bakersfield, Fresno, San Francisco, and Medford. The plane arrived at Portland in a driving rain at 11:40 a.m., on time, with a capacity load of mail which had left Los Angeles twelve hours previously
and San Francisco six hours before. This mail reached Seattle at 
1:30 p.m. the same day. At 5:45 a.m. the first southbound plane 
left Portland. Stops were made at Medford, San Francisco, Fresno, 
and Bakersfield, and the mail arrived at Los Angeles at 5:00 p.m., 
on time. Such was the simple yet dramatic beginning of a new 
era in rapid transportation on the Pacific Coast.

The advantages of air transportation on this route are of great 
importance to business along the Pacific Coast. The mileage alone 
between Los Angeles and Seattle is reduced no less than 326 miles 
by air. The journey by fast train takes 47 hours while by air it is 
accomplished in 14 hours. San Francisco to Portland is six hours 
by P. A. T. plane, although a journey of 27 hours by express train 
service.

The flying operations of the Pacific Air Transport have been 
very successful, from the outset. Between Sept. 15th, the date of 
the inauguration of the service, and Nov. 20th, the P. A. T. service 
was 98 per cent perfect. This excellent record could have been 
achieved only as a result of the preliminary care given to the organ-
ization of all aspects of the service. Yet the route has proved by 
no means an easy one over which to operate, largely owing to the 
very changeable weather and the lack of weather reporting facilities. 
Since Nov. 20th, with the approach of the worst weather, the service 
has met with some serious problems all of which have, however, 
been successfully overcome. The total mail poundage during the 
period, Sept. 15th to Dec. 31st, 1926, was 19,658 pounds.

While 102 passengers were carried up to the present time, no 
definite steps have been taken to encourage passenger traffic owing 
to the fact that the planes are the open cockpit type. Negotiations, 
however, are now under way for the procurement of cabin type 
aircraft in order to handle satisfactorily more passenger business.

The Pacific Air Transport, Inc., maintains an operating office 
in San Francisco. The total force of the company, including offi-
cers, pilots, mechanics and airport employees numbers 43 on the 
average.

The schedule of the service is as follows:

<table>
<thead>
<tr>
<th>Southbound</th>
<th>Northbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leave Seattle</td>
<td>Leave Los Angeles</td>
</tr>
<tr>
<td>Leave Portland</td>
<td>Leave Bakersfield</td>
</tr>
<tr>
<td>Leave Medford</td>
<td>Leave Fresno</td>
</tr>
<tr>
<td>Leave San Francisco</td>
<td>Leave San Francisco</td>
</tr>
<tr>
<td>Leave Fresno</td>
<td>Leave Medford</td>
</tr>
<tr>
<td>Leave Bakersfield</td>
<td>Leave Portland</td>
</tr>
<tr>
<td>Arrive Los Angeles</td>
<td>Arrive Seattle</td>
</tr>
</tbody>
</table>
Northwest Airways

Organized late in 1926, Northwest Airways of St. Paul, Minn., took over the air mail contract No. 9, Chicago-St. Paul and Minneapolis, via Milwaukee and LaCrosse, which was formerly held by Chas. Dickinson of Chicago, who had requested to be relieved of the contract after a few months operation.

Northwest Airways, organized by Detroit and St. Paul businessmen, has the following officers: H. H. Emmons, president; L. H. Brittin, vice-president and general manager; Frank W. Blair, treasurer; and William B. Stout, secretary. The company operates three Stinson Detrioter Cabin planes (Wright “Whirlwind” engines), intending to carry passengers in addition to the mail over the 377-mile route between Chicago and St. Paul.

The service was opened on November 1st, 1926. One plane leaves Chicago at 5:50 a.m. and arrives at St. Paul at 10:30 a.m., landing at the St. Paul municipal airport which was developed very largely through the work of Colonel Brittin. The schedule provides for regular stops at Milwaukee and LaCrosse. In addition, planes leave Milwaukee at 12 noon for St. Paul, leaving this latter
city for the return journey at 2:10 p.m. and arriving at Chicago at 6:15 p.m.

When passenger service starts on this route, the schedule will be arranged to link with the railroad time tables. Passengers coming from the Pacific Coast on trans-continental trains will be taken off at St. Paul and flown by plane to Chicago in time to catch the Twentieth Century Limited for New York City. Passengers traveling from New York to the Pacific Coast will be able to leave the train at Chicago, take a Northwest Airways airplane to St. Paul, transact business and there catch the trans-continental train which has left Chicago on the previous night.

**Florida Airways**

The Florida Airways Corporation was awarded Contract Air Mail Route No. 10, from Miami, Fla., to Jacksonville, Fla. Commencing operations on April 1st, 1926, it was one of the first contract air mail services to get under way. From the very outset the service aroused great interest and during the first sixty days an efficiency of operation of 98 per cent was established. Major Reed M. Chambers is president of the company; V. E. Chenea, vice-president in charge of traffic; John Harding, Jr., formerly of the Air Service and a member of the Round-the-World Flight, is vice-president in charge of maintenance; and J. H. Johnson, secretary-treasurer. Among the pilots are: H. J. Brady, formerly of Langley Field; Carl B. Eielson, chief pilot of the Detroit Arctic Expedition and the first pilot to carry mail in Alaska by air; L. S. Flo, formerly of Selfridge Field; and J. N. Kelly.

The route extended from Miami to Fort Myers, Tampa, and on to Jacksonville, with intermediate landing fields dotted every few miles between. On Sept. 15th, according to contract with the Post Office Department, the service was extended to Atlanta, Ga., and on Sept. 27th the city of Macon was included as a regular stop on the schedule.

The flying equipment consists of the following machines: one Stinson Detroiter (Wright “Whirlwind” engine), one Curtiss Lark (Wright “Whirlwind”), two Travel Airs (Curtiss OXX-6) and one Ford-Stout all-metal monoplane (Liberty). With this equipment, the total mileage for 1926 (nine months) was 259,924 miles.

Florida Airways service set up an average efficiency of operation of 90 per cent, and this in spite of the fact that the months of November and December offered unusually thick fogs in the vicinity of Atlanta. Furthermore, during September, the high efficiency of 94 per cent was maintained despite the hurricane which caused
Civil Aviation in the United States

so much havoc in Florida. It will be recalled, in fact, that Florida Airways service was one of the few transportation systems in this region not put out of action by the hurricane. The mail planes were the first to establish communication with the storm area, carrying doctors, medical supplies, food, water, and at one time, actually transporting $2,000,000 in currency, probably the largest monetary shipment ever made by air in the United States.

The total scheduled mileage for 1926 was 289,440 miles of which, as already mentioned, 259,924 miles were actually flown. In addition, 22,084 miles were covered in special flying, such as that at the time of the hurricane, making a grand total of 282,908 miles without an accident of any kind. Approximately 13,200 pounds of mail matter were carried during this period. With passenger transportation starting on June 1st, 939 passengers were carried, exclusive of the company's employees, during the seven-months period to December 31st. While not actually solicited, express matter was carried during the last five months of the 1926 operations. The loads in this class approximated 50 pounds per month, the rate being $1.00 per pound for the entire route, except between Miami and Fort Myers (100 miles), the rate for which distance was 50 cents per pound.

This flying record is all the more significant when it is recorded that there was not a single accident on the Florida Airways line during the entire nine months period of operation last year. The company actually did sustain the loss of one plane but this was in no way connected with its flying operations. On Sept. 18th, when the hurricane swept over Miami airport, one of the company's Ford-Stout monoplanes, after withstanding the storm for seven hours, finally was torn from its cement anchorage by the 120 mile gale and rolled about 500 yards across the field and dashed against some poles and was wrecked. Furthermore, but twelve forced landings were experienced during the entire operations, eight of which were due to mechanical trouble and four to bad weather conditions.

The schedule of the Atlanta-Miami service is as follows:

**Northbound**

<table>
<thead>
<tr>
<th>Leave Miami</th>
<th>7:00 a.m.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrive Ft. Myers</td>
<td>8:45 a.m.</td>
</tr>
<tr>
<td>Leave Ft. Myers</td>
<td>8:55 a.m.</td>
</tr>
<tr>
<td>Arrive Tampa</td>
<td>10:15 a.m.</td>
</tr>
<tr>
<td>Leave Tampa</td>
<td>10:25 a.m.</td>
</tr>
<tr>
<td>Arrive Jacksonville</td>
<td>12:35 p.m.</td>
</tr>
<tr>
<td>Leave Jacksonville</td>
<td>12:45 p.m.</td>
</tr>
<tr>
<td>Arrive Macon</td>
<td>3:40 p.m.</td>
</tr>
<tr>
<td>Leave Macon</td>
<td>3:50 p.m.</td>
</tr>
<tr>
<td>Arrive Atlanta</td>
<td>4:45 p.m.</td>
</tr>
</tbody>
</table>

**Southbound**

<table>
<thead>
<tr>
<th>Leave Atlanta</th>
<th>7:00 a.m.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrive Macon</td>
<td>7:55 a.m.</td>
</tr>
<tr>
<td>Leave Macon</td>
<td>8:05 a.m.</td>
</tr>
<tr>
<td>Arrive Jacksonville</td>
<td>11:00 a.m.</td>
</tr>
<tr>
<td>Leave Jacksonville</td>
<td>11:10 a.m.</td>
</tr>
<tr>
<td>Arrive Tampa</td>
<td>1:20 p.m.</td>
</tr>
<tr>
<td>Leave Tampa</td>
<td>1:30 p.m.</td>
</tr>
<tr>
<td>Arrive Ft. Myers</td>
<td>2:50 p.m.</td>
</tr>
<tr>
<td>Leave Ft. Myers</td>
<td>3:00 p.m.</td>
</tr>
<tr>
<td>Arrive Miami</td>
<td>4:45 p.m.</td>
</tr>
</tbody>
</table>
That the Florida Airways service proved a marked success may in part be judged by the fact that during the nine months of flying, the cost of operation was reduced by 51.8 per cent. However, not being connected by air with the Trans-Continental route the service always lacked much business that might otherwise have come to it had it been able to supply direct air connection with all other parts of the United States as can the other air mail feeder lines. Accordingly, at the instigation of the Post Office Department, the Florida Airways suspended its operations on December 31st, awaiting the installation of lighting by the Department of Commerce for night flying and the opening of the New York to Atlanta air mail service during the summer of 1927, which will, in conjunction with the operations of the Florida Airways, provide direct air transportation between Florida and New York and thence to all other parts of the country.

Clifford Ball

The contract for C. A. M. No. 11, Cleveland, Ohio, to Pittsburgh, Pa., has been awarded to Clifford Ball of Pittsburgh.

The schedule and date service is to begin had not been determined at the time this is written.

Colorado Airways

The Colorado Airways, Inc., of Denver, Colo., holds the contract for the carriage of mail by air over C. A. M. No. 12, Pueblo, Colorado Springs to Cheyenne, Wyo., via Denver, Colo., a distance of 199 miles. Both passengers and mail are carried over this route, the company's equipment including three Ryan M-I monoplanes equipped with Hispano-Suiza engines, one Ansaldo (Spa engine), four Standards (Hispano-Suiza), two NJII's (Hispano-Suiza) and two Woodson Expresses (Hispano-Suiza). Under the direction of Anthony F. Joseph, president, the company operates from a 40-acre fully lighted field in Denver under lease, and there maintains three large hangars and a complete repair shop. In addition to carrying the mail, the Colorado Airways carries on a considerable amount of other flying coming under the general heading of aerial service, including aerial photography, and has, during the past year, flown approximately 100,000 miles and carried 2,000 passengers, exclusive of pilots.

Ex. Sunday
5:30 a.m. Leave Cheyenne, Wyo.
6:55 a.m. Denver, Colo.
7:50 a.m. Colorado Springs Colo.
8:30 a.m. Arrive Pueblo, Colo.

Ex. Sunday
Arrive 7:15 p.m.
6:00 p.m.
5:05 p.m.
Leave 4:15 p.m.
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Stout Air Services

Early in 1926, W. B. Stout, designer of the Ford-Stout plane, realizing the possibilities of air transportation, organized the Stout Air Services, Inc., and started operations after the award of a mail contract (C. A. M. No. 14) on Aug. 2nd, 1926. The service carries passengers as well as mail and express, and the flying equipment consists of two Ford-Stout all-metal monoplanes with Liberty engines, each capable of carrying eight passengers and 200 pounds of mail or express.

The company operates from the Ford Airport at Dearborn, where hangar and complete overhaul and repair facilities are leased, and from the Grand Rapids Municipal Airport, the latter being one of the most up-to-date airports in the country.

The scheduled mileage for the five-months period of operations under review was 27,974 miles. In addition, 334 miles were flown in ferry work and test flying. The operations are very completely portrayed in the following table:

<table>
<thead>
<tr>
<th>Miles Flown</th>
<th>Pounds of express carried</th>
<th>Passengers</th>
</tr>
</thead>
<tbody>
<tr>
<td>August</td>
<td>4,686</td>
<td>1,694</td>
</tr>
<tr>
<td>September</td>
<td>3,692</td>
<td>1,108</td>
</tr>
<tr>
<td>October</td>
<td>6,390</td>
<td>1,905</td>
</tr>
<tr>
<td>November</td>
<td>7,032</td>
<td>1,651</td>
</tr>
<tr>
<td>December</td>
<td>5,541</td>
<td>1,041</td>
</tr>
<tr>
<td><strong>27,341</strong></td>
<td><strong>7,399</strong></td>
<td></td>
</tr>
</tbody>
</table>

During the five months, August to December, 1926, only six trips were defaulted and one uncompleted, in spite of the fact that at least seventeen trips were made in fog and rain. Furthermore, during this entire period of operation there were but two forced landings made, one of which was due to mechanical causes and the other to weather conditions. There were, however, no accidents of any kind. The complete records in this connection are:

<table>
<thead>
<tr>
<th>Trips scheduled</th>
<th>Trips attempted</th>
<th>Trips defaulted</th>
<th>Trips uncompleted</th>
<th>Trips in fog or rain</th>
<th>Trips in rain weather</th>
</tr>
</thead>
<tbody>
<tr>
<td>August</td>
<td>31</td>
<td>31</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>September</td>
<td>24</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>October</td>
<td>43</td>
<td>43</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>November</td>
<td>47</td>
<td>46</td>
<td>1</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>December</td>
<td>46</td>
<td>41</td>
<td>5</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><strong>191</strong></td>
<td><strong>185</strong></td>
<td><strong>6</strong></td>
<td><strong>1</strong></td>
<td><strong>17</strong></td>
<td><strong>167</strong></td>
</tr>
</tbody>
</table>


(Top) Wright-Bellanco "Whirlwind." (Bottom) Wright Service Plane "Whirlwind."
Considerable importance is attached by Stout Air Services, Inc., to passenger traffic as will be realized by the numbers carried during the few months of operation last year. For the trip Detroit-Grand Rapids, a distance of 142 miles, the fare one way is $18.00 or a round trip for $35.00. Trips are made daily in each direction except on Sundays.

William B. Stout is president of Stout Air Services, Inc.; William B. Mayo, vice-president; Geo. M. Holley, treasurer; Glenn H. Hoppin, secretary; and Stanley E. Knauss, general manager. The following are the members of the board of directors: Chas. T. Bush, Geo. M. Holley, Stanley E. Knauss, W. B. Mayo, W. B. Stout, R. A. Stranahan, A. T. Waterfall.

P. R. T. Air Service

One of the most significant events of the year in air transportation was the opening on July 16th of the Philadelphia Rapid Transit Air Service, a passenger and mail service operating between Philadelphia and Washington, D. C. Earlier in the year Mr. Thomas E. Mitten, of Mitten Management, Philadelphia, had visited Europe and become so impressed with the air transport lines covering the entire European continent that he was convinced that, as a demonstration of the possibilities of this modern method of rapid transportation, an air service should be started out of Philadelphia in connection with the Sesqui-Centennial Exposition. Accordingly, with the cooperation of the Government, the service was inaugurated, and passengers and mail carried regularly on a schedule of two trips in each direction daily, using three-engine Fokker monoplanes with a seating capacity for ten passengers. The company promptly secured the contract for the carriage of mail between Philadelphia and Washington, C. A. M. No. 13.

At Philadelphia the Navy permitted the use of the flying field at the Navy Yard, and at Washington, a field. This field was named Hoover Field in honor of the Secretary of Commerce, and a passenger station and other facilities were installed.

From the outset the service became very popular, due to the tourist season and the unusual attractions of Washington and Philadelphia. Two planes were in constant operation and in September the service was extended to Norfolk, Va. (C. A. M. No. 15), and the Philadelphia-Washington service increased to three trips a day in each direction. For this purpose a third Fokker plane was added to the P. R. T. fleet.

Under the original schedule of two trips a day in each direction,
planes left Philadelphia at 9:30 a.m. and 1:45 p.m. and Washington at 12 noon and 3:30 p.m. The distance is 130 miles and the flying time was approximately one and one-half hours each way. The passenger fare was $15 one way and $25 for a fifteen-day round trip ticket. Passengers were permitted 30 pounds of baggage free and a charge of 25 cents per pound was made for excess luggage.

During the five months of its operation, the P. R. T. Air Service carried 3,695 passengers and could have carried many more had the service been operated upon a sufficiently large scale, thus demonstrating that the passengers can be made comfortable and that the public will use the airplane for transportation purposes when the service is operated regularly along popular lines of travel. During the season 93,770 miles were flown in regular service, without even a minor mechanical failure. Every engine on every plane functioned perfectly at all times. Out of a total of 688 trips scheduled, 75 were cancelled because of adverse weather conditions, although such interruptions could have been avoided had the route been adequately supplied with weather reporting facilities and radio beacons.

A most significant feature regarding the operations of the P. R. T. Air Service is that, in spite of the fact that the revenues were insufficient, the Mitten Management at the conclusion of the experiment was convinced that regular air transportation for passengers, mail, and express could be operated at this time upon a sound commercial basis. One of the outstanding conclusions arrived at was the fact that the transportation of passengers and merchandise provided about 50 per cent of the total operating cost. The carriage of mail in large quantities under Government contract, supplementing the above, should increase revenues sufficiently to make the operation profitable, and this, the management was drawn to believe, was a perfectly feasible thing to expect.

The results of the P. R. T. operations are best visualized in the following statistics which relate to the Philadelphia-Washington and Philadelphia-Norfolk service during the period between July 16th and Nov. 30th, 1926:

**SCHEDULE**

*Southbound*

<table>
<thead>
<tr>
<th>Leave Philadelphia</th>
<th>8:30</th>
<th>10:15</th>
<th>3:30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrive Washington</td>
<td>10:00</td>
<td>11:45</td>
<td>5:00</td>
</tr>
<tr>
<td>Leave Washington</td>
<td>10:15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arrive Norfolk</td>
<td>12:00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Civil Aviation in the United States

Northbound

| Leaves Norfokk | ........................ | ........................ | 1:30 |
| Arrive Washington | ........................ | ........................ | 3:15 |
| Leave Washington | 8:45 | ........................ | 2:00 | 3:30 |
| Arrive Philadelphia | 10:15 | ........................ | 3:30 | 5:00 |

Kaess Aircraft Engineering Corp.

The contract for C. A. M. No. 16, Akron, Ohio, to Louisville, Ky., via Columbus, Dayton and Cincinnati has been awarded to the Kaess Aircraft Engineering Corporation, Amityville, N. Y.

The schedule and date service is to begin had not been determined at the time this chapter is being written.

Ryan Airlines

Ryan Airlines, Inc., has the distinction of being one of the oldest passenger air transportation companies in the United States, in addition to having been in the aerial service field for a number of years. On March 1st, 1925, the company opened its air passenger line between Los Angeles and San Diego, a distance of 120 miles, upon a daily round trip schedule. This service is the more interesting since it has been carried on independent of an air mail contract.

In addition to running the airline which is used extensively by Los Angeles and San Diego business men, a large number of pas-

Ludington Lizette.
sengers on short flights and in aerial taxi service are carried, to­
gether with aerial photography and mapping.

Ryan Airlines, Inc., with R. F. Mahoney, president and J. B.
Alexander, vice-president, operates a large well equipped flying field
at San Diego at which many students are trained each year. On the
Los Angeles-San Diego air service, the equipment employed is:
One Ryan Cloudster (Liberty) with cabin accommodation for ten
passengers; three Ryan Standards (Hispano-Suiza—150 h.p.) with
cabin accommodation for four passengers; one Ryan Brougham
(Wright E-2) a cabin modification of the M-1, with accommodation
for three passengers, and three Ryan M-1 monoplanes (Hispano-
Suiza—150 h.p.) with accommodation for two passengers. The fare
for the journey between San Diego and Los Angeles by air is $17.50
one way and $26.50 return, and during the last year 5,616 passengers
were carried by the company, which number includes those carried
on taxi service, etc. The company's planes flew 75,690 miles during
this period.

Other Operators

In addition to these routes carrying domestic mail, two contracts
have been in effect for a number of years carrying foreign mail, one,
New Orleans-Pilottown, 80 miles, and the other Seattle-Victoria, 84
miles. Service over these two routes has been successfully main­
tained, the former operated by the New Orleans Airline and the lat­
ter by Edward Hubbard of Seattle. The New Orleans-Pilottown
service has been running since April 9, 1923, while the Seattle-Vic­
toria service has been in existence since Oct. 15, 1920.

At the time of writing, the Post Office Department is engaged
in receiving bids for the private operation of air mail service over
the two divisions of the trans-Continental air mail route which has
been run by the Government for seven or eight years. This is in
accordance with the Kelly Air Mail Act, discussed in last year's Year
Book and referred to in other chapters of this volume, looking to­
w ard the eventual retirement of the Government from the active
operation of all air mail routes.

Aerial Service

No country in the world has applied aircraft to as many different
uses or to the extent that we have in the United States. A very
diversified and interesting industry has been built up in the use of
airplanes and seaplanes. A multitude of different and valuable serv­
ices provide superior transportation to any other means or methods.
Civil Aviation in the United States

So important has this phase of commercial aviation become, that a definite name—Aerial Service—has been adopted in order to differentiate this class of commercial flying from air transport.

Aerial service is a collective term including all forms of commercial flying, ranging from aerial taxi work and passenger carrying to crop dusting, photography and survey by air, flying instruction, special aerial news service, and many others. The use of aircraft in these spheres has become almost indispensable as a saver of time and money and as a more efficient method of carrying out certain essential services.

The past year has seen a very considerable increase in the number of commercial aircraft operators. In 1925 the Aeronautical Chamber of Commerce obtained reports from 290 operators, whereas this year 420 reports have been received. Operators reported owning 676 airplanes in 1925, whereas the past year 969 commercial aircraft were reported in operation in aerial service work. These operators and their machines are scattered throughout the entire country from the Atlantic to the Pacific, and from Alaska to Mexico.

Looking into the statistics closely it is apparent that the past year has witnessed what may be a more economical and business-like operation of commercial aircraft. The number of passengers reported increased from 205,094 in 1925 to 380,201 in 1926. In addition to the passengers, 182,508 pounds of express matter were carried during 1926 by commercial aircraft operators. The total mileage reported for the year was 7,656,492, irrespective, as are all these statistics, of air mail operation over regular routes.

In these statistics are included the figures pertaining to a certain amount of private flying carried on by individual owners either for pleasure or for personal business. Airplanes are being used by increasing numbers of doctors living in the open regions of the country, by real estate operators, by commercial travelers and salesmen, and by innumerable others. The very large increases in the sales of newly designed commercial airplanes in the low-powered class are indicative not only of the extent of the demand but of the firm establishment of this phase of civil aviation upon a basis which enables the purchase of new and modern equipment in large numbers and the evident scrapping of quantities of obsolete war surplus aircraft that were in such wide use in aerial service operations a few years ago.

With little doubt the oldest aerial service operating company is the Curtiss Flying Service, a subsidiary of the Curtiss Aeroplane and Motor Company, Inc. This company had its origin in the pre-
war Curtiss Exhibition Company, and has since the war been among the largest commercial aviation organizations in the country, under the direction of C. S. (Casey) Jones, well-known throughout the entire country. During 1926, this company flew a total of 2,320 hours corresponding to approximately 175,000 miles, and of this, 2,060 hours or almost 90 per cent, was paid commercial flying. The flying time was distributed as follows:

<table>
<thead>
<tr>
<th>Paid Flying</th>
<th>“Unpaid” Flying</th>
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</thead>
<tbody>
<tr>
<td>Cross Country</td>
<td></td>
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<tr>
<td>Aerial Photography</td>
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<td>Passengers, carrying</td>
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<tr>
<td>Instruction</td>
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<tr>
<td>Student Solo</td>
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<tr>
<td>Miscellaneous</td>
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<tr>
<td>Total</td>
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<td>519 hours</td>
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<td>248 hours</td>
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<td>Total</td>
<td>2,060 hours</td>
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<td>266 hours</td>
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Curtiss Flying Service Equipment.

Cross country flying which, with the exception of instruction amounted to more flying hours than any other individual item, was the result of very large variety of flying projects including flights made with photographers covering important news events for news agencies and news reel organizations, all of whom now use aircraft regularly to cover important stories in all parts of the country.

Among the outstanding events covered by newspaper men and photographers may be mentioned the explosion at the Naval Arsenal at Dover, N. J., when reporters and photographers using airplanes were the only ones to bring back accurate reports of the damage
done and the progress of the relief work. Another outstanding event was following the death of Colonel Coolidge, father of the President, when photographs brought from Vermont by air were the only ones to arrive in time for use in the daily newspapers. Owing to the time of year, March, and the thick snow in the northern state, even though in New York the flying field was clear, it became necessary for all the machines to fly north carrying skis which were substituted for the wheel undercarriages at Albany where the snow was thin enough to permit a landing on wheels and yet thick enough to enable the planes to take off for the remainder of the journey north on skis.

Some idea of the diversified uses to which airplanes are daily being put in emergencies may be gained from the following individual items noted in the operations of the past year: A rush shipment of Golflex clothes was carried from New York to Florida. Three planeloads of Goodrich Zippers (overshoes) were flown from Bethany to New York when the February blizzards tied up all transportation.

A Florida Airways plane rushed $500,000 in gold to Miami bankers from Jacksonville in the emergency following the hurricane. A woman suffering from lockjaw was carried in a Naval seaplane from Hatteras Village, Va., a point remote from rapid transportation facilities, to a Norfolk hospital. Similar service was rendered a patient in Little Rock, Ark., in dangerous condition from gangrene. Antitoxin was rushed from New Brunswick to New York, where it made the mail plane, arriving in Chicago at 4:50 a.m., and was relayed from there to Little Rock by an Army plane. Food and supplies were at various times during the year carried by airplane to people on an ice-bound fishing tug on Lake Michigan, snowbound on trains in the Spanish mountains, and to stranded motorists in the desert region between Beirut and Bagdad.

Other diversified uses of aircraft during 1926 were the feeding of birds in the snow-clad mountains of Pennsylvania; sowing rice in marshlands of Manitoba, to bring wild ducks farther south during the rice season; surveying teakwood in the Philippines, by Navy flyers; patrol of uncharted waters in British Columbia, in which salmon poachers work with great cunning, eluding the motor-boat patrol; bringing from California of a number of birds entered in the Sesqui-Centennial poultry show; scouting for whales and schools of fish; and transporting payrolls to Mexican mining camps, as a precaution against bandits.

Late in the year plans were made by a large mining group in Africa for an aerial survey of northern Rhodesia. The most promis-
ing area is a tract of 22,000 square miles believed to contain valuable deposits of copper, and this region will be minutely photographed from the air to aid in the geological study. During August airplanes were used in the Red Lake gold fields of Ontario to carry prospectors. The journey from Hudson is six days by dog team; airplanes made the trip and return in three hours and a half.

Several thousand square miles of territory were mapped from the air and hundreds of students during the year were trained to fly. In the well organized companies there were no injuries whatsoever sustained by pilots, passengers or students during the year; in fact one such company has flown almost one million miles without a casualty, a record that compares favorably with any other means of transportation.

Among the larger aerial service operators may be mentioned the Ludington Philadelphia Flying Service and the Pitcairn Aviation Company, both of Philadelphia, Pa. Each of these concerns operates large fleets of commercial airplanes for passenger carrying and aerial service work. The Ludington Company, in addition to flying operations, is a distributor for Waco Airplanes, while Pitcairn manufactures airplanes in the low powered commercial class. Other large aerial service operators include Yackey, of Chicago; Robertson, of St. Louis; Ryan, of San Diego; and Varney, of San Francisco; the operations in the air transport field of the latter three are discussed in the section of this chapter devoted to air transport operations.

Crop Dusting: The dusting of cotton and other crops with insect poison distributed from airplanes was first experimented with and demonstrated by the Army Air Service, and has since become one of the most important fields of aerial service flying. The Huff Daland Dusters, Inc., the largest commercial company specializing in this work, has met with considerable success during the past year. Using a special type of dusting airplane developed by the company, and equipped with a Wright “Whirlwind” engine, this firm has dusted no less than 124,200 acres of cotton in Louisiana, Georgia, Mississippi and North Carolina, in addition to other crops and plants, including a large number of peach trees.

Early in 1927, Huff Daland Dusters, Inc., received a large order from the Peruvian Government to dust more than 50,000 acres of cotton in the Canete and Chincha valleys of Peru. This ambitious program will protect practically all the cotton grown in Canete Valleys and a great deal of that in the Chincha Valley against the boll weevil, involving an estimated saving of $500,000.
Aerial Photography

Previous to 1926, new technical developments and applications of aerial photography followed each other in rapid succession. This resulted in a generally accepted commercial product which renders a dual service. Oblique aerial photographs have opened a wide field of application through advertising service and local study. Vertical photographs, or aerial photographic maps, have given great impetus to engineering development. The 100 per cent detail of these maps, their accuracy, and the great saving in time and money effected by their use as compared with ground methods, proves that aerial photographic surveying is a practical and economical engineering service.

The Fairchild Aerial Surveys, Inc., of New York City, number as part of their large clientele, public utilities, hydraulic, and railroad companies. Further proof of the practicability of aerial survey lies in the fact that this service has been demanded by engineers of national reputation.

The Fairchild Company has employed a generous policy during 1926, whereby its compiled engineering data on aerial surveys have been available to the general public. As a result, the public has become insistent on a stabilized price, quantity and speed of delivery. This forced all companies to turn their attention to the economic production of a high quality product, which in turn necessitated refinement of methods and greater efficiency in production; and it has the final result of standardizing the product with the desired quality of appearance and finish.

If comparative figures for the whole industry could be secured, they would be most interesting, but this is obviously impossible. However, Sherman M. Fairchild, president of the largest and best known concern in the business, has said that each successive year has shown a marked increase over the preceding year, and that during 1926 an increase of 20 per cent over 1925 in volume of business was secured.

Another development during the year 1926 has been a realization on the part of the smaller and under-financed concerns of the necessity of associating themselves with firms which have the necessary equipment and organization to undertake mapping projects of large magnitude, and during the latter part of the year the benefits of such associations had already been felt.

Oblique photographs are, as the term implies, photographs taken with the camera held at an angle over the side of the plane; and the use of this form of aerial photograph for the illustration of
various projects will be readily apparent. During the last year many writers have used aerial photographs for illustrations in text books, especially those of Geology, Geography and History. The appreciation of the value of this type of illustration in teaching will probably result in many of the leading schools using greater numbers of aerial pictures and lantern slides within the next few years.

A steady increase has been noted in the use of oblique views for advertising by various industries, realtors, etc.; and today keen executives use these views to a great extent in plant-layout studies.

By far the greatest development of the year 1926 has been the demand for aerial photographic maps covering large areas. In the past, individual municipalities have contracted for aerial surveys for the purpose of city planning and zoning, tax equalization study, parkway and traffic study, etc.; but during 1926, entire countries have been mapped, indicating the trend of public needs in regional planning, rather than the simple solution of problems in individual municipalities.

Aerial photography is one of the most extensively practiced of
Civil Aviation in the United States

aerial service operations, a very large number of airplane operators making the use of the camera a definite feature of their work. So extensive are these operations that it would be almost impossible to formulate definite statistics of the amount of work done in this sphere, for only the larger of these operators keep accurate account of their activities for future reference.

A typical example of the extent of aerial survey and photography in this country may be cited in the work of Hamilton Maxwell, Inc., of New York City, a company the business of which is purely in the operations end, and is not concerned with the manufacture of equipment, nor even, and this is somewhat exceptional, does this company operate its own airplanes. These are secured with the services of the pilot from airplane operators in the vicinity in which the photographic work is to be carried out. During 1926 the Hamilton Maxwell Company mapped 1,240 square miles of territory (at an average scale of one inch to 800 feet), while at the close of the year orders were in hand for the photographing of 360 square miles more. This work included twenty-three separate mapping contracts, the largest of which was the aerial surveying and mapping of Pinellas County, Fla., including all the Keys and underwater formation, the entire area amounting to approximately 550 square miles. The total sales of this company during 1926 amounted to $100,000 approximately.

In this country practically all contour maps have been made by the use of aerial photographs or line maps made from them as plain table sheets. By their use in this way a great saving in time is effected as it is not necessary for the surveyor to measure his horizontal distances. This is the method used by the United States Government and by the Fairchild Aerial Surveys, Inc.

In Germany during the past couple of years several processes have been developed for obtaining the contours directly from the photographs. They all depend on the fact that two pictures of the same territory taken from different positions will not scale the same over the entire picture and from this difference in scale the elevation can be computed.

In this country during the past several years, the firm of Arthur J. Brock, Inc. of Philadelphia, have been working on precision methods and equipment for utilizing this principle. A firm has been incorporated to carry out the methods, known as Brock and Weymouth. Several maps have been made in which the contours have been put in from the photographs. In this type of work as in any other, a certain amount of ground control is needed, the amount needed to be determined by the accuracy in the resulting map.
The leading German method—the Hugershoff method and apparatus—is being imported into this country by the Fairchild Aerial Surveys, Inc. This apparatus will be demonstrated to the Geological Surveys this June.

The United States Government has expressed a policy toward commercial aviation in no uncertain terms, realizing that in a sound system of commercial flying lies a great potential force in the national defense. The Government has realized that competition with private enterprise in developing commercial aviation, particularly in the field of aerial service, would be very detrimental to sound progress. Too much emphasis cannot be laid upon the importance of this non-competitive policy being strictly maintained. There have been indications of infractions of this policy which, if permitted to continue, will result most seriously to the disadvantage of progressive and sound development in commercial aviation.

**Aircraft in Sport and Personal Uses**

In the automobile field the pleasure car has become the backbone of the industry, and on the water the yacht and motor boat, small craft capable of being operated by a small crew, have become popular. In aviation considerable discussion is taking place on the possibilities of the privately owned sport and pleasure craft. The public has long demonstrated its profound desire for small personal vehicles of transportation. In the development of aircraft for civil purposes, therefore, many expect in the not distant future to see the airplane and seaplane used by the general public as vehicles of private ownership and operation. In fact there is evidence of what may be termed the era of private sport flying already in sight.

Statistics for 1926 indicate that the number of airplane owners who maintain their machines for purely sport and pleasure purposes is growing. The details further indicate that the ownership of private airplanes and seaplanes is by no means made up of the young dare-devil type of youth, but that men of mature age and experience are giving thought to the pleasures to be derived from flying, and furthermore, to the advantage derived from the regular use of aircraft in commutation and in other business traveling. Among those who now possess airplanes which they maintain for their own personal pleasures and business traveling may be mentioned: Horace and John Dodge, of Detroit, Mich.; William B. Stout, of Detroit, Mich.; Henry DuPont, of Wilmington, N. J.; William Burke, Okmulgee, Okla.; Frederick Ames, Boston, Mass.; R. W. Judson, president, Continental Motors Corporation, Detroit.
Civil Aviation in the United States

Mich.; G. M. Williams, Indianapolis; James Otis, San Francisco; Earl D. Oehorn, of New York City; Harold Vanderbilt, New York City, and Vincent Astor, New York City. These names are sufficiently well known to give a clear indication of the possibility of aircraft coming into extensive private use for purely personal pleasure or convenience.

However, eyes cannot be closed to certain inherent drawbacks to the use of airplanes for sport and pleasure flying, not the least significant of which is the necessity of flying always from a suitable flying field which may or may not be conveniently located for the owner pilot. Because of the simplicity attached to the ownership of the private automobile, pleasure cars have grown popular, but as yet this cannot be said of airplanes, although there is no reason to suppose that developments will not change the present conditions.

The extensive popularity of motor boats and yachts, however, suggests that the privately owned seaplane probably will become very popular and largely used in the near future. The conditions of maintenance are similar for motor boats and seaplanes. Both are usually kept in commission only in the summer, and the scope of the seaplane is, perhaps, even broader than that of the motor boat. Motor boating and yachting have their joys, but flying partakes of these and added pleasures. Never was greater freedom given the sportsman than in flying, for the aerial tourist knows no bounds. Already there are well over 3,000 flying fields and airports spread over the country and those cities which have not already established municipal flying fields have progressive citizens who are rapidly taking cognizance of the growing civil use of airplanes and advocating the establishment of landing facilities for their respective cities and at country clubs.

The popularity of the airplane and seaplane for private ownership will grow with the technical developments, but carefully considered opinion would indicate that it is yet too early for the hazarding of broad statements as to the future.

Aircraft in Exploration

Land or water, mountain or plain, forest or prairie have little influence upon aircraft when in flight; and it was to be expected, therefore, that the explorer would soon recognize in aviation a means whereby his work might be more easily and effectively met than by the land or water transportation. The year 1925 saw the first application of aviation to the problems of exploration and dis-
(Top) Geo. B. Foster, Miss Lucette Mayer, Allan Jackson, Col. Paul Henderson lunching on initial flight of Ford-Stout three motored all metal transport shown at bottom.
Civil Aviation in the United States

covety. In that year no fewer than three expeditions were successfully advanced towards a satisfactory conclusion with the aid of aircraft, and these three served adequately to establish the possibilities of heavier-than-air aircraft in exploration either in the heat of the regions near the equator or in frigid Arctic.

As recorded in the 1926 Aircraft Year Book, the Brazilian expedition led by Dr. A. Hamilton Rice was very materially assisted by the aerial observations and photographs taken from the Curtiss Seagull flying boat flown by Lieut. Walter Hinton, which accompanied the party up the Amazon River. The year 1925 also saw the successful use of Loening Amphibian airplanes in the Arctic regions with the MacMillan expedition; and in the same year, Amundsen and Ellsworth attempted a Polar expedition in two Dornier Wahl monoplane flying boats.

Encouraged by the experience already gained, explorers during 1926 looked upon aviation with even greater confidence. The Detroit Aviation Society sent Capt. George Wilkins to Alaska. Bases at Fairbanks and at Point Barrow were established for one single-engine motored and one three-engine Fokker monoplanes in an attempt to discover land which is believed to exist between Point Barrow and the Pole.

The expedition was not attended with complete success although a great amount of flying in ferrying gasoline from Fairbanks to Point Barrow was accomplished. That faith in the use of aircraft in polar flying was not shaken by the shortcomings of the first attempts, however, is shown by the fact that another expedition under Capt. Wilkins will again leave for the North early in 1927, taking with them two Stinson Detrioter machines in addition to one of the Fokkers which remained at Fairbanks during the winter.

But as shining examples of the success which can attend the use of aircraft, both lighter and heavier-than-air, in Arctic exploration, the brilliant flights of Commander Byrd from Spitzbergen to the North Pole and back in a Fokker monoplane equipped with three Wright “Whirlwind” engines, and of Amundsen and Ellsworth from Spitzbergen across the Pole and on to Teller, Alaska, in the Italian airship Norge, are without parallel.

Furthermore, the recent return of the Stirling expedition from New Guinea where a search has been made into the living conditions and habits of a strange race of Pigmies living in the tropical fastness of that unexplored country brings with it glowing accounts of the valuable assistance rendered the expedition by the Yackey Transport airplane which patrolled ahead of the land party all the way and reported the state of the terrain and gave advance information on the
possibilities of the ground party meeting hostility and other difficulties.

With this wide field of possible use of aircraft in exploration comes the probability of aircraft opening up an entirely new and as yet untried aspect of discovery. Reference is also made to the suggestion, grounded on sound authority, that aircraft may be expected to prove of the very greatest value to archaeological research in which the wide, all-inclusive view of the earth obtained at high altitudes makes possible the location of the remains of hidden structures, even of whole cities, of ancient civilizations by means of the topographical markings and other indications, which can best, and in fact in some cases can only, be seen from the air and recorded by aerial photography. The future of aircraft in exploration, discovery and archaeological research may be expected to be very important along lines already tried, and in ways and spheres as yet unthought of.

**A Forecast**

While the wide possibilities of civil aeronautics assure a great future for commercial aviation, no American commercial air transport company has as yet had sufficient general operating experience to express in concrete terms definite estimates of future business. At the same time it is apparent from the operations of the Government air mail service that there is an increasing demand for greater air mail facilities from all parts of the country. The extensive use which has already been made of the air mail, in spite of the complicated system of rates and zoning, indicates the extent of this demand. Furthermore, in cases where the contract feeder lines have not been patronized to the maximum, it has been due to the fact that the schedule maintained or some other alterable factor has failed to offer real advantage in saving time or other service. Proof of this may be found in the vastly increased use made of the Government operated Trans-Continental line when the night service was inaugurated between Chicago and Cheyenne, thus enabling the mail to go right through from New York to San Francisco without any delay due to nightfall. Further proof is to be found in the extensive use of the New York-Chicago division on the inauguration of the over-night service which enabled the air mail to provide real service between these two centers, not possible when the route was flown only by day.

These indications all point, therefore, to the need for night flying facilities on all airways; and the work of the Airways Division of the Aeronautics Branch, Department of Commerce, will make
night flying more universal, and will, therefore, very materially affect
the future of air transportation.

While the demand for air mail facilities is well established, the
exact field for air transportation in other spheres is not yet entirely
disclosed. Passenger-carrying operations in this country have been
distinctly limited, and there has been, to date, no regular transpor-
tation of express by air.

Both these fields present very favorable possibilities, and it is
reasonable to expect with the taking over, during the present year,
of the Trans-Continental route by private companies that express
and passenger traffic will be promptly developed.

Obviously the transportation of passengers or express by air
will be of greatest value over long distances in which the total
capsed time for air transportation is markedly less than in the case
of the railroad or waterways. The Trans-Continental route, divided
as it is into two divisions, presents, therefore, the best conditions
for the extension of air transport to include the carriage of express
and passengers. Under Government operation, such extension of
the service has been impossible, but with the Trans-Continental air
mail route in operation by private enterprise, the outlook for air
express and passenger service is excellent. Any operator venturing
in this field, however, will need an air mail contract before attempt-
ing to extend operations to include these services. Fortunately Con-
gress has authorized the Postmaster General to contract for the
transportation of mail by air on terms which will yield satisfactory
revenues and warrant responsible and experienced operating com-
panies undertaking the work. The Post Office Department, reflect-
ing the wishes of the public and the mandate of Congress, will
recognize that their primary responsibility in transferring these Gov-
ernment lines will be to demand that the contractor in each case
be representative of the highest type of moral and financial re-
sponsibility together with seasoned operating experience.

The air mail postage rate is about to be changed from the sys-
tem of zone rating to a standard of ten cents per half-ounce regard-
less of distance. This will greatly simplify its use and it is reason-
able to suppose that air mail patronage will promptly increase.
The new rate in the majority of cases will work out as a reduction;
and this fact, together with the marked simplicity in determining
the necessary postage on a given piece of mail, is bound to pro-
duce this result.

In reply to a request for the expression of an opinion on the
results that may reasonably be expected from the institution of the
new rates, postmasters in many large cities throughout the country
have advised the Aeronautical Chamber of Commerce that the traffic will undoubtedly show a substantial increase within a very short time.

The present air mail system has been built up in the main by the addition of feeder line routes to the trans-continental service. These lines have resulted from demands for air mail service made by the cities along the routes, based upon representations of business-producing capacity, as indicated by the quantities of first-class mail matter. Other routes will, it is reasonable to suppose, come into being in the near future, and among those already proposed are:


Air mail service has now become an established part of the transportation system of the country and it is bound to increase. With it as a basis, passenger and express transportation by air are logical corollaries.

The crucial and final test in the future development of the Air Mail Service in this country will come during the current year when the Government turns over these main lines—the Trans-Continental and Overnight Chicago-New York—to private contractors. If this vital transition is carried out with the full realization on the part of everybody of the fact that the success of all of the air mail operations of the country will depend absolutely upon the functioning of this main artery and that every opportunity for its successful maintenance must be taken, then there can be no doubt that the service will be carried out, extended, and greatly improved.
AIRWAYS OF THE UNITED STATES. No. 1, Boston-New York, Colonial Air Transport; No. 2, New York-Boston, United Airlines; No. 4, Salt Lake City-Los Angeles, Western Air Express; No. 5, Pasco-Elko, Walter T. Ford Motor Company; No. 8, Seattle-Los Angeles, Pacific Air Transport; No. 9, Chicago-Twin City, Kaess Aircraft Corp.; No. 12, Cheyenne-Pueblo, Colorado Airways; No. 13, Seattle-Victoria, Edgerton; No. 16, Detroit-Grand Rapids, Stout Air Service; No. 17, New York-Philadelphia, National Air Transport; No. 19, New York-Chicago (Night), National Air Transport; No. 20, Chicago-San Francisco, Western Air Express; No. 21, San Francisco-Los Angeles, Western Air Express; No. 22, Los Angeles-Seattle, Western Air Express; No. 23, Salt Lake City-New York, United Airlines; No. 24, Chicago-Los Angeles, Western Air Express; No. 25, New York-Chicago, United Airlines; No. 26, Chicago-Minneapolis, Northwestern Air Transport; No. 27, Boston-New York, Colonial Air Transport; No. 28, New York-Boston, United Airlines; No. 29, Salt Lake City-Los Angeles, Western Air Express; No. 30, Pasco-Elko, Walter T. Ford Motor Company; No. 31, Seattle-Los Angeles, Pacific Air Transport; No. 32, Chicago-Twin City, Kaess Aircraft Corp.; No. 33, Seattle-Victoria, Edgerton; No. 36, Detroit-Grand Rapids, Stout Air Service; No. 37, New York-Philadelphia, National Air Transport; No. 39, New York-Chicago (Night), National Air Transport; No. 40, Chicago-San Francisco, Western Air Express.
No. 2, Chicago-St. Louis, Robertson Aircraft Corp.; No. 3, Chicago-Dallas, National Air
Varney; No. 6, Detroit-Cleveland, Ford Motor Company; No. 7, Detroit-Chicago,
es, Northwest Airways; No. 10, Atlanta-Miami, Florida Airways; No. 11, Cleveland-
ward Hubbard; No. 14, New Orleans-Pilottown, Arthur E. Cambas; No. 15, Cleveland-
York-Atlanta, Pitcairn Aviation; No. 18, New York-Chicago (Day), National Air
rancisco, Boeing-Hubbard.
CHAPTER III.
GOVERNMENTAL AVIATION

As generally known, and as previously indicated in Chapter I of this volume, the principal aeronautical activities of the Government are concentrated in the Departments of War, Navy, Post Office and Commerce.

The Post Office Department is now about to retire from the field of aeronautical operations. Having furnished the greatest demonstration of the practicability of commercial air transportation in the world, the Postmaster General, in response to the wise policy laid down by President Coolidge, has decided to turn the operation of all the air mail lines over to private operators. This will be done as soon as contracts with responsible, experienced operators can be let. This policy means the withdrawal of the Government from actual flying operations. Their work in this field during the past ten years will always be recognized as one of the most important contributions to the development and ultimate success of commercial aviation.

Other departments of the Government having a special interest in aviation are: the departments of Agriculture, Treasury, Labor and Interior, as will be noted elsewhere in this chapter.

Patents and Design Board

With the gradual broadening and increase of interest in aviation throughout the various departments of the Government, there has been an increasing tendency toward centralization or more complete coordination of these activities. This tendency was evidenced, as previously noted in Chapter I, by the appointment of the Joint Sub-Committee of the Military and Naval Affairs Committee of the House, for the purpose of considering certain aspects of the Five Year Program Bill. As a result of the recommendations of this Joint Sub-Committee, the Law, as finally enacted, created a Patents and Design Board, consisting of the Assistant Secretaries for Aviation in the Departments of War, Navy, and Commerce, to carry out certain definite provisions of the Act as previously noted. The Board first met and organized on October 12th, 1926, and up to the end of the year had considered many designs and patents submitted by inventors.
Officer and Governors of the Aeronautical Chamber of Commerce of America, after conference with President Coolidge on December 22nd, 1926. They are (left to right, front row) Frank H. Russell, Vice President, Curtiss Aeroplane and Motor Co., Inc.; Charles L. Lawrence, President, Wright Aeronautical Corp.; Paul Henderson, President Aeronautical Chamber of Commerce of America and General Manager, National Air Transport, Inc.; Samuel S. Bradley, General Manager, Aeronautical Chamber of Commerce of America; Fred B. Rentschler, President, Pratt and Whitney Aircraft Corp. (Back row) Owen A. Shannon, Assistant Secretary, Aeronautical Chamber of America; Charles H. Colvin, President, Pioneer Instrument Company; J. F. Meade, General Manager, Aerial Service Corp.; Frederick Hume of New York; and Lester D. Gardner, President, Gardner Publishing Co.
Advisory Air Coordinating Committee

In line with the policy of cooperation between all agents of Government air activity, a committee, known as the Advisory Air Coordination Committee, was constituted on Oct. 6th, 1926, by order of the Secretary of War, the Secretary of the Navy, and the Secretary of Commerce. This committee is composed of the Assistant Secretary of War for Aeronautics, F. Trubee Davison; the Assistant Secretary of the Navy for Aeronautics, Edward P. Warner; and the Assistant Secretary of Commerce for Aeronautics, William P. MacCracken, Jr. Its duty is to recommend to the Secretaries of War, Navy and Commerce general policies relating to the coordination of the air activities of the Government, supplementing the work previously carried on by the Aeronautical Board dealing primarily with tactical problems. The Committee had several meetings during the last three months of 1926 and considered various problems relating to the bringing together of governmental aeronautical activities, but did not submit any formal recommendations.

Aircraft in the National Defense

The tremendous significance which aviation holds in the defense of any modern nation is becoming increasingly more apparent throughout the world. The importance which the United States in particular attaches to aeronautics in the scheme of national defense may best be understood by the outstanding legislative measures enacted by Congress during the past year, as previously noted in Chapter 1 of this volume. Furthermore, owing to the inherent nature of aeronautics as a new rapidly growing art, the air services of both the Army and the Navy have among their basic duties, in line with national defense, the actual development of aeronautics in all of its phases. Whether in the technical development of equipment, experimental work, or field work in tactical operations, both the Army and the Navy are responsible for a tremendous amount of what can only be regarded as genuine research work of the very greatest significance and importance. And it is in this development work that the two air services differ so greatly from all other branches of the Army and Navy.

Of such great importance is this development work and so greatly is it interrelated between the two services, that from the very earliest days, it was realized some co-ordinating link should be provided. This has been made possible in the past as above stated, through the agency of the Aeronautical Board. In June, 1924, this board, which had existed for some eight years, was reorganized. For the first
time a definite precept was assigned and its jurisdiction and mission made clear. The purpose of the Aeronautical Board is to prevent duplication of effort and to secure a more complete measure of cooperation and coordination in tactical operation. The board is required to investigate and study all major questions affecting jointly the development and employment of these two Services. In January, 1927, as this is being written, the above was amended somewhat, in view of the establishment of the offices of the Assistant Secretary for Aviation in the War, Navy and Commerce Departments, by the issuance of executive orders establishing the Air Coordinating Committee referred to in a previous paragraph.

Specific questions requiring the action of the Aeronautical Board are: (1) policies and plans for the tactical and strategical employment of aircraft; (2) the location of air stations; (3) assignment of development of new types of aircraft, engines, accessories, and weapons to the Army and Navy, respectively; (4) rendering available to either Service, whenever possible, training, repair and other aviation facilities; (5) plans to prevent competition in procurement and to provide for the use of surplus material; (6) consideration and recommendation in regard to all estimates for appropriations for the aeronautical programs of the Army and the Navy. (Further details on the Board are given in the Appendix).

Another joint aviation activity of the Army and the Navy is to be found in the Helium Board, the constitution and personnel of which is included in the Appendix. The Army and the Navy share the helium resources of the United States. During the year 1926, 7,157,354 cubic feet of helium of average purity equal to 94.6 per cent were produced and a new production plant was nearly completed. One of the major problems which has confronted both the Army and the Navy in regard to this gas, has been its transportation for service purposes. During the year, a helium tank railroad car was developed and accepted by the Government to meet this demand. It has a capacity of 208,000 cubic feet of gas under pressure of 2000 pounds. In addition, the Army has developed a helium purification unit mounted on a railroad car. This equipment is now in operation and has a capacity of 5000 cubic feet per hour and may be run continuously. The importance of this development may well be realized in its relation to the possibility of mobile observation balloon units, for example, being in a position to purify gas in transit.

The Army Air Corps

With the passage of the Army Five Year Aviation Program Act to which reference has already been made in an earlier chapter, the
(Top) Navy Curtiss Hawk with Pratt & Whitney "Wasp" engine. (Bottom) Hawk as a Seaplane with Curtiss D-12 engine.
former Army Air Service changed its name to the Air Corps in line with other changes in its organization and personnel. The executive personnel in Washington and at other stations, consists almost without exception of qualified pilots, a condition which may be regarded as extremely satisfactory as materially enhancing the efficacy of the Corps in service activities.

Provision for three brigadier generals, two of whom shall be flying officers, greatly strengthened the corps. As now organized with Major-General Mason M. Patrick as Chief, J. E. Fechet as Assistant Chief in charge of the Training and Operations Divisions, W. E. Gilmore, in charge of Materiel Division, Dayton, Ohio, and Frank P. Lahm, in command of the Training Center at San Antonio, Texas, the important work of the Air Corps is being directed and carried on most effectively.

On December 31st, 1926, the Air Corps personnel consisted of 969 officers and 8,256 enlisted men, who, together with the Reserve Corps, put in during the fiscal year 1926, an aggregate of 160,507 flying hours in heavier-than-air craft, and 3,874 hours in lighter-than-air. These figures are in addition to Flying School hours and Airways Division flying. The statistical details are as follows:

**Fiscal Year 1926**

<table>
<thead>
<tr>
<th>Heavier-than-air:</th>
<th>Flying Hours</th>
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<td>Advanced Flying School</td>
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<td>Total flying hours, National Guard</td>
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<table>
<thead>
<tr>
<th>Lighter-than-air:</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Total flying hours, Regular Army</td>
<td>3,874</td>
</tr>
<tr>
<td>Balloon and Airship School</td>
<td>2,139</td>
</tr>
</tbody>
</table>

*Pan-American Flight:* During the year the Air Corps of the Army launched a long distance flight around South America looking to training and massing of flying experience as the definite objective. The famous Around-the-World flight of 1924 may be regarded as the primary undertaking of this nature. As a second major undertaking in this field, five Army Air Corps Loening Amphibian Airplanes left Kelley Field for San Antonio, Texas, on Dec. 21st, 1926, on the first stage of a flight through Central and South America. The route to be followed is down the West Coast of South America, across the Andes, to the Atlantic, returning along the East Coast of South America and the principal islands of the West Indies. This flight will cover approximately 18,500 miles and
includes stops in every country of South and Central America. Complete details of the Pan-American Flight and its organization will be found in the Chronology Chapter of this volume.

_Army Model Airways:_ The Model Airway Section of the Army Air Corps has done notable work pioneering in this field. The experience and practice of the Airway Section had already been taken advantage of very largely by the Post Office Department in laying out Air Mail Routes; and now, with the transfer of all the commercial airways, the Aeronautics Branch of the Department of Commerce is in turn in a position to take advantage of their accumulated experience, including the Bulletins covering landing fields and the preparation and printing of strip maps.

_Aerial Photography:_ In the design and development of aerial photographic equipment, the Air Corps through the Engineering Division at McCook Field, in collaboration with the manufacturers of aerial photographic equipment in the industry, have made substantial and commendable progress during the past year. The general details of this work are noted elsewhere in this volume. However, aerial photography for military purposes is in many particulars so different from commercial photography that the progress which it has recently made deserves special reference. As applied to specific military needs the most notable achievement has been the development of a long distance camera, especially designed for making oblique photographs from extreme altitudes. This camera has been installed in a special super-charged airplane flying at an altitude of 30,000 feet over Dayton, Ohio, for the purpose of taking a photograph of the City of Detroit, Mich., over 200 miles away. This camera makes an exposure on a 9"x9" negative with a special 9" lens having a focal length of 36".

_General Technical Development:_ The above and many other phases of the technical development work of the Air Corps cannot be overestimated. The value of this work not only to military aviation, but to the general development of efficient and safe flying in all of its spheres is very great. During the year 1926, nearly one million miles were flown by McCook Field pilots in testing experimental aircraft. Many of these tests involved long cross-country flights, also altitude flights to determine the ceiling or maximum altitude of super-charged airplanes, and to accustom pilots to the use of liquid oxygen. In one flight with a super-charged pursuit plane the 200 miles between Dayton and Detroit were covered in 70 minutes, at an altitude of four miles, to demonstrate the speed possibilities of super-charged aircraft at high altitudes. That the
latter performance is not only of tremendous military, but also of commercial significance will be promptly appreciated.

**National Guard**

Owing to the authorization during 1926 of two additional Observation Squadrons, a total of sixteen Observation Squadrons and thirteen Photographic Squadrons are now included in the organization of the National Guard. Further extension of air activities in the National Guard is intended, in view of the contemplation by the War Department of a plan of Divisional Air Services, consisting of one Observation Squadron and one Photographic Squadron for each of eighteen authorized National Guard Infantry Divisions.

National Guard pilots maintained flying operations at the maximum permissible under the budget during the year 1926. Flying training was extensive, the pilots of fifteen squadrons (one unit not complete) averaging 75 hours 11 minutes each in the air at their home stations during armory drill year, in addition to the time put in during the annual fifteen-day encampment. All squadrons held at least forty-eight “armory drills” during the year where all the missions common to the rôle of a Division Air Service were practised.

During the two weeks of intensive field training, 110 pilots qualified on service type airplanes, though a lack of service equipment prevented the qualification of many others. Five squadrons held their encampments at regular Army stations, while the remainder stayed at their own airdromes or with the ground troops of their respective divisions. At the latter encampments, a number of missions in cooperation with the ground troops were satisfactorily performed. One squadron, Indiana’s, rendered effective service when called upon for assistance by the Governor during labor disturbances in the State.

The past year saw the delivery of the first standard observation airplanes to National Guard Squadrons, the beginning of the program aiming at the replacement of all obsolete aircraft in the National Guard. A new schedule of equipment provides three standard service type and five advanced training type airplanes for each Observation Squadron of the Guard. One standard Air Corps observation plane was delivered to each of the thirteen older squadrons during the year, and judging by orders now placed with manufacturers, there will be available during the year 1927 enough equipment to complete the issue of three service airplanes to each of the sixteen squadrons. Furthermore, funds to be made available July 1st, 1927, by Congress will provide for five advanced training planes
(Top) Vought Corsair as seaplane. (Bottom) Corsair Land Plane. Pratt & Whitney "Wasp" engines.
for all units. Thus, it seems that the end of the day of obsolete flying equipment in the National Guard is at last in sight.

Bureau of Aeronautics U. S. Navy

With the passage of the Navy Five-Year Program Act, to which reference has already been made in a previous Chapter, provision is made for procurement of 1,614 airplanes during the five-year period, at a cost not to exceed $85,078,750. The Act also contemplates after the fiscal year 1931 the constant maintenance of 1,000 useful airplanes in the naval service.

The Act has clarified the status of air personnel in the Navy, the beneficial effects of which, however, will not be fully realized until the next fiscal year. The increase in the number of naval aviators has been slow but constant and in order to improve this condition a program of training four classes per annum at Pensacola has been evolved.

A course of aviation instruction for all midshipmen was added to the curriculum of the Naval Academy. The class graduating in June, 1926, went to the fleet as officers trained in the rudiments of aviation. In addition, these officers, in the year following their graduation, will receive further aviation training in special classes at both San Diego and Hampton Roads. The effect of this will be to provide that all future naval officers will not only be seamen but airmen. This most important and wise addition to the training of cadets and officers is the direct result of the educational work and leadership of Rear Admiral W. A. Moffett, Chief of the Bureau of Aeronautics.

On July 1st, 1926, there were 426 naval aviators, 71 student naval aviators, 14 line ground officers, 129 staff ground officers, 11 naval observers, 19 officers having flight orders, making a total of 670. On the same date the enlisted personnel had been increased over the previous years. Training of aviation pilots has now been definitely placed on a program and calls for assignment of enlisted personnel to classes in such numbers that will bring the proportion of aviation pilots up to 30 per cent of qualified personnel by July 1st, 1928. On July 1st, 1926, of a total of 3,877 men, 1,722 had aviation ratings.

Flight operations in heavier-than-air craft for the year covered 103,518 flights for naval aviation, aggregating 73,576 hours. For the Marine Corps there were 16,913 flights aggregating 9,652 hours. In lighter-than-air there were 2,674 flights, aggregating 750 hours, making a grand total of 123,105 flights, totalling 83,979 hours.

Routine flying operations have been extensive and, although the
past year did not bring forth any spectacular flights, the performances of naval aircraft have been noteworthy. Typical of the class of flying carried out so extensively may be mentioned the flight of VT Squadron 1, which returned to its home station at Hampton Roads, Va., after a year's flying with the fleet, including taking part in bombing practice at Guantanamo Bay, Cuba, without a single forced landing. This was but one of many similar routine flights carried out by naval aviation squadrons in line of duty. No more impressive sight—characteristic of air power in the national defense—could have been witnessed than the flight in March, 1926, of VD Squadron 3, including eighteen planes, flying fifty miles at sea off Guantanamo Bay to welcome the Commander-in-Chief on the U. S. S. Seattle. The planes flew in three six-plane step-up formations with Admiral Magruder flying his flag from the Squadron Commander's machine.

No better idea of the prominent part played by aviation in the operations of the Navy can be gained than from the actual statistics of miles flown by naval aircraft during the past year. Excluding all lighter-than-air operations, naval aircraft operating from flying fields flew a total of 4,032,456 miles during 1926. At an average speed of, for example, 100 miles per hour, this represents approximately 40,324 hours in the air. However, of even greater interest, because of the necessity of aircraft going to sea with the fleet, is the figure of the total mileage of naval aircraft, heavier-than-air, at sea, operating from ships. This total amounts to 2,607,647 miles during 1926, which, on the basis of 100 m.p.h. average speed, indicates no fewer than 26,976 hours in the air operating from ships at sea with the fleet.

In addition to these figures, 1,128,104 miles were flown during 1926 in cross-country or cross-water flights of one kind and another, thus adding up to a total of 7,768,207 miles flown by naval heavier-than-air craft during the past year.

The problems of the development of naval aviation are, perhaps, among the most complicated phases of service flying. Aviation, as a part of the Navy, must go to sea with the Fleet on all naval missions and be able to operate from the Fleet. These requirements present complications which are peculiar to naval aviation and it is this aspect of specialization which is responsible for the experimental and development work which forms so large a part of naval aviation activity.

Heavier-than-air naval aviation may, for the purposes of discussion, be divided into four classes, namely, long distance patrol flying; scouting, bombing, and torpedo work, which are treated col-
lectively; high speed pursuit flying and fighting; and training. In each of these classes the Navy, during 1926, made considerable progress. In all cases, however, the pre-eminent necessity has been that designs of aircraft and methods of operation should be especially adapted to the needs of the surface fleet.

In line with this policy are the two new aircraft carriers, the U. S. S. Lexington and the U. S. S. Saratoga, both of which were launched in 1925, the former to be completed by December, 1927, and the latter by July, 1927. The Lexington will accommodate the following complement of aircraft: two squadrons of VT-VS-32 planes, six VO observation planes, and thirty-six VF fighting planes. The Saratoga will be equipped with the same number of planes except that there will be twelve VO operating planes. The details regarding flight deck, equipment for launching, arresting, refueling and servicing aircraft on these ships are confidential.

The propulsion of these carriers, which are of 33,000 tons each, will be by steam furnished by sixteen oil-burning boilers. Four 35,200 kilowatt turbine generators giving forth 180,000 h.p., will supply current direct to eight propulsion motors which are directly connected in pairs to the four propeller shafts. The speed of the ships will be 33.5 knots and each will be provided with armament consisting of four eight-inch twin mounts, and twelve five-inch anti-aircraft guns. Elevators will be installed between flight decks and hangar decks. The total complement of each ship will include 1,962 officers and men.

In line with the construction of these vessels, the Bureau of Aeronautics has been following a definite program of development work in the respective classes of aircraft which are to be placed aboard these new aircraft carriers. Detailed consideration of this technical development will be found in the chapter on Technical Development.

Owing to the fact that the aircraft carrier is a capital ship and is, therefore, somewhat limited in its field of action as a mobile parent ship for aircraft, it has been necessary to devise means whereby individual units of the Navy such as battleships and cruisers might be provided with airplanes for use as auxiliaries. This problem has not only necessitated the careful consideration of compactness in the design of naval aircraft, but has led to concentrated attention being given to the development of the catapult whereby individual planes may be shot off the decks of such ships.

For years the United States has led in the development and use of catapults and the past year has seen the production of an entirely new type of catapult which can handle much larger planes than
(Top) Catapulting a Loening Amphibian. (Bottom) Vought Seaplane leaving catapult
previously possible. The new catapult employs a charge of gun-
powder as the motive force to the carriage in place of the mechan­
isim employed in the smaller types. The launching, in this way, of
the largest airplane ever to be catapulted was rendered possible as
a result of the development of this “powder” catapult, as it is termed.
The machine was a Loening Amphibian three-passenger observa­
tion plane. The method has now been reduced to practice, render­
ing it possible for ships other than carriers, to take large aircraft
to sea for patrol and scouting work.

At the end of 1926 there were in the United States Navy twelve
battleships equipped with one catapult each, and ten scout cruisers
each equipped with two catapults. This represents, with little doubt,
the largest number of what might be called “aeronautically” equipped
warships in the world, and places the United States Navy in the
lead in this particular.

That the Navy has developed catapulting to a point beyond the
experimental stage was well illustrated during the Australian cruise
of the United States Navy, when Light Cruiser Division 2, exer­
cising as a division during the entire cruise, catapulted aircraft on
signal with great success and under the most severe conditions.
This is significant as one of the very first occasions on which catapult­
ing entered into the regular routine of naval operation at sea.

Compactness of design and all factors which lead to compactness
in maintenance, it has been said, are among the paramount neces­
sities of naval aviation. This has been responsible for the reduc­
tions made in the number of types of naval aircraft and the standard­
ization of design practices and of engine types. Furthermore, with
a view to reducing the number of spares necessary and for other
reasons which have been indicated by the Navy, the air-cooled engine
is being adopted as standard in all classes and the endeavor is to
develop in each power class an air-cooled engine suitable for naval
use. For some years the Navy has been well provided for in this
respect as regards the lower powers, but the past year has seen the
development to a state of service practicability of an air-cooled power
plant in the medium power class, and considerable progress has
been made in the production of suitable air-cooled engines in the
high power category. This development work while being carried
out primarily for naval requirements is proving of the greatest value
in other spheres, both military and commercial.

In the lighter-than-air field, activity other than that of a routine
nature was very largely at a standstill during 1926 owing to the
fact that legislation designed to provide for the replacement of the
Shenandoah was pending and was not passed until well into the
1926-27 fiscal year. This legislation authorized the construction of two six-million cubic feet rigid airships but did not appropriate any money for these ships. The Bureau of Aeronautics, however, devoted all of the limited resources at its disposal toward the necessary preparation work prior to advertising for bids. This was done early in 1927 after a comparatively small amount of money had been appropriated for starting the work on one of these airships. In addition, during the year, a contract was let for the construction of a small experimental all-metal rigid airship of entirely new design.

The first of the six-million cubic feet ships should be completed within three years. In the meantime, the Los Angeles, which has a capacity of 2,472,000 cubic feet, will continue to be employed as a flying laboratory for experimental and development work in airship design and operation. In pursuance of this work during the year, marked improvements were made in the methods of handling airships on the ground and into and out of hangars. Furthermore, considerable experimental work has resulted in the formulation of very definite ideas regarding the most suitable form of mooring mast for large rigid airships, and it is likely that the results of these investigations will take material shape in some new construction work when adequate funds are made available. It should be pointed out also that increased quantities of helium gas will be available for lighter-than-air work in the future as a result of the stimulus imparted by increased appropriations for helium development.

Marine Corps

The aviation organization of the Marine Corps, operating under the authorization of the Commandant, Major General John A. Lejeune, and Major Edwin H. Brainard, consists of:

First Aviation Group, Marine Barracks, Quantico, Va., comprising five squadrons and one balloon squadron, designated as two observation squadrons, two fighting plane squadrons, one service squadron and one kite balloon squadron.

Second Aviation Group, United States Naval Air Station, San Diego, Calif., comprising two squadrons, one observation and one fighting.

Observation Squadron 2 with headquarters at Port au Prince, Haiti.

Scouting Squadron 1, with headquarters at Sumay, Guam.

On Sept. 1st, 1926, the Marine Corps Aviation units at Quantico, Va., were designated as “Aircraft Squadrons, East Coast Expeditionary Force,” and the units at San Diego, Cal., as “Aircraft Squadrons, West Coast Expeditionary Force,” and under these designations extensive flying operations were carried out.
During the year, the Quantico units made 12,104 flights with a total of 5844 hours in the air. This station maintains an observation school for the training of Marine Corps officers as naval observers and enlisted men as aviation pilots. The flying operations consist of tests and training, gunnery and bombing, cross-country and reconnaissance work, and extensive photographic work. The Quantico station carries out important aerological work and is, in fact, one of the recognized stations of the U. S. Navy weather service.

The work at the San Diego station is similar to that at Quantico, and consists of extensive training, practice, and photographic work, and survey flying.

During the year, several trans-continental flights were made very largely for the purpose of ferrying aircraft. Among these were the flights from Quantico to San Diego of six Boeing FB-1 fighters, five DH observation machines and one Douglas OD-1 observation plane, and that of two Loening Amphibians from Washington, D. C., to Port au Prince, Haiti.

Characteristic of the high standard of Marine Corps flying, was the award of the 1926 Schiff Trophy for safe flying to an officer of the Marine Corps, Aircraft Squadrons, West Coast Expeditionary Force, San Diego, Cal., for having flown during the fiscal year 1925-1926 no fewer than 839 hours without a single accident.

CIVIL AERONAUTICS ACTIVITIES

While placing the responsibility for the encouragement and regulation of commercial aeronautics in the Department of Commerce launched the Government into very extensive civil aeronautical activity, the Government has for a number of years been actively interested in flying, in connection with the work of many of its civil departments.

Many of these activities will continue unaltered, while in other cases the new order has resulted in consolidation. Thus, for example, the Aeronautics Branch, as previously noted, has completely taken over from the Post Office Department the maintenance of aids to navigation on the Transcontinental Airway.

On the other hand, the bringing of aeronautics into the field of activity of Mr. Hoover's already most versatile and efficient Department has resulted in several bureaus and divisions of this Department which previously had no aeronautical interest now numbering civil aviation among their activities. Mention may be made, for example, of the taking over of the installation and maintenance of all lighted airways by the Bureau of Lighthouses, acting under the Aeronautics Branch in respect of this section of its work.
To outline a picture of the civil aviation activities of the Government, it is necessary to discuss, individually, the work and scope of each department so engaged.

Department of Commerce
Aeronautics Branch

Under Assistant Secretary of Commerce for Aviation, William P. MacCracken, Jr., the Aeronautics Branch will carry into effect the provisions of the Air Commerce Act of 1926, the details of which have been discussed in earlier chapters. The Aeronautics Branch includes three divisions: namely, the Air Information Division, the Air Regulations Division, and the Airways Division.

Air Information Division.—This division is in charge of the compilation of foreign and domestic air traffic statistics; foreign and domestic air accident data; progress reports; articles and press releases; airport, airway and other bulletins; the dissemination of airway strip maps; foreign and domestic industrial data, and correspondence in response to inquiries on all phases of civil aeronautics. Because of the importance of the circulation of accurate data and information on aeronautics, the Information Division is one of the most important sections of the new branch.

Air Regulations Division.—Under the jurisdiction of this division comes the regulation of civil aeronautics in the United States. Therefore, the activities of this Division have aroused the widest interest from civilian operators. The Division is charged with the identification of aircraft, licensing of aircraft as to airworthiness, licensing of pilots and mechanics, establishment and enforcement of air traffic rules, rating of air navigation facilities, and the investigation of accidents. The Division includes a field service consisting of inspectors who will assist in carrying out the work outlined above and will travel, in many cases by air, inspecting aircraft and pilots, and generally enforcing the regulations through the country. Under the Air Regulations Division comes also the Medical Examiner in Washington and authorized doctors in various parts of the country to whom pilots may go to receive medical certification.

Pilots receive an identification card and a license when they have satisfactorily passed their medical, piloting and intelligence tests. The license is renewable periodically depending upon the class in which the license has been issued. These classes include the Air Transport pilots' license, Limited Commercial pilots' license, the Industrial pilots' license and the Private pilots' license, and each calls for different qualifications.

Aircraft are registered in classes according to weight and are
provided with a license, which is placed in a holder in the passengers' cockpit or cabin of the machine, if it is a passenger plane, or elsewhere in other cases. In addition to this license, there is issued an identification plate, which must be placed in a convenient place on the outside of all aircraft in the United States, whether engaged in interstate commerce or not. This plate bears the name of the aircraft, its type and an identification number supplemented with larger marking on the wings of planes.

**Airways Division, Bureau of Lighthouses.**—This division selects and establishes intermediate landing fields, and installs and maintains lighting equipment and other aids to navigation on established airways. The field service consists of airway extension superintendents, an associate railway engineer and mechanic, caretakers and other personnel. This Bureau is also engaged in the establishment of radio aids to air navigation in close cooperation with the Bureau of Standards.

**Bureau of Standards.**—For many years the Bureau of Standards of the Department of Commerce has been engaged in carrying out research work in all fields of engineering. In this work aeronautical research has long been given an important place, and with the creation of the Aeronautics Branch their aeronautical work has greatly increased, in line also with extensive radio experimentation, notably in the investigation of the possibilities of the radio beacon.

**Mapping Section; Coast and Geodetic Survey.**—The first use made by the Coast and Geodetic Survey of the Department of Commerce of aerial photographs for mapping purposes was in 1920. In March of that year an Army airplane photographed the outer shore line of the coast of New Jersey from its southern limit, Cape May, to within a few miles of Sandy Hook. From these prints a revision of the shore line on the charts of the New Jersey coast was made. Later a cooperative project by the Coast and Geodetic Survey, the Corps of Engineers of the Army and the Naval Air Service, for the mapping of the Mississippi Delta was successfully carried out. Such maps were needed by the Corps of Engineers of the Army in connection with studies of the growth of the delta. The delta had never previously been mapped because of the difficulties of the terrain.

Again, in 1925, the Navy cooperated with the Survey in the mapping of Lake Okeechobee, Fla., the naval planes taking photographs covering the shores of the lake. In 1926 the Army Air Corps also began a cooperative project along the west coast of the Florida peninsula. The photographing of the Ten Thousand Islands along the southern portion of that coast is now approaching completion.
While the primary work of the Coast and Geodetic Survey concerns the surveying of the navigable waters of the United States and its possessions and the publication of data for the use of mariners, under the Air Commerce Act of 1926 the Department of Commerce has added airway mapping to their work. The Army Air Corps and the Engineers Corps of the Army are completing their series of fifty-one air maps and are relinquishing further work to the Department of Commerce. This work will include the publication of a series of strip maps, of which several have already been issued by the Air Corps. These maps will cover the most important airways of the country and are being arranged with sufficient overlap to provide a continuous airway series. A complete list of strip maps already available will be found in the Appendix.

Bureau of Fisheries.—In the past, the Bureau of Fisheries of the Department of Commerce has made use of aircraft in patrolling fishing grounds both for the purpose of cooperating with fishermen by locating from the air shoals of fish and directing the surface craft, and in the enforcement of fishery laws. The past year saw no new developments in the application of aircraft to the Bureau’s activities. The use of aircraft has always been in the nature of experiments and while they have continued to prove the value of aircraft for aid to the fishing industry, the practical use of aircraft in this field has not become general. It is also of interest to note that during 1926, the Provincial Fisheries Department of British Columbia used aircraft in their patrol work.

Consideration has been given to the possibilities of using seaplanes in patrolling the waters of southeastern Alaska to enforce the fishery laws and regulations. The Bureau of Fisheries planned to secure the cooperation of the Navy during 1927 with a view to securing a plane to patrol the fishing grounds during the weekly closed period. This, however, is expected to be impossible owing to the fact that Navy does not intend to continue its Alaskan survey this year and will not, therefore, have airplanes or seaplanes available in the vicinity of the Alaskan fishing grounds at the time required.

The Board of Surveys and Maps.—While not attached to any one department of the Government, it will be appropriate here to discuss the work of the Board of Surveys and Maps of the Federal Government. The board was created by executive order of Dec. 30th, 1919, for the purpose of making recommendations to the several departments or to the President, for coordinating all map making and surveying activities of the Government and to settle all questions at issue between executive departments relating to surveys and maps. Meetings are held at stated intervals, to which representatives of the
map-using public and the Aeronautical Chamber of Commerce are invited for conference and advice.

A central information office has been established in the United States Geological Survey of the Department of the Interior, for collecting, classifying and furnishing information concerning all map and survey data available in the several Government departments and from other sources. The Board has twenty-two members representing Government departments and nineteen alternates.

Many of these agencies use aircraft in their work. Privately owned photographic planes have been utilized and it is hoped and expected that a greatly increased proportion of aerial photographic work for governmental bureaus will be carried out by the aircraft industry.

The outstanding developments from an aeronautical point of view of the Board of Surveys and Maps during the calendar year 1926 are, first, the adoption of the report of the Photographic Committee, embodying methods of utilization of aerial photography in the production of maps and charts; and second, the adoption of a set of standards to be used in the production of maps and charts for aerial navigation.

The Post Office Department

The United States Post Office Department, under the direction of Postmaster General Harry S. New, and Second Assistant Postmaster General W. Irving Glover, has played no small part in the placing of America in the high and impressive position which it now holds in the development and practice of commercial aviation. The Post Office Department early realizing the tremendous potential possibilities of aviation in speeding up the mail and thereby materially quickening the nation's business began to experiment in the carriage of mail by air in 1918. So energetically has this policy of development work been pursued that today the Trans-Continental Air Mail Route stands as the greatest airway in the world.

The trans-continental airway from New York to San Francisco is 2,669 miles in length, of which the 2,045 between the eastern terminus and Salt Lake is equipped for regular night flying service, the remainder of the route also being lighted for the purpose of providing for delayed schedules. Day in and day out, post office mail planes have flown this route for the past eight and a half years, and for the past two and a half years post office night mail planes have flown the New York-Chicago overnight route. Rain or sunshine, fog or wind, snow or sleet, the post office planes have gone
through, maintaining in remarkable fashion, their daily and nightly schedules. The reported performance for last year on the trans-continental shows a flown percentage of 93.58 on a total of 1,860,190 miles flown. The over-night service from New York to Chicago set up a record equally impressive. Traveling a total of 432,083 miles, a percentage of performance of 93.33 was set up over the twelve months period, Jan. 1st-Dec. 31st, 1926. More significant, however, than even these figures is the fact that the highest individual monthly performance percentage was maintained, not in the daytime operations but by the overnight service. In July the daylight service set up its highest record of performance for the year, the figure being 99.51%. In July also, the overnight service set up its highest record for the year with the almost unprecedented figure of one-hundred per cent performance—45,226 miles scheduled and 45,226 miles completed to schedule. Such is the efficiency of operation of this greatest of all night airways.

A review of the extremely interesting figures on the air mail operations during the year 1926, published in the Appendix in full, also reveals a growing tendency on the part of the public of the United States to make use of air mail facilities. The report shows a steady increase month by month during the year, reaching the peak load in December, 1926, with a total of 2,003,026 letters, and a yearly total of 17,345,060 letters.

These records of performance, equalling and at times surpassing those of many far older forms of transportation, are the results of the work of pilots who have no superiors in the world. Typical of the flying ability and steadiness of all the pilots was the record of Shirley J. Short, a pilot on the Cleveland-Chicago leg of the overnight service, who flew, between July 1st, 1923, and Nov. 30th, 1926, without mishap of any kind, 2160 hours and 14 minutes on scheduled flights, in all kinds of weather and all hours of the day and night on numerous types of airplanes.

Contract Air Mail: With the creation by Congress of legislative authority, the Post Office Department has greatly extended the scope of air mail facilities by the establishment of a number of feeder lines to the trans-continental route. During the latter part of 1925 and the year 1926, contracts were let for operation on sixteen feederline air mail routes and the majority of these services have been put in operation as discussed in Chapter II of the Year Book. The aggregate mileage of the contract air mail routes is 4759 miles and a total of 4,428,772 miles are scheduled for operation each year.
The close of 1926 saw the issuance of advertisements by the Post Office Department for bids on the operation of the trans-continental and overnight New York-Chicago routes. As this is being written (January, 1927), a contract has been let for the Western Division of the trans-continental to the Boeing Airplane Company of Seattle, Wash., in co-partnership with Edward Hubbard, who has for some years been operating the mail service between Seattle and Victoria, B. C.

Another highly significant step taken by the Post Office Department during the latter part of last year was the initiation of steps for standardizing the air mail postage rate with a view not only to reducing the cost of air mail, but of eliminating the already existing practice of "zoning" air mail matter. The new rate of 10 cents per half-ounce scheduled to go into effect on Feb. 1st, 1927, is expected to bring about a marked increase in the use of air mail facilities throughout the country.

The Post Office Department is now retiring from the field of air mail operations, and private enterprise will, if given an opportunity under wise and constructive administration of contracts for air mail, advance the high standard of operation and performance set up by the Post Office Department.

The Coast Guard

Five airplanes were authorized under the provisions of the First Deficiency Act, 1926, for the use of the Coast Guard in enforcing the laws of the United States and in performing the many other duties with which the Coast Guard is charged. Although as far back as 1916 Congress authorized the establishment, equipment and maintenance of aviation stations by the Coast Guard for the purpose of saving life and property along the coasts and to assist in the national defense, and provided for the instruction of Coast Guard personnel, no provision was made for the procurement of aircraft until the passage of the Act of March 3rd, 1926, to which reference has been made.

In 1920 an abandoned naval air station at Morehead City, N. C., was placed in commission by the Coast Guard with six planes loaned by the Navy, but as no specific appropriation was made for its maintenance, it was discontinued in January, 1922. During the period of the operation of this station by the Coast Guard, many important and valuable duties were performed, notable among which was the location of derelicts and vessels in distress in the rough waters between Cape Hatteras and Cape May.
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The Coast Guard now owns five modern planes, namely, three Loening OL-5 Amphibians with inverted Liberty engines, and two Vought UO-4 single pontoon seaplanes with Wright J-5 Whirlwind engines.

Two of the Amphibians and one of the Voughts are stationed at Coast Guard Section Base No. 7, Ten Point Island, Gloucester, Mass., while the remaining two machines are established at Section Base No. 9, Cape May, N. J. An engine repair base is also maintained at Cape May.

The airplane has become a definite integral part of the Coast Guard Service for use in all phases of its work. In rescue work they have proved to be of the greatest value in locating wrecks and guiding rescue boats, saving time, property and life. The airplane, because of its wide cruising range, has proved of importance in lookout and patrol work and daily patrol routes, and schedules have been established.

In the enforcement of the Eighteenth Amendment, the utility of aircraft is beyond question and planes have been employed in the spotting of rum-runners and their auxiliary craft, and they have to their credit a number of important arrests.

The National Advisory Committee for Aeronautics

The National Advisory Committee for Aeronautics was established by act of Congress in March, 1915, charged with "the supervision and direction of the scientific study of the problems of flight with a view of their practical solution, the determination of problems which should be experimentally attacked, and their investigation and application to practical questions of aeronautics." The Committee holds itself at the service of any department of the Government interested in aeronautics for the furnishing of assistance and information on technical matters relating to aeronautics, and in particular investigates and studies fundamental problems submitted by the War and Navy Departments with a view to their practical solution.

The National Advisory Committee for Aeronautics, whose membership includes, in addition to the respective heads of the Army and Navy Air Services, some of the most distinguished and experienced engineers and scientists in the country, carries out very extensive research work in aerodynamics and aircraft engine development, including a great deal of full-scale test work. In addition, the N. A. C. A. spreads aeronautical information, not only through the publication of results of its own investigation work but also of other work which comes to hand, and translations of a considerable
amount of foreign literature relating to technical aeronautics. Much of the Committee’s research work is carried out at its aerodynamic laboratory at Langley Field, Va., where there are wind tunnels and other apparatus used in aeronautical test work, including the variable density wind tunnel developed by the N. A. C. A. in which it is possible to overcome many scale effect corrections by testing aircraft models under conditions of high density amounting to as much as twenty atmospheres.

The universal value of the work carried out under the direction of the Committee cannot be overestimated. In the field of commercial aviation this work is coming into even greater significance. With a view to cooperating to the greatest possible extent with the aircraft industry in the investigation of problems relating particularly to commercial airplane design, the Committee held early in 1926 the first of a series of meetings in which members and representatives of the aircraft industry participated. At these meetings to be held from time to time, problems will be discussed with a view of obtaining a common field of activity involving the greatest cooperation and thereby producing the greatest progress.

The National Advisory Committee for Aeronautics has built up for itself an enviable reputation throughout the world as to the quality and import of its scientific work and opinion, in addition to having attained in this country the position of authoritative spokesman in all matters pertaining to aeronautical development and progress.

Department of Agriculture

Bureau of Entomology.—To the Department of Agriculture must be given credit for the first “crop dusting” ever undertaken. So valuable has this work become that it now forms one of the most important, useful and prosperous phases of aerial service. Originally, with the cooperation of the Army and the stimulus of the Aeronautical Chamber of Commerce of America, the Bureau of Entomology of the Department of Agriculture initiated a series of experiments to demonstrate the possibilities of dusting cotton crops from the air, and this work has now been reduced to practice. Supplementing these previous contributions to airplane dusting for boll weevil and cotton leaf caterpillar control, the bureau during 1926 carried out a series of experiments in the possibilities of extending the use of airplanes to control the cotton flea, with very satisfactory and encouraging results.

During the year practical dusting was extended under commercial operations, but with the cooperation of the bureau, to the control of
the sugar cane borer and to insects on tomatoes and other truck and
vine crops in Louisiana and the Southwest, as well as to the control
of fungus and other diseases of tomatoes and grapes.

With the cooperation of the Air Corps, an entirely new field was
opened up in the spraying of alfalfa fields in Utah, with a view to
exterminating the destructive alfalfa weevil. Three alfalfa fields
were selected for the preliminary experiments. In the report on
the experiments, the entomologist in charge of the work stated that
of the three fields dusted, only one, a small field near Riverton, was
sufficiently damaged to make the results of the treatment show up.
A week after this field was treated, an extended examination, made
by brushing the tops of the foliage with a 12-inch insect net, showed
in the untreated parts of the field an average of about 2,500 larvae
captured in each 100 strokes of the net, whereas the same number of
strokes in the treated part of the field gathered upon only from ten
to twenty larvae in all.

The entomologist states:

"This is the most nearly complete extermination of weevil larvae that I
have ever been able to obtain by any method and its success from the practical
point of view may be estimated when I say that we consider spraying effective
if it reduces the number of larvae in the field so that 100 strokes of the net
capture only 500 larvae. ... We feel that this operation lays the foundation
for a dependable and inexpensive method of controlling the alfalfa weevil in
regions where the acreages are so great that no land machine can cover the
necessary amount of ground in the required time."

Dusting is not limited only to the use of planes for the elimina-
tion of the agricultural pests, but from extensive tests it has been
found that insect infection of almost any nature can be treated by
airplane spraying. The possibilities of using planes for mosquito con-
trôle and Paris green applied as a dust was found highly effective in
destroying the larvae of the malaria-bearing mosquito. Usually the
surface film is found upon the water infected by these tiny insects.
Paris green although heavier than water will float, due to the sur-
fase tension, long enough to be taken up by the larvae along with
their food. Since only a minute quantity is required to kill each
larvae it is not necessary to actually poison the water. For this rea-
son fish are not injured, and there is little or no danger from the
drinking of treated water by domestic animals.

Proof of the value of airplane dusting is shown in the steady
increase of acreage where cotton dusting has been regularly employed.

In 1921 practically all the work was of the most elementary ex-
perimental kind but during 1922 with the increase of experimenta-
tion about 2,000 acres were effectively treated. In 1923 approxi-
mately 7,000 acres were covered; in 1924 from 15,000 to 20,000 acres; and in 1925 this was increased to 50,000 acres. During 1926 by employing 14 of the Huff Daland "Puffer" special cotton dusting airplanes, 100,000 acres were spread with calcium arsenate.

During 1926 considerable experimental work was carried out in the development of equipment best suited to the requirements of dusting, and an entirely new field of entomological research was opened up with the perfecting of a means whereby aircraft could be used for the gathering of insects in flight. It is of very great interest to know the occurrence of insects in the air. Owing to the extreme difficulties of collecting insects at altitudes, very meagre data have previously been available. Collections have been made from the sides of mountains and from lighthouses, but such methods are decidedly limited and in the former case, as least, the results are most inaccurate, since the close proximity to the side of the mountain introduces the possibility of the insects so collected not being taken at their natural altitude but having been blown up the side of the hill.

With the use of the airplane it was found possible to take insects from the air at definite altitudes and to conduct the experiments with a precision which will prove of the greatest value. Accordingly, a special form of collecting trap has been designed and is placed between the wings of an airplane, and a number of flights undertaken. In the design of the trap it was of the greatest importance to provide means whereby insects taken at one altitude would not become mixed with insects taken during the same flight at another altitude. Trays were designed which could be drawn individually across the aperture of the trap by the pilot, and left exposed for a definite period while flight was carried out at a predetermined altitude, after which the tray would be drawn into a collecting magazine and another put into place for collecting at a new altitude. These trays were covered with a thin coating of a mixture of castor oil and resin in order to hold the insects when they came into contact with the screen.

There were eighty-three flights undertaken in the course of these experiments during 1926, and several thousands of insects were collected. Altitudes ranged from ten feet above the surface of the ground to as high as 14,000 feet, and in every altitude that the trays have been exposed insects were taken.

Purely with a view to give some idea of the delicacy of these experiments and the value of the airplane in enabling this work to be carried out, the following examples of collections made in this way are given:
Three cotton-leaf moths (Alabama argillacea) were taken at altitudes of 1,000 ft. and 3,000 ft., two of the specimens being taken at the former altitude. A boll weevil (Anthomonus grandis) was taken at 1,000 ft. Two tarnished plant bugs (Lygus pratensis) were taken at 1,000 ft. and 2,000 ft. respectively. One honey bee (Apis mellifera) was taken at 1,000 ft.; one demoiselle fly at 3,000 ft.; numerous "balloon" spiders were taken at altitudes ranging from 10 to 8,000 ft.

The importance of this form of work which is rendered possible on an accurate scale only by the use of the airplane, cannot be overestimated.

Weather Bureau.—With little doubt the one most important aeronautical activity of the Department of Agriculture is to be found in its weather reporting service. The Weather Bureau has long been the center of weather information for the Army Air Corps and the Naval Air Service, each of which cooperated with the Bureau in the gathering of information for the purpose of formulating forecasts. At the same time, the Army and the Navy maintain individual weather service departments on a small scale for supplying their own specific needs and as nuclei for rapid expansion in time of war.

With the creation of the Aeronautics Branch in the Department of Commerce, the work of the Weather Bureau has been greatly expanded and many new reporting and observation stations have been established for the purpose of providing frequent reports which will eventually be available for all aircraft operators over the civil airways of the country. Additional upper air stations have been established and a system is being created by which, with the addition of radio service, an addition anticipated in the not distant future, it will never be necessary for aircraft to leave a terminal airdrome or intermediate field without the pilot or navigator of the machine being in complete knowledge of the weather conditions immediately ahead and at his destination.

Since the observational data obtained by the Weather Bureau and the Navy and Army for their respective needs are essentially similar, the collection of weather data from these three sources and the dissemination of this information by the Department of Commerce will result in a more general and effective use of weather information by airplane pilots, with a resulting decrease in flying hazards due to bad weather conditions.

The Bureau of Agricultural Economics has not made regular use of the airplane in crop reporting but past experiments have pointed the way. The suggestion that airplanes might be used in
crop estimating work, like every new idea, has brought varying reactions. The subject has been considered with respect to two of the important problems of crop estimating (a) the determination of yearly changes in acreage devoted to individual crops, and (b) the inspection of crops to note their relative condition during the growing season.

With respect to acreage determination, it is possible to obtain photographic cross-sectional records for a given State in successive years and derive a valuable index of change as to each major crop. This involves an expenditure of money and time for photographic supplies and, in the analysis of results, seems prohibitive. This possibility has, therefore, been discarded.

There remains the possibility of air travel for the visual inspection of crop conditions. When flying at low altitudes the opportunities for critical study are unsurpassed. The sweeping vision may encompass whole fields at a time, taking in detail and amassing impressions not possible from ground inspection. If the worms are present in numbers their presence is pretty certain to be revealed in the color and density of the foliage. In fact, the healthfulness of the crop, the cleanness of cultivation or weediness of fields, the moisture condition of the soil, and such more general factors as progress of farm work are readily apparent from the air.

The superior opportunities for observation offered by air travel depend upon several important factors. In the first place, in looking down upon crops all parts of a field pass in review at approximately the same distance from the eye and at the same speed. In viewing the field from a train or car this is not so. Secondly, the area which may be inspected in a given time by flying is enormously greater than by any other mode of travel. This is particularly important in times of extensive flood, wind, or hail damage, when ordinary means of travel are interfered with and when a rapid inspection by a trained observer would forestall many wild estimates of damage sustained.

While, as a matter of fact, very little use has been made of airplanes in crop estimation work, the field is there and it is reasonable to assume that flying will soon become more widely used in this and similar activities.

The Bureau of Public Roads of the Department of Agriculture has used the airplane in the making of mosaics to show the route of a proposed road and to ascertain over what territory the proposed road will travel. The Army Air Corps has provided the equipment and personnel, and the Bureau has provided the films and paid the cost of operation.
During the past year aerial survey has been made of a proposed new highway from Washington to Mt. Vernon, Va. The survey showed the old road as well as the territory over which the new road would have to be laid. Surveys have been made in Connecticut along the coast line, and again between Boston and New York in the vicinity of the Boston Post Road, in an endeavor to find a new automobile route to take care of the crowded travel of the old Boston Post Road.

At present a survey is being made in the neighborhood of New Orleans over terrain that would be very difficult to map or survey from the ground. The saving in time and money by using the airplane in these projects has been very satisfactory and future use of this means of mapping and surveying is contemplated.

Forest Service.—Airplanes were used during the past year in forest fire control work in much the same way as the year before. The appropriation was the same as in the previous year, namely, $50,000, and planes were used in California, Oregon, Washington, northern Idaho, and western Montana. With the exception of some weeks of patrol over the Klamath National Forest in California because of an incendiary outbreak, regular air patrol was not carried on but the planes were held in readiness for reconnaissance of large fires, the confirmation of reports from other sources, and flights after lightning storms, and when the atmosphere was too smoky for the effective detection of fire by observers on the ground. A new use of airplanes, developed first in 1925, was in transporting materials and dropping them where needed on the actual fire lines. Use was made of this practice during the past year to great advantage.

Five bases were used during the season—Mather Field and Griffith Park, in California; Eugene, in Oregon; and Seattle and Spokane, in Washington. The airplanes were furnished by the Army Air Corps, and the pilots and mechanics employed by the Forest Service. With the cooperation of the liaison officer detailed by the Air Corps and a number of Air Corps officers in charge of reserve officers' squadrons in the Army Ninth Corps Area, the pilots were selected from reserve officer candidates. Mechanics were obtained from a select list of ex-Air Corps enlisted men with extensive experience in the upkeep of the types of machines in use. Officers and employees of the Forest Service acted as observers when necessity arose.

The number of flights made for fire protection, exclusive of test flights, engine-change trips, and transfer of planes, was 429, and the aggregate flying time was 1,002 hours. This very considerable
amount of flying was carried out without accident to personnel, although four of the planes were put out of commission temporarily by forced landings on rough ground.

As an example of the extent of the use of aircraft in forest fire patrol work and its value, it is of interest to report that during the months of June to September, 1926, inclusive, a total of 245 new fires were discovered by airplane observers. In the total of 318 patrol flights made, 93,870 miles were flown, and an area of approximately 3,711.495 square miles was observed. Nine airplanes were used.

In the Northern National Forest District, with Spokane, Wash., as base, experiments were made with airplanes in other Forest activities such as extensive scouting work over the lodgepole pine area for bark beetle damage, some scouting over an area proposed for acquisition by the Government, and flights for the purpose of taking vertical photographs of the area covered by large fires.

**Department of the Interior**

**Reclamation Service.**—The Reclamation Service of the Department of the Interior is concerned with the reclamation and ultimate usage of public lands. Surveys must be made of all projects in order that the feasibility of such projects may be established.

In conjunction with the Army Air Corps, which provided the personnel and equipment, the Reclamation Service, in 1926, made aerial surveys of the Arrowhead Dam in the Boise, Idaho, project. These surveys have been most valuable and could not have been carried out in any other manner without the expenditure of very considerably more money; even then, officials aver, the surveys would not have been as complete.

Aerial surveys have also been made of the dam site for the American Falls and a considerable portion of the Columbia Basin as a part of the Yakima River project. It would have been almost impossible, because of its inaccessibility, to have made a survey of the latter by any other means except the airplane.

The use of the airplane has saved time and money for the Service and has made possible the completion of work which would have been almost impossible by ordinary methods. It is the general belief that the future will see even more extensive use of the airplane by the Reclamation Service.

**Federal Power Commission**

The United States Federal Power Commission is interested in all matters pertaining to the utilization of natural resources for the
making and transmitting of power. Preliminary surveys have to be made of the feasibility of every project, both private and Federal. Frequently, owing to the roughness of the terrain in the neighborhood of a project, it is both difficult and costly to secure an adequate survey, using ordinary methods.

The airplane has been used in many of these surveys. At present the Air Corps are making a survey of the Tennessee River in the neighborhood of Chattanooga for the use of the Federal Power Commission. This survey not only includes the site for proposed power plants and transmitting stations, but includes the neighboring territory through which power lines would have to be erected.

When private enterprise applies to the Federal Power Commission for a license to erect a power project, maps and plans have to be submitted in addition to financial and other statements. In many instances aerial maps and photographs are submitted to the Commission and these have proved to be of great value to the Commission in considering applications.
CHAPTER IV
AIRWAYS

MUCH has been written and printed in previous editions of the Aircraft Year Book and elsewhere by students of aviation, emphasizing Airways and their vital importance in the schemes of commercial aeronautical development. It is interesting therefore, to note that in addition to the opinions of those directly identified with aviation, many business men, thinking of aviation purely as a means of improved transportation, are also giving frequent expression to the need of the development of Airways throughout the country. Among the many such expressions, is the following by James H. Rand, president of the Remington-Rand Company, in a recent issue of the "Bulletin" published by the Kardex Institute of Business Education and Research:

"The handling of transportation for carrying on the commerce of nations is one of the greatest problems of civilization." Developments in commercial aeronautics give convincing proof that rapid transport over the airways of the country will have a marked significance in the commercial affairs of the near future.

It is not likely that transportation by air will compete with rail carriers on the basis of ton miles. That is neither logical nor in any way necessary. Aeronautics has a field of its own, and the great bulk of freight will continue in the same course it now travels. On the other hand, we have fresh proof of the importance of air mail service every day. And, with the establishment of airways and the fixing of regular schedules, passenger traffic is destined to increase.

"Business men all over the country are lending their support to this movement in order to assure the permanent establishment of commercial adjunct." (James H. Rand, president of Remington-Rand Co., in statement in Bulletin of Kardex Institute of Business Education and Research, Sept. 27th, 1926.)

The permanent establishment of commercial aeronautics means a great deal more than the straightforward operation of aircraft and the putting into effect of flying schedules. The United States Air Mail Service, recognized as a masterpiece in air transport operation throughout the entire world, has built up its enviable reputation by attention, not only to flying operations, but to ground organization. The old idea that an airway consisted merely of an imaginary air-line joining cities has been superceded by recognition of the fact that an air-way is on the ground—not in the air. The new Aero-
nautics Branch, Department of Commerce, defines an airway as:

"An air route between air traffic centers which is over terrain best suited for an intermediate landing, with landing facilities at intervals, equipped with aids to air navigation and a communication system for transmission of information pertaining to the operation of aircraft. The term 'Airway' may apply to an air route for either airplanes or seaplanes, or both." From this definition, it will be very apparent that an airway, in every sense of the term, is far more than a mere air line. It is, in fact, a very material and permanent structure, laid out with the precision and care that an engineer adopts in choosing the course of and laying down a railway.

An airway, whether it be over land or water, is essentially "on the ground." Its existence and general layout depend entirely upon the commercial demand. Thus, airways follow the flow of that business which most urgently claims the advantages of air travel. The mere operation of aircraft between two important business or industrial centers can never offer the full advantages of air transportation, nor can any future air transport system be built upon such operations; for the primary requisite of any transport system is that it shall be safe, reliable and regular. None of these attributes can be gained in air travel without the existence of adequately laid out and equipped airways.

First and foremost, in order that these attributes may be secured, comes the question of landing fields. The outcry for more and still more landing fields throughout the country is not new and it is as urgent as ever—not that it has gone unheeded in the past but because, in view of the rapid increase in the development of commercial aviation during the past year, the demand for landing fields has very materially increased and will continue increasing.

Landing fields may be divided into two categories, namely, the so-called Emergency Field, which provides a means whereby an airplane may come to earth if at any time during flight it is necessary to make an unscheduled landing; and the Airport, which is either a main point of call along an airway or is a terminus of an airway.

Secondly, in order that the full advantages of air transportation may be made use of, an airway must be so equipped that flying is possible under adverse weather conditions and at night. It has been a prevalent opinion among those whose knowledge of air transportation is limited, that the airplane is purely a fair weather craft and that when meteorological conditions become bad the airplane has to put into shelter and await the return of favorable weather. That this is entirely erroneous is demonstrated by the operations of the Trans-
Airways

Continental, and the Overnight New York-Chicago Air Mail, which flies 6870 miles every day and night, throughout the year, in all weathers. It is true, of course, that the air mail has been delayed on account of adverse weather conditions and even at times held up, but in such cases the conditions have been bad in the extreme and have constituted a source of delay to all other forms of transportation as well. And it is the airway—the concrete firm structure of the airway, the ground system—which has made the airplane an all-weather craft.

The structure of an airway therefore consists of: (1) Airports, provided with full facilities for the handling of airplanes and their cargo, mail, express, or passengers, equipped with floodlights and boundary lights for night operations. (2) Intermediate landing fields spaced every 20 or 30 miles apart along the route and provided with refueling facilities and wire communication to the nearest city, and equipped with boundary lights and a beacon. (3) Beacons of very high power spaced at intervals of approximately 10 miles to guide pilots along the route at night time. (4) Weather Reporting Service, just as is provided for mariners at sea, and a system of radio and telegraph communication for distributing this service. (5) Radio Beacon or the leader cable, direction finding devices which enable navigation of aircraft in fog or at night.

As a typical example of a modern airway, the Trans-Continental route between New York and San Francisco, the most completely equipped airway in the world, may be taken. On it between New York and Salt Lake City are 12 airports and 92 intermediate fields, boundary lighted, with caretakers, connected by 612 electric and gas route beacons spaced along and indicating the entire distance. The electric beacons of 1,000,000 and 2,000,000 candlepower are, in general, located at or near intermediate fields and are spaced approximately 22 miles apart with the smaller gas beacons between.

With the passage of the Air Commerce Act of 1926, placing the maintenance of airways and aids to air navigation under the Department of Commerce, the balance of the Trans-Continental airway and a number of the contract air mail routes are being lighted. The full program now under way is discussed elsewhere in the Year Book but attention should here be directed briefly to the fact that the combined 1927 and 1928 programs contemplate the additional installation of 390 airway beacons and the lighting of 183 intermediate fields.

An airway is essentially a free highway and as such is open to all qualified aircraft. It is rightly, therefore, a Federal undertaking to lay out and equip airways. The maintenance of airports, however,
comes legitimately within the scope of a municipality in much the same manner as docks and harbor facilities for marine shipping. The Aeronautics Branch, Department of Commerce, will concern itself solely with the creation and maintenance of airways, but they recognize that airports are of paramount importance even though beyond the scope of the Department of Commerce. The airport is, in fact, the forerunner of the airway.

Mr. Rand, in the statement to which reference has already been made, speaks of airports in convincing terms. He says: "Airports are as important to commerce as are terminals to railroads or harbors to navigation. Municipalities are studying local conditions and commercial organizations are pressing the importance of establishing terminal airports and of providing proper lighting for landing fields, and facilities such as hangars, garages and repair shops. Industrial centers feel the need for encouraging aeronautics by affording the kind of airports that will bring aviators to their cities."

Emphasizing the value a well equipped modern airport will have to a city, Senator Hiram Bingham (Conn.), speaking at the aeronautic banquet of the Society of Automotive Engineers in Philadelphia on September 2nd, 1926, pointed to Houston, Tex., which ten years ago was considered as an inland city. In 1925 Senator Bingham had occasion to visit Houston, and during his stay was invited to inspect its harbor. Geographically, Houston had been connected with the Gulf of Mexico by a tiny stream, and expressing surprise at hearing of a harbor in the city, Senator Bingham was informed that no fewer than forty-one steamship lines now call at Houston. The city had been far-sighted and had spent millions of dollars to connect the city with the sea by a great channel. This seemingly costly investment had meant millions in increased value to property and business opportunities in Houston, and has made it one of the busiest seaports in the country.

The possession of an airport by cities is essential if similar opportunities for increased prosperity are to be secured through air commerce. A far-sighted municipality will place the building of an airport high in its program of requirements under its city plan of future needed developments. The cost of an airport will be but a fraction of the investment which Houston considered to be only a small outlay for the huge commercial returns which today it enjoys as a seaport.

Large open tracts of public land well situated with reference to the activities of cities have always proved to be profitable investments. Such land susceptible of improvement, as parks, playgrounds or general recreational purposes, or under other conditions, available
for the expansion of industry and commerce, constitutes an asset that increases in value while offering a congenial and attractive feature to any growing city. Happily this idea has recently been applied in considering plans for municipal airports. If developed upon a plan of utilizing the area surrounding the airport or central portion for parks, playgrounds, golf courses, and other recreational activities, the municipality is able not only to bring to itself the advantages of air commerce, but also to afford to its citizens those other inestimable advantages of improved beautification and health-giving opportunities.

![Curtiss Garden City Factory and Flying Field.](image)

Many progressive cities have already established airports. With a view to giving some idea of the factors, including expenses entailed in the creation of such airports, the following table is appended. In order that the representation may be fairly complete, details are given on seventeen first-class airports scattered in widely separated parts of the United States.
<table>
<thead>
<tr>
<th>City and name of Airport</th>
<th>Acres</th>
<th>Cost of Putting into Shape</th>
<th>Maintenance</th>
<th>How Bought</th>
<th>Sheds</th>
<th>Shops</th>
<th>Length of runways (Feet)</th>
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<td>Phoenix, Ariz.</td>
<td>160</td>
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<td>80,250</td>
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<td>Leased</td>
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<td>Hanger</td>
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<td>40,400</td>
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<td>2,200 by 1,200</td>
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<td>125,000</td>
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<td>Pittsburgh, Pa.</td>
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<td>by 1,200</td>
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<td>Muskogee, Okla.</td>
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<td>Fort Worth, Tex.</td>
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<td>411,000</td>
<td>203,000</td>
<td>Bond issue</td>
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<td>1</td>
<td>Cinder, 100 by 2000</td>
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</table>

PHOENIX—The site for the Phoenix Airport was purchased by the city from general funds. It is under direct municipal management, and is open for all planes. The maintenance cost is borne by the city. The field is located seven miles from the city on a paved road, and is in charge of a caretaker. Half of the 160-acre field not used at present, may be utilized when traffic warrants.

TUCSON—The Davis-Monthan Airport site was purchased by the city from municipal funds. The city leased the port to the Army Air Corps at one dollar per year. Eighty per cent of the maintenance cost is borne by the city, the remainder by the Army. The city is about to establish a larger field, total acreage 1,280, on land leased from the Department of Interior.

LOS ANGELES—The Los Angeles Airport is situated on land controlled by the City Park Board, and is maintained by that organization. Sheds were supplied by the Army Air Corps. The equip-
Airways

ment was put in order by the California National Guard, which also assists in maintenance.

HARTFORD—Ninety-six acres of the Hartford Municipal Airport site were obtained for aeronautical use by conversion of city property, and nine acres were obtained by purchase. The city has an option on another plot of 434 acres and is negotiating for 16 more. The airport is under direct city management, and all maintenance cost is borne by the city and the state.

ATLANTA—The city of Atlanta has acquired 300 acres from a private estate, by means of a 5-year lease with option to purchase at one-half the real value, which option will probably be exercised. Two hard surface roads lead from the field into Atlanta, which is 8 miles north.

PORTLAND, ME.—Stroutwater Field is privately owned and operated. The expense of constructing the runway and the shop was borne by pilots and other individuals interested in flying.

BOSTON—The site of the Boston Airport, available for seaplanes also, is State land. The Army and Navy lease portions, but the field is open to all planes, and hangar space is available for lease to private enterprise. The Federal Government, the State, city and public subscriptions provided money for improvements.

BATTLE CREEK—The Battle Creek Airport is situated on land leased until 1929 with option of purchase. The maintenance cost is borne by local interests and civic organizations.

ST. JOSEPH, Mo.—The Rosecrans Municipal Air Field is located on land purchased by the city from general funds. The maintenance cost is borne by the city.

BUFFALO—The site of the Buffalo Airport was purchased by the city through issue of bonds. It is directly managed by the air division, Department of Parks and Public Buildings.

PHILADELPHIA—The site of the Philadelphia Municipal Field was obtained by conversion of city property and condemnation of additional ground. It is managed by a board of control, representing the city, State of Pennsylvania National Guard, and the concessionaire.

CINCINNATI—The land for the Lunken Airport was deeded by Mr. E. H. Lunken, to Lunken Airport, Inc., a Cincinnati corporation. The corporation leases part of the field for Army use at one dollar per year. Lights to aid night landing in emergency have been installed.

CLEVELAND—Cleveland Airport is located on land purchased by bond issue, and maintained by the city.

MUSKOGE—Hat Box Field is situated on a 60-acre plot, of which
40 acres are leased and 20 are used by special agreement. The Army leases and maintains the field, but any licensed pilot may use it under permission from the commandant.

PITTSBURGH—Rodgers Field is located on land owned jointly by the city of Pittsburgh and the county of Allegheny. The Army Air Corps leases it at one dollar per year for training purposes. It is open to the public, as it is a municipal airport, although commanded by an Army officer. Maintenance is by the city and the county.

FORT WORTH—The Fort Worth Airport is situated on land leased for four years with an option to purchase. Maintenance is by the city.

The Aeronautical Chamber of Commerce welcomes inquiries from Chambers of Commerce, Boards of Trade or other municipal organizations desiring information on the establishment of a landing field in their city.

Airport Bulletin

Buffalo Airport

INFORMATION on BUFFALO AIRPORT, Buffalo, N. Y.

CLASS—Municipal; first class.

POSITION—Two miles east of Buffalo city line, one and onequarter miles south of village of Williamsville. Latitude, 42° 30' 30" North; longitude, 78° 40' 30" West; magnetic declination, 7° 43' 30" West. Altitude 765 ft. above sea level.

DESCRIPTION—Irregularly shaped piece containing 518 acres. Longest diagonal, in direction of prevailing wind, over 1 mile. Two-track railway along northeastern border of field. Black under runways 100 feet wide. The two main runways N. to S. Runway shown on map, will not be completed until about May, 1927.

ACCOMMODATIONS—Two hangars 65 feet by 80 feet, with knaps; one hangar 85 feet by 100 feet; garage and shop administration building. All buildings white brick. Good hotel accommodations in town. Transportation to towns available day or night.

REPAIR FACILITIES—First class mechanics on field for minor repairs; major repairs easily available at airplane factories c/o Buffalo; Curtiss Aeroplane & Motor Co., Inc., Consolidated Aircraft Corp., Eberhart Aeroplane & Motor Co., Inc., G. Eliaa & Bros., Inc.

STORES—Aviation gasoline and motor oil at field. Service at all times and hours, spares available from airplane factories listed above.

COMMUNICATIONS—Telephone in administration building, open all times, call "Fillmore 0726." Telegraph address, c/o Buffalo Airport, Buffalo, N. Y. Mail address, c/o Buffalo Airport, Williamsville, N. Y. Freight, c/o Buffalo Airport, Lehigh Valley R.R., Williamsville, N. Y.

METEOROLOGICAL DATA—Prevailing wind Southwest. Data from U. S. Weather Bureau, Telephone Ridge, Buffalo. By mail or telephone (Seneca 0726) or from U. S. Coast Guard Station, Fort Erie, Ont., Buffalo (telephone Seneca 2226).

REMARKS—Owned and operated by the City of Buffalo. N. to S. Runway shown on map, will not be completed until about May, 1927.

A sample "Airport Bulletin" issued by the Buffalo Airport. It is printed two sides of standard loose leaf S.A.E. filler sheets—uniform with those heretofore published by the Army Air Corps and the Navy. The Navy and Department of Commerce are continuing the work, the Navy covering seaplane facilities and Commerce the land facilities.
### LANDING FIELDS IN UNITED STATES

Classified and Charted Graphically by States

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<th>State</th>
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<th>Commercial</th>
<th>Emergency</th>
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Total 209 400 297 8801 3806 100.

Prepared in Training and Operations Division, O.C.A.C. Compiled as of December 31, 1926.
Aircraft Year Book

AIRWAY STRIP MAPS

The Department of Commerce, under the Air Commerce Act, is charged with the charting of the civil airways. This work is being done by the Coast and Geodetic Survey, one of the bureaus of the Department. The program includes the following maps, generally similar to those of the Army Air Corps and the Hydrographic Office of the Navy. None of these is, as yet, completed. It is expected they will be available at: Department of Commerce (Aeronautics Branch), 19th and Pennsylvania Avenue, N. W., Washington, D. C., 35 cents (coin or money order).

Chicago—St. Louis
Moline—Kansas City
Kansas City—Wichita
Wichita—Oklahoma City
Oklahoma City—Dallas
Dallas—Galveston
Los Angeles—Las Vegas
Las Vegas—Salt Lake City
Cheyenne—Pueblo
Washington—Richmond
Richmond—Greensboro
Greensboro—Atlanta
Atlanta—Jacksonville

Jacksonville—Tampa
Tampa—Miami
Pasco—Boise
Boise—Elko
Elko—Salt Lake City
Salt Lake City—Milwaukee
Milwaukee—Grand Rapids—Detroit
Dayton—Cleveland
Cleveland—Buffalo
Buffalo—Albany
Albany—Boston
Montreal—Albany
Albany—New York

AIR CORPS MAPS

The Army Air Corps Engineers maps cover the following routes. The program includes 51 maps, of which 43 have been completed. Those uncompleted are marked with an asterisk (*).

They may be secured at 35 cents each (coin or money order) by addressing: Engineer Reproduction Plant, Washington Barracks, Washington, D. C.

1 Wheeling—Dayton
2 Washington—Wheeling
3 Washington—New York
4 Washington—Langley Field
5 Dayton—Rantoul
6 New York—Boston
7 Beaumont—New Orleans
8 New Orleans—Montgomery
9 Chicago—Iowa City
10 Iowa City—Omaha
11 Omaha—North Platte
12 North Platte—Cheyenne
13 Cheyenne—Rock Springs
14 Rock Springs—Salt Lake City
15 Montgomery—Augusta
16 Augusta—Fayetteville
17 Fayetteville—Langley Field
18 New York—Bellefonte
19 Bellefonte—Cleveland
20 Cleveland—Chicago
21 Chicago—St. Louis
22 St. Louis—Kansas City
23 Kansas City— Muskogee
24 Muskogee—Dallas
25 Dallas—San Antonio
26 San Antonio—Beaumont
27 Beaumont—El Paso
28 El Paso—Tucson
29 Tucson—Phoenix
30 Phoenix—San Diego
31 San Diego—Los Angeles
32 Los Angeles—Salt Lake City
33 Salt Lake City—Idaho Falls
34 Idaho Falls—Boise
35 Boise—Tulsa
36 Tulsa—Oklahoma City
37 Oklahoma City—Dallas
38 Dallas—Beaumont
39 Beaumont—New Orleans
40 New Orleans—St. Louis
41 San Francisco—Yreka
42 Yreka—Van Nuys
43 Van Nuys—Bellingham
44 Bellingham—Mount Clemens—Rantoul
45 Mount Clemens—Unióntown
46 Washington—Middleton
47 Middleton—Mount Clemens—Dayton
48 Dayton—Louisville
49 Louisville—Tennessee
50 Nashville—Birmingham
51 Birmingham—Pensacola
52 Pensacola—St. Louis
53 St. Louis—Muskogee
54 Muskogee—Dallas
55 Dallas—San Antonio
56 San Antonio—Beaumont
57 Beaumont—El Paso
CHAPTER V
AERONAUTICAL ENGINEERING EDUCATION

In January, 1926, Daniel Guggenheim emphasized his belief in the future importance of aviation by the establishment of the Daniel Guggenheim Fund for the Promotion of Aeronautics, to which fund was made available the sum of $2,500,000. Previously, Mr. Guggenheim had given $500,000 to New York University for the establishment of the Daniel Guggenheim School of Aeronautics.

The immediate purposes of the Fund are to promote aeronautical education, extend the fundamental aeronautical science, and to develop commercial aircraft as an aid to the business and industrial activities of the nation.

As a first step in the administration, Harry F. Guggenheim, president, made a thorough investigation of the aeronautical situation both in this country and in Europe. His conclusion was that the primary need in aviation was the promotion of ways and means to secure safety in flying.

As one of the means to this end the Fund made grants for the promotion of aeronautical education in several American universities and colleges, as follows: California Institute of Technology, $300,000; Leland Stanford University, $195,000; University of Michigan, $78,000, and Massachusetts Institute of Technology, $230,000.

Mr. Guggenheim, in making his gifts to establish the Fund, did not intend that it be permanent. The money was to be expended to the best interest of aviation. For this reason a major portion of the gifts already made has been for the development of the physical properties of the universities involved, so as to better suit them for research and instruction in aeronautical science.

Of the grant to California Institute of Technology, $200,000 was donated for the construction of an aeronautics building, and the remaining $100,000 will be given in ten equal installments of $10,000 to finance research work and instruction. The grant to Leland Stanford University will be used to equip an aeronautical laboratory and finance experiments and study in aeronautics.

Of the appropriation to the University of Michigan, $28,000 will be used to complete laboratory apparatus and the construction
Aeronautical Engineering Education

of new testing and research instruments. The remainder of the appropriation will be paid in ten annual installments of $5,000 for the establishment of the Daniel Guggenheim Professorship of Applied Aeronautics. The entire grant to the Massachusetts Institute of Technology will be expended on a new aeronautical engineering building.

During the past winter, Professor Theo. von Karman, head of the Aerodynamical Laboratories at Aachen, Germany, and recognized as one of the foremost aeronautical scientists of today, came to the United States at the invitation of the Fund, where he visited the principal aeronautical centers for the purpose of giving educators and scientists in this country the benefit of his experience and advice. Professor von Karman also gave a series of lectures in Washington on modern phases of advanced aero-dynamics, which were received with tremendous enthusiasm and interest.

The Fund also contributed $2,500 to the Society for the Promotion of Engineering Education, for the purpose of coordinating aeronautical engineering education with other courses of engineering

Copper Mine, Bingham, Utah.
in carrying out the policy adopted by the engineering councils, based on the results of a survey conducted by this society.

Upon the invitation of the Fund, a conference was held in Washington during December of representatives of the universities in this country actively engaged in aeronautical education, of the National Advisory Committee for Aeronautics, and of the Fund, with the object of working out a permanent organization for the interchange of ideas, coordination of research work in the universities, and the development, by mutual cooperation, of specialized fields in aeronautical education in the respective educational centers.

Grants have been made by the Fund to organizations in foreign countries as follows:

1. Royal Aeronautical Society (England), $5,000, for the collection and dissemination of important technical aeronautical information that finds little or no place in existing publications.

2. Aero Club de France—$8,000 to assist in the establishment of an international aeronautical library and scientific center in Paris, and for the collection and dissemination of important technical aeronautical information that finds little or no place in existing publications.

The fund has extended the employment of Dr. C. G. Rossby, who had been engaged in research and study with the United States Weather Bureau, under the auspices of the American-Scandinavian Foundation, for a period of six months. The object of this research is to promote the application of meteorology to the development of aeronautics.

In addition to its activities in the educational field, the Daniel Guggenheim Fund financed the country-wide tour of the airplane in which Lieut. Commander Richard Evelyn Byrd flew to the North Pole. The purpose of this flight was to focus attention on the present development of aircraft and the need for municipal airports. During this tour, millions of people saw the history-making plane and had the possibilities of aviation brought vividly to their attention.

Following the first conclusion of the trustees of the Fund, who believe that, if a certain factor of safety is obtained, other improvements in aeronautics will follow as a matter of course, it was decided to hold a “Safe Aircraft Competition,” for which appropriate prizes will be awarded. Details of this competition have not been completed.

The Guggenheim Fund is cooperating with the aeronautical sections of the War, Navy and Commerce Departments in the study
of flying in fog and at night and in fog dissipation. This study involves investigation of radio control, lighting of fields for night flying, improvement and perfection of instruments, allowing airplanes to fly safely in fog, penetration of fog by light rays, and perfection of new instruments.

In addition to the activities outlined, the Daniel Guggenheim Fund from time to time issues the Bulletin, with a view to making known to the public the developments and progress of aviation. It has lately undertaken the publication of Aviation Notes, which is planned to give wider distribution to aeronautical news of interest to the general public.

Analysis of Survey

As a result of a questionnaire to more than 500 educational institutions throughout the country, some valuable details of the status of aeronautical education in this country have been obtained.

Aerial Photo Sent by Wire as Reproduced at Receiving Stations in New York and San Francisco.

It was found that there are twenty-three institutions giving some attention to aeronautical subjects, but the greater number of these has no special equipment or staff to give serious attention to this field. Of this number the five to which reference has already been made are fully equipped to give complete training in aeronautical engineering for both graduate and undergraduate students. During
the past year these five institutions had under instruction ninety-six students taking regular aeronautical engineering curricula.

To recapitulate, the following would appear to stand out:

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of institutions giving instruction of some kind in aeronautics</td>
<td>23</td>
</tr>
<tr>
<td>No. of institutions having school or department of aeronautical engineering</td>
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<tr>
<td>or chair of aeronautics</td>
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<tr>
<td>No. having aeronautical laboratory or equipment to conduct aeronautical tests</td>
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<tr>
<td>or research.</td>
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<tr>
<td>No. offering graduate courses in aeronautical engineering.</td>
<td>10</td>
</tr>
<tr>
<td>No. offering fellowships to graduate students in aeronautical engineering.</td>
<td>7</td>
</tr>
<tr>
<td>No. offering a course in aeronautical engineering leading to a degree.</td>
<td>5</td>
</tr>
<tr>
<td>No. providing elective subjects in aeronautical engineering to students</td>
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</tr>
<tr>
<td>taking regular engineering course.</td>
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<tr>
<td>No. carrying on organized research in the field of aeronautics.</td>
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<tr>
<td>No. of undergraduates taking regular engineering curricula leading to a</td>
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<tr>
<td>degree.</td>
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<td>No. of undergraduates taking regular engineering curricula electing certain</td>
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<td>subjects in aeronautics.</td>
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<tr>
<td>No. of graduate students taking courses in aeronautical engineering.</td>
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<tr>
<td>No. of students that can be accommodated throughout the country in</td>
<td>386</td>
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<tr>
<td>taking aeronautical engineering courses.</td>
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CHAPTER VI
AIRSHIPS

THE development of airships in the United States has appeared to be slower than that in heavier-than-air because the initial cost of construction is great. This has led to caution and hesitancy on the part of private groups and individuals who otherwise might have undertaken the building and operation of such craft for commercial purposes. While the airplane has been forging steadily ahead in the commercial field and proving itself capable of becoming profitable for the operator, the United States has witnessed no real commercial development in lighter-than-air.

A certain amount of hesitancy may also be attributed to the accidents to military airships operated by the Services, particularly the wreck of the Shenandoah. Lack of technical knowledge on the part of the general public precluded all possibility of explaining that the loss of a military ship—the Shenandoah was strictly a military type—had no practical bearing whatever on the question of safety in a commercial craft. The Shenandoah had been wrecked during a storm while cruising over Ohio at night; and it was quite natural that the public should fail to recognize that a commercial airship would not suffer a like fate if it happened to encounter similar atmospheric disturbances under conditions which would surround civil operations.

While these reasons may be accepted in explanation of the fact that this country at present has no commercial airship operations, there are other activities in lighter-than-air which indicate that the United States eventually will adopt the airship as an important factor in both military and commercial aeronautics.

The Naval airship Los Angeles, operating from her hangar at Lakehurst, N. J., made many successful flights during the year, all without accident of any kind. One of these took her to Detroit, where she was moored to the mast of the Aircraft Development Corporation at the Ford Airport in Dearborn, Mich. On other occasions she was moored to the U. S. S. Patoka anchored at various points along the Atlantic Coast. She made ground landings such as that during her visit to the National Air Races at Philadelphia, in September, 1926. The flights were reported at length in the press.
and contributed much toward arousing public interest and confidence in the airship as a vehicle of transport.

Voluminous evidence was presented to the Congressional Committees investigating the need for a definite aeronautical policy to show that lighter-than-air craft possesses both present and future possibilities. This evidence was compiled by experts who had made special studies of the airship. Their conclusions were that it is justly entitled to be classified as one of the most important means of waging aerial warfare and an equally important element in national defense because it can be used in long range naval operations.

The present status of the art, it was shown, permits the design and construction of ships ranging from six million to ten million cubic feet in size, with an operating range of from 5000 to 10,000 miles, depending upon the military load, which would always include some airplanes. Under normal conditions American military airships could be provided with helium protection, a feature which with expert handling would make them practically invulnerable and safe enough against any kind of attack at present known. This complete safety from fire by incendiary shells is the most important modern improvement, but it is by no means the last one.

The modern military airship would be able to carry fighting planes for its own protection, as the problem of carrying the planes and releasing them from the ship under actual war conditions has been solved. The third major improvement pertains to the improved automatic guns and machine guns. Batteries of automatic guns of substantial calibre can now be carried on board, thus making it almost impossible for enemy aircraft to get within normal range. Increased size and lifting capacity provides for a greater load of bombs. During the war the Zeppelins managed to cruise as high as 24,000 feet, and the more modern types can be designed for much greater altitudes. The danger from airplanes flying higher than the airship and therefore enabled to swoop down upon it is considered remote by the engineers who say that thus far the planes have not been able to remain aloft in the higher altitudes for any appreciable length of time and they would not be able to carry the armament necessary for a successful attack.

Another important point brought out was that the modern airship will be so designed and constructed that its strength would not be fatally impaired even if large pieces of the structural framework, outer hull of the gas cells, should be blown away or scattered to bits by explosives. The modern design also insures complete accessibility at all times, even during flight, so that damage from enemy
Airships can be repaired immediately and the loss of buoyancy confined to a negligible minimum.

One of the main features of a modern military airship is the observation car which was developed in Germany during the war and used successfully on many occasions when fog or poor visibility prevented the observers in the airship from seeing their objectives on the surface. In order to remain hidden behind clouds or banks of fog and still be able to attack the enemy, the crew of the airship carries a small car which can be lowered below the ship. The observer sits in the car and directs the course and the dropping of bombs.

It was also pointed out that the modern airship on naval patrol can go over distances at least seven times greater than any airplane; and with the use of planes operating from the ship itself the range of observation of one airship is increased at least 10 times. The big airship moving at a cruising speed of about 60 miles an hour, even under adverse weather conditions, which is twice the speed of any surface vessel, may be in fact a mother ship and a base for fast scouting planes which are constantly going off at a tangent and returning at short intervals for relief.

The following example of what even a small fleet of airships could accomplish in the way of efficient naval patrol was also given:

"With only ten airplane-carrier airships on the line it would be possible to throw a perfectly effective line of patrol clear across the whole Pacific Ocean, extending from the Aleutian Islands to the Marshall Islands, or across the Atlantic from Newfoundland to the coast of Africa. With a total of 20 airships, which would include ample reserve for ships undergoing overhaul or repairs, it would be possible to maintain such a patrol barrier continually for an indefinite time, so that it would be impossible for any surface fleet to pass such a line undetected. The investment required for such a purpose would amount to about 80 million dollars for the 20 airships and about 40 million dollars for the 10 double hangars.

"To attempt such a task on the surface would require at least 200 surface ships, the ships alone costing about twenty times as much as the airships and their hangars combined."

With the case for the airship presented in such a light Congress endorsed the Navy program for the continued development of lighter-than-air.

The Navy Five-Year Program, passed by Congress before adjournment in July, 1926, provides for the construction of two giant rigid airships surpassing in size anything yet built here or abroad. The Government, taking advantage of the engineering development
The Eyes of the Fleet. The proposed Goodyear-Zeppelin 6,500,000 cu. ft. naval airship as it might look in operation.
and construction methods of the Goodyear-Zeppelin Corporation, contemplates that each of these ships shall be nearly three times the size of the Los Angeles permitting engineering improvements which will ensure the maximum of strength and endurance under any and all conditions. As intended by Congress, these two new airships are to be the nucleus of the American airship fleet in the defensive establishment.

Unfortunately while authorizing the ships Congress failed then to appropriate money with which to defray the cost of construction. Lacking funds for such a project the Bureau of Aeronautics of the Navy could not at once contract for their construction. As this chapter is being written, however, (January, 1927), it appears that appropriations for next year will include sums sufficient to start this work.

**Goodyear-Zeppelin Plans**—The Goodyear-Zeppelin Corporation of Akron, Ohio, which holds the North American rights for construction and operation under the Zeppelin patents, designed the super-Zeppelin type which was recommended by the Navy experts. Postponement of the Navy plans for the big ships, because of the failure to appropriate money for their construction, resulted in the Goodyear-Zeppelin Corporation simply continuing its experimental and design work during 1926.

A staff of Zeppelin experts in Akron, headed by Dr. Karl Arnstein, the engineer who designed scores of the German Zeppelins, continued to improve their plans for larger airships. As a result of four years of planning the Goodyear-Zeppelin Corporation late in 1926 announced through the president, P. W. Litchfield, that it would be listed among the bidders for the contract when the money became available for such ships.

They would have many changes in design and construction over earlier types such as the Shenandoah and the Los Angeles. They would be especially built to use helium gas. Each ship would have 6,500,000 cubic feet instead of the Shenandoah's 2,115,000 and would be about 800 feet in length. The control car forward, instead of being suspended on struts from the body of the ship, would be a part of the hull and further stream-lined against air resistance. In all former airships the motors have been housed in power cars suspended from the hull, but in this design the engines would be placed within the framework with only the propellers projecting, further reducing head resistance and protecting the motors from atmospheric changes and climatic extremes.

Further improvements would be made in the ship's interior; instead of one keel there would be three of improved construction,
thus providing vastly more longitudinal strength, and with corridors throughout the interior designed to make the entire hull accessible for inspection and repair while in flight. No airship heretofore has been accessible in all its parts while in flight.

New type girders have been designed, so sturdily built and arranged in such a manner that even a failure of part of the hull would not seriously weaken the ship itself. This added strength would permit housing the engines inside the hull, along with many other accommodations and modern comforts for passengers and crew. For the first time in the history of rigid airships it would constitute a self-contained unit, with all operating parts, including the control car, built inside the main framework of the ship. To help control the ship more quickly the propellers would be capable of being tilted, turning in a 90 degree arc to force the ship either up or down at will.

Motors aggregating 4,800 horsepower would be installed on the ship, giving it a speed of 90 miles an hour and a cruising range of from 5,000 to 8,000 miles with full military load, without refueling. Such a ship actually in operation in the Naval service should through its performance attract private enterprise to a similar craft designed and built for commercial operations. Such a ship equipped for passenger and freight, carrying a hundred passengers with baggage and crew, with necessary supplies, fuel and other accessories, would be able to maintain a non-stop flying schedule across the Atlantic or between New York and San Francisco; and it is estimated that it could be operated at rates sufficiently low to guarantee patronage while returning a profit on the investment. A fleet of commercial airships in operation would serve as a reserve both in personnel and material equipment for the defensive establishment in case of emergency.

Congress in July, 1926, appropriated $300,000 for the construction of a smaller, experimental all-metal rigid airship based on the designs and plans of the Aircraft Development Corporation of Detroit, Mich. The Navy Department awarded the contract to that corporation and work was commenced immediately. The experimental ship is to be about 150 feet in length with a diameter of 53 feet and a gas capacity of 200,000 cubic feet. This metal-clad design is the result of years of laboratory tests and other experiments under the direction of Ralph H. Upson, Chief Engineer of the Corporation. Every conceivable test of materials, structure and performance had been made, so that the Aircraft Development Corporation was ready to begin detailed design and construction immediately. While the parts were being fabricated, property was
acquired adjacent to the Grosse Isle Airport in Detroit and there a hangar was erected, large enough to accommodate a ship five times the size of the present experimental craft. Delivery of the test ship was specified for September, 1927, but due to the experimental character of the work the agreement contemplated the possibility of additional time.

Much interest in this metal-clad experiment exists in engineering circles throughout the world. The officials of the corporation are convinced their new method of building rigid airships will revolutionize design and construction in lighter-than-air craft by making possible a marked improvement in safety, efficiency and durability of the larger units.

Airships Incorporated of Hammondsport, N. Y., one of the three companies identified with the production of various types of lighter-than-air craft, have continued their experimental work in the perfection of specially treated fabric for use in connection with their work. Another interesting phase of their activities has been in developing and broadening uses for this specialized fabric with a view to substantially increasing the demand for it and thus making its production possible at lower cost, which would be reflected not only in the initial price of balloons and airships, but also in the maintenance and repairs. Their most notable successes in this direction have been the perfection of their "Airraft," and "Flotation" equipment for heavier-than-air craft, and also for motor-boats and surface ships.

The B. F. Goodrich Company of Akron, Ohio, has devoted a great deal of time during the year to the development of materials and accessories for lighter-than-air craft, such as its new 20-inch Gammeter automatic airship valve, which may function either automatically or manually. This valve has undergone both ground and flight tests by the Army and the Navy.
COMMERCIAL AIRWAYS IN EUROPE
(SUBJECT TO CHANGE)
PREPARED IN TRANSPORTATION DIVISION
BUREAU OF FOREIGN AND DOMESTIC COMMERCE

- FRENCH
- BRITISH
- GERMAN
- DUTCH
- SWEDISH
- CZECHOSLOVAKIAN
- ITALIAN
- RUMANIAN
- HUNGARIAN
- POLISH
- SWISS

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To Mogador
Agadir
Cape Juby
Ras de Oro
Port Etienne
Port Louisa
 Dakar

(Extension to Buenos Aires proposed)
CHAPTER VII
FOREIGN AERONAUTICAL REVIEW

THE past year has seen a great revival of aeronautical interest throughout the entire world resultant, no doubt, upon the general settling down of all nations and the comparative degree of prosperity which to a varying extent visited all countries during 1926. It is difficult to point out any one country in which there is not to be found some rapidly developing aeronautical interest. It is to Europe due to the heavy cash subsidies paid by a number of Governments, that the world continues to look for the latest in civil aviation from the standpoint of passenger transportation. While this is permitting the accumulation of much valuable experience and data, it is on the other hand not altogether convincing—as the unsubsidized aerial activities in the United States are demonstrating the economic practicability of air transport.

During the year 1926, there were thirty-three companies operating in Europe. This number is only approximate as the actual number was constantly changing due to the organization of new companies during the course of the year on the one hand, and the many amalgamations on the other.

In trying to determine the number of miles of air routes in Europe, the following method has been used: The distance between any two points is considered only once although several different companies may use this same route or one company may cover the same route as a part of several different lines. The distances of routes operated by European companies, but lying entirely outside of Europe, have not been used, but where the larger part of the route lies within Europe, the entire distance has been considered.

The resulting distance arrived at is approximately 25,000 miles of airway in Europe. This figure, however, fluctuated considerably during the year as new lines were created and old routes were temporarily or permanently discontinued. The correct figure lies between 20,000 and 30,000 miles.

It should be noted that no deductions may be drawn from the above figure and the total number of airplane miles flown, because some of these distances were covered on an average of three or four
Lava Flow from Mauna Loa in Hawaii.—Photo Army Air Corps.
times per day during the course of the year, while others have been flown only a few times per week or may have been closed entirely during the winter season.

Mileage figures in the form of yearly statistics are not, in the more important cases available at this time for the year 1926 but there is little doubt that all previous records have been surpassed, especially in view of the vast extensions of the German air transport operations during the year.

Each country upon which it has been found possible to obtain some information is treated individually hereafter:

Africa

On November 15th, 1926, the first seaplane to be used in the new commercial flying service between Khartoum and East Africa was launched at Short Brothers’ Aeronautical Works at Rochester. The machine is known as the Pelican, and is a four-seater D.H. 50, fitted with 420 h.p. Bristol Jupiter, a Fairey-Reed metal propeller, and special duralumin floats made by Short Brothers. The service was organized by the North Sea Aerial and General Transport Company, Limited, which is allied with the Blackburn Aeroplane Company, and started in January, 1927. Trips are weekly in each direction, the route following the White Nile from Khartoum to Malakal and terminating at Kisumber, on Lake Victoria, a total distance of 1,400 miles.

Air mail service, Lisbon-West Africa, was inaugurated on September 19th, 1926. The service includes stops at Tangier and Casablanca, and on the return at Alicante, Perpignan, Marseilles, Toulouse and Paris. From Casablanca, another plane will carry mail to Dakar, whence it will be forwarded by steamer to points in West Africa and South America. (See France).

Albania

There is one air transport company at present operating in Albania, as follows:

The Adria Aero Lloyd, Tirana, which operates the following routes:

1. Tirana-Valona, 65 miles, once a week.
2. Tirana-Scutari.
3. Tirana-Korca, 71 miles, three times weekly.

This company is almost entirely owned and operated by German interests, and carries mail and passengers.
Argentina

There are two air transport companies at present operating in Argentina, as follows:

Junkers Mission, Buenos Aires, operating from Buenos Aires to Montevideo three trips weekly; and Aero Lloyd, Cordoba, operating the service Villa Dolores-Cordoba-Rio Cuarto, three trips weekly. Commercial aviation is confined to the operation of an air mail and passenger service between Buenos Aires and Montevideo, Uruguay, and an air mail line between Cordoba and Villa Dolores, both of which were established in 1926. The German promoters of this enterprise are usually referred to as the Junkers Mission in Argentina, this being supported by some Argentine capital. The machines employed are Junkers seaplanes with 185 h.p. motors. Round-trip flights are made three days each week, Mondays, Wednesdays, and Fridays—the time required for the one-way flight being slightly less than two hours. The operators hold a mail carrying contract from the Argentine and Uruguayan governments. In addition to mail, the planes are permitted to carry four passengers, the charge being 50 pesos per passenger (approximately $20.00 U. S. currency) for a one-way trip.

The Villa Dolores service is small and unimportant, using only one plane and making irregular flights.

The Department of Agriculture has undertaken experiments with one plane in spreading chemical insecticides, gases, and gas bombs to combat a severe locust plague in the Province of Santa Fe. If this is successful the use of planes in agricultural work will probably be extended.

Regulations governing civil aviation were established by an executive decree of October 4th, 1926. The Buenos Aires Rotary Club recently petitioned the Government to include in the 1927 budget authorization for expenditures to establish mail and commercial air services within the country, particularly between Buenos Aires and the territories of the far south and north, with which present communication is difficult. As yet, however, no action has been taken on this.

On December 13th, 1926, the Instituto Aerotecnico Argentino (Argentine Aerotechnical Institute) was founded, and Señor Vicente Almandos Almonacid was elected chairman. This institution, of a purely scientific character, will carry on aeronautical investigations, and for this purpose is building up a technical staff of experts.

Commercial aviation in Argentina is under the supervision of the Department of Civil Aviation of the Aeronautical Service of the Army.
Australia

There are three air transport companies at present operating in Australia, as follows: Larkin Aircraft Supply Company, operating the routes Adelaide-Gloncurry-Hay-Mildura-Narrandera-Cootamundra, 578 miles, weekly; Mildura-Broken Hill, 189 miles, twice weekly; Hay-Echuca-Denilguin-Melbourne, 233 miles, twice weekly.

Queensland and Northern Territory Aerial Services, Ltd., which operates the route Charleville-Tambo-Blackall-Longreach-Winton-Mackinley-Gloncurry-Camooweal, 825 miles weekly.

Western Australian Airways, Ltd., operating the route Perth-Geraldton-Carnarvon-Onslow-Rochburne-Whim Creek-Port Hedland-Broome-Derby, 1,442 miles weekly.

The Larkin Aircraft Supply Company uses Anec. III-7 passenger planes with 360 h.p. Rolls-Royce engine on their routes.

It would appear that there is a great future for civil aviation in Australia. The standard of reliability is very high. A total distance of over 1,000,000 miles has been flown in regular transport and taxi-work with only one fatal accident (that which occurred at the opening of the Geraldton-Derby service), and public confidence in the services is firmly established. Traffic is increasing steadily as the services become better known, and although the day when Australian civil aviation will be self-supporting is not yet definitely within sight, the fact that at least one company has been able to pay a dividend is encouraging. With regard to extensions of the air transport system in the near future, a service between Melbourne and Launceston is now receiving consideration and a number of other services are in prospect, notably one between Brisbane and Charleville. Further steps in the expansion of Australian air transport are likely to follow as a natural outcome of the proved utility of the existing services.

The Australian Government, besides giving a subsidy of about 4 shillings per mile flown in accordance with the contract schedule to the different commercial lines, has followed the example of Great Britain and is assisting in the formation of an Australian citizen air force. With this end in view, it has assisted in the formation of a number of light airplane clubs, two clubs having been approved at Sidney and Melbourne, respectively.

The Government will loan to each club two De Havilland Moth airplanes, free hangar and workshop facilities, club-room accommodation at a reasonable rental, part-time services of a resident ground engineer, free medical examinations of prospective pupils,
and for every pupil who qualifies for the private pilot's license a bonus of £20 will be paid.

Commercial aviation is under the control of the Australian Civil Aviation Department.

Austria

There is one air transport company at present operating in Austria, the Austrian Air Transport Company, Vienna, which operates routes as follows: Vienna-Graz-(Klagenfurt)-Venice, daily, except Sunday, 310 miles, approximately; Vienna-Linz-Salzburg-Innsbruck (Bregenz-Zurich), three times weekly; Vienna-Munich-(Zurich), 379 miles, daily except Sunday.

These lines carry mail, passengers, and goods. The machines used are Junkers, all-metal monoplanes, carrying four passengers, powered with single 200 h.p. engines.

To October 20th, no serious airplane accidents had occurred on Austrian territory during 1926, and only two persons were slightly injured in a forced landing. Freight traffic by air in 1926 advanced substantially, as did also the number of ordinary letters and shipments of gold. Up to the present time, mail has been carried by the ordinary passenger planes. In 1927 it is planned to introduce the use of special freight planes on some lines.

The following services will be maintained in 1927:
2. Vienna-Graz-Venice and Budapest-Graz-Venice.
4. Vienna-Prague-Berlin (this route does not yet exist but its establishment is contemplated in order to fill a long felt need).
7. Paris-Vienna-Balkan (Franco-Roumaine).

The first four services are operated by the Oesterreichische Luftverkehrs A. G. with the exception of the line Budapest-Graz.

Schedules for 1927 are planned in such a manner that it will be possible to fly in one day from Vienna to Paris; Vienna to London; Berlin to Venice, via Vienna; or Dantzig-Warsaw to Venice, via Vienna.

The Austrian Government, being financially unable to pay a direct subsidy for the operation of these lines, both the German and Italian Governments contribute to their operation.

The Austrian Government and some of the municipalities provide these lines with landing fields and daily weather reports.
The Parliament has under consideration a law intended to encourage and develop air traffic by granting various legal and financial facilities to private air lines in public service. The more important concessions are as follows: the right of eminent domain; the exemption of stamp duties and court fees incurred in legal activities; exemption from tax on net earnings, and all other additional Government or local taxes; reduction of duties on goods imported; exemption from charges for the use of Government-owned airports.

These unusual privileges apply not only to air lines in the strict sense of the word, but also to such institutions as are vital for the proper functioning of air traffic.

Belgium

The financial crisis following the depreciation of the franc greatly influenced Belgian aviation, particularly as regards transport. As the subsidies were voted in 1922 for a period of five years payable in paper franc, it was impossible to operate the line between Brussels and London last year, except during the summer months. The result of those operations that were possible have, however, been very satisfactory and were carried on without accident or any particularly noteworthy incident.

In contrast, Belgian colonial aviation has made progress in 1926. The flights of Lieuts. Medaets and Verhaegen from Brussels to Leopoldville by way of the Nile, followed by the flight of Thieffry along the trans-Sahara route, drew attention to the possibility of regular services by airplane between Belgium and the Congo, based upon a six- or seven-day schedule. These projects are being studied and it is possible that a realization will be forthcoming.

In the Congo the year 1926 has witnessed the inauguration of the second section of the line from Leopoldville to Katanga. Quick communication between the lower Congo and the rich Province of Katanga is now an accomplished fact. This journey which previously required fourteen days, is now made regularly in two days with a round trip each seventeen days. The departures from Leopoldville coincide with the arrival of the steamers from Antwerp. In addition, there has been established an air line between Leopoldville and Boma, the flight requiring three hours instead of at least two days by railroad. These services are largely patronized by business men.

There is one air transport company at present operating in Belgian Congo, as follows: The S. A. B. E. N. A., Brussels, which operates the route Kinshasa-Bandundu-Ilebo-Luebo-Kanda, Kanda-Bakama-Katanga in conjunction with all European steamers.
It is reported that this company discontinued its European services during the past year and has concentrated all of its efforts on the above route. The planes used are Page W8f's and D.H. 50's. The line carries mail, passengers, and goods. No traffic statistics are available. A remarkable saving of time has been accomplished. By law, the Government aid to commercial aviation consists in covering the deficit to an amount not to exceed 3,100,000 francs annually for the years 1925 to 1927, inclusive.

Insurance—The SABENA, with its reserve, creates funds for the insurance of pilots, and the members of the working staff are insured against all risks of labor accidents by virtue of obligatory legal insurance. Passengers, those traveling by regular lines as well as those flying for the first time, are insured against flying risks at their special request only, and upon payment of an insurance premium fixed according to a schedule established by the insurance company. The SABENA has with the insurance company a floating policy, premiums being paid as the applications are made. A register of policies is filed at Haren, the field near Brussels, and the declaration of risks is made by the passenger the day on which the flight is made. The SABENA has no knowledge of flying risks which may not be covered by insurance; but the insurance companies limit those risks to maximum rates. For instance, the floating policy covering the risks of flights made by passengers provides for a maximum of 75,000 francs per passenger. For greater sums the risks are to be covered by a special policy.

Commercial aviation in Belgium is under control of the Ministry of Railways, Marine, Posts, and Telegraphs.

Bolivia

The only service operated so far in Bolivia is one between Cochabamba and Santa Cruz by the Lloyd Aero Boliviano Company. Equipment consists of two Junker airplanes capable of carrying mail, passengers, and freight.

New aerial landing fields will be built in Bolivia at Mizque, San Isidro, El Paso, Pampa Grande, and Taruma, according to reports. The Lloyd Aero Boliviano hopes to have within a comparatively short time a passenger service that will connect even the remotest districts of Bolivia. The Government will pay the Lloyd Aero Boliviano a subsidy of Bs. 25,000 so that work may begin immediately.

Twenty thousand Bolivars for air mail and passenger service in Eastern Bolivia, between Santa Cruz, San Jose de Chiquitos, Robore,
and Puerto Suarez, is provided for in a bill presented to the Chamber of Deputies of the Bolivian Congress by the Department of Santa Cruz.

Brazil

An air line between Manaos and Bolon, Brazil, has been authorized by the State of Amazonas. Calls will be made at intermediate points. The operator of the line will be Felippe Strazzeri.

An aviation service in Rio Grande de Sul is under consideration. The lines to be operated are: Porto Alegre to Pelotas and Rio Grande; Porto Alegre to Santa Maria; Porto Alegre to Praia de Banhos and cities along the coast.

There is a central meteorological office in Rio de Janeiro that can furnish general information on aerological conditions over Brazil. Included in this general system are nine stations which make upper air soundings with balloons.

Bulgaria

Preparations are being made for the operation of a state air service between Sofia and Varna, a distance of 250 miles. From September 28th to October 10th, an experimental service was carried on successfully, and it is expected regular operations will begin in the summer of 1927.

Canada

There are three air transport companies at present operating in Canada, as follows: Northern Air Service Syndicate, Haileybury-Rouyn Gold Fields, daily; the Central Canada Air Lines, Ltd., Kenora-Red Lake Gold Fields, daily; the Canadian Air Force, Ltd., Sioux Lookout—Cat Lake—Clear Water Lake—Red Lake—Woman Lake—Rice Lake—Bee Lake—Ricably Lake.

In Canada, aviation has had to face requirements of a totally different order from those in other countries, and air transport on fixed routes has not been one of the most important uses of aircraft. Forest fire protection and air survey, to name but two of these requirements, have demanded the first and principal attention.

Even so, there are occasionally opportunities for a regular service of aircraft to be operated with advantage. For example, on the opening up of the Rouyn mining district in northwest Quebec, a service of flying boats was run which covered in thirty minutes a stretch of country that could not be crossed in less than three days on ground. The air service not only carried the prospectors and their kit to the field, but kept up a supply of fresh provisions.
Conditions of a similar type were found from time to time in different parts of Canada and it cannot be doubted that with more experience and increased public interest there will be many opportunities for commercial air transport both on fixed routes and in taxi service. As in the United States, the great distances separating the principal centers of Canada favor air transport, and the advantages of connecting these centers by air are immediately apparent.

The Canadian Government does not pay any subsidies or make any special appropriations for commercial air services. However, it authorizes companies carrying mail to issue a special 25-cent stamp. The Government has not established or planned air routes, nor does it give any service in connection with civil or commercial air light-houses, radio beacons, radio telephone or telegraph service, or the marking of fields. However, it uses the Canadian Air Force in useful and practical services of a civil nature, such as making aerial maps, etc. Thousands of miles of undeveloped areas have been mapped and surveyed, and a permanent guard of airplanes has been instituted to send wireless reports of forest fires.

A new airplane service will be inaugurated to the mining district east of Lake Winnipeg in the Province of Manitoba. The line will be operated by the Western Canada Airways, Winnipeg, Manitoba. A Fokker Universal monoplane will be used.

Civil aviation in Canada registered a marked increase in 1926 as compared with previous years, according to a statement issued by the Department of National Defense. A total of 4,755 flights were made as against 3,171 in 1925. Flying hours increased from 4,091 in 1925 to 5,860 last year. In 1926, 6,436 passengers were carried over 631,715 miles, as compared with 4,897 passengers and 446,648 miles the year before. Freight traffic amounted to 724,721 pounds, as against 502,220 pounds in 1925. These figures include apparatus carried by the Provincial Air Service in Northern Ontario. Aerial survey companies photographed 20,921 square miles in 1926 and 3,167 in the previous year. Air patrols protected 105,000,000 acres in Northern Ontario. Timber type mapping by sketching was done over 22,295 square miles.

The control of civil and commercial aviation is carried out under the authority of the Ministry of National Defense by the Royal Canadian Air Force.

Chile

The Chilean War Department has selected El Salar de Carmen for an aviation base. Thirty-five planes of various kinds now at
Antofagasta will be transferred to El Salar de Carmen when the hangars, shops, and barracks are completed.

An air line between Santiago and Iquique is proposed by a commercial aviation company organized in 1926; and mail service between the port of Valparaiso and Santiago is announced for early in the year to make connections with incoming and outgoing ships.

China

Operation of a regular air mail service between Osaka, Japan, and Shanghai, China, was begun October 7th, 1926. The planes used are of Japanese design, powered with German motors.

Colombia

There is one air transport company at present operating in Colombia. The Sociedad Colombo-Alemana de Transportes Aereos (S. C. A. D. T. A.), which operates the lines up the Magdalena River as follows: Girardot-Neiva, 94 miles, twice weekly; and Barranquilla-Puerto-Wilches-Barranca-Bermeja-Puerto-Berrio-Honda-Girardot, 622 miles, twice weekly.

In the latter part of 1925, the company inaugurated its first international service between Barranquilla and Maracaibo (Venezuela).

During 1925, the company flew 183,206 miles, the amount of mail carried being 11.7 tons, and the passengers numbering 1,124.

The S. C. A. D. T. A. has formed three associated companies, known respectively as the Condor Syndicate, the International Aerial Surveys, and the Compania Stranandereana de Aviacion. The former undertakes experimental air transport operations, the second has been very active in planning and carrying out air survey, and the third is responsible for the operation, on behalf of the S. C. A. D. T. A. of the Sabana de Torres-Bucaramanga service.

Colombia has a population of about 6,000,000 and is the second largest coffee producing country in the world. The centers of population and production are located on high plateaus, several hundred miles from the coast. The country is divided by three long parallel mountain ranges and traffic between the plateaus is forced to follow the lines of the valleys, principally the main valley of the Magdalena River which is the only navigable waterway in the country and the only practical traffic route for exports and imports.

The air service has been running entirely without artificial assistance since 1921. It connects the port of Barranquilla with Bogota, the capital, following the course of the Magdalena River as far as Girardot. With its branch lines this service covers 790 miles.
The only means of communication are by the river itself or mule-pack; and the river boats are very slow, being delayed for long periods in times of low water. Normally, the service saves from nine to eleven days between Barranquilla and Bogota.

Encouraged by its success in Colombia, the German-Colombian company responsible for this service is endeavoring to obtain support for a service linking up with central and adjoining South American Republics with the United States. An associated company has been formed in the United States and is now engaged in interesting the other countries concerned.

This service is an example of regular air transport running under typical colonial conditions and filling a need for improved communication which could not otherwise be satisfied except at great expense.

Cuba

According to an announcement by the Cuban Department of Communications on May 15th, 1926, an air mail service between Havana and Santiago, Cuba, will be established in the near future. Army aviators will operate the route and the service will be controlled by the Government.

The President of Cuba plans to have a seaplane for the use of Government officials who may find it necessary to make quick trips into the interior on Government business. It is reported also that a thorough reorganization of the Aviation Corps of the Army is contemplated. An up-to-date flying school is to be established so that cadets may obtain necessary instruction without going to the United States, as is now the case.

Czechoslovakia

A series of successes in 1926 has given proof of the marked development of aviation in Czechoslovakia. The year has seen great progress characterized by the notable flights which have been made in Czechoslovakian planes, powered with Czechoslovakian engines and manned by Czechoslovakian pilots. The Aero Company, with the Aero AO-11b, equipped with a Perun engine, manufactured by Breitfeld & Danek, organized a successful flight around Europe, Africa and Asia. With the same plane a flight was carried out around all of the countries in the Little Entente without landing. This company in addition to constructing airplanes, also manufactures seaplanes.

The Avia Company was successful in winning a prize in the International races at Brussels, and at D'Orly, and recently, for the
second time, they won the Italian Cup, thus gaining permanent possession of it. This company is about to establish an air line between Prague and Liberec, using planes equipped with the little air-cooled 60 h.p. Walter engine.

The excellent results obtained with aircraft engines manufactured by the Walter Company have resulted in many foreign countries buying their 60, 85, and 110 h.p. air-cooled types. In addition, the Breitfeld and Danek Perun and Blesk motors have proved highly successful.

There are two air transport companies operating in Czechoslovakia, as follows: Ligne Aérienne D'État Tchécoslovaque, Prague, which operates the route Prague-Bratislava-Kassau, 373 miles; and the Aero Club of Czechoslovakia, Prague, which operates the route Prague-Marienbad, 75 miles, daily.

The planes used on these routes consist of the De Havilland 50, Junkers F13, and Aero 22. 260 h.p. Maybach engine. Lines carry mail, passengers, and goods.

A new air transport company, with a capital of about £50,000, has been formed at Prague for the purpose of operating international air lines, the first of which will be between Toplitz and Trieste, via Prague, Brunn, Bratislava, and Zagreb.

The Czechoslovakian Government gives very practical aid to commercial aviation companies. It builds airplanes and supplies them to transport companies. It builds and grades airdromes and emergency fields and equips them with lighthouses, meteorological, and wireless services. It runs the State's school for pilots, both sport and commercial. Besides, it gives them a very generous subsidy, and spends a large sum of money on propaganda.

All commercial and civil aviation is under control of the Ministry of Public Works.

Denmark

There is one air transport company at present operating in Denmark, the Danish Air Transport Company, Copenhagen, which operates the lines Copenhagen-Hamburg, 192 miles, daily except Sunday; and Copenhagen-Hamburg-Cologne, 308 miles, daily except Sunday.

The Danish Air Transport Company operated these two routes during their flying season of 1926 with a regularity of 98.6 per cent to Hamburg and 95 per cent to Cologne. The reconstruction undergone by the Danish Air Transport Company during 1926 contributed greatly to the relatively poor results obtained, but should operate
to a decided advantage during the coming year, now that the system has passed the experimental stage.

These services were operated in conjunction with the Dutch, German and French services. Passengers were able to make connections with K. I. M. at Hamburg and with the French Farman Line at Cologne.

<table>
<thead>
<tr>
<th>Distance Flown</th>
<th>Mail</th>
<th>Merchandise</th>
<th>Passengers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925</td>
<td>201,417 Kms.</td>
<td>2,639 Kgms.</td>
<td>17,126 Kgms.</td>
</tr>
<tr>
<td>1926</td>
<td>203,954 Kms.</td>
<td>1,079 Kgms.</td>
<td>26,803 Kgms.</td>
</tr>
</tbody>
</table>

Air regulations are under the Ministry of Public Works.

**Estonia**

There is one air transport company at present operating in Estonia, The A. S. Aeronaut, Tallinn, which operates the route Tallinn-Helsinki, 53 miles, daily.

From the beginning of the 1926 flying season, one service each way has been carried out daily between Tallinn, Estonia, and Helsinki, Finland, by the A. S. Aeronaut and the A. S. Aero.

Up to October 1st, 1926 statistics were as follows: Flights, 904; passengers, 2,243; baggage and freight, 30,294 kg.

**Finland**

There is one air transport company at present operating in Finland, the O. Y. Aero, Helsinki, which operates the following services:

Helsinki-Stockholm, 217 miles, daily except Sunday.
Helsinki-Tallinn, 53 miles, daily.

Air traffic has showed noteworthy development during the summer of 1926. The traffic statistics of the route Helsinki to Stockholm, between June 1st, and October 1st, for the last two years are as follows:

<table>
<thead>
<tr>
<th>Passengers</th>
<th>Kg. of Mail</th>
<th>Kg. of Luggage</th>
<th>Kg. of Freight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925</td>
<td>430</td>
<td>340</td>
<td>...</td>
</tr>
<tr>
<td>1926</td>
<td>782</td>
<td>2606</td>
<td>10,811</td>
</tr>
</tbody>
</table>

Junkers seaplanes are used on these routes.

The services which continue the year round are discontinued temporarily in the spring while the ice is melting, and in the fall until the ice is firm enough for the winter traffic to commence.

Besides subsidizing the air mail and passenger service, the Finnish Government and municipalities have purchased and equipped landing fields, loaned money for the purchase of planes, and lifted the import duty on airplanes intended for general passenger and mail transportation.
There are four air transport companies at present operating in France, as follows:


The Compagnie General d'Enterprises Aeronautiques, known as the Latécoère line, Paris, which operates the services: 1. Toulouse-Perpignan-Barcelona-Alicante-Malaga-Tangier-Rabat-Casablanca, 1,146 miles, daily service—requires two days. 2. Casablanca-Agadir-Port Etienne-St. Louis-Dakar, 1,770 miles, once a week; 3. Marseille-Perpignan, 170 miles, daily except Monday; 4. Oran-Alicante, 189 miles, four trips weekly; 5. Casablanca-Rabat-Fez-Oran, 469 miles, twice weekly.

The equipment of the Compagnie Air Union includes twin-engine Goliaths, Bleriots, Liore et Oliviers, a total of 35 planes. A series of successful night flights were made by this company during the winter of 1926. It is expected that a lighted airway linking London, Paris and Marseille will be completed this year.

The equipment used on the Latécoère line consists of the Late-17, a monoplane equipped with either a Renault 300 h.p. motor or a Jupiter. The load capacity is about 1,200 kilograms. Also the seaplane Late-21 equipped with two Jupiter engines with a load capacity of 760 kilograms and two cabins with four comfortable seats. The fleet maintained consists of 122 airplanes and seaplanes.

In 1927, Latécoère intends to close the circuit between Dakar and Buenos Aires, with one trip a week as follows: Dakar to Cape Verde Islands by seaplane; from Cape Verde to Noronha by fast ship capable of making 18 knots; from Noronha to Pernambuco by seaplane, and from Pernambuco to Buenos Aires by a Late-17 air-
plane making an average of 180 kilometers per hour. This is to be realized by July 1 and as Latécoère has the reputation of meeting its engagements, it will undoubtedly succeed, with the hearty approval and support of the French Government.

The heavy postal traffic of Latécoère is looked upon as a peculiar characteristic of the line. There are hardly more than 100,000 Europeans in Morocco but all who can, utilize the service, having gained confidence in its regularity. In seven years, postal traffic has multiplied 833 times, from 9,124 letters in 1919 to 7,502,191 in 1925. During the first nine months in 1926, 4,722,099 letters were carried.

The equipment used on the Air Union routes is as follows:
1. Goliath twin-engine planes, 520 h.p.—12 passengers.
2. Spad, 260 h.p.—3 seaters.
2. Bleriot, 420 h.p.—6 passengers.
2. Liore et Olivier, twin-engine seaplanes, 840 h.p.—18 passengers.
2. Bleriot twin-engine, constructed and ready for service, same type as the Liore et Olivier, 18 passengers.

The personnel of the Compagnie Internationale de Navigation Aérienne consists of about 550 of whom 50 belong to the general management and service of operation. In this number are included 27 pilots. The firm has a very large equipment of planes consisting of Spads, Portez 9, and Bleriots.

Lignes Aériennes Farman use largely Farman-Goliath twin-engine planes on their routes, and operate 20 planes all told.

Traffic Statistics of the French Air Line Companies Year 1926

<table>
<thead>
<tr>
<th>Companies and Lines</th>
<th>Kilometers Flown</th>
<th>Passengers Transferred, Per Thousand Kilometers</th>
<th>Express Matter Tons Per Kilometer</th>
<th>Postal Matter Tons Per Kilometer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air Union</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paris-London</td>
<td>563,827</td>
<td>2,347</td>
<td>182,072</td>
<td>718</td>
</tr>
<tr>
<td>Paris-Marseille</td>
<td>225,243</td>
<td>343</td>
<td>4,222</td>
<td>354</td>
</tr>
<tr>
<td>Lyons-Geneva</td>
<td>24,747</td>
<td>30</td>
<td>268</td>
<td>69</td>
</tr>
<tr>
<td>Antilles-Ajaccio-Tunis</td>
<td>80,220</td>
<td>147</td>
<td>180</td>
<td>33</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>894,037</td>
<td>2,867</td>
<td>187,362</td>
<td>1,354</td>
</tr>
<tr>
<td><strong>Compagnie Generale d'Entreprises Aero Nautiques (Latécoère Lines)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toulouse-Casablanca</td>
<td>1,400,097</td>
<td>1,122</td>
<td>15,835</td>
<td>160,050</td>
</tr>
<tr>
<td>Casablanca-Oran</td>
<td>158,463</td>
<td>173</td>
<td>1,954</td>
<td>5,038</td>
</tr>
<tr>
<td>Marseilles-Perpignan</td>
<td>172,427</td>
<td>45</td>
<td>197</td>
<td>6,720</td>
</tr>
<tr>
<td>Oran-Alicante</td>
<td>125,834</td>
<td>25</td>
<td>354</td>
<td>1,411</td>
</tr>
<tr>
<td>Casablanca-Dakar</td>
<td>612,588</td>
<td>205</td>
<td>2,171</td>
<td>16,256</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2,469,329</td>
<td>1,570</td>
<td>19,631</td>
<td>189,475</td>
</tr>
</tbody>
</table>
Compagnie Internationale
de Navigation
Aerienne—
Paris-Constantinople ...... 1,335,124 1,185 114,949 3,588
Prague-Warsaw .......... 216,806 102 7,433 466

1,551,930 1,287 122,382 4,054

Societe Generale de Transports Aeriens (Farman Lines—
Paris-Amsterdam ........ 271,405 532 25,961 191
Paris-Berlin et Brussels,
Cologne-Essen ........... 120,656 336 6,013 320

392,061 868 31,974 511

France-Algeria—
Marseilles-Algiers (Trial flights) ........... 13,228 
5,220,585 6,592 361,349 195,404

The French Government over and above generous subsidies given
to these companies, aids commercial aviation in the following ways:
All airdromes used by commercial companies in transportation of
mail, freight, and passengers are owned and maintained by the
French Government. The French Government provides and main­
tains air lighthouses, radio beacons, radio telephone and telegraph
services, marking of landing fields, weather reports, etc. However,
the companies are required to pay a certain rental for the use of the
fields, etc. The French Government also supplies funds for experi­
mental and propaganda purposes, and offers substantial prizes to
French constructors who succeed in regaining or retaining the
world’s principal air records.
The chief French development of the past twelve months might
be summarized as follows:
An auspicious beginning, with the French aviation industry
producing planes and motors at a pace faster than any other
country in the world—planes at the rate of 3,000 annually, it
was estimated.
A gradual slowing down of operations in the industry as the year
advanced, culminating in general depression at the end, and the
failure of several small firms.
An increase in operations of commercial lines with the coming
of spring and summer, indicating that the year would produce the
largest volume of traffic yet carried on French lines.
The sudden appearance of Germany as the chief competitor of
France in international commercial aviation as a result of a diplo­
matic accord in May, which freed Germany’s hands for international
developments.
New lines inaugurated: Paris-Lyons-Marseilles (May 25th); Paris-Berlin (May 26th); Ajaccio-Tunis (June 1st); Lyons-Geneva (June 1st).

Important amalgamation in French commercial aviation when the Air Union Company (London-Paris-Marseilles line) assimilated Aero-Navale (Antibes-Ajaccio-Tunis line) on July 21st.

Abolition of the office of “Under-Secretary of State for Aeronautics” (July), and reorganization of civil air service by creation of the office of “General Director of Aeronautics and Aerial Transport (November).

Tenth Exposition Internationale de l’Aeronautique at Paris (December 3rd-19th), in which there were 170 exhibitors.

The first of the huge Richard-Penhoet Seaplanes on which work was begun nearly three years ago was completed. The preliminary trials which the machine has been given are reported as having been very satisfactory. It flew over St. Nazaire roads for several hours at an average speed of 200 kilometers per hour. The machine is said to be the largest seaplane in the world, having a monoplane wing spread of 40 meters, weighing 26,460 pounds empty and is powered with five Jupiter motors of 420 h.p. mounted on the wings.

Increased budget voted by parliament for aeronautics in 1927 (December), including $13,751,250 for subsidies.

French Aviation Clubs and Societies were active in 1926, according to answers to a questionnaire recently submitted by the Aero Club de France to its affiliated organizations. Answers were received from 32 clubs and societies in all parts of France and in Algeria and Morocco. All except two held numerous meetings, lectures and aerial demonstrations. Fifteen reported extensive flights by members, the list being headed by the Aero Club du Gard with 886 hours of flight. Fourteen reported balloon ascensions, the most important record having been made by the Aero Club Caenclusien with 65 ascensions. An additional organization not affiliated with the Aero Club de France, the “Union des Pilotes Civils de France,” conducted many airplane flights and held conferences and receptions.

Throughout the year, many record-breaking performances, stimulated by governmental policy to encourage “grands raids:,” an altitude of seven and one-half miles attained, a non-stop flight from Paris to the Persian Gulf of 3,500 miles; a voyage by seaplane across Africa connecting France and Madagascar for the first time.

New Lines under Consideration—Besides the extension from Dakar to Buenos Aires, a second major route is considered running from Marseilles across the Mediterranean via Naples and Corfu to
Bevrouth and Baghdad. Another route is from Marseilles to Antibes, Tunis, Tripoli to Cairo. With the French Chamber of Commerce much concerned over France's lack of feeder lines, the following routes are being considered: Lyons-Clermont Ferrand-Bordeaux; Marseilles-Toulouse-Bordeaux; Nancy-Brest; and Cherbourg-Bordeaux.

Air Services in the French Colonies—On April 3rd, 1926, a regular weekly air mail service was begun between Saigon-Kratie-Savannakhet, Indo-China. It is proposed to extend this service to Hanoi. It is hoped to complete the journey from Saigon to Hanoi in 12 hours. This service is suspended during the period of the monsoon.

The attempts to establish an air service in Madagascar have not yet proved successful. Experimental air mail services have been operated in Syria with results.

Germany

German air transport has been placed in the hands of one large well-capitalized company, which is known as the Deutsche Lufthansa. The amalgamation was effected in January, 1926, and service resumed by the newly organized company in April. This organization operates over 50 lines, including some run jointly with foreign companies. Its total active fleet comprises about 120 planes, of which 40 are kept at Berlin and the rest scattered; in addition there are between three and four hundred in reserve. This fleet is composed of three types of Dornier Wal planes, three types of Junkers, two types of Albatross, and one type each of Udet and Rohrbach. Virtually all these lines carry mail, passengers, and goods, and maintain daily services.

Government participation in Deutsche Lufthansa (both State and Federal), amounts to about 45 per cent of the total capitalization. During 1927 this company plans to establish an all-freight line between Berlin and London, which will be the first in Europe. The first European sleeping service commenced September 3rd, 1926, between Berlin and London. An Albatross machine was used, (two engines, 260 h.p.) with eight leather passenger chairs convertible into four regular size berths. Light meals and drinks were served en route.

The Deutsche Lufthansa A. G., Berlin, operates the greatest air transport system in the world, made up of the following services:

Berlin-Danzig-Königsberg-Tilsit-Memel, 513 miles, daily except Sunday.
Berlin-Leipzig-Nuremberg-Munich, 327 miles, daily except Sunday.
Berlin-Halle-Munich, 322 miles, daily except Sunday.
Berlin-Halle-Erfurt-Stuttgart-Zurich, 432 miles, daily except Sunday.
Berlin-Magdeburg-Cologne, 300 miles, daily except Sunday.
Berlin-Breslau, 182 miles, daily except Sunday.
Berlin-Danzig-Konigsburg, 398 miles, daily except Sunday.
Berlin-Stettin, 81 miles, daily except Sunday.
Berlin-Hamburg, 158 miles, daily except Sunday.
Munich-Innsbruck, 93 miles, daily except Sunday.
Munich-Bad Reichenhall, 68 miles, daily except Sunday.
Malmo-Copenhagen-Hamburg-Bremen-Amsterdam, 440 miles, daily except Sunday.
Hamburg-Bremen-Dortmund-Essen-Dusseldorf-Cologne, 240 miles, daily except Sunday.
Hamburg-Kiel-Flesnburg (Westerland), 90 miles, daily except Sunday.
Hamburg-Schwerin-Stettin, 196 miles, daily except Sunday.
Zurich-Munich-Vienna-Budapest, 518 miles, daily except Sunday.
Basle-Mannheim-Frankfort-Cologne-Dusseldorf-Amsterdam, 411 miles, daily except Sunday.
Basle-Stuttgart-Nuremberg, 209 miles, daily except Sunday.
Essen-Dortmund-Braunschweig-Berlin, 284 miles, daily except Sunday.
a. Dusseldorf-Essen, 18 miles.
b. Crefield-Essen, 22 miles.
c. Gladbach-Dortmund, 50 miles.
Dortmund-Essen-Cologne-Frankfort-Furth-Nuremberg-Munich, 380 miles, daily except Sunday.
Rotterdam-Essen-Dortmund, 134 miles, daily except Sunday.
Essen-Dortmund-Frankfort, 167 miles, daily except Sunday.
Frankfort-Giessen-Cassel, 95 miles, daily except Sunday.
Mannheim-Karlsruhe-Baden Baden-Villingen-Konstanz, 146 miles, daily except Sunday.
Gleiwitz-Breslau-Halle-Cologne, 535 miles, daily except Sunday.
Dresden-Chemnitz-Plauen-Nuremberg, 170 miles, daily except Sunday.
Plauen-Gera-Halle, 76 miles, daily except Sunday.
Stettin-Kalmar-Stockholm, 428 miles, daily except Sunday.
Stettin-Stolp-Danzig, 191 miles, daily except Sunday.
Stettin-Swinemunde-Sellin-Stralsund, 101 miles, daily except Sunday.
Danzig-Marienburg-Elling-Allenstein, 95 miles, daily except Sunday.
Berlin-Essen-Cologne-Paris, 565 miles, daily except Sunday.
Munster-Cologne, 74.5 miles, daily.
Dortmund-Cologne, 56.5 miles, daily.
Bremen-Wangeroog, daily.
Bremen-Norderney-Borkum, daily.
Hannover-Erfurt-Munich, daily.
Dortmund-Borkum, daily.
Dortmund-Gelsenkischen, daily.
Freiburg-Stuttgart, daily.
Borkum-Norderney-Emden-Osnabruck-Hannover-Hildesheim, 221 miles, daily.
Hamburg-Bremerhaven-Wangeroog-Norderney-Borkum, daily.
Lubeck-Kiel-Flensburg-Westerland, daily.
Bremerhaven-Helgoland, daily.
Essen-Norderney, daily.

In addition to the Lufthansa there are a number of regional air transport companies, which do not possess equipment of their own, but depend on the Lufthansa to carry their traffic. A list of these regional companies follow:

Badisheimer Lufthansa A.-G., Mannheim.
Bodensee Aero Lloyd G. m. b. h., Lindau.
Hessische Flugbetriebs A.-G., Darmstadt.
Luftverkehr Pommern G. m. b. h., Stettin.
Luftverkehrsgesellschaft Ruhrgebiet A.-G., Essen.
Luftverkehrsgesellschaft Schwarzwald m. b. H., Freiburg.
Luftverkehr A.-G. der Provinz Sachsen, Halle.
Luftverkehrs A.-G. Niedersachsen, Hannover.
Luftverkehrs A.-G., Westfalen, Dortmund.
Luftverkehr Ostpreußen G. m. b. H., Königsberg i. Pr.
Norddeutsche Luftverkehrs A.-G., Bremen.
Oberschlesische Luftverkehrs A.-G., Gliwitz.
Rheinische Luftverkehrs A.-G., Köln.
Sächsische Luftverkehrs A.-G., Dresden.
Südwestdeutsche Luftverkehrs A.-G., Frankfurt a. M.
Schlesische Luftverkehrs A.-G., Breslau.
Süddeutsche Lufthansa A.-G., München.

The report of the Lufthansa for 1926 includes these items: 6,141,471 kms. were flown; the length of the airways operated increased from 17,574 kms. in 1925 to 20,408 kms. in 1926; the total number of passengers was 56,268; the amount of baggage 384 metric tons; freight, 258½ metric tons; and postal matter, 302 metric tons.

New air lines proposed for the near future are as follows: Berlin to Paris to Lisbon, Munich to Lyons, Capetown to Johannesbugh to Durban, Teheran to Enseili to Bendir, Buschir to Kanikin, Moscow to Vladivostok. Many of the new lines will lie wholly in foreign lands far distant from Germany. One falls within the British Empire, another in Persia. The former is said to be on
the verge of definite enactment through contract, whereby, for a trial period, the German Junkers Air Transport Company (now part of the Lufthansa) will be empowered by the Government of the Union of South Africa to establish two commercial air enterprises out of Capetown.

There are federal, state and municipal subsidies, several different kinds of each. In form they are both direct and indirect. Altogether for the year 1926 they are estimated roughly by officials of the Lufthansa at $7,146,000.00.

Federal grants are made by the Reichstag through the Air Department of the Ministry of Transport and Communication. As direct gifts, they take the form mainly of a bonus for every kilometer flown, a bonus amounting on an average to about $0.48 per kilometer (with operating costs about $0.70 per kilometer). Thus, over two-thirds of the expenses incurred have to be footed by the taxpayer through the Government.

The Reich Government, besides their regular subsidies for air traffic, contributes the wireless and meteorological equipment and service to the air transport company, and defrays the cost of insuring passengers and goods. It also contributes generously to the expenses of exhibitions, research, experimental stations, and the development of gliders and low-powered aircraft. The cost of providing and maintaining airdromes is borne by the municipal authorities. They also invest in airdromes and air transport companies, and this has become a particular feature of German civil aviation.

However, Germany does not grant subsidies to sport aviation nor for training student pilots for sport aviation, nor to persons engaged in aviation with the exception of the personnel assigned to operating the commercial lines in service, or needed for the regular requirements of factories, under a pledge recently given by the countries of the State to the Reich.

Insurance—The Deutsche Lufthansa and its affiliated companies have made an arrangement with the Stuttgarter Versich­erungs-Verein (Stuttgarter Insurance Corporation) whereby every passenger in the company’s airplanes should carry insurance to the amount of 25,000 reichmarks (approximately $5,950.) The insurance is called automatic, i. e., the passenger insures himself by purchasing a ticket for a flight, the insurance fees being included in the price of the ticket. The policy covers any injuries sustained by a passenger, or death, as a result of an accident on board an airplane, or by the crashing of an airplane in which he is a passenger, including any injuries which might be incurred in entering or leaving the vehicle, or injuries or death occurring while en route to or
from airdromes, if such transportation is supplied by the aviation companies. If a passenger is killed in an accident, his heirs or legal representative receive 25,000 reichmarks. The same amount is paid to a passenger in case of permanent disability. In case of temporary disability as a result of injuries sustained in an accident, the passenger is entitled to a payment of 25 reichmarks for each day he is prevented from following his profession. No automatic insurance is granted on passengers' baggage and freight; it must be arranged for beforehand at the rate of one mark per thousand. The policy covers all risks (explosion, fire, destruction, theft, loss, etc.) The Lufthansa states that the insurance company is doing a very satisfactory business under this plan, owing to the small number of accidents which have occurred since the inauguration of this insurance system.

Great Britain

In England practically all regular commercial airplanes are operated by Imperial Airways, Ltd. In addition, there are a number of taxi and "joyride" companies.

Subsidies are granted in lump sums annually, with the requirement that the Imperial Airways shall fly a certain number of h.p. miles in each year.

In February, 1923, a committee appointed by the Secretary of State for Air recommended a monopoly run on business lines. Imperial Airways was formed, which took over all the shares of Handley-Page, Limited; Instone Air Line, Limited; Daimler Hire, Limited; and British Marine Air Navigation Company, Limited. The authorized capital is $4,870,000. Imperial Airways was guaranteed a subsidy of $4,870,000 spread over a period of ten years but not in equal annual installments. The company was to fly one million miles per annum, but this was changed on January 15th, 1926, to payment of the subsidy for the completion of 425,000,000 h.p miles. The purpose of this change was to make it to the interest of the company to operate high power airplanes carrying large loads. It was also provided that every mile performed by a marine aircraft should be counted as one and a half miles.

From March, 1921, to March, 1922 .............. $417,217
From April, 1922, to March, 1924 .............. 962,667
From April, 1924, to March, 1925 .............. 640,502

Imperial Airways will receive an additional annual grant of $456,000 for the Egypt to India air route, opened this year, for five years.
Kladiman Mosque, Baghdad.—Photo Royal Air Force.

The company's full fleet last year comprised:

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>Seating Capacity</th>
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<tbody>
<tr>
<td>3 Handley Page type W.8.B.</td>
<td>14</td>
</tr>
<tr>
<td>1 Handley Page type W.8.F.</td>
<td>12</td>
</tr>
<tr>
<td>1 Handley Page type W.9.</td>
<td>14</td>
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<tr>
<td>4 Handley Page type W.10</td>
<td>14</td>
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<tr>
<td>2 Armstrong-Whitworth &quot;Argosy&quot;</td>
<td>20</td>
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<tr>
<td>1 Vickers &quot;Vulcan&quot;</td>
<td>6</td>
</tr>
<tr>
<td>2 De Havilland D. H. 50</td>
<td>4</td>
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</tbody>
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On the Cairo-Karachi route the machines used are De Havilland Hercules D. H. 66, 14-passenger capacity, powered by three Bristol Jupiter air-cooled 425 H. P. engines. Five planes are employed.

Eighteen pilots are engaged in normal services; and a ground staff of 350 maintained in summer, and 270 in winter.

The Cairo-Karachi service was inaugurated in January, 1927. Until April, the service will be only between Cairo and Basra, from which point it is hoped to extend to Karachi. The westbound planes will stop at Dairys instead of Lingeh.

Since the stage from England to Egypt is not yet provided for, the air time table is being arranged to connect both the outward and homeward journey with the arrivals and departures of the P. & O. liners at Port Said.

Complete figures for 1926 are not available, but the following partial returns are of interest:

Passengers travelling by British airplanes between England and the continent increased 48 per cent for the six months April to September of 1926 as compared with the same period in 1925.

During the six months April to September, 1926, inclusive, the figures received show 3,838 aircraft flights were made between England and the continent in the transportation of freight and passengers. During the six months 20,913 passengers were carried and 618 tons of freight were transported over this same route.

During the six months period April to September, 1926, goods were imported into England by airplane to the value of $2,500,000;
exports and re-exports carried by air at a value of $2,000,000, giving a total of $4,500,000 foreign trade transported by airplane during the period. In addition imports of bullion and specie for the six months amounted to 31,219 pounds sterling, while exports were 3,010,305 pounds sterling, a total of 3,041,524 pounds sterling for the period.

An experimental air line between Khartoum and Kisumu, Uganda, Africa, was inaugurated early in January. If this route proves successful there will be a saving of time between these points of from 10 to 12 days.

In the way of providing indirect aids, the British Government contracts to provide certain specified ground facilities in the way of airfields, wireless apparatus, and weather service to Imperial Airways, Ltd. It also provides for the staffing and maintenance of the civil airfields, for the marking of air routes and the support of light airplane clubs. These aids are over and above the direct subsidies for the operation of the lines.

Insur¬ance—Practically all the insurance on flying risks being written in Great Britain is handled by the British Aviation Insurance Group which is understood to accept every possible risk. It is customary to write insurance on the craft for fire, theft, and passenger liability, and on passengers and cargo. Passengers may effect extra insurance when flying by means of small additional premiums on already existing life or accident policies, or by means of special policies. Professional aviators and pilots may take advantage of special policies offered for six months or a year. Cargoes are insured from airfield or from door to door when specified.

At present, except for standard rates quoted, applicable to cargo and passengers flying between London and Paris, there is no established schedule of premium rates, and in all other cases the underwriters quoted rates strictly on individual requirements and after careful scrutiny of details. No averages are yet established.

Safety and Reliability—In regard to safety, the record of the British air lines proves that air transport when properly administered and efficiently operated is reasonably safe. Imperial Airways, Ltd., and its predecessors have in seven years carried over 75,000 passengers in the course of flying approximately 5,000,000 miles, equal to 200 times round the world at the equator. In all this flying only four accidents have occurred causing the death of passengers.

Greece

The American Commercial Attaché at Athens reports the purchase of twenty-five training planes by the Greek Government.
Morane-Saulnier airplanes were decided upon by the committee appointed to study the needs of the Army.

Guatemala

On June 15th, the formal delivery of an airplane given Guatemala by the Mexican Government took place before a distinguished assembly. The Mexican Military Commission made the presentation, which was followed by a speech of acceptance by the President of Guatemala. Medals were awarded to the aviator and the mechanic who brought the machine from Mexico.

A concession for air mail service was granted to Dr. Peter P. Von Bauer of the Sociedad Colombiano Alemana de Transportes Aereos (SCADTA).

Hungary

There is one air transport company at present operating in Hungary, the Hungarian Air Transport Company, Budapest, which operates the two lines, Budapest-Vienna, 140 miles, twice daily, and Budapest-Craz.

India

The Indian Air Board has recommended its own extinction to the Government of India, and the appointment of a Director of Civil Aviation to take over its work.

Up to the present time India has done very little to develop her commercial air service. It is now recommended that a service be inaugurated between Calcutta and Rangoon as a start, as this route holds the greatest chance of success. It is believed that a regular service could be maintained between these two port cities for at least eight months in the year and possibly during the monsoon season also. The Government would construct and equip the bases, and lease them to a company and possibly levy landing and housing charges from it. The company would be registered in India with a rupee capital, and undertake to afford training and opportunities for employment to Indians in all branches of its work.

The Indian Air Board has also suggested that it might be practical for a night service to be inaugurated between Calcutta and Bombay, so that letters mailed after business hours in Calcutta could be delivered before business hours in Bombay the next morning.

Italy

There are four air transport companies at present operating in Italy, as follows:

The Societe Italiana Servizi Aerei, Trieste, which operates the routes Turin-Pavia-Venice-Trieste, 298 miles, twice daily; Trieste-Brioni-Lussinpoccolo-Zaza, twice daily.
The Societe Aero Expresso Italiana, Rome, which operates the route Brindisi-Corfu-Athens-Salonica-Constantinople, 988 miles, semi-weekly.

The Societe Anonima di Navigazione Aerea, Genoa, which operates the service Genoa-Ostia-Naples-Palermo, 573 miles, daily except holidays.

The Transadriatica Societa, which operates the service Vienna-Graz-(Klagenfurt)-Venice, 310 miles, daily except Sunday.

The first commercial air line in Italy was inaugurated at Trieste on April 1st, 1926, when operation commenced between Trieste and Turin with stops at Venice and Pavia. Since then, the above routes have gone into operation. Virtually all these routes carry mail, passengers, and goods. The machines used on the respective routes are as follows: Turin-Trieste and Trieste-Zaza use Cant. 10 type-4 passengers, 400 h.p. Lorraine engines; Brindisi-Constantinople use Savoia S-55 flying boats with twin 400 h.p. Lorraine engines, carrying 12 persons including crew; Genoa-Palermo use Dornier Wal seaplanes, 10 passengers, 2 Bristol Jupiter engines, 450 h.p. each; Venice-Vienna use 6 passenger, all-metal Junkers monoplanes, with one 200 h.p. engine.

Proposed routes for this next year are as follows: Rome-Munich via Bologna and Milan; Taliedo-Brindisi and to Merano; and an extension of the Venice-Vienna route from Venice to Rome and from Vienna to Warsaw.

The personnel and equipment of the four lines operating this last summer were: 100 pilots, 40 machines, and 8 passenger stations, including land and floating stations.

The companies at present in existence are independent of each other. The State subsidizes them in a different measure in accordance with the cost of the line as agreed upon in contracts between the State and the individual companies. The subsidy varies from 11 to 16 lire per kilometer flown.

The Italian Government, besides the regular subsidies based on mileage covered, gives many other aids, such as free use of wireless and meteorological services, military airdromes, mail subsidies, contributions to expense of plants, exemption from customs duties, communal taxes, and sales taxes on gasoline and lubricating oils, stamp taxes, registration fees, etc. Large amounts are also contributed for experimental work.

When speaking of the development of the commercial aviation of a country it is well to bear in mind its geographical configuration. Italy has not a very extensive territory, especially when compared with the United States; two-thirds of this territory is covered with
mountains. Also, she has a highly developed railway system. These three conditions make the progress of commercial aviation much more difficult in Italy than in other countries; and this explains, in part at least, why she has arrived later than other nations in the field of aerial transportation.

Mussolini, in a message to the Italian people, makes this statement on the progress of aviation in Italy:

"In 1922 we had only nine flying schools; today we have fifteen. In 1922 there was no air line in existence; today four are in operation. In 1922 Italian aviation could count only 4,220 hours of flying; whereas during this year, from January to September, 42,581 hours have already been flown. In 1922 no flight of any consequence, while in the two years that have just elapsed, Nobile, de Pinedo, Locatelli, Maddalena, Bolognesi, Storioni, and Paloni have flown Italian wings across the world. In 1922 we had 400 pilots; today we have on duty 1,195, and 385 in the training schools. Finally, in 1922, we would count only 600 machines, in all, for the most part old, damaged, or otherwise useless. Today we have 1,678, and 350 are under construction."

Commercial aviation in Italy is under the supervision of the Ministry of Aeronautics, of which General Bonzani is undersecretary.
There are four principal lines operating in the Island of Nippon. The Tokio-Osaka line is about 260 miles long and is flown three times a week. Breguet XIX's and Salmson engines are used. At least four are always in commission. The planes are flown principally for carrying mail and newspapers. The operator of the line is the Air Navigation Department of the Asahi Newspaper Company.

This newspaper also operates a line northwards from Tokio to Sendai, over a route of about 250 miles. Planes are flown once a week and the equipment is the same as that of the Tokio-Osaka line.

The third line in regular route connects at Osaka with the lines to Tokio and Sendai. The distance is a little over 300 miles and seaplanes especially built for this service are used. They are of the Kawanishi type. This line is operated by the Nippon Kohkuk Kaishi (Japan Air Navigation Co.), which also builds the planes used.

The fourth air line in regular operation is between Sakai-Osaka-Takamatsu-Imaharu-Oita. This is also a seaplane route and operates five seaplanes of different kinds three times a week. The company is the Nippon Kohkuk Yusch Ken Kinsho (Japan Air Transport Investigation Institute).

Air mail service between Osaka and Shanghai was begun with the arrival of two planes at Shanghai October 8, 1926.

The trial air mail route between Osaka and Dairen includes stops at Osaka and Hiroshima in Japan, Seoul in Korea, and Dairen. For the present, however, planes do not land at Dairen, but at Eijoshi on the South Manchurian railway, approximately midway between Dairen and Port Arthur. Later it is planned to have the mail planes use the new landing fields at Choushuitzu, 5½ miles northwest of Dairen. Although the first trial trips of the mail planes appeared successful, a regular service has not been decided upon.

Because of the retrenchment program of the present Government, the original estimates for civil aviation routes proposed by the Ministry of Communications have been severely cut. The proposal was to expend Yen 7,000,000 over a period of seven years for the establishment of new routes and to grant Yen 20,000,000 in subsidies to the operating company or companies to be expended over a period of eleven years.

Jugo-Slavia

Service on the Belgrade-Zagreb line is expected to begin during the summer of 1927. This line will be operated by a firm organized
in 1926 by the Aero Club. A ten-year concession has been granted
by the Government, and yearly subsidies will be paid.

An important development during the year was the decision to
establish civil aviation schools for pilots and mechanics. Pilots will
receive their training at the Bezanja airdrome near Belgrade; the
practical work of the school for mechanics will be carried out at
the Vlajkovic airplane factory. It is announced that there will be
no tuition charge.

The National Aero Club plans to hold a number of aviation
meetings and competitions during the year, which will stimulate
interest in aeronautics throughout the Little Entente.

Latvia

The Latvian Air Service Company discontinued their Riga-
Tallinn, and Riga-Helsingfors lines and sold their planes, as the
company closed its service with a deficit in 1925.

Negotiations are being conducted between the Latvian Govern-
ment and the “Deruluft” and “Lufthansa” regarding the opening of
an air line between Berlin and Moscow via Riga in the spring of
1927. This new line will replace the present Berlin to Moscow line,
but only on the condition that the Latvian Government will place
an up-to-date landing field at the disposal of these companies in
Riga, as the existing airdrome is not adequate. Other routes con-
templated via Riga are Berlin to Helsingfors, and Moscow to
Scandinavia.

Mexico

There is one air transport company at present operating in Mex-
ico, namely: The Compania Mexicana de Aviacion, which operates
the route Mexico City-Tampico-Matamoros, in addition to flying
in the oil fields.

This company has made 1,450 trips with a total mileage of
286,000 kilometers from the time of the organization of the com-
pany on October 1st, 1924, to November 30th, 1926. It is the only
aviation company in Mexico doing regular commercial flying. The
principal owners and pilots are Americans who were formerly Army
aviators.

The company now has four planes in service, all of which are
Lincoln Standards equipped with Hispano-Suiza engines.

On December 9th, 1926, a pilot of this company, with one passen-
ger, made a trip from Mexico City to Matamoros, opposite Browns-
ville, Texas, in the same day. The plane took off from Valbuena
field at Mexico City at 6:40 a.m., and landed at Tampico at 9:30
Tampico, Mexico.—Photo Fairchild Aerial Surveys.

a.m. It left Tampico at 1 p.m., arriving at Matamoros at 4:15 p.m. The air distance traveled was about 600 miles.

It is reported that the Mexican Government may establish air service to detect smuggling along the Mexico-United States border. Such a project is being prepared, according to the press, by the director general of customs for presentation to the secretary of interior. It is understood that the plan calls for the acquisition of three modern airplanes, which will be equipped with machine guns and bombing apparatus.

The Netherlands

Thanks to technical development on one hand and to the confidence of the public in aviation on the other, the year 1926 has furnished many new and encouraging indications of the development of commercial aviation in the Netherlands. During the summer of 1926, the following lines operated to and from this country:

The KLM (Royal Dutch Air Transport Co.)

Amsterdam to Paris, two trips a day.
Amsterdam to Rotterdam and London, two trips a day.
Rotterdam, Amsterdam, Hamburg, Copenhagen and Malmo, daily.
In the operations of these services, each day during the summer eleven airplanes operating on international lines depart from the Netherlands, and the same number of machines arrive daily in that country.

In order to determine the possibilities of a direct air line between Amsterdam and Marseilles, the permanent committee for the development of aviation between the Netherlands and the Dutch East Indies arranged, on May 28th, 1926, for a flight from Rotterdam to Marseilles. The plane, an FV21-a, reached Marseilles after an uninterrupted flight of 6½ hours. Three days later the opening of services between Paris and Marseilles by the Air Union assured a permanent airline from Amsterdam to Marseilles by way of Paris. At the end of August an aircraft exposition was held at Sceveginen.

The fleet of the KLM was very materially changed during the year on account of the constant need for larger machines. Most of the planes formerly used, F-31, were replaced by the newer type, FV21-a, providing greater tonnage and comfort for the passengers. Five of the F31's that were in good condition, however, continued to be regularly used until they were finally sold to a foreign country. In addition, KLM sold two of its FV21-a's to a foreign country at the end of the summer season, with the expectation of replacing all of these machines for next season by new types.

There is a general feeling that the future of aviation in the Netherlands is encouraging and that the operations are now upon a sound and permanent basis.

The KLM services are among the most efficiently operated routes in Europe. In addition to operating its regular lines, the KLM maintains a number of supplementary services such as local pleasure flights, special seasonal short flights, photographic and advertising work. Local passenger flights are offered to the public on Sundays and holidays and this service has not only brought in a considerable
revenue, but also has familiarized many people with the idea and practicability of air travel.

Due largely to improved equipment the working expenses of the company have decreased considerably. The cost of transportation per airplane in 1920 was set at Fl. 4.60 ($1.84) per ton per kilometer (that is, the transportation of 1 metric ton for 1 kilometer distance). The estimated cost in 1926 was Fl. 1.35 ($0.54).

In the first nine months of 1926 the total transport on all lines of the KLM amounted to 5,592 passengers and 206,614 kilograms of goods, as compared with 3,336 passengers and 129,500 kilograms of goods in the corresponding period of 1925.

The KLM has been subsidized from its inauguration by the Netherlands Government, and has this year entered into negotiations with the Government for an extension of the subsidy period until 1934, after which the company hopes to be in a position to operate on a self-supporting basis.

The regular landing fields are maintained by the municipalities of Amsterdam and Rotterdam. The National Government gives the four following services:
1. Wireless telegraph and telephone intelligence service, weather intelligence service and ground signalling.
2. Equipment of intermediate fields along the routes.
3. Making of experiments in lighting and signalling systems.
4. Publication of various data important for aviation.

Holland is anxious to participate in the organization of an air service to the East, which would provide her with a rapid connection to the Dutch East Indies, and the KLM wishes to expand in this direction. Attempts to start operations in the East Indies have hitherto been checked by financial difficulties, but there are signs that these difficulties are becoming less formidable.

Civil aviation is under the control of the Air Navigation Division of the Department of Public Works.

Nicaragua

By Government order the Ministry of Aviation has been annexed to the Ministry of the Interior.

Norway

The Norwegian Department of Commerce has contributed a 5,000-kroner subsidy for experimental flights under the auspices of the Aero Club of Norway, with a view to establishing air lines from Oslo to Copenhagen by way of Goteborg, and also from Oslo to Kristianssand, Coxhaven, Amsterdam and Harwich.
Panama

There are at present no military or commercial airplanes on the Isthmus of Panama except those belonging to the United States Government and stationed at flying fields in the Canal Zone. There is no department of the Panama Government which is specifically concerned with matters related to aviation and no appropriations have been made by the Government for aviation purposes.

Aids to aviation in Panama, such as airways, emergency landing fields, terminals, lighting equipment, and radio have been established by the War and Navy Departments of the United States in connection with the defense of the canal. Permanent installations of the character referred to are within the Canal Zone, but an airway has been established on the Pacific side of the Isthmus between Balboa and David, with intermediate landing fields at various places en route. The Republic of Panama has aided in the establishment of fields whenever requested to do so, supplying police and labor to assist in clearing and maintaining such fields, and to guard planes while outside the territory of the Canal Zone.

Paraguay

Paraguay is in the process of organizing its army under the direction of a French Mission. Aviation is their principal arm of defense, particularly because the percentage of population to the square kilometer is very small, and the communication and transport facilities throughout the country are meagre. For these and other reasons, the Government is making a great effort to establish an efficient aviation organization. Military aviation at the present time maintains but a few machines of types that are already more or less obsolescent and a few pilots trained in Brazil by a French Military Mission. These, however, are about to be developed upon a new and solid foundation. Five training planes, of the most recent design, have just been ordered from France. A new aviation field situated at the entrance to the Capitol is about to be completed and upon it will shortly be inaugurated a school for military pilots and mechanics.

The establishment of a school for military observers, as well as one for the training of pilots, together with the installation of a number of landing fields and the formation of the service into squadrons, are included in the progressive plan of development by the Government of Paraguay. Finally the creation in the near future of a certain number of air transportation companies for oper-
ating lines into the interior provinces, is expected to permit the entire country to maintain an aerial fleet composed of trained pilots flying efficient and modern aircraft.

**Persia**

An agreement for the organization of civil aviation in Persia has been concluded between the Junkers Company and the Persian Government. Under this agreement the company will operate a service for five years on the Teheran-Enzeli, Teheran-Bushire and Teheran-Qaratou routes. In addition, the company undertakes to connect one of these routes with the European air mail system and to open additional services in Persia in accordance with the requirements of the Persian Government.

The company also agrees to form a Persian aviation company to train a number of Persians as aviators and mechanics, and to establish in Persia a repair factory and a technical school of aviation. The Government is to pay a subsidy based on the number of kilometers flown, in addition to making a fixed monthly payment for the carriage of Government mails.

**Peru**

The Supreme Decree of September 20th, 1926, provided for a commercial air line between Iquitos and the central part of the country on the Upper Amazon, using seaplanes, by allotting 45,000 Peruvian pounds ($250,000) in the general budget for 1927 for the expenses of this service. The new service will function under the general supervision of the Ministry of Marine and will be used to map the Upper Amazon territory, as well as to transport mail and passengers. The overland trip from Lima to Iquitos requires from 20 to 30 days, whereas the plane service (travelers will continue to use the railroad for the stretch between Lima and Oroya) will cut the transit by two or three days, and will eliminate the hardships of mule and canoe travel.

The Huff Daland Dusters, Inc., have contracted to dust the cotton fields of the Canete and other valleys.

Late in 1926 the first direct flight with a passenger between Lima and Arequipa was made by Pilot E. Faucett. The flight was accomplished in a little over six hours with one stop en route, at Pisco, for fuel. The distance is about 775 kilometers, or 470 miles. This flight was arranged by the *West Coast Leader* in order to announce the international edition of that review, which will appear early in 1927.
The airlines of Poland have finished five successful years of existence in spite of financial difficulties and the absence of an aeronautical industry within the country, producing transport machines. Commercial aviation has developed in normal fashion and has become more and more an important means of transportation.

Poland’s geographic situation as well as its topography permits it to assume an advantageous position in the scheme of European air transport.

At the present time there exist in Poland two aeronautical companies and one international company: The Aérolot Company, the Aéro Company, the Campagne Internationale de Navigation Aérienne (C. I. D. N. A.).

The Aérolot Company operates the following lines:
1. Warsaw-Lodz-Cracow.
2. Warsaw-Leopold.
3. Warsaw-Cracow-Vienna.
5. Cracow-Leopold.

In a short time this company will commence regular operations with a line between Leopold and Czerniowce; a line between Puck and Copenhagen is being prepared. Puck is situated on the Baltic Sea near Dantzig and belongs to Poland.

Another organization, the Aéro Company, operates the line between Warsaw and Posen. The C. I. D. N. A. operates a line between Warsaw and Prague, making connections there for Paris.

The Polish aerial lines have been operated with great regularity during the past two years, most of them continuing their schedules throughout the entire year. The lines at present in operation cover a distance of 3,500 kilometers. The development of traffic is shown by the following:

In 1922: 613 passengers and 19,374 kgs. of express
In 1925: 5,018 passengers and 61,086 kgs. of express

For the first nine months of 1926 they carried 5,400 passengers and 60,118 kilograms of express.

The companies operating these lines are subsidized by the State, which gives them certain concessions. Up to now the machines employed have been manufactured in other countries. Efforts, however, are being made for the construction of necessary aircraft of domestic manufacture. Late in 1926 a contract for the establishment of an airplane factory near Warsaw was signed between the Skoda Works of Prague, Czechoslovakia, and the Polish Government. After the ratification of the contract by the Government of Poland
a joint stock company, capitalized at 1,000,000 Polish Zloty, will be formed under the name "Aeroplane Factory of the Skoda Works in Poland," which will take over the former airplane factory "Franco-pol," founded by French capital and later owned by French and Polish interests. The new company, in which the Government will be financially interested, will be fully controlled by the Skoda Works. As soon as the most urgent reconstruction work is completed it is planned to start manufacturing airplane motors of the type "Lorrain-Dietrich." The Skoda Works have already obtained the necessary license for the manufacture in Poland. The Ministry of War of the Polish Government strongly supports the development.

**Roumania**

Internal air mail will be organized and operated in Roumania under an agreement between the postal authorities and the Ministry of War. Mail will be carried by airplanes belonging to the so-called Aviation Section of the Ministry of War.

The first route to be opened will be between Bucharest, Galatz and Chisinau (Bessarabia), and between Galatz and Constantza, but the service will be extended as additional facilities are available.

Organization and exploitation of air navigation in Roumania is proposed by law. The exploitation of air transport lines in the interior of the country will be reserved exclusively to national companies. The control of State Air Lines will be vested in a Council of Administration.

**Russia**

There are four air transport companies at present operating in Russia, as follows:

- Deruluft Company, Moscow, operating the routes, Moscow-Smolensk-Kowno-Konigsburg-(Danzig-Berlin)—749 miles, daily (except Sunday).

- Ukrainian Airways, operating the routes, Moscow-Orel-Char-kow-Artemowsk-Rostov-Mineralnije Wody, 974 miles; Charkow-Jekaterinoslaw-Odessa, 366 miles; Charkow-Poltawa-Kiew, 267 miles.

- Dobrolet Company, operating the routes, Bokhara-Termez-Din-shambe, 453 miles, three times weekly; Bokhara-Khiva, 298 miles; Verkne-Udinek-Urga-(Pekin), 373 miles; Leninsk-Khiva-Teschaus, three times weekly; Samarkand-Dinshambe; Pishpek-Almata, irregular; Taskent-Vyernyi; Moscow-Leningrad, 390 miles; Moscow (Nizhni-Novgorod)-Kazan, 570 miles; Tiflis-Teheran.

- The Zakawia Company, operating the route, Tiflis-Tabriz.
All of the air lines are subsidized by the Soviet Government. Planes and equipment belong to the Government, and it bears the operating expenses and pays the companies an additional fee amounting to one-fifth of their expenses. A great deal of money is spent in propaganda and for experiments by the Aviachim Society (Friends of the Air Fleet), which is a Government organization.

Although accurate statistics are not available, it appears that these air lines together are carrying from 600 to 700 passengers a month and making about 100 trips in this period. On the Siberian and Central Agencies the tonnage of the planes is almost invariably fully used. No accidents have been reported.

During 1925, the Society of Friends of the Air Fleet combined with the "Dobrokhim" (Volunteer Chemical Society), the combined society being known as the "Aviokhim." In April, 1925, the Society of Friends of the Air Fleet had a membership of 2,400,000 and had collected 4,821,278 roubles, of which 3,235,093 had been expended on airplane construction. "Dobrokhim" had at the time of the union 1,300,000 members, a considerable number of whom already belonged to the Society of Friends of the Air Fleet. Branches of the Society have been opened at Berlin, Hamburg, and Kabul.

The latest scheme for raising money for aviation in Soviet Russia is a lottery. The prizes consist of free flights to the capitals of foreign countries, as Berlin, Paris, Rome, etc., or on any one of the regular commercial routes in the U. S. S. R., as Moscow to Kharkov, to Leningrad, etc.

Two million tickets will be sold at 50 copecks (25 cents) each, and any ticket may win a flight. The receipts will be used to establish a fund for the development of new flying routes and to promote the scientific study of aviation.

**Salvador**

There has been no development worthy of note in the use of aircraft in El Salvador up to the present time. Aviation is entirely under the jurisdiction of the War Department, there being no planes owned by private individuals or commercial organizations. Consequently, there are no agents or representatives of foreign airplane manufacturers located there, and the Government's requirements are ordered direct from the manufacturers abroad.

According to the Aviation Bureau of the War Department, there are now nine planes being used; seven of these are French planes, and two, American. The two American planes and two of the French planes have been in operation for several years, but the
other five French planes were purchased last year by the Minister of War in Paris, and arrived recently. One of these planes is a Breguet bombing machine, 300 h.p. The others are commercial planes of the Hanriot and Pregot type.

Siam

Air transport services in Siam are carried out by units belonging to the Royal Aeronautical Service. There are at present two lines in operation:

(1) Korat-Roi Ech-Ubon (opened June, 1922), extended to Nong-Kai during 1924.
(2) Korat-Roi Ech-Udorn (opened in 1924).

Goods of all descriptions, passengers and mail are carried, and both routes are operated weekly in each direction, the time saved over ordinary means of transport being two or three weeks. The machines engaged in these services have covered about 150,000 miles without serious accident, and during the year 1924-25 carried 255 passengers and approximately 50 tons of mail. The machines used are of French types and the pilots are Siamese, trained by French instructors.

In addition to the machines employed on the regular services, six ambulance machines are kept available for conveying invalids and doctors. Doctors and vaccines are carried free and patients requiring urgent medical attention are carried without charge if they cannot afford the fare.

Spain

There is one air transport company at present operating in Spain, as follows:

Compania Espanola de Trafico Aereo operating the route, Seville to Laraich, daily.

Civil aviation in Spain is under the control of a bureau in the Ministry of Labor. In 1922 the first purely Spanish commercial line was started by the Compania Espanola de Trafico Aereo between Seville-Tetuan-Laraich. There is little information as to traffic, personnel, or equipment on this route, but it is believed the line is principally occupied with the transportation of mail.

The policy of the Spanish Government is to make the aircraft industry completely self-sufficient. At present practically all the materials necessary for the construction of planes are produced in the country.

The Union Aerea Espanola has recently been given two concessions for the operation of airplane services, one between Madrid,
Cordoba, Seville and Jerez de la Frontera, and the other between Madrid, Guadalajara, Calatayud, Zaragoza, Lerida, Barcelona, Tarragona, Castellon and Valencia. These will be under the inspection of the Civil Aeronautic Section of the State and the usual conditions are imposed by the Government to guarantee the continuity of the service, the Government reserving the right to take over this line when the requisites of national defense render such action necessary. The concession is of six years duration and the concessionnaire is given the period of a year to inaugurate service. After being put into operation the suspension of service for two months will be equivalent to its cancellation. A bond of 25,000 pesetas has been given by the solicitors for this concession as a guarantee.

The Spanish Council of Ministers on November 18th, 1926, approved the establishment of an air line between Seville and Buenos Aires. The Sociedad Colon Transaerea Espanola has agreed to construct in Seville the hangars and shelters, and immediately on the realization of the first successful trip by the company, the State engaged to subsidize it to the extent of 30,000,000 pesetas. After a certain period of exploitation under subsidy the Government will take over the line and will then determine whether it should continue by lease or by direct exploitation. The company also agreed to operate a line between Seville and the Canary Islands, and it is stated that technical experts regard Seville as having the best conditions necessary for an airport of any city in Europe; and it is furthermore reported that this port will be utilized by the British Government in lines which it has planned for Europe and India.

It is stated that the 30,000,000 pesetas will be payable in a period of five years, during which time twelve round trips will be made per year at the rate of 500,000 pesetas per trip and occupying four and a half days each. The planes will be equipped for forty passengers and ten tons of freight, the State always reserving for each trip two passengers and five hundred kilos of mail and express. The company will build its planes on its own account and without Government assistance, and will complete the airport in Seville within three years. The company binds itself to inaugurate the line within a period of three years and establish a monthly round trip service which may be converted into bimonthly or weekly round trips, according to necessity. If the service is not a success, the obligation contracted by the Government will be cancelled without right on the part of the concessionaire to any indemnification whatever.

The Hispano-American Aviation Congress opened on the 24th of October, 1926, in Madrid. This Congress was attended by the
Ambassadors of Portugal and of all of the Latin American countries, while the Argentine Republic and Uruguay had special delegates. It culminated in the forming of a so-called Ibero-American Convention of Aerial Navigation, signed by the following nations: Spain, Argentina, Bolivia, Brazil, Colombia, Costa Rica, Cuba, Chile, Dominican Republic, Ecuador, el Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Portugal, Uruguay and Venezuela.

Sweden

There is one air transport company at present operating in Sweden, the Aktiebolaget Aerotransport, Stockholm, flying over these routes: Malmo-Copenhagen-Lubech-Berlin-Dresden, 407 miles daily; Malmo-Copenhagen-Hamburg-Amsterdam, 440 miles daily; Stettin-Kalmar-Stockholm, 428 miles, daily except Sunday; Stockholm-Helsingfors, 217 miles, daily except Sunday; Malmo-Copenhagen-Gothenburg; Copenhagen-Malmo, 17 miles, daily except Sunday.

The Swedish Air Service, in common with other European airlines, is part of an interlocking system, providing relay connection at important local and terminal points. The planes used from Copenhagen to the south are three-engine Junkers planes, carrying nine passengers. Between Malmo and Copenhagen and other routes it uses a single-engine Junkers machine carrying four or five passengers, except on the line Stockholm to Stettin, where it uses Dornier Wal twin-engine seaplanes.

During the quarter ended September 30th, 1926, three air routes were operated from Malmo, Sweden; namely, the Malmo-Amsterdam, the Malmo-Berlin, and the Malmo-Gothenburg routes. The last two lines are operated solely by the Aktiebolaget Aerotransport, but the Malmo-Amsterdam line is operated by the Dutch firm of Koninklijke Luchtvaart Maatschappij, in conjunction with the local company. All three of the lines were opened for traffic on April 15th, 1926, but the Malmo-Gothenburg line was suspended on September 1st, 1926, while the other two routes were continued until October 15th, 1926. A total distance of 128,285 kilometers was flown over the three routes during the past season by the airplanes of these two concerns.

Aktiebolaget Aerotransport reports that business during the year was very satisfactory. The largest volume of traffic was carried on the Malmo-Amsterdam route, and was especially heavy on this line during the month of July. The Dutch firm, which considers Malmo an important terminus for air transportation in Scandinavia,
likewise reported a profitable season, but the frequency on this line was not so good as that on the lines operated by the local firm.

A very favorable increase was noted in the amount of mail and parcel post carried this year over the continental routes, and it is generally attributed to the fact that commercial and industrial enterprises are realizing the value of aerial transportation.

Besides regular subsidies, the Swedish Government makes loans to transport companies with which to purchase airplanes, and maintains radio stations and landing fields.

In its petition to the Riksdag, the Aviation Board requested an extra appropriation of 2,100,000 kroner for the fiscal year 1927-1928 to meet the expense of establishing a domestic factory for the manufacture of airplane motors.

Switzerland

The development of aerial traffic in Switzerland has continued to progress in 1926 in a manner that is entirely satisfactory. Of the fourteen aerial operations touching Switzerland, eight have been exploited by enterprises originating in this country. Marseilles, Paris and Lyons have been brought within easy reach of Switzerland by the Air Union; London and Paris, by Imperial Airways; while the air traffic between Switzerland and Amsterdam, Brussels, Cologne, Copenhagen, Hamburg, Berlin, Dresden, Budapest and Vienna has been maintained by German operations by way of Frankfurt, Stuttgart or Munich. The new Swiss Company, founded by Belair, has established a liaison between the German and French lines by the route from Basle, Geneva and Lyons; while the Ad Astra has connected south Germany with western Switzerland by way of Zurich.

Switzerland has thus become somewhat of an air traffic center, and the extensions now in preparation for the lines touching Switzerland from all directions will make this country the central point of all transcontinental routes. During the last season, no air accidents occurred in Switzerland, making the fifth year that has been ended without a single serious accident in this country. The regularity of operations has reached nearly 100 per cent. In spite of the bad weather at the beginning of the season, Ad Astra and Belair maintained at least 98 per cent of their scheduled flights. There was a falling off of passenger traffic, however, during the bad weather. Nevertheless, 6,000 paying passengers and 15,000 kilograms of excess baggage were transported between April 7th and September 30th. The mail carried increased to 30,000 kilograms and at the same time express traffic reached 32,000 kilograms.
At the airdrome in Zurich alone, merchandise valued at more than eight million francs (Swiss) was received for shipment.

In addition to the number of important international air lines, two companies have been established to operate entirely within Switzerland. One is for handling air mail between Basle and LaChaux de Fonds, and brings the isolated center of the watchmaking industry to the Jura in touch with the international center at Basle; and the other is a line for tourist traffic between Zurich, Lucerne and Interlaken, which will permit tourists visiting Switzerland to secure flights over the Alps.

Important progress has been realized during the course of the year by the perfection of the meteorological service for air navigation. Four radio stations, Zurich, Basle, Geneva and Lausanne, are the principal centers for the transmission of meteorological reports. A large number of posts for observation situated along the route of the regular air lines, send out, at certain hours of the day and night, forecasts of local meteorological conditions.

It is now planned to proceed slowly with the establishment of permanent air transport operations throughout the entire year. During the last winter, an attempt toward the maintenance of regular operations was made.
The following companies are at present operating:

Ad Astra Aero, Zurich, over the routes, Zurich-Stuttgart-Mannheim-Frankfort-Hanover-Hamburg, 452 miles, daily except Sunday; Geneva-Lausanne-Zurich-(Munich), 296 miles, daily except Sunday.

Alfred Comte & Company, Zurich, flying the route, Zurich-Lucerne-Interlaken, 57 miles, daily.

Basle Air Traffic Company, Ltd., Basle, operating the route, Lyons-Geneva-Basle-Karlsruhe-Frankfort, 370 miles, daily except Sunday; Basle-Zurich, 46 miles, daily except Sunday; Basle-LaChaux de Fonds, 47 miles, daily.

The safety and reliability records of the Swiss Aerial Transportation Company for the year ending November 1st are as follows: 6,000 passengers between April 7th and December 30th without an accident. No bad weather was encountered; 96 per cent of regular service was maintained as compared to 88 per cent for 1925.

Single-engine Junkers planes are used by the Ad Astra Aero Company. On the Zurich-Lucerne-Interlaken route flying boats are used, supplied by Alfred Comte & Company. This company underwent a complete reorganization during the summer. The company is now styled “Ad Astra-Aero Avion Tourisme Suisse S. A.” and has a capital of 200,000 francs made up of 16,000 shares. All the shareholders are Swiss.

Aside from a generous sum included in the Federal Budget for the assistance of Swiss civil aviation, additional sums are contributed by the Post Office and by the various cantons and towns. Most of the sums contributed by the latter are for the purchase, construction, and equipment of commercial airdromes in their localities. Their purpose is to attract the air traffic of other countries to Switzerland and, therefore, this type of subsidy is considered the most effective. The Geneva Council of State and the Executive Council of the Canton of Zurich have just voted generous amounts with this end in view.

Basle’s air traffic during the 1926 season began on April 19th, and ended on October 23rd. The three principal lines operating were the Imperial Airways, Ltd., London; Deutsche Lufthansa, Berlin; and Basle Air Traffic Company, Ltd., Basle. Despite adverse weather conditions during the spring months, two of the lines maintained 98 and 99 per cent of their schedules to and from Basle, and 91 and 92 per cent of their planes were on schedule time. There was not an accident of any kind recorded during the entire season. Number of passengers transported was as follows: incoming, 1,106; outgoing, 1,017; transit, 442. Total quantity of freight handled,
consisting of mail, passengers' luggage and other commodities, amounted to 50,679 kilograms (111,494 pounds), as shown by the following figures: incoming, 19,488 kilograms (42,784 pounds); outgoing, 15,054 (33,119 pounds); transit, 16,137 kilograms (35,501 pounds). During the season service was maintained between Basle and the following cities: Paris, London, Berlin, Stuttgart, Karlsruhe, Frankfort, Zurich, Lausanne, Geneva, La Chaux de Fonds, and Lyons. At Basle there were 784 starts and 775 landings. No figures have been issued showing the financial result of the operations, but after deducting the subsidies granted, it is not believed that any of the lines will show a profit.

**Turkey**

The first stone of an airplane factory was laid at Cesarea on October 6th, 1926. It is being built by the Turkish Airplane and Motor Company, Inc. The head of this concern is Refik Bey, a Deputy for Konia and Secretary General of the Red Crescent Society.

Looking Southeast on Rudyerd Bay, Alaskan Mainland.
The Turkish press reports that at the general aviation congress, which was held at Angora from November 26th to November 30th, 1926, it was decided to obtain from the National Assembly during 1927 control of certain monopolies as a means of furnishing funds for aeronautical purposes for the Turkish Aviation League.

For the past two years the Turkish government has shown a desire to further aviation in the country. The Aviation League was inspired by declarations of the Prime Minister, and is supposed to be a purely private organization. In fact, it is quasi-governmental.

Considerable funds have been raised by voluntary subscription, a government lottery, etc. The recommendations of the Aviation Congress mark the first serious move to elaborate a definite program and obtain extensive revenues.

Certain influential deputies are at the head of the Aviation League, and it is, therefore, believed that there will be little difficulty in obtaining the passage of laws by the Assembly to carry out the program of the League. The application of the measures contemplated will naturally result in handicapping private enterprise.

If the various monopolies are granted by the Assembly, it is foreseen that the Aviation League will cede them to private individuals or companies against a fixed yearly monetary guarantee.

**Uruguay**

The Uruguayan Government is trying domestic air mail service, a temporary service having been established between Montevideo and Rocha. Planes of the Centro Nacional de Aviacion, a local company, are used.
Group in attendance at Luncheon given by Secretary of State, the Hon. Frank B. Kellogg, in honor of the Pan American Fliers.
CHAPTER VIII

CHRONOLOGY OF AERONAUTICAL EVENTS DURING 1926

1 km.—0.621 miles
1 kg.—2.20 pounds

*(For amplification, see end of Chronology).

Jan. 6 Amalgamation of the German air lines, Aero Lloyd and Junkers, forming the Deutsche Lufthansa A. G.
Jan. 22 Start of Spain-Argentina flight by Commander Ramon Franco.
Jan. 23 Lieut. George C. McDonald established four seaplane records at Langley Field, Va.; speed over 100 km. with pay load of 500 and 250 kg. respectively; and speed over 200 km. with pay load of 500 and 250 kg. respectively, flying an average of 111 m.p.h.
Jan. 27 Resignation of Colonel William Mitchell as Assistant Chief of the Army Air Service.
Jan. 29 Lieut. John A. Macready sets new American altitude record at McCook Field, Dayton, Ohio, reaching a height of 38,204 feet.
Feb. 4 Lecture by Charles L. Lawrence, President of Aeronautical Chamber of Commerce, before the Royal Aeronautical Society of Great Britain and the Institution of Aeronautical Engineers, on "American Aircraft Engine Development."
Feb. 5 Collier Trophy awarded to Dr. Albert Reed for the development of the Reed metal propeller.
Feb. 10 End of Spain-Argentina flight by Comdr. Ramon Franco, 6,32 miles, flying time, 60 hrs. 59 min.
Feb. 13 *Start of Detroit Arctic Expedition under the leadership of Capt. George H. Wilkins.
Feb. 13 New ten-cent air mail stamp put on sale by the Post Office Department.
Feb. 15 Opening of contract air mail service between Detroit and Chicago, and Detroit and Cleveland, by the Ford Motor Company.
Feb. 17 Arrival at Capetown of Alan Cobham (having left London on Nov. 16, 1925).
Feb. 21 Two Loening amphibian plane launched from catapult successfully for the first time.
Mar. 4 Two Loening amphibian airplanes, flown by pilots of the Army Air Corps, made an "all island flight" in Hawaii in less than 12 hours.
Mar. 6 Presentation of Mackay Army Trophy to Lieut. Cyrus Retts, winner of the 1925 Pulitzer Race, and to Lieut. James H. Doolittle, winner of the 1925 Schneider Cup Race.
Mar. 13 Arrival at Capetown Airdrome, London, of Alan Cobham, on his return flight from Capetown.
Mar. 17 Coupet (France) sets altitude record for an airplane carrying 1,000 kg. useful load, reaching a height of 21,456 feet at Tonnusse-le-Noble.
Mar. 26 Bajac (France) sets duration record for airplanes with useful load of 1,500 kg. and 1,000 kg. respectively, flying 3 hrs. 40 min. 35.6 sec.
Apr. 1 Opening of contract air mail service between Jacksonville and Miami, by the Florida Airways Corporation.
Apr. 1 *Start of Major L. D. Gardner's European air tour, from Croydon Airdrome.
Apr. 5 Start of Madrid-Manila flight, by Captains Lorika and Gallarza.
Apr. 6 Opening of contract air mail service between Elko, Nev. and Pasco, Wash., by Walter T. Varney.
Apr. 6 *Commander Richard E. Byrd sails from New York on his North Pole expedition.
Apr. 7 Aerial review, Potomac Park, Washington, D. C., by Army, Navy, and Marine Corps planes, for the benefit of visiting Pan-American journalists.
Apr. 14 Franco-German air treaty signed in Paris, permitting French and German airplanes to fly over German and French territory, respectively.
Apr. 15 Opening of contract air mail service between Chicago and St. Louis by the Robertson Aircraft Corporation.
Apr. 17 Opening of contract air mail service between Salt Lake City and Los Angeles, by Western Air Express, Inc.
Apr. 17 Army Air Corps fliers in Hawaii make flight over the volcano Mauna Loa, then in eruption, taking photographs of the eruption, lava flow, and the destruction of the village of Honopuia, which was in the path of the lava.
Apr. 19 Army Air Corps aerial maneuvers at Wright Field, Fairfield, Ohio, concluding May 3.
Apr. 21 Secretary Wilbur signs order under which Naval Academy graduates will be given instruction in flying, beginning with the class of 1926.

Apr. 27 Dumez (France) sets an altitude record for seaplanes with a useful load of 500 kg. at St. Raphael, reaching a height of 16,014 feet.

Apr. 28 United States-Canada Air Traffic agreement renewed until April 30, 1927.

Apr. 29 National Balloon Race for the Litchfield Trophy, at Little Rock, Ark., won by Ward T. Van Orman, in a flight of 848 miles.

Apr. 29 New American duration and distance records for balloons set by W. C. Naylor and K. W. Warren in the “Skytark,” flying from Little Rock, Ark., to Crawford, Tenn., a distance of 410 miles, in 19 hours.

May 5 Air traffic agreement among Great Britain, France, and Belgium signed in Paris.

May 9 Commander Byrd flies from Spitzbergen to the North Pole and returns in 15 hours, the first aviator to accomplish the flight.

May 11 *Italian airship Norge, with Amundsen, Ellsworth and Nobile, leaves Spitzbergen on a flight across the North Pole.

May 12 Norge crosses the North Pole at 2:30 p.m.

May 12 Opening of contract air mail service between Chicago and Dallas by the National Air Transport, Inc.

May 13 Captains Loriga and Gallarza, Spanish fliers, reach Manila in their 11,000-mile flight from Madrid.

May 13 Demongeot (France) sets speed record for 100 km. for seaplanes with useful load of 500 kg., flying 1,263.99 m.p.h.

May 14 Lasne (France) sets distance and speed records for 1,000 km. for airplanes with useful load of 500 kg. and 250 kg., at Villesseau-vane-La-Marmagne, flying 621.37 miles at 146.66 m.p.h.

May 14 Curtiss Marine Trophy Race on the Potomac won by Lieut. Thomas P. Jeter, at an average speed of 136.94 m.p.h.

May 15 Third annual aerial machine gun and bombing competition completed at Langley Field, Va., in which the teams of the Air Corps won all the events.

May 20 President Coolidge signs the Bingham-Parker Bill (S41), known as the Air Commerce Act of 1926.

May 24 Joint conference of the Subcommittee on Aerodynamics of the N. A. C. A. with representatives of aircraft manufacturers and operators, at Langley Field, Va.

May 24 Three Navy amphibians leave San Diego for Alaska on an aerial surveying and mapping expedition undertaken by the Bureau of Aeronautics.

May 30 Gordon Bennett Cup Race at Antwerp won by Wade T. Van Orman, flying “Goodyear III” a distance of 534.0 miles.

May 31 Opening of contract air mail service between Cheyenne, Wyo., and Pueblo, Colo., by the Colorado Airways, Inc.

June 3 President Coolidge signs an amendment (HR1841) to the Kelly Bill, authorizing the Postmaster General to contract for the carriage of air mail at a rate not to exceed $3 per pound for the first 1,000 miles.

June 3 Ferdinand Shuelz sets new record for the motorless glider, when he remains in the air 9 hrs. 21 min. with a passenger on board, making the flight at Rositten, Germany.

June 5 Arrival in England of four R. A. F. machines on their return from the Chiro-Capetown flight, having covered 56,000 miles.

June 7 Opening of contract air mail service between Chicago and St. Paul-Minneapolis by the Northwest Airways, Inc.

June 11-17 Pelletier D’Oisy (France) flies from Paris to Peking in 6 days, 18 hours.

June 23 Members of the Byrd Arctic expedition return to New York City.

June 24 Mittelholzer and Zinsmaier (Switzerland) set new distance, duration, and speed records for planes with useful load of 500 kg. at Dukendorf, flying 1,429.7 miles in 14 hrs. 43 min. 29.2 sec. at a rate of 103.365 m.p.h.

June 24 Record long distance flight by Capt. Arrachart and his brother (France) from Paris to Basra, Mesopotamia, a distance of 2,673 miles.

June 24 Mitchell and Zinsmaier (Switzerland) at Dukendorf set duration, distance, and speed records for airplanes carrying a useful load of 1,000 kg., flying 869.9 miles in 10 hrs. 5 min. 8 sec. at a rate of 100.652 m.p.h.

June 30 Start of London-Australia flight by Alan Cobham.

July 1 Department of Commerce given $550,000 by Congress in the second deficiency appropriation to carry out the terms of the Air Commerce Act.

July 1 Opening of contract air mail service between Boston and New York by Colonial Air Transport, Inc.

July 2 Appointment of Hon. F. Trubee Davison as Assistant Secretary of War for Aeronautics, and Professor Edward P. Warner as Assistant Secretary of the Navy for Aeronautics.

July 2 Twenty-four bags of tree seeds are dropped from an airplane flying over forest reserve lands in Hawaii which had been devastated by fire.

July 6 Opening of contract air mail service between Philadelphia and Washington by the Philadelphia Rapid Transit Company.

July 10 King’s Cup Race at Hendon won by Hubert Broad.

July 14-15 Record non-stop flight by Capt. Girier and Lieut. Dordilly (France) from Paris to Osaka, Siberia, a distance of 2,930 miles.
Aeronautical Chronology

July 15 Elks' National Balloon Race, won by the Detroit in a flight of 854 miles, pilots being A. G. Nloesser and C. D. Williams.

July 20 End of Major L. D. Gardner's European air tour, with his arrival at Croydon Airdrome, London.

July 24 Bajac (France) sets duration record for airplanes with useful load of 2,000 kg., flying 4 hrs. 30 min. 37.2 sec. at Buc.

Aug. 7-21 Airplane Reliability Tour for Ford Trophy won by Walter Beach.

Aug. 10 Appointment of Hon. William P. MacCracken as Assistant Secretary of Commerce for Aeronautics.

Aug. 14 Announcement of air mail service to Mexico City, whereby Mexican mail will connect with the C. A. M. service at Fort Worth and the Transcontinental line at Chicago.

Aug. 18 A training plane was descended at San Diego Naval Air Station by means of a parachute, the first time this was accomplished.

Aug. 23 Calizo (France) sets new altitude record at Buc, reaching a height of 40,850 feet.

Aug. 23 Trial flight of the Sikorsky S-35, built for the New York-Paris non-stop flight to be attempted by Capt. Rene Fonck.

Aug. 26 *Aeronautical Chamber of Commerce dinner to Assistant Secretaries Davison, Warner, and MacCracken, at the Biltmore, New York City.

Aug. 28 Landman (Denmark) sets speed record for 500 km. for seaplanes with useful load of 500 kg.; also distance record for seaplanes with useful load of 1,000 kg.; and speed record for 100 km. and 500 km., respectively, testing the Ford mooring mast, returning to Lakehurst.

Aug. 31 Capt. Waiser and Lieut. Challe (France) fly from Paris to Bender-Abbas, a distance of 3,215 miles, setting a new record.

Sept. 2-3 Aeronautics meeting of the Society of Automotive Engineers at Philadelphia.

Sept. 3 First airplane with sleeping accommodations arrives at Croydon Airdrome from Berlin, operated by the Luftthansa and Imperial Airways.

Sept. 3 Lieut. James H. Doolittle, demonstrating Curtis airplanes in South America, flies over the Andes from Santiago, Chile.

Sept. 4-11 *National Air Races, Philadelphia.

Sept. 7-9 Fifth annual convention of the N. A. A. at the Bellevue-Stratford Hotel, Philadelphia.

Sept. 9 Porter H. Adams of Boston elected President of the N. A. A. to succeed Godfrey L. Cabot.

Sept. 9-30 Inspection by Assistant Secretary Warner of all the Naval Air Stations and the battle fleets on the Atlantic and the Pacific.


Sept. 11-19 First trans-Canada flight in one machine and with one crew; flying time, 36 hrs. 52 min.

Sept. 15 Opening of contract air mail service between Seattle and Los Angeles by Pacific Air Transport, Inc.

Sept. 15 Opening of contract air mail service between Atlanta, Ga., and Jacksonville, Fla., by Florida Airways, Inc.

Sept. 15 Dubon (France) sets new altitude record for airplanes with useful load of 500 kg., reaching a height of 17,962 feet.

Sept. 16 Bajac and Lamothe (France) set duration, distance, and speed records for 100 km. and 500 km. for planes carrying 2,000 kg. useful load, flying 310.68 miles in 4 hrs. 4 min. 13.2 sec. at a rate of 93.23 m.p.h. for 100 km. and 91.658 m.p.h. for 500 km.


Sept. 21 Capt. Rene Fonck, French ace, piloting a Sikorsky plane, crashed during the take-off at Westbury, L. I., in an attempted transatlantic flight.

Sept. 23 Airplanes rush large quantities of medical supplies to Florida for hurricane sufferers.

Sept. 24 Death of Admiral William F. Fullam, assistant to the President of the National Aeronautic Association.

Sept. 25 Municipal airport at Buffalo, N. Y., dedicated.

Oct. 7 Cross-country tour of the Josephine Ford, Commander Byrd's North Pole plane, begins at Washington, D. C.


Oct. 15 Bureau of Aeronautics awarded the gold medal by the Executive Committee at the Sesqui-Centennial Exposition, for excellence of displays.

Oct. 16 Award of the Herbert Schiff Memorial Trophy to Capt. H. H. Campbell of the Marine Corps, for attaining the highest number of flying hours during the year.

Oct. 19 Passaleva (Italy) sets a speed record for seaplanes with useful load of 2,000 kg. for 100 km. and 500 km., respectively, at La Capo Majeur, flying 109.361 and 107.849 m.p.h. for the two distances.

THE Chronology of Aeronautics for 1926 is notably brilliant as a result of a number of outstanding events, many of which deserve individual discussion because of their effect, direct or indirect, upon the progress of many phases of aviation. The year has seen many achievements which have not only served as landmarks of progress, but have added experience upon experience, all leading up to ultimate and complete mastery of the air, both in the
military sense and from the commercial standpoint. Furthermore, events during 1926 have served to bring the entire aeronautical world into closer unity and sympathy upon a wholesome basis of international sportsmanship.

The Byrd-Bennett Arctic Flight

As a triumph of piloting and aerial navigation, and significant of the high degree of perfection to which the modern airplane and aircraft engine has been brought, the flight of Commander Richard E. Byrd, U.S.N., and Aviation Machinist Floyd Bennett, U.S.N. from Spitzbergen to the North Pole and back on May 9th, 1926, was an outstanding event. Ever since his experience in the Arctic in 1925 with the MacMillan Expedition, during which Loening Amphibians were used in exploration work with such success, Commander Byrd had set his mind on the possibilities of using the airplane for a flight to the North Pole itself, with a view also to the possible discovery of land.


As flying equipment, the expedition took a three-engine Fokker monoplane of the type which had distinguished itself in a number of long distance flights, equipped with Wright "Whirlwind" 200 h.p. air-cooled radial engines. Also, and as a standby for practice flying and possible relief work, a Curtiss Oriole with Curtiss C-6 engine was taken. Through the co-operation of the Standard Oil Company, large quantities of gasoline were shipped in the "Chantier" sufficient for the entire undertaking, together with a supply of Mobiloil contributed by the Vacuum Oil Company.

The "Chantier" arrived at Kings Bay, Spitzbergen, on April 29th to find that the only available dock was already occupied by a Norwegian gunboat coaling. It became necessary, therefore, to consider means whereby the airplanes might be unloaded and set on shore in spite of the pack ice which drifted in the 300-yard span that separated the ship from land. The work of building a raft, loading the huge plane on it, and navigating it ashore was an achieve-
ment which had no small bearing upon the success of the expedition. Once ashore, the problem of preparing a suitable track of level, snow-covered land from which the heavily loaded plane might successfully take off on its skis, was tackled, this entailing day and night work on the part of the personnel of the expedition.

The plane, loaded for the flight to the Pole, which was expected to last about 20 hours, weighed a total of 10,000 pounds and considerable difficulty was experienced with skis, those prepared prior to the start of the expedition proving not sufficiently strong to withstand the severe shocks of taxiing over the uneven snow under load. More than once did the enthusiastic men spend the entire night repairing or remaking skis, until a set was constructed which proved strong enough for the requirements.

On May 8th, late at night, for there was no darkness in those regions at that time of year, the first attempt to start on the actual flight to the Pole ended in failure owing to the inability of the machine to leave the ground under the extreme load. Finally, a second attempt was made after some gasoline had been unloaded, and with Floyd Bennett piloting and Commander Byrd navigating,
the machine successfully took off across Kings Bay at 12:30 a.m. May 9th, 1926.

The story of the long and no doubt tedious flight across the vast stretches of ice and snow to the North Pole is a simple one, tinted only by the enthusiasm of the two lone flyers, as after 8 hours and 34 minutes (0:04 a.m., May 9th, 1926), of steady flying, they peered down at the top of the world and circled in preparation for the return flight. The only unforeseen incident was the oil leak which sprung in the auxiliary oil tank, but which fortunately caused no serious difficulty.

The return flight, which was set direct for Spitzbergen, was as uneventful as was the outward journey. Commander Byrd setting the course with his sun compass which had enabled him to navigate the machine so accurately to the Pole. Without any change of direction, land was sighted at about 2:30 p.m. Greenwich time, and a landing made at Kings Bay, Spitzbergen, approximately 15 hours after the departure.

Thus ended a flight of notable achievement from every standpoint. Commander Byrd has since said that without the untiring efforts of his companion, Floyd Bennett, in the pilot’s seat during the flight, and the enthusiasm of every member of the crew of the “Chantier” in the preparation stages, the expedition would have been a failure. On the other hand, Bennett and all others of the expedition contend that in the organizing and navigating skill of Commander Byrd lay the chief factors contributing to success. The real facts are, however, that the success of the entire undertaking was the result of a combined effort, in which the manufacturers of the plane and the engines and instruments played their part.

The Amundsen-Ellsworth-Nobile Arctic Flight

When the S.S. “Chantier,” carrying Commander Byrd’s Arctic Expedition arrived at Kings Bay, Spitzbergen, it was met by friends, for Capt. Roald Amundsen, the famous Norwegian explorer, Lincoln Ellsworth, the well-known American sportsman who accompanied Amundsen on his 1924 Arctic expedition, and Col. (now General) Umberto Nobile, the Italian airship designer, were already encamped. They had arrived with the Italian semi-rigid airship Norge, having flown from Rome, via Pulham, England, Oslo, Norway, and Leningrad, Russia, preparatory to an attempted flight across the Arctic Unknown and the North Pole to Nome, Alaska.

Captain Amundsen had been drawn to the conclusion that in the use of lighter-than-air craft lay the possibilities of exploring the
Arctic regions from the air. Two days after Commander Byrd’s return from his successful polar flight, despite what must have been intense disappointment at having been forestalled, the three explorers representing Italy, Norway and America, set out with a crew of seventeen in the 654,000 cubic feet airship, to fly over the North Pole and continue across the other side to Alaska.

The *Norge* soared gracefully into the air over the snow-clad village of Kings Bay at 8:55 a.m. Greenwich time, May 11th, and kept in close touch with the civilized world by means of her powerful radio until shortly after 2:00 a.m. the next day, during which time the weather had remained almost ideal. According to sun observations, the *Norge* actually crossed the North Pole on May 12th at 2:30 p.m. Greenwich time. Shortly after this, however, the weather became bad and grew steadily worse, so that all communication was lost with the outside world. No more was heard of the airship until early on May 13th, when a newspaper man reported seeing her off Point Barrow, Alaska. Again, however, the ship was lost until 3:30 a.m., May 14th, when a landing was successfully made at Teller, a little Alaskan village miles from Nome. During the latter stage of the flight the ship encountered extremely high winds and also a very dense fog which caused a shortage of fuel and necessitated the forced landing at Teller.

The entire flight was a notable achievement of navigation, and served to give some idea of the possibilities of what had been considered a frail airship. The *Norge* covered a distance of 2000 miles from Spitzbergen to Point Barrow in 46 hours. Two hours of this time was spent in cruising around the North Pole at which time excellent weather prevailed, so that the actual time taken to cover the straight line flight was 43½ hours, representing a speed of 46 m.p.h. On the other hand, it took the *Norge* 25 hours to cover the distance between Point Barrow and Teller, 700 miles, which would indicate a speed of only 28 m.p.h. the very bad weather undoubtedly being responsible for this greatly reduced speed.

While the actual distance in a straight line from Spitzbergen to Teller is 2700 miles, the distance covered by the *Norge*, according to General Nobile’s report, was 3291 miles.

The times made over different sections of the flight were:

<table>
<thead>
<tr>
<th>Section</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kings Bay to North Pole</td>
<td>15 hrs.</td>
</tr>
<tr>
<td>Circling Pole and taking observations</td>
<td>2½ hrs.</td>
</tr>
<tr>
<td>North Pole to Point Barrow</td>
<td>20½ hrs.</td>
</tr>
<tr>
<td>Point Barrow to Teller</td>
<td>24½ hrs.</td>
</tr>
</tbody>
</table>

Kings Bay to North Pole, 750 miles................................. 15 hrs.
Circling Pole and taking observations .............................. 2½ hrs.
North Pole to Point Barrow, 1250 miles........................... 20½ hrs.
Point Barrow to Teller, 700 miles................................. 24½ hrs.
The total flight from Rome, Italy, to Teller, Alaska, was:

- Rome to Pulham, England ........................................ 1200 miles
- Pulham to Oslo, Norway ........................................ 750 miles
- Oslo to Leningrad, Russia ...................................... 720 miles
- Leningrad to Vadsoe, Russia .................................. 800 miles
- Vadsoe to Spitzbergen .......................................... 650 miles
- Spitzbergen to Teller, Alaska ................................. 2700 miles

Total ........................................................................ 6820 miles

On arrival at Teller, the airship, after some difficulty in landing owing to the absence of the usual landing party, was deflated and packed for shipment, thus ending a flight of very great interest and import, and one destined to have a marked bearing upon the future employment of airships in commercial air transport and the possibility of routes being established across the Arctic.

Wilkins Detroit Arctic Expedition

Leaving during the second week in February, 1926, the Detroit Arctic Expedition was the first to get under way of the three projects which were planned last year. The expedition, under the leadership of Capt. George H. Wilkins, with Lieut. Carl B. Eielson as chief pilot, and accompanied by Major Thomas G. Lanphier of the First Pursuit Group, Air Corps, left Seward, Alaska, by rail for Fairbanks, where a base was established and the two machines of the expedition were erected. Both machines were Fokkers, one a single-engine Universal and the other a three-engine F-VII, the engines in each plane being Wright "Whirlwinds."

The primary purpose of the Detroit Arctic Expedition was not merely to fly to the North Pole but was to locate the "Pole of Relative Inaccessibility," which is described as that point farthest from any navigable waters, the virtual center of any so-called continent which may exist in these regions. The plan of the expedition was to establish a flying base at Point Barrow from which the actual exploration flights might be carried out, and for this purpose gasoline and supplies were to be transported from Fairbanks by both plane and dog-sled. From the outset bad weather and other contingencies marred the progress of the expedition.

While the expedition was prevented, owing to the lateness of the season and the constant delays, from actually accomplishing the mission for which it was organized, one very notable flight was carried out.

Captain Wilkins and Lieutenant Eielson left Fairbanks, on March 31st, for Point Barrow, a flight of 500 miles, carrying supplies. Reaching Point Barrow, the fliers continued in a northerly
direction without landing, returning to Fairbanks on April 11th, having penetrated farther north than any human being had gone before in this particular region. The fliers went 140 miles north beyond Point Barrow. Seventy miles due north from Point Barrow, Wilkins passed over the point reached by Stefansson in the steamer Karluk in 1913. From their point of vantage in the plane, they were able to view approximately 6,000 square miles of unexplored territory. However, they sighted no land.

This was the only exploration flight made by the expedition, since as already mentioned, the greater portion of the flying carried out was in ferrying supplies to the northern base. Major Lanphier, accompanied by Malcolm Smith and Lieut. Charles M. Wisely, members of the expedition, returned to Detroit on June 25th, followed shortly thereafter by Captain Wilkins and Lieutenant Eielson, disappointed with the results of the first attempt but confident of success when they went north again in 1927, with much of the pioneer work already accomplished.

National Air Races

In celebration of the 150th anniversary of the Declaration of Independence of the United States, the Sesqui-Centennial Exposition was held during 1926 in Philadelphia, and aviation very naturally took its rightful place in the forefront of this celebration. Not only was there a historical exhibition of aircraft held in the Transportation Building within the walls of the exposition, but it was decided also to hold the National Air Races in Philadelphia as an added attraction to the Sesqui, which was already bringing visitors from all over the world. Accordingly, from Sept. 4th to 11th the Air Races were held under the direction of Howard F. Wehrle at Model Farms Field, Philadelphia.

The meet was held entirely under civilian supervision and
events for civilian flyers were the feature, although of the nineteen races and contests on the program, four were exclusively for military or naval pilots and one was for the National Guard. The entry list established a record, reaching close to 200; and the attendance, in spite of the fact that the Services had decided not to hold the Pulitzer Trophy race which usually is the great attraction, was reasonably good even if not as high as was expected, due to the inclement weather.

Fred D. Hoyt won the “On to the Sesqui” race, flying a distance of 2558 miles from Eureka, Cal. to Philadelphia in 31 hours flying time. He flew a Travel Air with Curtiss OX-5 engine. Second and third places went, respectively, to Austin Lawrence and to Ross Arnold, both of Love Field, Dallas, Tex. They flew Curtiss JN4C planes (OX-5). Undoubtedly one of the most sporting entrants in the "On to" race was that of Jack Laass who flew from Dayton, Ohio, in the little Driggs Dart monoplane, a lightplane with Wright Morehouse engine. The fact that the flight necessitated the crossing of the Allegheny Mountains made the attempt all the more commendable. Casey Jones, flying his clipped winged Curtiss Oriole with Curtiss C-6 engine won with ease the Independence Hall Trophy in the free-for-all race for two-, three-, or four-place commercial planes over a distance of 84 miles, this being the third consecutive year that he has won this event. His speed was 136.11 m.p.h., and he was followed by James G. Ray in the Pitcairn Sesqui-Wing Arrow (Curtiss C-6), a plane not unlike the clipped-wing Oriole, at a speed of 127.81 m.p.h.

An interesting event was the relay race for the B.B.T. Trophy over a distance of 36 miles (three 12-mile laps) in which four teams of three planes each took part. The race was won by the Basil L. Rowe team, comprising Rowe and Casey Jones on Thomas Morses and A. H.
Kreider on a Waco-9, with a total time of 25 minutes, 7 seconds. From the standpoint of a pure race, the National Guard race attracted wide attention, for in it contested eleven JN machines of the New York, Pennsylvania and Maryland National Guard Units. This event was won at a speed of 93.08 m.p.h. by Carl W. Rach (New York).

As usual, the race for the Aviation Town and Country Club of Detroit Trophy attracted considerable attention since not only was it a speed contest but efficiency also had a chance of winning prize money. From the standpoint of pure speed, the race was a contest between Jim Ray in the Sesqui-Wing and Casey Jones in the Oriole. Jim Ray won at 136.37 m.p.h. with Jones closely on his tail at 135.78 m.p.h. C. C. Champion, Jr., flying the new Wright-Bellanca with the “Whirlwind” engine, however, flew away with all honors in efficiency, according to expectation, with a score of 678.5 points to the 426.8 points of his nearest contender, Walter Beach, in a “Whirlwind” engined Travel Air.

Two elimination races were flown during Race Week for the Aero Club of Pennsylvania Trophy for light commercial planes. The third and final race was won by Bob Hewitt of the Ludington Exhibition Company in his racing Waco. The race from the outset was between Hewitt and Basil Rowe flying the Thomas Morse with the Aeromarine engine. Hewitt’s speed, however, was 107.51 m.p.h. to the 104.32 m.p.h. put up by Rowe.

Of the military races the Liberty Engine Builders Trophy for observation type planes was won by Capt. Ira Eaker, Air Corps, flying a Curtiss O-1 Falcon with Curtiss D-12, 450 h.p. engine at 142.26 m.p.h. Curtiss Falcons also took second, fourth, and fifth places in this event, third place being won by Lieut. G. T. Owens, U.S.N. in a special DH with a Packard 1A-1500 engine. The second Service Race was the transport and bombing plane contest in which Huff Daland LB-1 (Pegasus) with Packard 800 h.p. engines, competed against Douglas C-1 Transports with Liberty engines. The three Huff Dalands in the race secured the first places, Lieut. Wolfe flying the leader across the finish at 123.71 m.p.h.

The John L. Mitchell Trophy race for the Air Corps planes of the First Pursuit Group was won by Lieut. L. G. Elliott at 160.438 m.p.h. with Capt. F. H. Pritchard second at 160.121 m.p.h. All of the nine planes entered were Curtiss P-1 Hawks with Curtiss D-12 engines, and this uniformity of entries, as usual, served to attract wide enthusiasm in the purely racing element of the contest. Piloting played the leading part in defining the winner and the results proved there was in reality little to choose among the pilots of the First Pursuit Group, all flying a remarkably close race.
The events of the closing day of the meet, Sept. 11th, were in many respects the most interesting. In place of the Pulitzer Trophy race which was not staged at all in 1926, an open race for pursuit planes and fighters of both Services and the Marine Corps was held in competition for the Kansas City Rotary Club Trophy. There were twelve entries including Boeing and Curtiss Pursuits and the Wright Apache F3W1 with the Pratt & Whitney "Wasp" air-cooled engine. Another particularly interesting entry was the Curtiss P-1 Hawk with the inverted air-cooled Liberty engine.

The race, after an exciting chase over a distance of 120 miles, was won by the navy, Lieut. G. T. Cuddihy, flying the Boeing FB-3 with a 600 h.p. Packard 2A-1500 engine in to the finish at 180.495 m.p.h. Lieut. L. G. Elliott of the Air Corps was second, flying a Curtiss Hawk P-2 with 500 h.p. high-compression Curtiss V-1400 engine at a speed of 178.609 m.p.h.

The other of the two final events of the meet was the transport race for the Detroit News Trophy which was a speed and efficiency contest for planes capable of carrying 1000 pounds useful load. G. C.
(Top) Winner Second Reliability Tour. Travel Air with Wright "Whirlwind." (Bottom) Johnson Twin-60.
Champion, again flying the Wright-Bellanca with the Whirlwind J-s engine won both sections of the contest with a maximum speed of 121.531 m.p.h. and efficiency points mounting to 896.

**The Aeronautical Exhibit at the Sesqui**

Visitors, not only to the air races but also to the Sesqui-Centennial Exposition itself, were attracted by the aeronautical exhibit under the sanction of the Aeronautical Chamber of Commerce in the Transportation Building. In addition to a large number of parts and appurtenances to aircraft, the exhibition included many complete airplanes and engines. The Curtiss NC-4, the first aircraft to cross the Atlantic Ocean, was on view in addition to various types of more modern aircraft. Engines were very well represented, the development during the past ten years or so being depicted by many of the outstanding power plants produced during this period.

The Aeronautical Chamber of Commerce assembled an exhibit of large mural paintings depicting the historical crossing of the Atlantic and the North American continent, from the legendary visit of the Vikings in 1000 A. D. to the first trans-continental flights by aircraft in 1919.


**The Second Reliability Tour**

The second Airplane Reliability Tour for the Edsel B. Ford Trophy was marked by even more favorable results than was the first contest in 1925. It will be recalled that the idea of the tour was patterned after the tours which became famous in the early days of the automobile industry, the plan being to demonstrate the reliability of travel by air on a pre-determined schedule regardless of intermediate ground facilities.

Among the stipulations of the 1926 tour was the requirement that planes should carry 0.5 pound per cubic inch of engine displacement, and that for every 25 pounds carried in this way there should be at least one cubic foot of cabin, cockpit, or other cargo space. Furthermore, the winners were judged on the basis of load
carried and speed, taking into consideration in the formula, however, the time taken for each plane to take off and land.

The total length of the tour was 2599 miles, compared with the 1900 miles of 1925, and this distance was divided into stages as follows: Detroit to Kalamazoo, to Chicago, to Milwaukee, to St. Paul, to Des Moines, to Lincoln, to Wichita, to Kansas City, to Moline, to Indianapolis, to Cincinnati, to Cleveland, to Ft. Wayne, and back to Detroit. The time devoted to this itinerary was two weeks.

Twenty-five machines started on the tour, including two Alexander Eaglerocks (Curtiss OX-5), one Babcock Teal (Curtiss C-6), one Driggs Dart (Wright Morehouse), one Ford Stout Transport (Liberty 12), one Ford-Stout Three-engine Transport (Wright Whirlwinds), one Fairchild Monoplane M-1 (Curtiss OX-5), one Hess Bluebird (Curtiss OX-5), one Mercury Arrow (Curtiss C-6), one Pitcairn Fleetwing (Curtiss C-6), one Pitcairn Orrowing (Curtiss OX-5), one Stinson Detroiter (Wright Whirlwind), one Swallow (Curtiss OX-5), three Travel Airs (Wright Whirlwind, Hispano-Suiza, and Curtiss OX-5), three Waco (Curtiss C-6 and Hispano-Suiza), and three Woodson (Salmon).

The tour started from Dearborn Airport, Detroit, on Aug. 7th and on Aug. 21st eighteen of the twenty-five starters returned at the completion of the tour. Owing to the more concrete method of adjudging the winner, the result of the tour was decidedly better defined than was the case the previous year. Walter Beach won, flying a Travel Air plane with a Wright Whirlwind engine, with a point score of 4043.3. Louis G. Meister, with a point score of 3972.1 was second, flying a Buhl-Verville Airster, also with a Whirlwind engine, and third place went to Eddie Stinson in the Stinson Detroiter (Whirlwind). His score was 2737.5 points. Thus, again, as last year, the Wright Whirlwind engine was well to the fore in the commercial machines which scored highly in the tour.

The tour was particularly interesting because of its introduction of wheel brakes into the design of undercarriages in commercial planes. While one or two commercial planes had been so fitted before, it was the landing restriction placed upon planes entered in the tour which encouraged other manufacturers to look into the possibilities of equipping their planes with wheel brakes and these apparently proved highly successful. Accordingly, six of the entries were so fitted, including the winners of the first three places in the finish.

At every city the flyers were greeted enthusiastically by civic officials, the aeronautical fraternity and the public. From the stand-
point of attracting attention to the tremendous possibilities of commercial aviation, the tour was a marked success, and as a medium of publicity and advertising for the products of the companies participating—one of the objects held in view by the promoters of the tour—it may be said to have achieved its purpose.

The results of the 1926 Reliability Tour were as follows:

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<thead>
<tr>
<th>Name of plane</th>
<th>Engine</th>
<th>Pilot</th>
<th>Score</th>
</tr>
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<tbody>
<tr>
<td>Travel Air</td>
<td>Wright J-4</td>
<td>Walter Beach</td>
<td>4043.3</td>
</tr>
<tr>
<td>Buhl-Verville Airster</td>
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<td>Louis G. Meister</td>
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<td>Wright J-4</td>
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</tr>
<tr>
<td>Waco 9</td>
<td>Curtiss C-6</td>
<td>J. W. Livingston</td>
<td>2672.3</td>
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<tr>
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<td>Philip E. Doones</td>
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<td>Curtiss ON-5</td>
<td>William A. Munn</td>
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The Schneider Trophy Race

Due to its historical importance and international aspect, as well as the almost phenomenal speeds achieved, the 1926 race for the Jacques Schneider Trophy may well be regarded as the greatest air race ever held. On Nov. 13th, when Major Mario de Bernardi of the Italian Air Force, flying his scarlet Macchi M-39 racer equipped with an 800 hp. Fiat engine, passed the home pylon at the Naval Operating Base at Hampton Roads, Va., at an average speed of 244.496 m.p.h., Italy not only wrested the prized trophy from what might have been the permanent possession of the United States, but established herself thereby even more firmly among the leaders in the aeronautical world. Major de Bernardi's plane was one of three identically similar machines constituting the Italian team, of which he himself was captain.

The great interest created in this race was largely due to the well-known fact that Italy, as the only contender against the United States for the seaplane honors, was ready to put up a close race with the American entries, since with our two victories in succession, a third success would, under the regulation governing the Schneider Trophy, have given the United States permanent posses-
(Top) Loening *Amphibian* used by the Navy in the Alaskan Survey.
(Bottom) Mirror and Manzinita Lakes, Alaska.
sion. The Italian Government, while not able to win permanent possession, was determined to keep the Trophy still in competition, and accordingly, sent over a team of picked pilots, engineers and mechanics to all of whom is due a share of the glory of the remarkable race.

The Macchi M-39 seaplanes were low-wing pontoon monoplanes with wing radiators closely resembling the Curtiss wing radiators but somewhat different in detail construction, and a fuselage in which every detail showed the results of the most careful streamlining. The engine, a twelve-cylinder Fiat type AS-2, which drove a Curtiss-Reed duralumin forged propeller, was designed especially for the contest and represented the last word in Italian aero engine design and construction.

Against the Italians, the United States team consisted of the three 1925 Curtiss racers, R3C-2, -3, and -4 with, respectively, Curtiss V-1400 (600 hp.), Packard geared V-1500 (700 hp.), and Curtiss V-1550 (700 hp.) engines. The R3C-2 machine was, in fact, the identical plane and engine with which Lieut. James H. Doolittle won the Schneider Trophy race in 1925 at 232.573 m.p.h. The other two machines were merely modified to take the new engines and they were all three equipped with pontoons of new Navy design.

Misfortune befell the United States team when, a week or so before the contest Lieut. Frank H. Conant, U.S.N., was drowned while flying to Hampton Roads in a Service Pursuit plane. It is believed that when attempting to make an alighting the pontoons of his machine hit a mooring stake. This left the American Schneider Trophy team deprived of one of its ablest pilots. The other members of the American team were Lieut. Geo. T. Cuddihy, U.S.N., who flew in the 1925 race, and Lieut. C. Frank Schilt, U.S.M.C. Lieut. W. G. Tomlinson was later designated as alternate to fill Lieut. Conant's place. The Italian team, in addition to Major de Bernardi, consisted of Capt. Arturo Ferrarin and Lieut. Adriano Bacula.

The preliminary trials at Hampton Roads were filled with unfortunate occurrences culminating in the complete wreck of the Packard-engined racer. During a practice flight with Lieut Tomlinson piloting the plane for the first time, the machine completely capsized on alighting on the choppy water of Little Bay, and Lieut. Tomlinson narrowly escaped being drowned. Thus, misfortune deprived America of one of its best machines, although Lieut. Tomlinson actually took part in the race, flying a standard service Curtiss Hawk Seaplane.

Perfect weather attracted some 30,000 spectators, including Secretary of the Navy Curtiss D. Wilbur and Assistant Secretary of
the Navy for Aeronautics E. P. Varner, and many members of the Foreign Legations in Washington.

Of the six machines which crossed the starting line in the race for the most prized seaplane trophy in the world, only four finished the course. At the end of his third lap Captain Ferrarin of the Italian team, after making an average speed of 238.358 m.p.h. and covering one lap at 243.012 m.p.h., was forced down close by the home pylon with a broken oil line. This left five machines in the race with Major de Bernardi for Italy making a little more speed than Lieut. Cuddihy, who was flying America’s fastest plane. The former was already being hailed the winner, assuming that nothing unforeseen happened, putting up, as he was, speeds of well over 245 m.p.h. to Lieut. Cuddihy’s 239 m.p.h. The latter was not, however, even to be permitted a close second place in the race, for he was forced to alight when, just as he entered upon the last leg of the last lap of the race, the Curtiss V-1550 engine, which was running perfectly, ran dry of gasoline owing to a faulty fuel pump designed for pumping gasoline up from the reserve tanks in the pontoons, and which had apparently failed to operate from the start of the race. Lieut. Cuddihy made a perfect landing in Hampton Roads.

At this time considerable surprise was expressed at the apparent slowness, comparatively speaking, of the other Macchi plane in the contest, that being flown by Lieut. Bacula who was only making 217 to 218 m.p.h. It developed later that, as only one example of the remarkable team work which characterized the actions of the Italian flyers from the day they arrived in this country, Lieut. Bacula had been instructed to fly the entire race with engine throttled with a view to conserving his engine and rendering almost certain the finishing of at least one of the Italian planes in the race.

In winning the race Major de Bernardi broke at least four world speed records for seaplanes when he covered the 350 km. (217.483 miles) course in a total elapsed time of 52 minutes, 56.22 seconds. These were 50 km. (248.520 m.p.h.), 100 km. (248.189 m.p.h.), 20 km. (248.0025 m.p.h.), and 350 km. (246.496 m.p.h.) He thus beat all the records established by Lieut. Doolittle in last year’s Schneider Trophy race.

America secured second place in the race when Lieut. Schilt, flying the Curtiss R3C-2, last year’s winner, finished with an average speed of 231.363 m.p.h. which, incidentally, was more than one mile slower than the same plane made in last year’s race, in spite of the fact that Lieut. Schilt flew a perfect course. Third place went to the Italian Lieut. Bacula, who had been flying slowly, with a speed of
218.006 m.p.h.; and fourth place went to Lieut. Tomlinson, flying the Service Pursuit plane at an average speed for the race of 136.953 m.p.h.

On Nov. 17th Major de Bernardi flew his Macchi racer over a three kilometer straight-away course and set up a new world speed record for seaplanes of 258.873 m.p.h., exceeding Lieut. Doolittle's record in 1925 by more than 13 m.p.h. Major de Bernardi's record speed was the average of four laps, two with and two against the wind. His best speed was 272.132 m.p.h. with the wind and 243.233 m.p.h. against the wind.

The Pan-American Flight

During the year, the Air Corps launched another long-distance flight project looking to training and the massing of flying experience, and as a cordial gesture to the countries of Central and South America as its definite objective. The famous New York to Alaska and the Round-the-World flights of 1919 and 1924 may be regarded as the greatest undertaking of this nature in the history of American Army aviation. The “Good-Will Flight” starting from Kelly Field, San Antonio, Texas, December 21st, 1926, consisting of five Army Air Corps Loening Amphibian airplanes, may be classed as another notable event in this class. This flight into and around South
America, when concluded to schedule, is to cover approximately 18,500 miles and includes stops in every country in South America and Central America and the principal islands of the West Indies. The flight is under the command of Major Herbert A. Dargue and includes nine other officers, as follows: Capt. Ira C. Baker, Capt. Arthur B. McDaniel, Capt. C. G. Woolsey, Lieut. John W. Benton, Lieut. Muir S. Fairchild, Lieut. E. C. Whitehead, Lieut. L. D. Weddington, Lieut. Bernard S. Thompson and Lieut. Charles McK. Robinson.

The machines, Loening Amphibians equipped with inverted Liberty engines and three-bladed Standard Steel duralumin propellers, are now standard equipment in the Air Corps and are flying under service conditions. These planes are admirably suited to a flight of this nature since the route being followed takes the machines over extensive stretches of both land and water. The Loening Amphibian, while maintaining the high performance necessary for a service observation machine, functions as a seaplane or as a land machine equally well.

The object of the flight is not primarily to set speed records, but is for the purpose of securing extensive training in cross-country flying for Air Corps personnel. The flight is demonstrating the practicability of linking the two American continents by air and will undoubtedly strengthen the amicable relations now existing between the North, Central and South Americas.


The entire flight has been divided into six divisions, as follows:

<table>
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<th>Mileage to next stop</th>
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<tr>
<td>San Antonio, Tex., United States</td>
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<tr>
<td>Brownsville, Tex., United States</td>
</tr>
<tr>
<td>Tampico, Mexico</td>
</tr>
<tr>
<td>Vera Cruz, Mexico</td>
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<tr>
<td>Puerto Mexico, Mexico</td>
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<td>Salina Cruz, Mexico</td>
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Mileage to next stop

55
110
110
350
210
250
400
Aeronautical Chronology

Second Division

Buenaventura, Colombia 185
Tumaco, Colombia 455
Tumbez, Peru 130
Paita, Peru 255
Trujillo, Peru 300
Lima, Peru 290
Lomas, Peru 200
Mollendo, Peru 415
Tocopilla, Chile 250
Taltal, Chile 330
Coquimbo, Chile 305
Santiago, Chile 350
Talcahuano, Chile 235
Valdivia, Chile 300

Third Division

Nouquon, Argentina 320
Bahia Blanca, Argentina 565
Buenos Aires, Argentina 240
Santa Fe, Argentina 315
Corrientes, Argentina 180
Asuncion, Paraguay 180
Corrientes, Argentina 315
Santa Fe, Argentina 360
Montevideo, Uruguay 340
Rio Grande do Sul, Brazil 375
Florianopolis, Brazil 300
Santos, Brazil 210
Rio de Janeiro, Brazil 270

Fourth Division

Victoria, Brazil 280
Porto Saguru, Brazil 240
Bahia, Brazil 435
Pernambuco, Brazil 160
Natal, Brazil 455
Camocim, Brazil 240
Maranhao, Brazil 370
Para, Brazil 515
Cheyenne, French Guiana 210
Paramaribo, Dutch Guiana 220

Georgetown, British Guiana 360
Port of Spain, Trinidad (Great Britain) 365
La Guayra (Caracas), Venezuela 365
Port of Spain, Trinidad (Great Britain) 100

St. George, Island of Grenada (Great Britain) 85
Kingstown, Island of St. Vincent (Great Britain) 100
Fort de France, Island of Martinique (France) 125
Pointe a Pitre, Island of Guadeloupe (France) 265
St. Thomas, Virgin Islands (United States) 80

San Juan, Porto Rico (United States) 215
Santo Domingo (Dominican Republic) 210
Port-au-Prince, Haiti 270
Santiago de Cuba, Cuba 175
Manzanillo, Cuba 250
Cienfuegos, Cuba 145
Havana, Cuba 250
Miami, Florida (United States) 330
Jacksonville, Florida (United States) 130
Savannah, Georgia (United States) 255
Wilmington, North Carolina (United States) 200
Langley Field, Virginia (United States) 130
Washington, D. C. END 18,524

Lester D. Gardner's European Air Tour

Typical of the tremendous possibilities of air transportation was the
tour carried out by Major Lester D. Gardner, publisher of
Aviation and a member of the board of governors of the Aeronautical
Chamber of Commerce, when, sailing from the United States
Air routes flown by Major Lester D. Gardner on his 21,000 mile air tour. The tour included the airways of the Royal Air Force from Cairo to Baghdad and Jerusalem.
on March 20th, 1926, he traveled a total of 21,000 miles over Europe, Northern Africa, Egypt and Palestine by airplane, using in the majority of cases regular air transport services. The rapidly expanding air lines of Europe had for many years been the subject of much written and spoken discussion in this country, a great deal of which had led to misunderstanding as to our own state of development of commercial aeronautics. It was very largely with a view to studying carefully and with an experienced eye the actual conditions pertaining to commercial aviation abroad that Major Gardner undertook his prolonged tour. He was accompanied by Mrs. Gardner, who flew a considerable part of the total mileage with her husband.

A study of the analytical table of the tour reveals the following facts: Between March 30th and July 20th Major Gardner flew a total of 19,726 miles, which is the sum total of the actual schedule distances and does not include added mileage due to detours on account of bad weather, circling in, taking off, and landing, etc., all of which may reasonably be expected to bring the total up to 21,000 miles. The total time in the air was 234 hours, 49 minutes. Subtracting from this the time spent in minor demonstration flights (5 hours, 18 minutes), which cannot justly be included as air transportation from place to place, the total time in air travel was 229 hours, 31 minutes. Had the railroad been used in this tour the total time in traveling would have been 938 hours, more than four times as long as the time by air. Since Major Gardner's time was distinctly limited, these figures would indicate that traveling by air, he was able to do four times as much business, sightseeing, etc., as would have been possible had he resorted to the usual methods of transportation.

Owing to the courteous invitations extended to him, Major Gardner was able to study the operations and fly in the planes of all the large air transportation companies of Europe, including the Imperial Airways, the Dutch K.L.M., the Deutsche Luft Hansa, the Lineoere Air Lines, the Air Union, the C.I.D.N.A., as well as the air transport companies of Switzerland, Poland, Czechoslovakia, Denmark, Sweden, Italy and Hungary. In addition, the British Air Ministry and the Royal Air Force extended the exceptional courtesy of flying him over the official Cairo-Bagdad air route, which this year has become a section of the Imperial Airways Egypt-India service. Fourteen days were spent as a guest of the Royal Air Force and during this time 2727 miles were flown in service planes over the historic country of the Nile, Palestine and Iraq—an experience which is probably unique to all but members of the R.A.F. and officials of the British Government.
(Upper left) Sphinx and Pyramids of Gizeh. (Upper right) Ruins at Samarra, Holy City near Baghdad. (Lower left) The Citadel at Cairo. (Lower right) Dome of the Rock Mosque, Jerusalem; site of Solomon’s Temple.
The accompanying map will serve to indicate the extent of Major Gardner's tour.

Aeronautical Chamber of Commerce Banquets

Two events of the year 1926 are of outstanding importance as symbolic of the close bond of union which exists in the aviation world both nationally and internationally. On August 26th, 1926, the Aeronautical Chamber of Commerce gave a banquet in honor of the then newly appointed Assistant Secretaries in charge of aviation in the War, Navy and Commerce Departments, and again on November 29th, 1926, the Chamber gave a banquet in honor of Sir Alan J. Cobham, the well-known British flier, and at the same time to the Italian pilot, Major Mario de Bernardi, who had just won the Jacques Schneider Trophy from the United States.

It was more than fitting that the American Aircraft Industry, through the Aeronautical Chamber of Commerce, should be the first to bring together with the industry the three newly appointed Air Secretaries, and the occasion of the banquet, held at the Hotel Biltmore in New York City, in their honor will long be recalled as an event of outstanding importance which represented the getting together of the aviation fraternity to welcome the three men—Assistant Secretary of War for Aviation, F. Trubee Davison, Assistant Secretary of the Navy for Aviation, Edward P. Warner, and Assistant Secretary of Commerce for Aviation, William P. MacCracken, Jr.—who had been so wisely chosen by President Coolidge to guide the Government's aviation policies.

Under the arrangement of a dinner committee of which Charles L. Lawrance was chairman, and Grover Loening, Lester D. Gardner, Frank H. Russell and Samuel S. Bradley were members, the banquet was a marked success. Charles L. Lawrance, then president of the Aeronautical Chamber of Commerce, was toastmaster, and among the speakers were: the Hon. F. Trubee Davison, the Hon. Edward P. Warner, the Hon. William P. MacCracken, Jr., and Major Lester D. Gardner. In addition, at the speakers' table were: the Hon. W. Irving Glover, Maj. Gen. Mason M. Patrick, Rear Admiral William A. Moffett, Brig. Gen. W. E. Gillmore, Dr. George W. Lewis, Hollinshead N. Taylor, Lieut. Comdr. Bruce Leighton, Harry F. Guggenheim, Elmer A. Sperry, Lieut. Col. Benjamin D. Foulois and Howard F. Wehrle.

The following excerpts from the addresses of the three assistant secretaries in charge of aviation are especially interesting:

Hon. F. Trubee Davison said in part:

"The Congress of the United States at its last session laid down
a plan for expansion of the Army Air Corps over a five-year period, which, if carried to completion, will constitute a long step forward toward the establishment of an Air Defense consistent with our well established national policy.

"In considering this very important subject, it is necessary to appreciate the fact that the action taken by Congress is merely an authorization, and cannot be carried into effect until funds are appropriated.

"The experience of the Great War, combined with practical development in aviation since 1918, have brought to military men, and the public at large, an appreciation of the necessity for an adequate air service and an adequate air force. Expert opinion may differ in detail as to the value of aircraft, but I believe it is safe to say that today all unite in the conclusion that aircraft will be essential to make future military operations a success. Certainly Congress, by its recent action, and as the voice of the American people, has clearly indicated its point of view in that regard.

"It is obvious that in air development the industry plays a fundamental role, not only in development work and in times of peace, but as a basis on which to build our sources of supply in emergencies. As the 'Morrow Board' said: 'Anything that strengthens the industry as a whole, and especially anything that conduces to the strengthening of the design and engineering departments of the companies building aircraft, must be considered as a contribution toward the national defense.'

"The industry is today performing its task—producing planes and equipment unsurpassed by any in the world. The future holds out to the producers an ever-increasing opportunity for service to the Nation, on the one hand, and promise of sound growth and development on the other. In meeting this problem, the government should make every effort to avoid entering into competition.

"The path has been laid out, and the route clearly indicated. Already the wheels are turning, but this program will remain only a plan until funds are appropriated to transform it into a reality. Then, and then only, will the unselfish and patriotic efforts of those who have worked toward the common end have been materialized."

The theme of the Hon. E. P. Warner's address was—How the Navy Department is putting into effect the policies recommended by the President's Aircraft Board and the first requirements of the Five-Year Program. After sketching the problems which confronted both the Navy Department and the Industry, due to huge surplus stocks left over from the war, Mr. Warner said in part:

"It has taken time to bring relations to their present basis, but
I feel that the outlook is now happier than at any previous moment, and that we are all set to go ahead on a clear course and with a fair wind under conditions which will insure to the Navy the provision of the best product made possible by the state of the engineering art, and to the industry, treated as a whole, a reasonable continuity of orders."

With this new era under way, and with the Navy looking to a sound aircraft industry for its equipment, Mr. Warner foresaw a further development—commercial aviation—the importance of which he stressed, as follows:

"We hope that the critical period in aircraft building is nearing an end for other reasons, too, and especially because of the prospect of a commercial development which will make exclusive dependence on government orders to keep shops running a thing of the past. It is unnecessary to say with what delight we hail that prospect, or to emphasize the depth of the Navy Department's interest in the development of civil flying. Both in that future time and now, when governmental channels still offer the primary outlet for your products, we are going to make most progress through cooperation to keep American Aircraft to the fore and through full and frank recognition of the Services' aims and problems and of the conditions under which anyone attempting to meet those aims, whether from within the naval establishment or from within the industry, has to work."

Hon. Wm. P. MacCracken said in part: "If there is one thing more than any other that I desire to impress upon you gentlemen tonight, it is that the job of making civil aeronautics pay its own way in this country requires the closest cooperation on the part of all those connected with it. It is not your job, nor my job, but OUR job.

"Both President Coolidge and Secretary Hoover are taking a marked interest in this subject and have indicated that it would be the policy of their administration to call on the industry for counsel and advice. Let me assure you, gentlemen, that the ear of the Assistant Secretary is at your disposal and suggestions from you, either collectively or individually, will be not only listened to, but will be given careful consideration. You realize even better than I do, that there are differences of opinion among you, and that, therefore, it will be impossible for me to carry out all of the suggestions which you may make, but please do not be discouraged merely because your first few suggestions may be among those that I will find impossible, either through lack of funds or because of conflicting opinion, to put into effect. No one realizes better than I do the
need for team play in order to succeed in carrying out this policy and in getting the most out of our investment. Be assured, however, that I have confidence that it can be done and am willing to pledge my best efforts towards its accomplishment.”

This occasion being the first public appearance of the three new Assistant Secretaries for Aviation, it represented a momentous event in the history of American Aviation. Approximately 200 guests attended the function.

Equally impressive, although of an entirely different character, was the banquet given in honor of Sir Alan Cobham and to Major de Bernardi, representatives of two of the leading countries in aeronautics in the world, Great Britain and Italy. The banquet was held at the Waldorf-Astoria Hotel in New York City. The dinner committee were Major Lester D. Gardner, chairman, and Charles L. Lawrance, C. M. Keys, F. B. Rentschler, Grover Loening, Chance Vought, and Samuel S. Bradley.

Colonel Paul Henderson, then president of the Aeronautical Chamber of Commerce, was toastmaster, and the speakers included Sir Alan Cobham, Major Mario de Bernardi, and the Hon. Will H. Hays. Among the guests of honor were many of rank and achievement in aeronautics, both at home and abroad. From “overseas” came, in addition to Sir Alan Cobham and Major de Bernardi, Major Aldo Guglielmetti, Captain Ferrarrin, Captain Guasconi, Lieutenant Bacula, all of the Italian Schneider Trophy Team; Signor Macchi, of the Italian Macchi Air Craft Company; Signor Castoldi, designer of the Macchi seaplanes used in the race for the Schneider Trophy; Signor Ferretti, designer of the Fiat engines which powered the seaplanes; Comm. Emilio Axerio, Italian Consul General in New York City; Wing Comdr. T. G. Hetherington, Air Attaché to the Royal British Embassy in Washington, and Major Silvio Scaroni, Air Attaché to the Royal Italian Embassy in Washington.

CHAPTER IX

THE TREND OF TECHNICAL DEVELOPMENTS IN AERONAUTICS

A REVIEW of the recent technical progress in aeronautics will reveal no sensational or revolutionary developments, but rather a steady and satisfactory progress in the improvement and refinement of aircraft and their accessories. This is a healthy sign, and indicates that aeronautics has passed the experimental stage and has reached the stage of engineering development. Aerodynamic theory has been well developed, structural investigation is on a scientific basis, the properties of materials are well understood. The modern aeronautical engineer is thus well equipped to carry on his work, and with the experience of the past several years to guide him, is proceeding with the technical development of aircraft on a sound, scientific basis.

Airplanes

In general, it can be said that the “style” of aircraft, whether for military or commercial use, seems to have crystallized along definite lines. There are few radical types in existence. The tractor biplane is the predominating type, with a small but steadily increasing proportion of tractor monoplanes, particularly in the commercial field. Single-engined machines are by far the most popular in the United States, with only a few of the larger types using two or more engines. The influence of the aerodynamic engineer is apparent in all types. Interplane bracing is simplified, biplanes being usually of the single-bay type and monoplanes either cantilever or semi-cantilever; struts and wires are streamlined; all external lines smoothed and faired to present a minimum of resistance. The result is that the modern airplane is a vastly “cleaner” and more presentable craft than its predecessor of a few years ago.

Furthermore, the aerodynamic engineer has contributed greatly toward improving the flying characteristics of the modern airplane. Intelligent wind tunnel research has developed new wing curves that show better speed and better lift than old types. Stability, controllability, and maneuverability have been carefully studied and analyzed so that the modern designer is able to avoid unpleasant and dangerous characteristics in his planes. It is interesting to note
(Top) Sikorsky three motored transport. (Bottom) Interior of same machine.
the increasing importance of the wind tunnel as a part of the aircraft manufacturer’s equipment. Until recently, manufacturers, with one exception, have relied on the wind tunnel mainly for the accumulation of scientific information on aerodynamics. The practical use of the wind tunnel by the manufacturer, to predetermine the performance and flying characteristics of a new design, is now so generally recognized that several manufacturers are installing wind tunnels as part of their equipment.

In the field of materials, the development is paralleling that of the automobile. Metal is rapidly encroaching upon wood, which was almost universally used for structural members in early aircraft. Steel has been widely used during the past few years, with an increasing tendency toward the use of the stronger alloy steels; while duralumin, a remarkably strong and light alloy of aluminum, is rapidly gaining in favor, now that it is readily available to the manufacturer in almost every shape and form. Welded steel fuselages have almost entirely replaced the old wood-and-wire type, and now duralumin is often used in place of steel. Tail plane structures are usually of steel or duralumin, interplane struts and wires are of steel, most of the furnishings such as seats, controls, instrument boards, etc., are either of steel or duralumin. Even propellers are now made of duralumin. The only exception to the rapidly increasing use of metal is in wing structure, where wooden framing, fabric covered, still reigns supreme, mainly because of the great expense in fabricating from metal the many parts involved. Even here, however, metal is coming in for attention. There has been built a successful monoplane using all-duralumin wings, even to the covering, and other manufacturers are experimenting with metal wing skeletons.

For covering wings, fuselages, and control surfaces, fabric seems to be firmly entrenched. As noted above one manufacturer has used sheet duralumin, and another uses veneer, but almost without exception other manufacturers are sticking to fabric, with little prospect of any pronounced change in the near future.

There is one other exception to the universal use of metal in aircraft and that is in the hulls and floats of flying boats and seaplanes. Here wooden framing, covered with 2-ply mahogany planking, is still the favorite, though there have been successful duralumin hulls built.

Rapid strides are being made in the improvement of maintenance features of aircraft. In fact, the present tendency is to subordinate sheer performance if necessary, to the requirements of accessibility, easy maintenance, and reliability. Particular attention is being paid
(Top) Keystone Heavy Bomber *Cyclops* with "Packard" 800 h.p. engine.
(Bottom) Keystone Light Bomber *Pirate* with 2 "Liberty" 12 engines.
to power-plant items. These are being located so as to be readily accessible to the mechanic for inspection or repair. Some manufacturers are now designing their power-plants that the entire unit may be quickly and easily removed for overhaul, and a spare power-plant fitted. Careful provision is now being made for each inspection and maintenance of all parts which are subject to wear, such as control surface mechanism, tail skids, etc., and in addition the proper lubrication of such parts is carefully studied and provided for.

Military Airplanes

Unquestionably the outstanding American military airplanes of today are the pursuit and observation types which are being procured by both the Army and Navy. The rapid development of these types has been remarkable. They possess performance and maneuverability characteristics which are unsurpassed in the world. In addition, these types have been developed to a very high degree of excellence as regards strength, durability and ease of maintenance. An interesting development, initiated by Curtiss, is the adaptation of the basic pursuit type, with various power-plants, to fulfill several specific functions of Army and Navy pursuit operations. Particular attention is being paid by the Navy to the development of shipboard fighters and scouting planes. Successful catapulting of seaplane types is now common, and deck landing types have been developed to the point where the feasibility of this type is apparent beyond question.

The progress in the larger types of military aircraft has necessarily been slower and less spectacular than the development of the past fighting types. Nevertheless there has been progress, mostly along the lines of refinement of orthodox types. The Navy has fostered the development of large “three-purpose” seaplanes—intended for torpedo carrying, bombing and scouting, and also of multi-engined flying boats for long-distance reconnaissance. The Army has experimented with a single-engined light bomber but is concentrating on the development of twin-engined bombers of advanced design that will have much better performances than the standard service types now in use.

Commercial Airplanes

In direct contrast to military aviation, where basic types of planes have long been established and have now reached an advanced stage of refinement, commercial aviation in the United States is almost “brand new.” Manufacturers and users alike hold various
opinions as to just what is wanted. The preciseness of military specifications and requirements is entirely lacking in the commercial field. Consequently, there is a great deal of experimentation going on, with little time devoted to careful refinement of design except in a few notable instances. Another handicap, partially resulting from the above condition, is that only one or two satisfactory commercial aircraft engines are being manufactured in quantity, so that the designer finds himself limited in his choice of power-plants.

Nevertheless, great progress has been made during the past year, and there was more commercial activity than ever before.

Of the types now in existence, the small two-or-three-place sport plane is by far the most numerous. A score or more manufacturers are making planes of this type, and practically all follow the same general pattern, that is, tractor biplane powered with the obsolete 90 h.p., OX-5 motor, and having steel tube fuselage and wooden wings, fabric covered. As a type, this class of plane may be considered relatively unimportant, since it is destined to disappear with the OX motor. Nevertheless, it has played its part in bringing aviation within the reach of many.

A far more important class is the somewhat larger machine that has been developed for mail service, passenger transportation, etc. A large majority of planes of this type is powered with the 200 h.p. Wright air-cooled engine, one of the few truly commercial engines in America. Cantilever and semi-cantilever monoplanes are gaining in favor in this class. Many of the machines are provided with enclosed cabins, and some are adopting starters, wheel brakes, and other devices which contribute to the comfort and safety of flying.

The development of large, multi-motored air-liners has by any means kept pace with the same development in Europe, chiefly because there are at present no passenger lines requiring quantities of such planes in this country. Two or three manufacturers have produced successful multi-motored planes, the outstanding examples being Ford and Fokker. Both of these machines are monoplanes using three air-cooled engines. The Ford machine is of all duralumin construction, while the Fokker uses a steel tube fuselage and the characteristic Fokker veneer wing.

Strangely enough, the flying boat is being neglected by commercial manufacturers. For sheer comfort and pleasure in flying, the flying boat surpasses any other type of plane, and it seems that designers are overlooking a profitable field.

Likewise, the amphibian, capable of operating from either land or water, is receiving scant attention from commercial designers,
although the possibilities of the type appear to be great and its practicability has been thoroughly demonstrated by Loening.

In the low-powered "light-plane" field, most of the activity is confined to amateur enthusiasts who construct their own machines. None of the recognized manufacturers are devoting any time to this type—in marked contrast to Europe, where almost every manufacturer is at least dabbling in light plane construction. The lack of interest on the part of American constructors is possibly due to the scarcity of satisfactory low-priced engines.

**Airplane Engines**

Recent developments in the design of airplane engines have been of especial importance, primarily because of the revival of interest in air-cooled engines. Since the World War, water-cooled engines have been used in the majority of American aircraft, mainly because they have been superior to air-cooled engines on the basis of reliability and compactness. The U. S. Navy, however, realizing the value of the low weight and simplicity of air-cooled engines, has encouraged their development. As a result of the Navy's interest, the 200 h.p. Wright "Whirlwind" engine was evolved and has been successfully used in a large number of naval and commercial aircraft. The past year also saw the advent of the Pratt & Whitney "Wasp," a 400 h.p. radial engine, which has shown remarkable performance in naval pursuit and observation planes. Still larger types, the Pratt & Whitney "Hornet" of 500 h.p., and the Wright "Cyclone" of 525 h.p. give promise of successful use in large multi-engined bombing and torpedo planes. Another type of air-cooled engine, the inverted Vee (re-designed Liberty) has been produced by the Army. This engine has also been quite successful, and it is claimed by some engineers that the inverted Vee-type is destined to supersede the radial type because of lower frontal area.

On the other hand, some manufacturers, notably Curtiss and Packard, have continued the development of water-cooled engines as being the most satisfactory type, particularly for high speed military planes. Curtiss now has the V-1550, producing 600 h.p. at a weight of only 730 pounds, and developed from the famous Curtiss D-12 engine of 435 h.p., which is being produced in quantities for both Army and Navy pursuit planes. Packard has continued the development of its 1A and 2A types of 600 and 800 h.p. Both Curtiss and Packard engines are 12 cylinder Vee types and are produced with either geared or direct driven propeller shafts.

Thus there are two schools of military engine design. The air-
cooled engine enthusiasts point to the lower weight and freedom from cooling system trouble, and claim equality of performance with water-cooled types. Supporters of water-cooled engines admit the first two points but insist that for high speed and high power the water-cooled type is superior and has greater reliability. It is too early yet to predict which is right, but the probability is that both types will continue in use, at least for some time to come.

As mentioned before, the development of modern commercial aircraft engines has been decidedly slow. The Wright "Whirlwind" of 200 h.p. is almost the only commercial engine being produced in quantities. However, the past year has seen an awakening of interest on the part of designers and constructors as evidenced by the adaptation by Pratt & Whitney of their "Wasp" service engine to commercial uses. As this chapter is being written the Boeing Company has ordered twenty-five "Wasp" engines for installation in commercial planes. There are several promising engines, ranging from 30 to 150 h.p., now in the experimental stage. Almost all of them are of the radial, air-cooled type, and there is little doubt that the air-cooled engine is the commercial engine of the future.

Accessories

The steady progress of technical development has of course not been confined to aircraft and their power-plants, but has extended to propellers, superchargers, starters, instruments and many other accessories with which modern aircraft are equipped. Space will not permit of a detailed recitation of all the refinements and improvements that have been accomplished, but a brief account of some of the more important developments will give some indication of the progress in accessory design.

The design of airplane propellers has been revolutionized. A few years ago, wood was the only material used in propellers. Then came the Curtiss-Reed duraluminum propeller, which not only showed a higher efficiency than wooden propellers, but greater durability, freedom from climatic difficulties and far longer life. Today, practically all of the military aircraft in the United States, and an ever-increasing proportion of commercial aircraft, are equipped with metal propellers. Standard Steel, Curtiss-Reed and Hamilton, have produced the bulk of those now in use. The Standard Steel propeller is of the variable pitch type, with duralumin blades and a steel hub. Curtiss-Reed propellers are in one piece. The original type was twisted from a flat slab of duralumin, while the new type is forged from a single ingot into a blade
Pioneer Instrument Boards.
very similar in form to the wooden type, but having better airfoil sections with consequent increased efficiency.

The development of the supercharger for aircraft engines has been carried to a very high degree in the United States. It is of course a well known fact that the power of an airplane engine decreases rapidly with altitude due to the rarified air, which does not provide the proper "mixture" to the cylinders. The supercharger compresses this rarified air and thus permits the engine to develop full power at high altitudes, which is absolutely essential for military pursuit operations.

The first superchargers developed were operated by the exhaust gases of the engine. This type is in some use both in this country and abroad. Difficulties in cooling the valves of the motor, reduction in power developed, and other mechanical features have made it desirable to depart from this method of propulsion.

Hence there has been developed in America the gear-driven supercharger in two types. First, that which receives the air without passing through the carburetor and compresses through a centrifugal fan as it enters the engine. The changing of the gears of this type makes it possible to give ground atmospheric pressure at almost any altitude. This type has been particularly developed through the agency of the Matériel Division of the Air Corps at McCook Field.

The other type, known as the Root type of supercharger, is gear-driven, but it compresses the air before it reaches the carburetor, which it is said offers some advantages over the type above-mentioned.

The National Advisory Committee for Aeronautics and the Navy Bureau of Aeronautics have devoted a great deal of experimental development to this type, apparently with unusual success.

Which of the two types will become standard, it is at this time impossible to foretell.

The problem of developing satisfactory instruments and navigational aids has received a great amount of attention. One of the most important of recent developments is the radio beacon, which received its first practical application in the air mail service during the year. Night illumination systems for airports have also been perfected. The Pioneer Instrument Company has developed a new type of airplane instrument board, using narrow vertical instruments. This saves space and makes possible a convenient grouping of related instruments.

The old dangerous method of starting airplane engines by swinging the propellor is rapidly disappearing, due to the development of several reliable, compact, and light starters of both mechanical and
electrical types. One of the most successful is the mechanical "inertia" starter as developed by Aeromarine. In this type, the operation of a hand crank causes a light flywheel to rotate at high speed, and the energy thus developed is used to crank the engine. A still later type is a combination electric inertia starter by Eclipse, in which electric power is substituted for the hand crank.

The above are but a few of the many recent improvements that have been made in airplane accessories. To these might be added countless others such as hydraulic wheel brakes, "oleo" landing gears, etc., to say nothing of developments in purely military accessories such as bomb sights, range finders, cameras, radio equipment, and armament of all kinds.

References to developments in the lighter-than-air field are included in the chapter on Airships.

A Smoke Screen.—Photo Naval Air Station Anacostia.
CHAPTER X
THE AERONAUTICAL INDUSTRY

At the close of 1926, the aircraft industry, as a whole, was in its most satisfactory condition since the end of the World War. Practically every one of the well-known constructors of military aircraft received a satisfactory volume of business during the year, and the passage of the Five-Year Acts for Army and Navy aircraft procurement gave assurance that responsible manufacturers would continue to receive a reasonable continuity of orders. The construction of military aircraft proceeded on the sound policy of refinement and quantity production of established types, supplemented by the experimental development of new types.

The extension of the contract air mail routes, passage of the Air Commerce Act, and awakened public interest in aerial transportation, gave impetus to commercial aviation, with the result that many new manufacturing concerns were organized during the year, in addition to those already established. Practically all of them found ready markets for their products, and while many of the aircraft produced were of designs temporary in character, much real progress was made, and the nucleus of a strong commercial aircraft industry firmly established.

Aircraft accessories of every conceivable type, including propellers, instruments and navigational aids, power-plant accessories, life-saving devices, cameras, radio, and a host of others were developed or refined by their respective manufacturers, working in close cooperation with the Government and the aircraft manufacturers. Materials, too, came in for their share of attention, with many manufacturers producing special lines of aircraft fabrics, tubing, wire, finishes, protecting coatings, and the like.

Airplanes

The Aerial Service Corporation, of Hammondsport, N. Y., has continued its production of the "Mercury, Jr." plane designed for various commercial uses and a combination wheel and ski type of landing gear, in addition to its other activities.

The Alexander Aircraft Company, of Denver, Colo., continued to produce the "Eaglerock," a light three-place commercial biplane, powered with the Curtiss OX-5 motor of 90 h.p. A factory pro-
duction of three planes per week was attained on the model. The "Eaglerock" has a high speed of 97 miles per hour.

Anderson Aircraft Company, of Anderson, Ind., were engaged in extensive experimental work on a biplane with steel fuselage, equipped with high lift folding wing, motored with a six-cylinder radial air-cooled engine.

The Atlantic Aircraft Corporation, of Hasbrouck Heights, N. J., continued, in 1926, the intensive development of strictly commercial aircraft. These aircraft were Fokker monoplanes, and with one exception, were powered with Wright "Whirlwind" engines. All were cabin planes, and incorporated many refinements such as hot air heating for the cabins, long exhaust pipes for silencing the exhaust, wheel brakes, and improved seating arrangement and toilet facilities.

The Fokker "Universal," four to six-passenger cabin monoplane, powered with a single "Whirlwind" engine, was continued in production during the year.

The Fokker "Trimotor," a large passenger monoplane, using three "Whirlwind" engines, was produced in quantities and saw regular service on several air mail and passenger lines during the year, as well as being used by Commander Byrd on his famous North Pole flight and by the Wilkins Arctic Expedition. A de luxe model of the "Trimotor," equipped with Turkish carpets, mahogany paneling, galley, and other luxuries, was built for the Continental Motors Company for rapid transportation of executives between various business centers.

The Boeing Airplane Company, of Seattle, Wash., one of the large producers of military aircraft in the United States, maintained its position with a steady flow of experimental and production types.

The well-known PW-9 Army pursuit type, powered with the Curtiss D-12 motor, was refined and continued in production as the PW9-A, and a still later refinement, known as the PW9-C, was built during the year. One PW9-A was equipped with the 180 h.p. "Hisso" engine and submitted to the Air Corps as a pursuit training plane.

For the Navy, a modified PW9-A, powered with the Packard IA-1500 engine, and equipped either as a deck-landing airplane or twin-float seaplane, was produced. This machine was known as type FB-3, and in official performance trials attained the remarkable speed of 187 miles per hour. A later development of this type, known as Model FB-5, was put in production for the Navy during the year.
(Top) Consolidated *Trusty* (PT-1). (Bottom) Consolidated *Husky* (NY-1A) Standardized by Air Corps and Naval Air Services for Primary Training.
Two new pursuit types were developed during the year. The first of these, known as Model 66, and designed for the Air Corps, mounts the Packard 2A-1500 inverted engine, and incorporates many novel design features, including radiators in the wings, treadle-type oleo landing gear, and a new armament installation. The second development was a carrier-type fighter, powered with the Pratt & Whitney "Wasp" engine, and built for the navy.

A three-purpose bomber, torpedo, or scout plane, using the 2A-2500 Packard engine, was built for the Navy. It is of all-metal construction, equipped with either landing gear or twin floats, and provided with folding wings. A primary training plane, known as Model 64, and powered with the "Whirlwind" engine, was also submitted to the Navy for test.

In the commercial field, Boeing produced Model 72, a cabin airplane carrying a pilot and four passengers, and powered with the "Whirlwind" engine. It has a high speed of 110 miles an hour.

The Buhl Aircraft Company, of Marysville, Mich. (formerly the Buhl-Verville Aircraft Company), continued its production of the "Airster," a three-place commercial biplane powered with either the OX-5 motor or the 200 h.p. Wright "Whirlwind" motor. With the OX-5 motor its high speed is 95 miles an hour, and with the "Whirlwind," 130 miles an hour.

The Consolidated Aircraft Corporation, of Buffalo, N. Y., produced in quantities its "Trusty" (PT-1) and "Husky" (NY-1) airplanes. The "Trusty" is the standard primary training airplane of the Army Air Corps.

It is a two-place biplane of simplified design, powered with the 200 h.p. Wright E-2 engine. The "Husky" is for Navy primary training and is convertible equipped as a landplane or single-float seaplane. It is powered with the Wright "Whirlwind" engine.

During the year, a new set of wings was designed and constructed for the "Husky" and provided the plane with greatly increased performance.

The Curtiss Aeroplane and Motor Company, Inc., with factories at Garden City, N. Y., and Buffalo, N. Y., was extremely busy during the year. In addition to producing in quantities several types of military airplanes, motors and propellers, this company carried out an extensive research program in applied aeronautical engineering and was responsible for many contributions to the art.

The outstanding accomplishment of the Curtiss Company during the year was the successful adaptation of the standard Curtiss "Hawk" type of pursuit airplane to several different power-plant installations, thus creating a series of basically similar types, each
(Top) Curtiss Pursuit Training Wright E-2 engine. (Bottom) Curtiss Falcon, Curtiss D-12 engine.
modification being particularly suited for some special requirement of Army or Navy pursuit operations.

The basic Army type of “Hawk” is powered with the 435 h.p. Curtiss D-12 motor and is the standard pursuit machine of the Army Air Corps. The 1926 production model is known as Type P-1B.

With the inherent excellence of the basic “Hawk” type established through years of service, the Air Corps encouraged the design of a modified “Hawk” for use in pursuit training, and the Curtiss Company produced the AT-4, which is a standard “Hawk” with a 180 h.p. “Hisso” motor in place of the usual 430 h.p. D-12 motor. This arrangement provides the Air Corps, at low cost, with a standardized approved type, particularly suited for training purposes, and possessing excellent performance and maintenance features. In addition, the 180 h.p. power-plant can be replaced easily with the standard D-12 power-plant, thus converting the AT-4, in time of emergency, into a standard fighting “Hawk.”

The Navy is also using the “Hawk” with the D-12 motor, as a fighting plane. This type is known as the F6C-3 and is interchangeably equipped as a landplane, deck-landing airplane, or twin-float seaplane.

Another modification of the “Hawk,” which is known as Navy type F6C-4, is powered with the new air-cooled Pratt & Whitney “Wasp” engine. The experimental installation of the new “Wasp” motor in the well-known “Hawk” provided the Navy at once with a first-class air-cooled pursuit type.

Another Curtiss military type which is attracting wide attention is the O-1 “Falcon,” a two-seater observation type developed for the Army Air Corps. The “Falcon,” after thorough service tests, has now been adopted as the standard observation plane of the Air Corps.

The Curtiss Company’s efforts with respect to racing aircraft were confined to the reconditioning, for the Navy, of one of the seaplane racers used in winning the 1925 Schneider Cup Race. The major change was the substitution of the new Curtiss V-1550 motor for the V-1400 motor previously used. Although beaten in the Schneider Cup Race by the much greater horsepower of the Italian entries the motor performed in faultless style and thoroughly proved its worth.

The Eberhart Aeroplane and Motor Co., Inc., of Buffalo, N. Y., well known as manufacturers of airplane ordnance equipment, airway flares, lights, and ignition equipment, appeared for the first time as an airplane manufacturer in 1926. The company pro-
(Top) Pitcairn Orowing. (Center) Sesquioing. (Bottom) Main Hangar at Pitcairn Field. Harold F. Pitcairn (right), James G. Ray (left).
duced and demonstrated at the end of the year the “Iroquois,” a three-place commercial airplane for training, cross-country, and general commercial flying; and the “Comanche,” a single seat fighter for the Navy.

The Edo Aircraft Company, of College Point, N. Y., produced some very interesting duralumin pontoons for use with small commercial airplanes.

G. Elias & Brother, Inc., of Buffalo, concentrated during 1926 on the development of a new commercial airplane to be known as the “Airmobile.” It is to be powered with the 400 h.p. Liberty engine, designed to combine exceptional performance with maximum comfort for passengers. A design for Class VN Navy Training Airplane was also developed in the latter part of 1926.

Elias contributed to the development of aircraft accessories with an overflow sight fuel gage and an oleo type of landing gear of new design, and in addition manufactured quantities of bomb-racks and other armament for the Air Corps.

The Fairchild Airplane Manufacturing Company of Farmingdale, N. Y., brought out the FC-2, a commercial cabin monoplane accommodating a pilot and four passengers, and powered with the 200 h.p. Wright “Whirlwind” engine. The FC-2 has a high speed of 120 m.p.h., initial rate of climb of 1025 feet per minute, and service ceiling of 12,400 feet, with a gross weight of 3225 pounds. Folding wings are provided.

Charles Ward Hall, of New York, has continued specialization in engineering development of all-metal airplanes for the Army and the Navy.

The Johnson Aircraft Corporation of Dayton, Ohio, built during the year a new type of small airplane, known as the “Twin-60.” This plane is a twin-engined pusher biplane powered with two Bristol “Cherub” 30 h.p. engines. It has a span of 28 feet, overall length of 21 feet, and gross weight of 1320 pounds.

The Keystone Aircraft Corporation, of Bristol, Pa. (formerly Huff-Daland), developed during the year the “Pirate,” a twin-engined bomber for the Air Corps. This machine, which is a modification of the well-known single-engined LB-I bomber, is powered with two 400 h.p. Liberty engines, and has a high speed of 113.5 miles an hour, landing speed of 55 miles an hour, and ceiling of 13,500 feet, carrying 5162 pounds of useful load. The gross weight is 11,800 pounds.

The “Cyclops,” the largest single-engined bomber in the United States, was completed for the Army Air Corps in 1926. It is equipped with the Packard 2A-2500 engine, is of all metal con-
struction (fabric covered) and has a gross weight of 16,600 pounds.

In addition to the above, the well-known Huff-Daland agricultural dusting operations were extended on a large scale to South America.

The Loening Aeronautical Engineering Corporation of New York City is justly famed for the development of the Loening "Amphibian," which has been perfected by this organization until it is now far ahead of other amphibian types throughout the world. The Loening "Amphibian" is used by the Army, Navy, Coast Guard, and civilian operators, and participated in many notable aerial exploits during 1926, of which the aerial photographic survey of Alaska and the projected "Good Will" flight around South America were the most noteworthy. Successful catapulting of an amphibian plane was accomplished, for the first time, by the U. S. Navy in 1926, using the Loening "Amphibian," and as a result this plane is now a part of the regular equipment of several American battleships. The Loening "Amphibian" is powered with the inverted Liberty motor.

The Ludington Exhibition Company, Inc., of Philadelphia, made its debut as an aircraft manufacturer with the "Lizette" monoplane. This is a two-place sport machine having a duralumin monocoque fuselage. It is equipped with the 35 h.p. Anzani engine and has a speed range of from 41 to 90 miles an hour.

B.B.T. 500,000,000 Candle Power Floodlight. The Planes are Vought UO's.
Pitcairn Aviation, Inc., of Bryn Athyn, Pa., produced two commercial types of aircraft in 1926, the "Orowing," a three-place biplane powered with the OX-5 motor, and the "Sesquiwing," a fast messenger plane powered with either the Curtiss C-6 or OX-5 motor. An interesting feature of this machine is the provision for rapid exchange of engines. This was accomplished during the National Air Races at Philadelphia in thirty-one minutes.

The Sikorsky Manufacturing Corporation, now of College Point, Long Island, built during 1926 a large three-motored commercial cabin biplane, known as the S-35. This was prepared for a non-stop flight from New York to Paris, and the flight was attempted on September 21st. The failure of an auxiliary landing gear caused the total destruction of the plane before it left the ground. In test flights, however, with the normal gross weight of 18,000 pounds, the S-35 showed excellent performance, its high speed being 141 miles an hour. With a weight of 16,500 pounds, the S-35 reached an altitude of 17,000 feet in 45 minutes. The engines were 425 h.p. air-cooled Gnome-Rhone Jupiters.

The Thomas Morse Aircraft Corporation of Ithaca, N. Y., specializing in metal construction of aircraft, continued its development of the O-6 type of observation plane, in conjunction with the Matériel Division of the Air Corps, with satisfactory results. This company also constructed during the year metal wings for pursuit aircraft.

The Chance Vought Corporation, of Long Island City, N. Y., maintained its enviable position as one of the principal producers of military aircraft in the United States. It is interesting to note that during the fiscal year ending June 30, 1926, over 25,000 hours, corresponding to almost three million miles, were flown by Vought Navy airplanes.

The outstanding Vought development of the year was the "Corsair," a two-place Navy observation and fighting plane.
(Top) Vought UO-4 used by Coast Guard. (Bottom) Vought UO-3 Navy Training Fighter. Wright “Whirlwind” engines.
possessing exceptionally high performance and maneuverability. The “Corsair” is a convertible land or seaplane and is powered with the 400 h.p. Pratt & Whitney “Wasp” engine. It is being supplied to the Navy as replacement for the famous Vought UO-1 catapult-launched fleet spotter and reconnaissance plane.

The Vought UO-3, a single-seat naval seaplane fighter for catapult launching, designed particularly for high performance at altitude, was put in production in 1926. The UO-3 is powered with the Wright J-5 engine, and marks the first production use of a supercharged air-cooled engine in the United States. Another model, the UO-4 seaplane, powered with the Wright “Whirlwind” engine, was built during the year for the U. S. Coast Guard Air Service.

**Motors**

The Motor Division of the Curtiss Aeroplane and Motor Company, at Buffalo, N. Y., developed, during the year, the Curtiss Model V-1550, a 12-cylinder water-cooled Vee engine, of basically the same design as the famous Curtiss D-12 engine. The V-1550 engine develops 600 h.p. at 2300 r.p.m. with a dry weight of only 730 pounds. This model is also supplied as a geared engine, rated at 575 h.p. at 2500 r.p.m.

The Curtiss D-12, rated at 435 h.p. at 2300 r.p.m., was refined and continued in large quantity production for both Army and Navy. This engine, during the past several years, has firmly established itself as one of the most serviceable aircraft engines in the world.

A large air-cooled radial engine, known as Model R-1454, and built to designs of the Air Corps, was completed in 1926 and delivered to the Army for test. It is rated at 400 h.p.

The Fairchild Caminez Engine Corporation, of Farmingdale, N. Y., continued the development of the Fairchild-Caminez Model 447-C, a 4-cylinder air-cooled engine of unique design, which promises much in the way of simplicity, light weight and high efficiency. The engine develops 150 h.p. at 1200 r.p.m. and weighs 360 pounds, including propeller hub and accessories.

The Packard Motor Car Company, of Detroit, devoted the year to the refinement in design and production of its well-known 600 and 800 h.p. aircraft engines.

The 600 h.p. engine was built in three types, namely, the direct drive, direct drive inverted, and geared. The 800 h.p. engine was produced both as a direct drive and as a geared model. Both the 600 and 800 h.p. engines are 12-cylinder water-cooled, Vee-type, of low frontal area and compact design.
The entire Packard aircraft engine production to date has been delivered for use by the Army or Navy in military airplanes. One of the geared engines of normal 600 h.p. was fitted with high-compression pistons, increasing its output to 700 h.p., and installed in one of the Curtiss Racers for the 1926 Schneider Cup Race. In preliminary trials, this ship was very fast, but an unfortunate accident prevented its participation in the race.

The Pratt & Whitney Aircraft Company, of Hartford, Conn., has developed for the Navy the "Wasp," one of the most remarkable of modern aeronautical engines. The "Wasp" is an air-cooled radial engine, developing 425 h.p. on a weight of 650 pounds. It has shown remarkable performance in fighting planes, and is being produced in quantities as the standard Navy fighter power-plant for 1927. The "Wasp" has also been adopted for commercial use and is about to be installed in a fleet of twenty-five of a new type of air transport by Boeing.

Simultaneously with the production of the "Wasp," the Pratt & Whitney Company has been developing a larger radial air-cooled engine for the Navy. This type is known as the "Hornet," and develops 500 h.p. at 1800 r.p.m. This engine, which has passed
its Navy acceptance test, is designed for use in larger aircraft such as scouting, bombing, and torpedo planes.

The Wright Aeronautical Corporation of Paterson, N. J., pioneer producer of aircraft engines, was actively engaged during the year in the development and production of several models of air-cooled radials.

The well-known 200 h.p. "Whirlwind" was produced in large quantities for both military and commercial use, and, in fact, was the only modern commercial engine in large production during the year in the United States. The "Whirlwind" has won for itself an enviable reputation, and participated in many outstanding aeronautical accomplishments during the year, of which perhaps the outstanding feat was Commander Byrd's flight to the North Pole. A refinement of the original type, known as Model J-5, and designed primarily for military service, was developed during the year and successfully passed its type tests. This engine develops 238 h.p. at 2000 r.p.m. and in one 50-hour test, when equipped with a supercharger, developed 287 h.p. at 2150 r.p.m.

Six engines of the Wright "Simoon" type, developing 340 h.p. at 1800 r.p.m., with a weight of 640 pounds, were completed and delivered to the U. S. Navy.

Development of the Wright "Cyclone" line was continued and several engines of both geared and direct drive type were delivered to the Navy. The "Cyclone" develops 435 h.p. at 1800 r.p.m.

The outstanding technical development of the Wright Company during the year was the new type of "Cyclone" engine, Model R-1750. This engine, which has passed its 50-hour Navy test, is said to be the largest air-cooled engine in the world, developing 525 h.p.

**Airships**

The Aircraft Development Corporation of Detroit, Mich., has been responsible for the work on metal-clad airships, in addition to their other experimentations, and the design and construction of a new type mooring mast for airships at Scott Field.

Airships Incorporated is one of three companies identified with the production of various types of lighter-than-air craft and have continued their experimental work in the perfection of specially treated fabric for use in connection with other work. Another interesting phase of their activities has been in developing and broadening uses for this specialized fabric with a view to substantially increasing the demand for it and thus making its production possible at lower cost, which would be reflected not only in the initial price
of balloons and airships, but also in the maintenance and repairs. Their most notable successes in this direction have been the perfection of their “Aircraft” and “Flotation” equipment now in regular use by the Army, Navy and Coast Guard for heavier-than-air craft, and also for motorboats and surface ships.

The Goodyear-Zeppelin Corporation of Akron, Ohio, has pursued its program in the perfection of plans and engineering data for large airships. The continuation of the latter, by the most experienced engineers and operators of airships in the world, has enabled this branch of our aircraft development to continue under favorable conditions. The activities of this company are given more in detail in the chapter on airships.

Propellers

The Curtiss Aeroplane and Motor Company continued the refinement and production of Curtiss-Reed duralumin propellers. Two types are manufactured, a “slab” type, twisted from a flat slab of duralumin, and the new “R” type, forged from a solid ingot, and possessing still higher efficiency. Curtiss-Reed metal propellers are used on a large proportion of both military and commercial aircraft in the United States.

The Hamilton Aero. Manufacturing Company of Milwaukee, Wis., in addition to extending the scope of its activities in production of wood propellers, has also become conspicuous as a producer of metal propellers of the larger sizes.
It is also reported that important work is in progress on the
design of a new type of plane for use in commercial air transport
and aerial service.

The Hartzell Walnut Propeller Co., of Piqua, Ohio, as pioneers
in the production of high-grade lumber and in the perfection of
processes of propeller construction, have extended their operations
in the manufacture of wooden propellers during the year.

Paragon Engineers, Inc., of Baltimore, concentrated on the develop-
ment of moulded and twisted interlaced wood fiber propellers
of exceptional lightness. These propellers have been used on a
number of commercial planes with highly satisfactory results.

The Standard Steel Propeller Company, of Pittsburgh, con-
tinued to develop and produce all-metal, adjustable pitch propellers.
These propellers are used in large quantities on military aircraft
and to some extent on commercial planes.
Instruments and Navigational Aids

The American Gas Accumulator Co., of Elizabeth, N. J., completed development of the AGA Sunrelay, a device which controls electric routing beacons, automatically switching the beacons on at night and off during daylight hours.

The B.B.T. Corporation, of Philadelphia, improved its standard types of lighting units and also developed several new types. The large air mail type of Landing Floodlight used on the transcontinental air mail route, as well as by the Navy and several municipal airports, was improved, and equipped with a new type of adjustable shutter. A small floodlight for naval aircraft carriers and a rotating mechanism for searchlights were among other developments.

The General Electric Co. of Schenectady, N. Y., developed an automatic lamp charger for aviation beacons, which upon failure of a lamp, automatically brings another one into service. Boundary lights for aviation fields were also produced.

The Interflash Signal Corporation, of New York City, improved
its automatic flashing aviation beacon lights for landing field boundary limitations and airway marking.

The Pioneer Instrument Company, of Brooklyn, continued the refinement of aircraft instruments and added new models of Altimeters, Turn Indicators, Air Speed Meters, Rate of Climb Indicators, and Flight Indicators. The well-known series of vertical instruments, developed by Pioneer, was augmented by the addition of a Centrifugal Tachometer. The famous Earth Inductor Compass was also improved.

The Sperry Gyroscope Company, of Brooklyn, produced a revolving type of airway beacon, equipped with an automatic lamp charger, and a high intensity landing field light.

The Westinghouse Lamp Co., of New York, cooperated with the Government and manufacturers in the development of special lamps for aviation lighting devices. Boundary lights, hangar lights, and airport projectors were produced by this company.

Materials, Supplies, Etc.

The Aero Supply Manufacturing Company, Inc., College Point, N. Y., developed and manufactured many special accessories, sup-
plies and equipment for the aircraft trade, having moved to a new and larger factory, especially equipped for the more adequate handling of the increasing amount of business in this field.

The Allison Engineering Company of Indianapolis, Ind., while not engaged in the production of complete new aircraft engines, has carried on general development work that is worthy of note. In addition to the design and construction of such items as reduction gears, air-cooled cylinders, etc., much successful experimental work has been accomplished for the Army Air Service, both in engines and accessories.

The Aluminum Company of America, of Pittsburgh, Pa., have extended their production and maintained their valuable research work in the perfection of duralumin to meet the special demands of all phases of aircraft construction. With the increasing tendency toward metal construction, the importance and significance of this work is constantly and increasingly recognized.

American Hammered Piston Ring Company, of Baltimore, furnish steel products in various forms, manufacturing piston rings for a large percentage of American aircraft engines.

Berry Brothers, Inc., of Detroit, perfected its “Aircraft Berryloid,” a pyroxylin lacquer finish for fabric and metal. This material is finding extensive use in the commercial aircraft industry.

The Bohn Aluminum & Brass Corporation, of Detroit, Mich., have continued extensive production of aluminum and brass castings for aircraft uses.

Brewster & Company, of Long Island City, N. Y., produced during the year a large amount of special fuselages and fittings for the industry, sustaining their long established reputation for the production of work of the highest quality.

The Carpenter Steel Company of Reading, Pa., have enjoyed the advantage of large production due to their foresight in their
extensive research work developing special alloys, particularly adaptable for many purposes through the industry.

The B. F. Goodrich Company, of Akron, Ohio, continued the manufacture of rubber products for aircraft, including new ring type shock-absorber cord, pontoon hand-hole covers, and airplane tires.

The Stewart-Hartshorn Company, of New York, developed, during the year, a square-section tie rod for internal bracing on aircraft. Streamline tie rods are also manufactured by this company.

The Haskelite Manufacturing Corporation, of Chicago, produced its well-known Haskelite plywood, which is extensively used by aircraft manufacturers throughout the country. The company also developed a new moulded plywood seat for airplanes.

The Macwhyte Company, of Kenosha, Wis., produced a new type of round tie-rod for internal bracing on aircraft. Streamline tie rods for external bracing are also manufactured by this company.

Meisel Press Mfg. Co., of Boston, manufactured gears which were used in a large number of American aircraft engines.

The National Steel Products Co., of Dayton, Ohio, manufactured an extensive line of valves, fuel strainers, fuel pumps, and other metal fittings for aircraft.

The New Jersey Veneer Co., of Paterson, N. J., produced plywoods especially adapted for aeronautical use.

The Norma-Hoffman Bearings Corporation of Stamford, Conn., produced a very complete line of bearings, ranging from the large roller bearings used in aircraft engines to the tiny ball bearings used in delicate aircraft instruments.
Manufactured by National Steel Products Company, Dayton, O.
Aeronautical Industry

The Park Drop Forge Company, of Cleveland, Ohio, continued the extensive production of aviation crankshafts.


John A. Roeblings Sons Co., of Trenton, N. J., very greatly increased their production of aircraft wire and cable.

S. K. F. Industries, of New York, materially increased their production of ball and roller bearings of fine quality for various aircraft uses.

The Standard Oil Company of Indiana, of Chicago, continued its development and production of aviation fuels and oils.

The Summerill Tubing Company, of Bridgeport, Pa., manufactured a complete line of steel tubing for aircraft, in all shapes and sizes.

W. Harris Thurston & Company, of New York, handle fabrics for various aircraft uses.

The Thompson Products Company, of Cleveland, Ohio, are extensive manufacturers of aircraft engine parts.

Titanine, Inc., of Union, N. J., produced "Titanine" and "Ti-Two," dopes for aircraft fabrics, as well as dope resisting paint, paint remover and fillers.

E. S. Twining & Company, of New York, improved its Flightex Fabric which is in general use by aircraft manufacturers throughout the country.

Valentine & Company, of New York, are manufacturers of dopes and varnishes, their "Valspar" being one of the best known and favorite brands.

Wellington Sears & Company, of New York, furnish fabrics to meet the peculiar needs of the aircraft industry.

The Winchester Repeating Arms Company, of New Haven, Conn., acquired the Radiator Division of the U. S. Cartridge Company and continued the development and production of extruded seamless copper tubes for aircraft radiators.

Wood & Spencer Company, of Cleveland, Ohio, manufacture connecting rods and screw machine products.

Wyman-Gordon Company, of Worcester, Mass., are extensive manufacturers of crankshafts for the aircraft engine industry.

Accessories, Etc.

The A. C. Spark Plug Company, of Flint, Mich., continued its experimental and production work on spark plugs for aircraft use.
(1) Scintilla Aircraft Magnetos Types AG9-D and AG-12D.  
(2) Aeromarine Inertia Starter Types A (left) and D (right).  
(3) Scintilla Vertical Double Aircraft Magneto Type SC.  
(4) Eclipse Series VII Hand and Electric Starter.  
(5) Eclipse Series VI Hand Inertia Starter.
The Eastman Kodak Company, of Rochester, N. Y., have further developed aerial camera equipment and the super-sensitized anchromatic film.

The Eclipse Machine Co., in its Hoboken, N. J., plant, continued its policy of cooperation in the solution of problems incident to the starting of aviation engines. Additions to its line during the year include several types and sizes of inertia starters for either hand or electric operation, or both, as well as hand turning gears and direct-cranking electric starters. One of these particularly adapted for radial engines up to 1200 cubic inches displacement weighs only 18 pounds, and another rated for 2500 cubic inches, 26 pounds.

The Electric Storage Battery Company, of Philadelphia, Pa., has continued its experimental and production work on their new line of Exide aircraft batteries in addition to those built to Army and Navy specifications, which are being used in some quantities by commercial operators.

The Fairchild Aerial Camera Corporation, of New York, continued its development of aerial photographic apparatus. Its most recent product is the Model K-8 camera, a military creation, which is entirely automatic in operation. It takes 115 consecutive exposures, 7x9 inches, and is capable of automatically mapping an area of 180 square miles from a height of 15,000 feet. It is standard equipment of U. S. Army and Navy planes. Among other Fairchild developments is an Aerial View Indicator, which eliminates the constant maneuvering usually necessary in securing the proper position for taking aerial photographs.

The General Electric Company, of Schenectady, N. Y., cooperated with the Government in the development of a geared type of supercharger for air-cooled radial engines. This supercharger is designed as an integral part of the engine and is being supplied on air-cooled engines now being produced for the Navy.

The Hayes Wheel Company, of Jackson, Michigan, manufactures standard and special wheels for various types of airplanes.

The Healey-Aeromarine Bus Co., of Keyport, N. J., also con-
continued with the development of aircraft engine starters. Its outstanding product of the year was the type D Inertia Starter, weighing but 23 pounds, and suitable for engines of up to 750 horsepower. It is designed to be adaptable to all current types of American aircraft engines.

The Irving Air Chute Company, of Buffalo, N. Y., produced its famous parachute in large quantities for the Army, Navy, and Air Mail Service. Three types of the Irving Parachute are manufactured, the standard "seat-pack" type for pilots, the "lap-pack" type for gunners and observers, and the "back-pack" type for personnel of lighter-than-air craft. The Irving Air Chute is standard equipment for all Government fliers, and has already saved upwards of 30 lives in the United States.

The Leece-Neville Company, of Cleveland, Ohio, produced a complete line of voltage-regulated generators and control units, which are used on Army, Navy, and commercial airplanes engaged in night flying operations.
The Moto Meter Company, Inc., of Long Island City, N. Y., have specialized in the adaptation of their standard accessories to the peculiar and exacting needs of airplane motors and have maintained their pre-eminence in this field.

The Plane-Speaker Corporation, of New York, assisted by the Bell Telephone Laboratories and the Graybar Electric Company, developed the "Voice of the Sky," a large amplifier which is carried aloft in an airplane, and which transmits to the public below, advertising messages, music and the like.

The Radio Corporation of America, of New York, has specialized in the perfection of radio telephones, signalling and control, cooperating with the trade and the Army, Navy, Post Office and Commerce Departments, in the perfection of this equipment.

The Russell Parachute Company, of San Diego, Calif., has perfected a new type of parachute, which opens quickly and has a controllable rate of descent. The latest development is a soft back-pack type, providing a maximum of comfort on long flights.

The Scintilla Magneto Company, Inc., has, during the year 1926, established a factory in and moved its office to Sidney, New York. This company started the delivery of American-built Scintilla Aircraft magnetos of the nine and twelve-cylinder types to the Navy Bureau of Aeronautics in November, 1926, and is in production on these, as well as eight-cylinder types for the Army Air Corps, the Navy Bureau of Aeronautics, and aircraft engine manufacturers in general.

Since the first Scintilla Aircraft magnetos were adopted by the Government and the aircraft industry, many improvements have been made resulting in marked increase in efficiency and life, as well as very close cooperation with all makers and users of aircraft motors.

The development of a vertical double magneto in collaboration with the Engineering Division at McCook Field has been carried out, and several of these machines of various designs have been delivered. Light weight, simplicity and compactness are the points in favor of this type.

The Splitdorf Electrical Company, of Newark, N. J., has continued extensive experimentation and production of aircraft magnetos.

Stromberg Motor Devices Company, of Chicago, Ill., has also continued with the design and manufacture of carburetors and carburetor accessories for all types of aircraft engines.
The Russell Seat Type Parachute.
AIRCRAFT AND ENGINE DESIGN SECTION
ALEXANDER AIRCRAFT, INC.
DENVER, COLO.

EAGLEROCK THREE-PLACE COMMERCIAL
ENGINE—CURTISS OX-5

247
ATLANTIC AIRCRAFT CORPORATION
HASBROUCK HEIGHTS, N. J.

Fokker "Trimotor" Transport
Engines—Wright Whirlwinds

248
ATLANTIC AIRCRAFT CORPORATION
HASBROUCK HEIGHTS, N. J.

FOKKER "UNIVERSAL" TRANSPORT
ENGINE—WRIGHT WHIRLWIND

249
Boeing Airplane Company
Seattle, Wash.

Advanced Training AT-3
Engine—Wright E 250
Boeing Airplane Company
Seattle, Wash.

Carrier Type Fighter FB-5
Engine—Packard 2A-1500

251
Boeing Airplane Company
Seattle, Wash.

Carrier Fighter F2B-1
Engine—Pratt & Whitney "Wasp"
Boeing Airplane Company
Seattle, Wash.

Pursuit Model FB-3
Engine—Packard 2A-1500

254
**Boeing Airplane Company**
*Seattle, Wash.*

**Pursuit PW-9C**
*Engine—Curtiss D-12*

255
Boeing Airplane Company
Seattle, Wash.

Torpedo Plane TB-1
Engine—Packard 2A-2500

257
AIRPLANE COMPANY
SEATTLE, WASH.

TRAINING ENGINE—WRIGHT WHIRLWIND

258
CONSOLIDATED AIRCRAFT CORP.
BUFFALO, N.Y.

"HUSKY" NY-1-A (TRAINING PLANE)
ENGINE—WRIGHT WHIRLWIND

259
Curtiss Aeroplane & Motor Co., Inc.
Garden City, N.Y.

"Hawk" Pursuit Training Plane AT-4
Engine—Wright E-2

260
Curtiss Aeroplane & Motor Co., Inc.
Garden City, N. Y.

The "Hawk" F6C-4
Engine—Pratt & Whitney "Wasp"

262
Curtiss Aeroplane & Motor Co., Inc.
Garden City, N. Y.
Hawk Pursuit P-1B
Engine—Curtiss D-12
263
Curtiss Aeroplane & Motor Co., Inc.
Garden City, N. Y.

"Hawk" Seaplane F6C-3
Engine—Curtiss D-12
264
Curtiss Aeroplane & Motor Co., Inc.
Garden City, N. Y.

Curtiss R3C-4 Racer
Engine—Curtiss "V-1550"

265
Eberhart Aeroplane & Motor Company
Buffalo, N. Y.

"Iroquois" 3-place Commercial
Engine—Curtiss OX5

266
G. ELIAS & Bro., Inc.
BUFFALO, N. Y.

"AIRMObILE" COMMERCIAL
ENGINE—LIBERTY 12-A (REMODELLED)

267
THE JOHNSON AIRCRAFT CORP.
DAYTON, O.

TYPE 3
ENGINE—BRISTOL "Cherub"

270
KEYSTONE AIRCRAFT CORP.  
(Formerly Huff-Daland)  
BRISTOL, PA.  

HEAVY BOMBARDMENT "Cyclops" XHB-1  
ENGINE—PACKARD 2-A-2500
KEYSTONE AIRCRAFT CORP.
(Formerly Huff-Daland)
BRISTOL, PA.

LIGHT BOMBARDMENT "PIRATE" XLB-5
ENGINE—2 LIBERTY

272
Loening Aeronautical Engineering Corp.
New York, N. Y.
Loening "Amphibian"
Engine—Inverted Liberty 12
273
LUDINGTON EXHIBITION COMPANY
PHILADELPHIA, PA.

"LIZETTE"
Engine—Anzani

274
PITCAIRN AVIATION, INC.
PHILADELPHIA, PA.

"SESQUIWING"
ENGINE—CURTISS OX-5 (or) C-6-A
276
Sikorsky Manufacturing Corp.
New York, N.Y.

Trimotor S-35
Engine—3 Jupiters

277
CHANCE VOUGHT CORPORATION
LONG ISLAND CITY, N. Y.

"CORSAIR" (LAND OR SEAPLANE)
ENGINE—PRATT & WHITNEY "WASP"

279
CHANCE Vought Corporation
Long Island City, N. Y.

Type FU-1
Engine—Wright Whirlwind
280
CHANCE VOUGHT CORPORATION
LONG ISLAND CITY, N. Y.

2 PLACE NAVAL OBSERVATION UO-1
ENGINE—WRIGHT J-4-A
281
AIRCRAFT DEVELOPMENT CORPORATION
DETROIT, MICH.

DESIGN OF METAL CLAD AIRSHIP 200,000 CU. FT.
Airships Incorporated
Hammondsport, N. Y.
Advertising Kite Balloon
Airships Incorporated
Hammondsport, N.Y.
Emergency Flotation Bag
Installed on Curtiss F6C Fighter
Curtiss AeroPlane & Motor Co., Inc.
Garden City, N.Y.

Model GV-1550  12 Cylinders  Water Cooled
525 B.H.P. at 2100 R.P.M.  600 B.H.P. at 2400 R.P.M.
Weight 800 Lbs. Dry
Curtiss Aeroplane & Motor Co., Inc.
Garden City, N. Y.

Model R-1454  9 Cylinders  Air Cooled
450 B.H.P. at 1800 R.P.M.  Weight 800 Lbs.
Model V-1550  12 Cylinders  Water Cooled

525 B.H.P. at 2100 R.P.M.  600 B.H.P. at 2400 R.P.M.

Weight 700 lbs. Dry
FAIRCHILD CAMINEZ ENGINE CORP.
NEW YORK, N. Y.

MODEL 447-B  4-CYLINDER AIR COOLED  CAM ENGINE
RATED 150 H.P. AT 1200 R.P.M.   360 Lbs.  COMPLETE
PACKARD MOTOR CAR COMPANY
DETROIT, MICH.

MODEL 2A-1500    12 CYLINDERS    WATER COOLED
600 B.H.P. AT 2500 R.P.M.    730 LBS. DRY    30 LBS. WATER
Packard Motor Car Company
Detroit, Mich.

Model 2A-1500  Geared 2:1  12 Cylinders  Water Cooled

600 B.H.P. at 2500 Engine R.P.M.  850 Lbs. Dry  30 Lbs. Water
PACKARD MOTOR CAR COMPANY
DETROIT, MICH.

MODEL 2A-1500 12 CYLINDERS WATER COOLED
600 B.H.P. AT 2500 R.P.M. 750 LBS. DRY 30 LBS. WATER
PACKARD MOTOR CAR COMPANY
DETROIT, MICH.

MODEL 2A-2500  12 CYLINDERS  WATER COOLED
800 B.H.P. AT 2000 ENGINE R.P.M.  1146 LBS. DRY  39 LBS. WATER
Packard Motor Car Company
Detroit, Mich.

Model 2A-2500  Geared 2:1  12 Cylinders  Water Cooled

PRATT & WHITNEY AIRCRAFT COMPANY
HARTFORD, CONN.

"HORNET" 9 CYLINDERS  AIR COOLED
NORMAL 500 B.H.P. AT 1800 R.P.M.
PRATT & WHITNEY AIRCRAFT COMPANY
HARTFORD, CONN.

"WASP"
9 CYLINDERS
NORMAL 425 B.H.P. AT 1900 R.P.M.
AIR COOLED
WEIGHT 610 Lbs.
Wright Aeronautical Corporation
Paterson, N. J.

Wright Morehouse 2 Cylinder Air Cooled
Standard 29 B.H.P. at 2500 R.P.M. Dry  Weight 89 Lbs.
WRIGHT AERONAUTICAL CORPORATION
PATERSON, N. J.

"WHIRLWIND" J-4-B 9 CYLINDER AIR COOLED
Wright Aeronautical Corporation
Paterson, N. J.

"Whirlwind" J-5 9 Cylinder Air Cooled

Weight Dry 513 Lbs.
WRIGHT AERONAUTICAL CORPORATION
PATerson, N. J.

"SIMOON" 9 CYLINDER  AIR COOLED
STANDARD 350 H.P. AT 1900 R.P.M.  DRY WEIGHT 640 LBS.
WRIGHT AERONAUTICAL CORPORATION
PATERSON, N. J.

"TORNADO" 12 CYLINDER WATER COOLED
STANDARD 600 H.P. AT 2000 R.P.M. WEIGHT DRY 1154 LBS.
OBJECTS OF THE AERONAUTICAL CHAMBER OF COMMERCE OF AMERICA, AS SET FORTH IN THE ARTICLES OF INCORPORATION

To foster, advance, promulgate, and promote trade and commerce, throughout the United States, its territories, possessions, and in foreign countries, in the interests of those persons, firms or corporations engaged in the business of manufacturing, buying, selling and dealing in aircraft, aircraft motors, and aircraft parts and accessories of every kind and nature.

To reform any and all abuses which may arise relative thereto.

To secure for its members and those persons, firms or corporations dealing with them, freedom from unjust or unlawful exactions of whatever description.

To diffuse among its members accurate and reliable information as to the standing of its members and those persons, firms or corporations engaged in similar lines of business.

To procure uniformity and certainty in the customs and usages of trade and commerce among its members and those persons, firms or corporations having a common trade, business or professional interest in all matters pertaining to aeronautics.

To aid and assist in mapping out air roads and lanes, the location of landing fields, airdromes, hangars, or such other structures as may be necessary for the advancement of aeronautics.

To advocate and promote in every lawful way the enactment of just and equitable laws, both national and state, pertaining to aeronautics.

To settle, adjust and arbitrate any and all differences which may arise between its members, and persons, firms or corporations dealing with them.

To promote a more enlarged and friendly intercourse between its members and persons, firms or corporations engaged in the business of, or dealing in aircraft, motors and aircraft parts and accessories.

To acquire by grant, gift, purchase, devise, bequest, and to hold and dispose of, such property or assets as the purposes of the corporation shall require, subject to such restrictions as may be prescribed by law, and

Generally to do every act and thing which may be necessary and proper for the advancement of the aeronautical art and industry and the accomplishment of the objects and purposes hereinbefore set forth; provided, however, that nothing herein contained shall authorize this corporation to engage in any business for pecuniary profit.
AERONAUTICAL CHAMBER OF COMMERCE OF AMERICA, Inc.

Officers

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First Vice-President ............................................. Frank H. Russell.
Second Vice-President .......................................... F. B. Rentschler.
Third Vice-President ............................................ R. H. Fleet.
Treasurer ................................................................... Charles H. Colvin.
General Manager and Assistant Treasurer ....................... Samuel S. Bradley.
Assistant Secretary ................................................ O. A. Shannon.

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Frank H. Russell.
F. B. Rentschler.
R. H. Fleet.
Charles H. Colvin.

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Charles H. Colvin.
Frank H. Russell.
Sherman M. Fairchild.
Samuel S. Bradley.

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Ralph Upson.
Beckwith Havens.

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W. E. Arthur.

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Charles H. Colvin.
Lester D. Gardner.

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Stephen H. Philbin.
J. P. Tarbox.

State Committeemen

California—Donald Douglas, Los Angeles.
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Delaware—E. R. Armstrong, Wilmington.
Florida—Glenn H. Curtiss, Hialeah.
Illinois—Allan Jackson, Chicago.
Indiana—N. H. Gilman, Indianapolis.
Maryland—Spencer Heath, Baltimore.
Massachusetts—O. C. F. Meisel, Boston.
Michigan—J. G. Vincent, Detroit.

Raymond Ware, Ithaca.

Ohio—E. A. Johnson, Dayton.
Pennsylvania—E. N. Gott, Bristol.

Texas—J. H. McEvoy, Jr., Houston.
Washington (State)—P. G. Johnson, Seattle.

Wisconsin—Thomas Hamilton, Milwaukee.
Appendix

AERONAUTICAL CHAMBER OF COMMERCE OF AMERICA, Inc.

Members and Subscribers

Pioneers

Orville Wright, Dayton, Ohio.
Glenn H. Curtiss, Garden City, N. Y.

Manufacturing and Engineering

Aerial Service Corp., Hammond, Ind., N. Y.
American Aircraft Development Corp., Detroit, Mich.
Airships Incorporated, Hammondspur, N. Y.
Alexander Aircraft Co., Denver, Colo.
Boeing Airplane Co., Seattle, Wash.
Buhl-Verville Aircraft Co., Detroit, Mich.
Consolidated Aircraft Corp., Buffalo, N. Y.
Curtiss Aeroplane & Motor Co., Inc., Garden City, N. Y.
The Douglas Co., Santa Monica, Calif.
Eberhart Aeroplane & Motor Co., Inc., Buffalo, N. Y.
G. Elias & Bros., Inc., Buffalo, N. Y.
Fairchild Aviation Corp., New York, N. Y.
The Goodyear Tire & Rubber Co., Inc., Akron, Ohio.

Operators and Distributors

Anton F. Brodz, Sr., Kohler, Wis.
Colonial Air Transport, Inc., New York, N. Y.
Curtiss Aeroplane Export Corp., New York, N. Y.
Curtiss Metropolitan Airplane Co., New York, N. Y.
Orton Hoover (Curtiss Aeroplane Export Corp.), Rio de Janeiro, Brazil.
Johnson Airplane & Supply Co., Dayton, O.
Lawrence Leon (Curtiss Aeroplane Export Corp.), Buenos Aires, Argentina.
Lloyd J. Logan, Cleveland, O.
R. B. C. Noorduin (Fokker), Hasbrouck Heights, N. Y.
Marvin Northrup, Minneapolis, Minn.
National Air Transport, Inc., Chicago, Ill.
C. O. Frest, Arlington, Cal.
Robertson Aircraft Corp., Anguilla, Mo.
Walter T. Varney, San Francisco, Calif.
P. J. Williams (Williams Bros. Aircraft Corp.), San Francisco, Calif.
W. A. Yackey, Jr., Maywood, Ill.
Lloyd Yost, Convingham, Pa.

Accessories

Aero Supply Mfg. Co., College Point, N. Y.
Allison Engineering Co., Indianapolis, Ind.
Aluminum Co. of America, Pittsburgh, Pa.
American Gas Accumulator Co., Elizabeth, N. J.
American Hammered Piston Ring Co., Baltimore, Md.
Armour & Co., Chicago, Ill.
Wm. E. Arthur & Co., Inc., New York, N. Y.
Aviators Preparatory Institute, New York, N. Y.
Berry Bros., Inc., Detroit, Mich.
Bohn Aluminum & Brass Co., Detroit, Mich.
Breuster & Co., Long Island City, N. Y.
The Carpenter Steel Co., Reading, Pa.
Dayton Wire Wheel Co., Dayton, Ohio.
Eastman Kodak Co., Rochester, N. Y.
Eclipse Machine Co., Inc., Hoboken, N. J.
General Electric Co., Schenectady, N. Y.
Healey-Aeromarine Bus Co., Inc., Keyport, N. J.
Charles Ward Hall, Inc., New York, N. Y.
Manufacturers Aircraft Association, Inc., New York, N. Y.
Pratt & Whitney Aircraft Co., Hartford, Conn.
Remington-Burnselli Aircraft Corp., New York, N. Y.
Sikorsky Manufacturing Corp., New York, N. Y.
Thomas-Morse Aircraft Corp., Ithaca, N. Y.
Chance Vought Corp., L. I., N. Y.
Wright Aeronautical Corp., Paterson, N. J.

Supplies, etc.

Hartzell Walnut Propeller Co., Piqua, O.
Stewart Hartshorn Co., New York, N. Y.
Hayes Wheel Co., Jackson, Mich.
Interlake Signa Aluminum Co., New York, N. Y.
Irons Air Chute Co., Buffalo, N. Y.
Lecroy-Neville Co., Cleveland, Ohio.
Macwytte Company, Kenosha, Wis.
Modler Metal Products Co., Mt. Vernon, N. Y.
Moto-Meter Co., Inc., Long Island City, N. Y.
National Steel Products Co., Dayton, Ohio.
Navigator Instruments, Inc., San Francisco, Calif.
New Jersey Veneer Co., Paterson, N. J.
Norma Hoffman Bearings Co., Stamford, Conn.
Park Drop Forge Co., Cleveland, Ohio.
Paragon Engineers, Inc., Baltimore, Md.
Perry Austen Mfg. Co., Grasmere, N. Y.
Pioneer Instrument Co., Brooklyn, N. Y.
Radio Corp. of America, New York, N. Y.
Reed Propellor Co., Inc., New York, N. Y.
Aircraft Year Book

Members and Subscribers

Accessories, Supplies, etc. (Contd.)

John A. Roebling's Sons Co., Trenton, N. J.
Russell Parachute Company, San Diego, Calif.
Schermagno Co., Inc., Sidney, N. Y.
SKF Industries, New York, N. Y.
A. G. Spalding & Bros., Inc., New York, N. Y.
Sperry Gyroscope Co., Brooklyn, N. Y.
Splitdorf Electrical Co., Newark, N. J.
Standard Oil Co. (Indiana), Chicago, Ill.
Standard Oil Co. (Calif.), San Francisco, Calif.
Stromberg Motor Devices Co., Chicago, Ill.
Summerill Tubing Co., Bridgeport, Pa.

Publications

American Machinist (Fred H. Colvin), New York, N. Y.
Aviation (L. D. Gardner), New York, N. Y.
U. S. Air Services Magazine (Earl N. Findley), Washington, D. C.

Executives, Engineers, Designers, Pilots

E. R. Armstrong.
W. E. Arthur.
H. M. Bennett.
A. Black.
S. S. Bradley.
A. P. Brutz.
M. Geo. DeForest Brush.
Vincent J. Burnelli.
J. L. Callan.
Albert Champion.
L. N. W. Colin.
Fred. H. Colvin.
Henry M. Crane.
Ralph S. Damon.
Richard H. Depew, Jr.
Donald Douglas.
Sherman M. Fairchild.
Earl N. Findley.
Edson F. Gallaudet.
John R. Gammeter.
L. D. Gardner.
W. L. Gilmore.
E. P. Gott.
Clarence D. Hanscom.
E. R. Hart.
Harold E. Hartney.
Beckwith Havema.
Spencer Heath.
George H. Houston.
R. A. Ireland.
G. S. Ireland.
P. G. Johnson.

W. W. Kellett.
Robert Kemp.
C. F. Kettering.
C. Roy Keys.
Alexander Kemlin.
Herman T. Krafft.
Charles L. Lawrence.
W. Lawrence LePage.
Albert E. Leening.
Grover Loening.
Stephen J. McMahon.
Charles M. Manly.
J. S. McDonnell, Jr.
Jos. H. McEvoy, Jr.
George J. Meade.
Jos. F. Meade.
W. Stuart Moir.
F. L. Morse.
A. R. Mosler.
R. B. C. Noordyuv.
Marvin Northrup.
Arthur Nutt.
John F. O'Ryan.
E. D. Osborn.
H. B. Page.
Philip H. Peckin.
Alexander A. Pedu.
C. G. Peterson.
Stephen H. Philbin.
C. O. Prest.
J. F. Prince.
S. Albert Reed.

Sweeney Aviation School, Kansas City, Mo.
Thompson Products Co., Cleveland, Ohio.
W. Harris Thurston & Co., New York, N. Y.
Titanine, Inc., Union, N. J.
E. S. Twining & Co., New York, N. Y.
Valentine & Co., New York, N. Y.
Wellington, Sears & Co., New York, N. Y.
Westinghouse Electric & Manufacturing Co., South Bend, Ind.
Winchester Repeating Arms Co., New Haven, Conn.
The Wood & Spencer Co., Cleveland, Ohio.
"X" Laboratories, New York, N. Y.

Public Relations

Geo. S. Wheat, New York, N. Y.

Insurance

Travelers Insurance Co., Hartford, Conn.
Duncan A. Woodman, New York, N. Y.

MANUFACTURERS' AIRCRAFT ASSOCIATION, Inc.
300 Madison Ave., New York, N. Y.

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Vice-President ..................................................... G. L. Martin.
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C. L. Lawrence.
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Appendix

Membership

Aeromarine Plane & Motor Company, Keyport, N. J.
Boeing Airplane Company, Seattle, Wash.
Curtiss Aeroplane & Motor Co., Inc., Garden City, N. Y.
Curtiss Engineering Corp., Garden City, N. Y.
Dayton Wright Company, Dayton, Ohio.
Douglas Company, Santa Monica, Calif.
G. Elias & Bro., Inc., Buffalo, N. Y.
Fisher Body Corporation, Detroit, Mich.
Gallaudet Aircraft Corp., East Greenwich, R. I.

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Chairmen of Committees—Executive, Hollinshead N. Taylor; Membership, John J. Bergen; Contest, Orville Wright; Finance, Godfrey L. Cabot; Legislative, Hon. Wm. P. MacCracken, Jr.; Foreign Relations, Sidney B. Veit; Program, Harry Block; Publicity, Col. C. DeF. Chandler; Honorary Membership, Frederick B. Patterson; Civic Organization, Carl H. Woffley; Publications, L. S. Horner; Airways and Landing Fields, Charles Rumke.

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Daniel Guggenheim
Harry F. Guggenheim
Aircraft Year Book

U. S. AIR CORPS WAR DEPARTMENT
Munitions Building, Washington, D. C.

Organization

Major General Mason M. Patrick is Chief of Air Corps with office in the Munitions Building, Washington, D. C. The Assistant Chiefs of Air Corps are Brigadier General James E. Pechet in charge of the Training and Operations Division at Washington, D. C.; Brigadier General Frank P. Lam in command of the Training Center at San Antonio, Texas; and Brigadier General William E. Gillmore in charge of the Material Division at Dayton, Ohio.

In the office of the Chief of Air Corps is the Executive Office, under which comes the Finance and Patent Section, and the following divisions:

Training and Operations Division in Washington under which come the War Plans, Schools, Operations and Medical Sections.

Material Division under which come the following Sections: Experimental Engineering, Procurement, Field Service, Repair and Maintenance, Administration, Industrial War Plans and Special.

Information Division which is composed of the Intelligence, Press Relations, Publications, and Photographic Sections. This Division is located in Washington.

Personnel Division, which is in Washington, and is composed of the Commissioned, Enlisted, and Reserve Sections.

Officers on Duty in Washington

Major General Mason M. Patrick, Chief of Air Corps.
Brig. General James E. Pechet, Assistant Chief of Air Corps.

Matériel Division

McCook Field, Dayton, O.
Brig. General William E. Gillmore.

Majors—J. F. Curry, L. MacDill, H. S. Martin, H. H. Rudolph.

Corps Areas and Departments

FIRST CORPS AREA—Includes States of Maine, New Hampshire, Vermont, Massachusetts, Connecticut, and Rhode Island, in so far as Coast defense and field operations incident thereto are concerned; that portion of State of New York which lies east or west longitude 72° 9' is attached to First Corps Area; headquarters, Army Base, Boston 9, Mass. Air Corps Officer, Maj. Ira Longenecker.

SECOND CORPS AREA—Includes States of New Jersey, Delaware, and New York, except for certain specific purposes only, that portion thereof which is attached to First Corps Area; headquarters, Governors Island, N. Y. Island of Porto Rico with islands and keys adjacent thereto is attached to Second Corps Area. Air Corps Officer, Col. Theodore A. Baldwin, Jr.

THIRD CORPS AREA—Includes States of Pennsylvania, Maryland, Virginia and District of Columbia, except in so far as concerns troops and agencies of the Regular Army within the territorial limits of District of Washington; headquarters, Standard Oil Building, Baltimore, Md. Air Corps Officer, Major John C. McDonell.

FOURTH CORPS AREA—Includes North Carolina, South Carolina, Georgia, Florida, Alabama, Tennessee, Mississippi and Louisiana; headquarters, Red Rock Building, Atlanta, Ga.

FIFTH CORPS AREA—Includes Ohio, West Virginia, Indiana and Kentucky; headquarters, Ft. Hayes, Columbus, Ohio. Air Corps Officer, Lieut. Col. Seth W. Cook.
Appendix

SIXTH CORPS AREA—Includes Illinois, Michigan, Wisconsin, the post of Jefferson Barracks, Mo., and Arcadia Target Range, Arcadia, Mo.; headquarters, 1819 W. Pershing Road, Chicago, Ill. Air Corps Officer, Colonel Chalmers G. Hall.

SEVENTH CORPS AREA—Includes Missouri, Kansas, Arkansas, Iowa, Nebraska, Minnesota, North Dakota and South Dakota; headquarters, Army Building, Omaha, Neb. Air Corps Officer, Major Geo. A. Reinhart.

EIGHTH CORPS AREA—Includes States of Texas, Oklahoma, Colorado, New Mexico, and Arizona, except that portion thereof west of west longitude 114° and south of north latitude 32°, which is attached to the Ninth Corps Area for purposes of administration, training, and tactical control in connection with Border Patrol and field operations incident thereto only; headquarters, Ft. Sam Houston, San Antonio, Texas. Air Corps Officer, Major Henry B. Chagett.

NINTH CORPS AREA—Includes States of Washington, Oregon, Idaho, Montana, Wyoming, Utah, Nevada, and California, and that portion of Arizona which is attached for certain specific purposes only; headquarters, Presidio of San Francisco, Calif. The Territory of Alaska is attached to the Ninth Corps Area. Air Corps Officer, Lt. Col. Frank J. Lahm.

HAWAIIAN DEPARTMENT—Includes all islands belonging to the United States within area between 150° west longitude and 160° east longitude and between 15° south latitude and 30° north latitude; headquarters, Honolulu, Hawaii. Air Corps Officer, Lieut. Col. John H. Howard.

PHILIPPINE DEPARTMENT—Includes all islands of Philippine Archipelago; headquarters, Manila, P. I. Air Corps Officer, Major Wm. H. Duty.

U. S. FORCES IN CHINA—American Barracks, Tientsin, China.

PANAMA CANAL DEPARTMENT—Includes entire Canal Zone; headquarters, Quarry Heights, Balboa Heights, Canal Zone. Air Corps Officer, Lieut. Col. Arthur G. Gisher.

January 1, 1927

Stations and Organizations Under Jurisdiction Chief of Air Corps

<table>
<thead>
<tr>
<th>Station</th>
<th>P. O. Address</th>
<th>Troops and Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akron, Ohio</td>
<td>508 Elycott Square, Akron, Ohio</td>
<td>District Office, Balloon Production &amp; Inspection Procurement Section, 11th School Group Hq., 46th, 47th School Sq., 62nd Service Sq., Primary Flying School, Flying Cadet Det., School Aviation Medicine, Procurement Planning Representative.</td>
</tr>
<tr>
<td>Buffalo, N. Y.</td>
<td>Buffalo, N. Y.</td>
<td>Technical School, School Troops, 4th Photo Sec., 15 O. B. S. Sq., Procurement Planning Representative.</td>
</tr>
<tr>
<td>*Chanute Field</td>
<td>Rantoul, Ill.</td>
<td>Procurement Planning Representative.</td>
</tr>
<tr>
<td>Chicago, Ill.</td>
<td>1819 W. Pershing Road, Chicago, Ill.</td>
<td>Procurement Planning Representative.</td>
</tr>
<tr>
<td>Duncan Field</td>
<td>San Antonio, Texas</td>
<td>Procurement Planning Representative.</td>
</tr>
<tr>
<td>*Fairfield Air Intermediate Depot</td>
<td>Fairfield, Ohio</td>
<td>Procurement Planning Representative.</td>
</tr>
<tr>
<td>Kelly Field</td>
<td>Kelly Field, Tex.</td>
<td>Supply &amp; Repair Depot.</td>
</tr>
<tr>
<td>Langley Field</td>
<td>Hampton, Va.</td>
<td>Field Service Section.</td>
</tr>
<tr>
<td>Little Rock Air Intermediate Depot</td>
<td>Little Rock, Ark.</td>
<td>Engineering School, Materiel Division Experimental Engineering Section; Procurement Planning Representative; Production Planning Representative; Repair and Maintenance Section; Industrial War Plans; Field Service Section (located at Wright Field).</td>
</tr>
<tr>
<td>McCook Field</td>
<td>Dayton, Ohio</td>
<td>Engineering School, Materiel Division Experimental Engineering Section; Procurement Planning Representative; Production Planning Representative; Repair and Maintenance Section; Industrial War Plans; Field Service Section, Industrial War Plans Section.</td>
</tr>
</tbody>
</table>

*See stations under Corps Area, Dept., Dist. or Post Commanders.
Aircraft Year Book

Station | P. O. Address | Troops and Activities
--- | --- | ---
*Mitchel Field | Mitchel Field, L. I., New York | The School of Aviation Medicine.
San Francisco, Calif. | Room 624 Exchange Block, 369 Pine St. | Procurement Planning Representative.
Santa Monica, Calif. | Production Mgr., P. O. Dist. Procurement Office, 2435 Wilshire Blvd., Santa Monica, Calif. | Property & Supply Officer.
Scott Field | Scott Field, Ill. | 8th, 9th, 12th Airship Co. 21st Airship Grp. Hq. 21st Photo Sec. 24th Airship School. Air Intermediate Depot.
Seattle, Wash. | Air Corps Representative, District Procurement Office. | Boeing Airplane Co., Georgetown Station, Seattle, Wash.
Stinson Field | San Antonio, Texas | Intermediate Landing Field.

Stations and Organizations Under Jurisdiction of Corps Area, Dept., Dist. or Post Commanders

Station | P. O. Address | Troops and Activities
--- | --- | ---
Armstrong, Ft. | Honolulu, Hawaii | Air Depot.
Biggsfield | Ft. Bliss, Texas | 12th Obs. Sq.
*Bolling Field | Anacostia, D. C. | 18th Hq. Sq., 3rd Photo Sec., 99th Obs. Sq., 56th Service Sq. Flying Field.
Bowman Field | Louisville, Ky. | Intermediate Landing Field.
Chanute Field | Rantoul, Ill. | 5th Photo Sec., 15th Obs. Sq.
Clark Field | Camp Stonestown, P. I. | 3rd Pursuit Sq.
Clover Field | Santa Monica, Calif. | Airdrome.
Crispy Field | Presidio of San Francisco | 91st Obs. Sq., 15th Photo Sec., Calif.
Crockett, Ft. | Galveston, Texas | 12th Attack Group, 8th, 90th Attack Sqs., 60th Service Sqn.
Cumberland Field | Cumberland, Md. | Intermediate Landing Field.
Dryden, Texas | Dryden, Texas | 12th Obs. Sq., Border Patrol Station, Airdrome.
Hatbox Field | Muskogee, Okla. | Intermediate Landing Field.
Kindley Field | Fort Mills, Corregidor, P. L. | 2nd Obs. Sq.
Laredo, Texas | Det. 12th Obs. Sq.
Logan Field | Dandalk, Md. | Intermediate Landing Field.
Love Field | Dallas, Texas | Intermediate Landing Field.
Lunken Airport | Cincinnati, Ohio (Station Airdrome. C)

* See Stations under Corps Area, Dept., Dist. or Post Commander.
* Chief of Air Corps.
** Under the Jurisdiction of the Chief of Air Corps.
† Under jurisdiction of Post Commander.
### Appendix

#### Troops and Activities

<table>
<thead>
<tr>
<th>Station</th>
<th>P. O. Address</th>
<th>Troops and Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marfa, Camp</td>
<td>Marfa, Texas</td>
<td>Det. 12th Obs. Sq., Airdrome.</td>
</tr>
<tr>
<td>Maxwell Field</td>
<td>Montgomery, Ala.</td>
<td>22nd Obs. Sq., less Det. at Ft. Bragg.</td>
</tr>
<tr>
<td>Mitchell Field</td>
<td>Mitchell Field, L. I., New York</td>
<td>9th Obs. Grp. Hqrs., 8th, 14th Express, pounds</td>
</tr>
<tr>
<td>Norton Field</td>
<td>Columbus, Ohio</td>
<td>Corps Area Hqrs. Flight.</td>
</tr>
<tr>
<td>Richards Field</td>
<td>Kansas City, Mo.</td>
<td>Intermediate Landing Field.</td>
</tr>
<tr>
<td>Ross Field</td>
<td>Arcadia, Calif.</td>
<td>Det. 91st Obs. Sq. (See Crissy Field).</td>
</tr>
<tr>
<td>Wheeler Field</td>
<td>Schofield, Barracks, Honolulu</td>
<td>4th Obs. Sq., Flying Field.</td>
</tr>
<tr>
<td>Woodward Field</td>
<td>Salt Lake City, Utah.</td>
<td>Intermediate Landing Field.</td>
</tr>
</tbody>
</table>

† See Stations under Chief of Air Service.
‡ Under jurisdiction of Post Commander.

#### MODEL AIRWAY STATISTICAL RECORD CHART

<table>
<thead>
<tr>
<th>Fiscal Years</th>
<th>1923</th>
<th>1924</th>
<th>1925</th>
<th>1926</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flights Started</td>
<td>143</td>
<td>147</td>
<td>175</td>
<td>236</td>
</tr>
<tr>
<td>Flights Completed</td>
<td>138</td>
<td>144</td>
<td>166</td>
<td>223</td>
</tr>
<tr>
<td>Hours Flown</td>
<td>2,086</td>
<td>3,127</td>
<td>4,075</td>
<td>5,047</td>
</tr>
<tr>
<td>Passengers Carried</td>
<td>128</td>
<td>225</td>
<td>342</td>
<td>517</td>
</tr>
<tr>
<td>Express, pounds</td>
<td>1,775</td>
<td>13,746</td>
<td>27,485</td>
<td>16,203</td>
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<tr>
<td>Crashes</td>
<td>5</td>
<td>2</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Accidents, Personnel</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Fatalities</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Flights Abandoned</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
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(Excluding Crashes)

Gasoline Consumed (Gallons)

<table>
<thead>
<tr>
<th>1923</th>
<th>1924</th>
<th>1925</th>
<th>1926</th>
</tr>
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<tbody>
<tr>
<td>65,730</td>
<td>73,989</td>
<td>83,692</td>
<td>106,600</td>
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</table>

Oil Consumed (Quarts)

<table>
<thead>
<tr>
<th>1923</th>
<th>1924</th>
<th>1925</th>
<th>1926</th>
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<tbody>
<tr>
<td>14,926</td>
<td>18,727</td>
<td>20,206</td>
<td>28,236</td>
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Flights Cancelled

<table>
<thead>
<tr>
<th>1923</th>
<th>1924</th>
<th>1925</th>
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<tr>
<td>6</td>
<td>8</td>
<td>11</td>
<td>13</td>
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Forced Landings

<table>
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<tr>
<th>1923</th>
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<tbody>
<tr>
<td>18</td>
<td>22</td>
<td>28</td>
<td>59</td>
</tr>
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Miles Flown

<table>
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<tr>
<th>1923</th>
<th>1924</th>
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<tbody>
<tr>
<td>197,190</td>
<td>264,800</td>
<td>335,750</td>
<td>403,630</td>
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Delays En Route

<table>
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<tr>
<th>1923</th>
<th>1924</th>
<th>1925</th>
<th>1926</th>
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<tr>
<td>105</td>
<td>117</td>
<td>112</td>
<td>389</td>
</tr>
</tbody>
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Expenses, Pilots

<table>
<thead>
<tr>
<th>1923</th>
<th>1924</th>
<th>1925</th>
<th>1926</th>
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<tr>
<td>$3,377.81</td>
<td>$6,101.44</td>
<td>$5,889.36</td>
<td>$5,189.67</td>
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</tbody>
</table>

### Bureau of Aeronautics, Navy Department

**Organization**

The Bureau of Aeronautics of the Navy Department was established August 10, 1921. The following organization carries on the duties of the bureau under the Chief of the Bureau:
the Assistant Chief of the Bureau, and the six following divisions: (a) Plans, (b) Administrative, (c) Materiel, (d) Flight, (e) Carriers, (f) Information. Duties have been distributed as follows: The Planning Section deals with the planning of the work of the Bureau, the formulation of plans of war in conjunction with the Planning Sections of the Offices of Naval Operations, and recommendations concerning types of aircraft which are necessary for Naval Aviation. The Administration Division handles all civilian personnel employees under the jurisdiction of the Bureau, and keeps a record of and approves of the expenditure of funds allotted to the Bureau. The Material Division has under its cognizance all matters pertaining to the operation of naval aircraft, training of personnel, aviation photography and aeronautics. The Carrier Division has under its development the design for aircraft. The Information Division collects all data pertaining to Aeronautics and supplies information as desired to the press, and to commercial organizations and individuals.


Officers on Duty in the Bureau of Aeronautics, Navy Department
Rear Admiral W. A. Moffett, O .................................................. Chief of Bureau
Captain E. S. Land (CC), O .................................................. Asst. Chief of Bureau

Administration—Lt. Commander R. G. Pennoyer, N. A.
Financial—Captain J. H. Gummell (SC), U. S. N.
Plans Division—Commander N. H. White, Jr., N. A.; Lieutenant J. L. Cotten, N. A.; Lieutenant John Perry, N. A.

Information Section—Captain H. C. Major, U. S. M. C.

Navy Air Stations

Pensacola, Fla., Training—Commandant, Capt. F. B. Upham, SNA; Captain of Yard, Commander W. G. Child, N. A.
San Diego, Calif., Fleet Base—Commanding Officer, Captain S. H. Doyle, O; Executive Officer, Lt. Comdr. A. E. Montgomery, N. A.
Hampton Roads, Va., Fleet Base—Commanding Officer, Commander A. C. Read, N. A.; Executive Officer, Lt. Comdr. G. S. Gilkeson, N. A.; Lakehurst, N. J., Lighter-than-air—Commanding Officer, Captain E. S. Jackson, FO; Executive Officer, Lt. Comdr. R. M. Pierce, N. A. (L.TA)
Pearl Harbor, T. H., Fleet Base—Commanding Officer, Lt. Comdr. M. B. McComb, N. A.; Executive Officer, Lt. A. P. Schneider, N. A.
Coco Solo, C. Z. Fleet Base—Lt. Comdr. R. P. Molten, N. A.; Executive Officer, M. B. Stonestreet, N. A.
Rockaway, L. I., N. Y., Reserve Training—Commanding Officer, Lieut. H. S. Kendall, N. A.
Sand Point, Wash., Naval Aviation Reserve Unit—Commanding Officer, Lt. Comdr. J. H. Campman, N. A.

Aircraft Squadrons

Aircraft Squadrons, Scouting Fleet—Commandant, Capt. J. J. Ralry, N. A.; Senior Aide, Captain F. J. Horne, O.
Scouting Plane Squadron One—Squadron Commander, Lt. Comdr. Wm. Masek, N. A.; Executive Officer, Lt. J. B. Sykes, N. A.
Torpedo and Bombing Plane Squadron One—Squadron Commander, Lt. Comdr. W. W. Spencer, N. A.; Executive Officer, Lt. G. R. Fairlamb, N. A.
Observation Squadron Three (Light Cruisers) Squadron Commander, Lt. W. D. Thomas, N. A.; Executive Officer, Lieut. F. C. Dickey, N. A.
Fighting Plane Squadron Five—Squadron Commander, Lt. Comdr. Isaac Schloßbach, N. A.; Executive Officer, Lieut. (jg) A. D. Nelson, N. A.
Appendix


Airship


Aviation Duty Other than Department Stations and Squadrons


Aircraft Carriers

U. S. S. Lexington—Promotive Commanding Officer, Captain W. R. Gherardi, O; Exec. Officer, Comdr. T. G. Ellysun, N.A.; U. S. S. Saratoga—Promotive Commanding Officer, Captain H. V. Butler, O; Exec. Officer, Comdr. Kenneth Whiting, N.A.

MARINE CORPS, NAVY DEPARTMENT

Organization

Marine aviation is an integral part of the Marine Corps, and its mission is to furnish the air forces necessary to Marine Expeditionary duty, Marine advanced base operations, and the defense of naval bases outside the continental United States which are defended on shore by Marines. In peace time, in addition to training and preparation for these duties, the Marine Corps aviation carries on air operations similar to those of the Army Air Service. Its officers are detailed to aviation duty from permanent line officers of the Corps, and its enlisted men are Marines enlisted especially for aviation duty. The administration, training and operations of Marine aviation are directed by the Chief of Aviation.
Headquarters U. S. Marine Corps, whose office constitutes a section of the division of Operations and Training of the Major General Commandant's Office. A new table for the aeronautic organization of the Marine Corps was approved by the Major General Commandant on July 30th and by the Chief of Naval Operations on August 3, 1922, and accordingly the aviation force of the corps was redesignated and organized into the First Aviation Group, at Quantico, Va., consisting of one observation plane squadron, one fighting plane squadron, one service squadron, and one kite balloon squadron; Observation Squadron No. 1 at San Diego, Calif.; Observation Squadron No. 2 at Port au Prince, Haiti; and Scouting Squadron No. 1 at Sumay, Guam. On July 1, 1922, two new units, to be known as "Observation Plane Squadron Four," and "Fighting Plane Squadron Two" were added to the organization of the First Aviation Group, Quantico, Va. On September 1, 1925, the Marine Aviation unit at San Diego, Calif., became known as the "Second Aviation Group," consisting of "Observation Plane Squadron One" and "Fighting Plane Squadron Three." On September 1, 1926, the Marine Aviation Units at Quantico, Va., were designated as "Aircraft Squadrons, East Coast Expeditionary Force," and the units at San Diego, Calif., as "Aircraft Squadrons, West Coast Expeditionary Force."

### Officers

<table>
<thead>
<tr>
<th>Lieut. Col. Thomas C. Turner</th>
<th>Capt. Louis E. Woods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Charles A. Lutz</td>
<td>Capt. Francis E. Pierce</td>
</tr>
<tr>
<td>Major Ross E. Rowell</td>
<td>Capt. Walter E. McCaughtry</td>
</tr>
<tr>
<td>Major Francis T. Evans</td>
<td>Capt. Russell A. Frenley</td>
</tr>
<tr>
<td>Major Roy S. Geiger</td>
<td>Capt. Robert J. Archibald</td>
</tr>
<tr>
<td>Capt. Louis M. Bourne</td>
<td>Capt. Thomas R. Shearer</td>
</tr>
<tr>
<td>Capt. Ralph J. Mitchell</td>
<td>Capt. Harold D. Campbell</td>
</tr>
<tr>
<td>Capt. James E. Davis</td>
<td>Capt. William T. Evans</td>
</tr>
<tr>
<td>Capt. James T. Moore</td>
<td>Capt. Jesse A. Nelson</td>
</tr>
<tr>
<td>Capt. James F. Moriarty</td>
<td>Capt. Harold C. Major</td>
</tr>
<tr>
<td>Capt. Francis F. Mulcahy</td>
<td>Capt. Henry S. Hausmann</td>
</tr>
</tbody>
</table>

### Aviation Stations

- Aircraft Squadrons, East Coast Expeditionary Force, Marine Barracks, Quantico, Va.
- Aircraft Squadrons, West Coast Expeditionary Force, San Diego, Calif.
- Observation Squadron, U. S. Marine Corps, Port au Prince, Haiti.
- Scouting Squadron No. 1, U. S. Marine Corps, Sumay, Guam, M. I.

### STRENGTH OF THE U. S. AIR FORCES

<table>
<thead>
<tr>
<th>Enlisted</th>
<th>Officers</th>
<th>Aviators</th>
<th>Students</th>
<th>Men</th>
<th>Civilians</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Army</td>
<td>969</td>
<td>884</td>
<td>62</td>
<td>8,256</td>
<td>2,466</td>
<td>11,691</td>
</tr>
<tr>
<td>Navy</td>
<td>175</td>
<td>457</td>
<td>40</td>
<td>3,743</td>
<td>2,145</td>
<td>6,579</td>
</tr>
<tr>
<td>Marine</td>
<td>84</td>
<td>54</td>
<td>13</td>
<td>888</td>
<td>982</td>
<td>971</td>
</tr>
<tr>
<td>Air Corp. Reserve</td>
<td>6,662</td>
<td>4,662</td>
<td>None</td>
<td>1,307</td>
<td>None</td>
<td>1,307</td>
</tr>
<tr>
<td>National Guard</td>
<td>261</td>
<td>227</td>
<td>None</td>
<td>1,258</td>
<td>None</td>
<td>1,258</td>
</tr>
</tbody>
</table>

### AIR EQUIPMENT, UNITED STATES

- **Army**
  - Bombardment: 74 Fighting
  - Observation: 462 Observation
  - Pursuit: 111 Torpedo and Bombing
  - Total: 964 Total

- **Navy**
  - Patrol and Scouting: 84

---

*As of December 31, 1926.

†Includes National Guard and Reserve Corps.

### DEPARTMENT OF COMMERCE

**Aeronautics Branch**

**William P. MacCracken**, Assistant Secretary for Aeronautics

**Air Regulation Division:**
- Clarence M. Young ............. Chief
- Louis H. Bauer ................. Medical Director
- Ralph G. Lockwood ............. Supervising Inspector

**Inspectors**

- R. H. Gast
- P. D. Cramer
- W. R. Jones
- W. N. Breingan
- Frank H. Jerdone

**Airways Division:**
- Fred C. Hingsburg ............. Chief Engineer
- Roy T. Wall ................... Radio Engineer

**F. H. Jerdone** ............. Experimental Pilot

**R. H. Conerton** ............ W. F. Parkinson

**S. A. McClellan** ............ R. H. Lees, Jr.

**G. G. McElravey** ............ D. Scarritt
### Appendix

#### Extension Superintendents

<table>
<thead>
<tr>
<th>Name</th>
<th>Designation</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. R. Brooks</td>
<td>Alvin Smith</td>
<td>New York—Chicago</td>
</tr>
<tr>
<td>John Bonforte</td>
<td>J. D. Summers</td>
<td>Chicago—Cheyenne</td>
</tr>
<tr>
<td>W. J. MacKenzie</td>
<td>J. P. Worthington</td>
<td>Cheyenne—Salt Lake City</td>
</tr>
<tr>
<td>C. C. Miller</td>
<td>W. T. Miller</td>
<td>Salt Lake City—San Francisco</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Repair Depot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and Warehouse</td>
</tr>
<tr>
<td>Ivan D. Marshall</td>
<td>Associate Airway Engineer</td>
<td></td>
</tr>
<tr>
<td>George E. Stratton</td>
<td>Associate Airway Engineer</td>
<td></td>
</tr>
<tr>
<td>Arthur G. LaBate</td>
<td>Airway Engineer, Lighting Section</td>
<td></td>
</tr>
<tr>
<td>Wesley T. Huntress</td>
<td>Senior Engineer Draftsman</td>
<td></td>
</tr>
</tbody>
</table>

#### Information Division:

- Ernest L. Jones: Chief
- Donald E. Keyhoe: Editor
- Harry H. Blee: Senior Business Specialist
- R. S. Moore: Airplane and Engine Inspector
- Stafford Kernan: Aeronautic Information Clerk
- John Groves: Aeronautic Observer

#### AIR MAIL SERVICE AND CONTRACT AIR MAIL SERVICE

**Post Office Department**

**Department Headquarters, Washington, D. C.**

- Postmaster General: Hon. Harry S. New
- Second Assistant Postmaster General: Hon. W. Irving Glover
- Deputy Second Assistant Postmaster General: Hon. Chase C. Gove
- Alvin E. Peterson: Asst. General Superintendent
- J. W. Sutherlin: Chief Clerk
- William E. Kline: Chief, Maintenance of Way
- Eugene Sibley: Radio Supervisor
- B. F. Myers: Traffic Manager

As Assistant Traffic Managers, there have been temporarily assigned to the Air Mail Service, from the Railway Mail Service, E. C. Garrassart, New York, N. Y.; C. H. Kaufield, Cleveland, Ohio; A. O. Willoughby, San Francisco, Calif.; E. A. Clark, St. Louis, Mo.

#### Supervisory Officials

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Designation</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. F. Egge</td>
<td>Cleveland, Ohio</td>
<td>Supt., Eastern Div.</td>
<td>New York—Chicago</td>
</tr>
<tr>
<td>F. E. Caldwell</td>
<td>Omaha, Neb.</td>
<td>Supt., Central Div.</td>
<td>Chicago—Cheyenne</td>
</tr>
<tr>
<td>H. B. Shaver</td>
<td>Cheyenne, Wyo.</td>
<td>Supt., Mountain Div.</td>
<td>Cheyenne—Salt Lake City</td>
</tr>
<tr>
<td>W. E. LaFollette</td>
<td>Salt Lake City, U.</td>
<td>Supt., Western Div.</td>
<td>Salt Lake City—San Francisco</td>
</tr>
<tr>
<td>W. P. Hoare</td>
<td>Maywood, Ill.</td>
<td>Supt., Repair Depot</td>
<td>Maywood, Ill.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and Warehouse</td>
<td></td>
</tr>
</tbody>
</table>

#### Number of Employees

- **Washington and Omaha Headquarters**: 15
- **Pilots**: 41
- **Radio Operators**: 41
- **Supervisors**: 22
- **Beacon Caretakers**: 113
- **Mechanics, Helpers, etc., at Repair Depot and Fields**: 291

#### Service Record of Air Mail Pilots

<table>
<thead>
<tr>
<th>Pilot</th>
<th>Hours Min.</th>
<th>Miles</th>
<th>Time (As of Dec. 31, 1926)</th>
<th>Hours Min.</th>
<th>Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allen, E. T.</td>
<td>869</td>
<td>83,983</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allison, E. M.</td>
<td>3,112</td>
<td>330,198</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barker, Hugh</td>
<td>1,533</td>
<td>145,284</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barnes, J. M.</td>
<td>1,189</td>
<td>113,704</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bertaud, L. W.</td>
<td>1,304</td>
<td>116,382</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biffle, L. O.</td>
<td>1,723</td>
<td>168,270</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boonstra, H. G.</td>
<td>2,087</td>
<td>278,808</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bowen, L. S.</td>
<td>845</td>
<td>83,368</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brown, H. T.</td>
<td>966</td>
<td>93,591</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burnside, F. H.</td>
<td>1,061</td>
<td>98,644</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chandler, H. A.</td>
<td>3,659</td>
<td>343,095</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collins, P. F.</td>
<td>3,073</td>
<td>306,214</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collison, H. A.</td>
<td>3,538</td>
<td>306,329</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Aircraft Year Book

### Air Mail Service Inventory

**June 30th, 1926**

<table>
<thead>
<tr>
<th>Buildings</th>
<th>$200,000.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repair Depot and Warehouse (1)</td>
<td>$200,000.00</td>
</tr>
<tr>
<td>Hangars (21)</td>
<td>$461,001.00</td>
</tr>
<tr>
<td>offices (9)</td>
<td>$18,788.00</td>
</tr>
</tbody>
</table>

**Field Improvements**

- Runways, tiles, drains, etc.: $160,870.00
- Machinery, tools, etc.: $82,375.00
- Repair Depot equipment: $893,500.00
- Airplane Motors: $1,054,000.00
- Supplies and Material in Stock Rooms: $331,884.00
- Field Equipment (lamps, generators, etc.): $488,896.00
- Motor Vehicles: $31,240.00
- Gasoline on hand (22,732 gallons): $4,449.00
- Oil on hand (2,799 gallons): $1,380.00
- Mileage scrip on hand: $599.00
- Miscellaneous Office Equipment: $5,162.00

**Office Equipment**

- Furniture, typewriters, file cases, etc.: $7,900.00

**Radio Equipment**

- Office Equipment (17): $59,435.00
- Radio Equipment (7): $1,610.00

**Total**

- $1,816,679.00

### Inventory of Flying Equipment

**As of Dec. 31st, 1926**

- Number of planes in service: 74
- Number of planes in reserve: 17
- Total: 91

**De Haviland**

- Liberty Motors in service: 41
- Liberty Motors in stock: 120

**Douglas**

- Number of planes undergoing repair: 88
- Unserviceable Liberty Motors in stock: 177

**Type of planes:**
- Liberty Motors used 100 to 300 hours: 435

### Report of Revenue and Expenditures

**January 1—December 31, 1926**

**Revenue (Excess postage):** $1,064,393.67

**Expense**

#### Maintenance of Way

<table>
<thead>
<tr>
<th>Description</th>
<th>Per cent</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fields</td>
<td>.087</td>
<td>$568,043.47</td>
</tr>
<tr>
<td>Lights</td>
<td></td>
<td>$271,882.68</td>
</tr>
<tr>
<td>Communications</td>
<td></td>
<td>$149,791.84</td>
</tr>
<tr>
<td>Motor Vehicle</td>
<td></td>
<td>$18,750.48</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>.383</td>
<td>$1,088,468.77</td>
</tr>
</tbody>
</table>

#### Maintenance of Equipment

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rebuilding Planes</td>
<td>$87,198.60</td>
</tr>
<tr>
<td>Rebuilding Motors</td>
<td>$97,521.50</td>
</tr>
<tr>
<td>Repairing Field Equipment</td>
<td>$23,248.59</td>
</tr>
<tr>
<td>Warehouse</td>
<td>$29,230.23</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$227,198.92</td>
</tr>
</tbody>
</table>
Appendix

Transportation
Pilots' Mileage Pay, Base Pay, Travel Expense $339,176.75
Gasoline 188,334.20
Oil 21,193.93
Forced Landings 1,317.09

Executive Overhead
General Superintendent's Office $47,155.99
Division Superintendent's Office 43,280.81
Superintendent Repair Depot 23,598.78

Capital
New Buildings $6,509.44
New Lighting Equipment 27,422.80
New Flying Equipment 693,121.73
New Miscellaneous Equipment 8,560.10
Ground Improvement 4,937.35

$114,035.58

Grand Total $729,551.51

The above figures include all expenditures, New York-Chicago night as well as transcontinental route. No segregation of New York-Chicago night route available.

Statement of Monthly Performance and Revenue
Transcontinental Route
(Calendar Year, 1926)

<table>
<thead>
<tr>
<th>Month</th>
<th>Excess Mail Traveled</th>
<th>Miles Traveled</th>
<th>Per Cent of Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>51,299.78</td>
<td>172,211</td>
<td>83.28</td>
</tr>
<tr>
<td>February</td>
<td>46,274.14</td>
<td>159,795</td>
<td>83.61</td>
</tr>
<tr>
<td>March</td>
<td>56,165.21</td>
<td>168,786</td>
<td>93.45</td>
</tr>
<tr>
<td>April</td>
<td>57,924.97</td>
<td>166,173</td>
<td>95.32</td>
</tr>
<tr>
<td>May</td>
<td>63,922.57</td>
<td>166,789</td>
<td>99.23</td>
</tr>
<tr>
<td>June</td>
<td>69,538.17</td>
<td>163,598</td>
<td>98.87</td>
</tr>
<tr>
<td>July</td>
<td>73,137.45</td>
<td>164,734</td>
<td>98.87</td>
</tr>
<tr>
<td>August</td>
<td>78,473.66</td>
<td>165,071</td>
<td>98.69</td>
</tr>
<tr>
<td>September</td>
<td>82,769.59</td>
<td>159,705</td>
<td>95.37</td>
</tr>
<tr>
<td>October</td>
<td>90,906.10</td>
<td>164,999</td>
<td>96.94</td>
</tr>
<tr>
<td>November</td>
<td>86,406.97</td>
<td>160,158</td>
<td>93.73</td>
</tr>
<tr>
<td>December</td>
<td>98,976.53</td>
<td>175,496</td>
<td>87.22</td>
</tr>
<tr>
<td>Total</td>
<td>$850,729.14</td>
<td>1,987,834</td>
<td>93.58</td>
</tr>
</tbody>
</table>

Statement of Monthly Performance and Revenue
New York-Chicago Overnight Route

January 1 to December 31, 1926

<table>
<thead>
<tr>
<th>Month</th>
<th>Excess Mail Traveled</th>
<th>Miles Traveled</th>
<th>Per Cent of Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>9,826.27</td>
<td>109,556</td>
<td>89.49</td>
</tr>
<tr>
<td>February</td>
<td>8,487.85</td>
<td>99,880</td>
<td>80.83</td>
</tr>
<tr>
<td>March</td>
<td>10,729.18</td>
<td>166,000</td>
<td>89.21</td>
</tr>
<tr>
<td>April</td>
<td>12,035.94</td>
<td>161,966</td>
<td>89.78</td>
</tr>
<tr>
<td>May</td>
<td>18,666.15</td>
<td>219,440</td>
<td>94.61</td>
</tr>
<tr>
<td>June</td>
<td>21,091.35</td>
<td>236,160</td>
<td>93.78</td>
</tr>
<tr>
<td>July</td>
<td>20,529.84</td>
<td>248,520</td>
<td>93.25</td>
</tr>
<tr>
<td>August</td>
<td>23,118.28</td>
<td>252,880</td>
<td>93.76</td>
</tr>
<tr>
<td>September</td>
<td>23,567.27</td>
<td>364,480</td>
<td>93.47</td>
</tr>
<tr>
<td>October</td>
<td>22,122.15</td>
<td>289,060</td>
<td>94.56</td>
</tr>
<tr>
<td>November</td>
<td>20,551.41</td>
<td>260,480</td>
<td>94.53</td>
</tr>
<tr>
<td>December</td>
<td>22,750.57</td>
<td>260,480</td>
<td>94.53</td>
</tr>
<tr>
<td>Totals</td>
<td>$213,664.53</td>
<td>3,331,680</td>
<td>93.33</td>
</tr>
</tbody>
</table>
Recapitulation, Miles Flown, Mail Carried and Total Revenue Earned
(From Start of Service for which Extra Postage was Charged for Extra Speed, July 1st, 1924, to December 31st, 1926)

<table>
<thead>
<tr>
<th>Day</th>
<th>Miles Flown</th>
<th>Night</th>
<th>Total</th>
<th>Number of Letters</th>
<th>Excess Postage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>4,835,536</td>
<td>2,152,049</td>
<td>6,987,585</td>
<td>16,664,760</td>
<td>17,095,496</td>
</tr>
</tbody>
</table>

Summary of Air Mail Performance from Start of Experimental Day Time Service, May 15, 1918, to June 30, 1924, When Through Transcontinental Day and Night Service Was Began

<table>
<thead>
<tr>
<th>Year</th>
<th>Trips Possible</th>
<th>Trips Attempted</th>
<th>Trips Defeated</th>
<th>Trips Uncompleted</th>
<th>Weather Encountered</th>
<th>Miles Traveled with Mail</th>
<th>Miles Ferry and Test</th>
<th>Total Miles Traveled</th>
<th>Percentage of Performance</th>
<th>Mail Carried (No. of Letters)</th>
<th>Cost of Service</th>
<th>Forced Landings Due to Mechanical Causes</th>
<th>Other Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1918</td>
<td>793</td>
<td>761</td>
<td>32</td>
<td>...</td>
<td>258</td>
<td>87,042</td>
<td>81,868</td>
<td>20,650</td>
<td>102,568</td>
<td>94.09</td>
<td>$4,720,240</td>
<td>22</td>
<td>24</td>
</tr>
<tr>
<td>1919</td>
<td>1,761</td>
<td>1,674</td>
<td>87</td>
<td>...</td>
<td>603</td>
<td>430,275</td>
<td>363,066</td>
<td>65,209</td>
<td>430,275</td>
<td>91.75</td>
<td>$17,660,700</td>
<td>69</td>
<td>97</td>
</tr>
<tr>
<td>1920</td>
<td>4,941</td>
<td>3,093</td>
<td>1,009</td>
<td>289</td>
<td>2,164</td>
<td>1,017,669</td>
<td>864,128</td>
<td>184,541</td>
<td>1,048,644</td>
<td>84.50</td>
<td>$3,975,500</td>
<td>445</td>
<td>385</td>
</tr>
<tr>
<td>1921</td>
<td>5,820</td>
<td>6,690</td>
<td>512</td>
<td>400</td>
<td>2,633</td>
<td>1,846,672</td>
<td>2,013,534</td>
<td>180,924</td>
<td>2,226,838</td>
<td>94.84</td>
<td>$4,620,280</td>
<td>642</td>
<td>841</td>
</tr>
<tr>
<td>1922</td>
<td>5,291</td>
<td>7,999</td>
<td>293</td>
<td>145</td>
<td>2,293</td>
<td>1,643,657</td>
<td>1,576,089</td>
<td>166,578</td>
<td>1,740,661</td>
<td>95.52</td>
<td>$6,925,020</td>
<td>206</td>
<td>367</td>
</tr>
<tr>
<td>1923</td>
<td>8,072</td>
<td>7,847</td>
<td>226</td>
<td>117</td>
<td>3,245</td>
<td>1,870,422</td>
<td>1,870,422</td>
<td>3,245</td>
<td>3,714,275</td>
<td>95.43</td>
<td>$9,275,020</td>
<td>1,040</td>
<td>1,657</td>
</tr>
<tr>
<td>1924</td>
<td>4,071</td>
<td>3,887</td>
<td>184</td>
<td>59</td>
<td>1,866</td>
<td>807,395</td>
<td>763,236</td>
<td>100,469</td>
<td>872,722</td>
<td>94.53</td>
<td>$10,317,080</td>
<td>632</td>
<td>191</td>
</tr>
<tr>
<td>Total</td>
<td>37,131</td>
<td>34,790</td>
<td>2,341</td>
<td>1,043</td>
<td>14,852</td>
<td>7,524,817</td>
<td>6,031,631</td>
<td>1,003,186</td>
<td>8,024,977</td>
<td>91.82</td>
<td>$25,856,600</td>
<td>86,837</td>
<td>1,618</td>
</tr>
</tbody>
</table>

Miles Flown, Mail Carried and Total Revenue Earned Air Mail Service, Calendar Year, 1926
(Includes both Transcontinental and New York-Chicago overnight)

<table>
<thead>
<tr>
<th>Month</th>
<th>Day</th>
<th>Miles Flown</th>
<th>Night</th>
<th>Total</th>
<th>Mail Carried</th>
<th>West</th>
<th>East</th>
<th>Total</th>
<th>Excess Postage</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>121,214</td>
<td>76,676</td>
<td>197,890</td>
<td>467,880</td>
<td>450,020</td>
<td>927,880</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>February</td>
<td>111,370</td>
<td>70,537</td>
<td>181,900</td>
<td>421,720</td>
<td>434,280</td>
<td>856,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>126,282</td>
<td>76,784</td>
<td>203,066</td>
<td>535,750</td>
<td>530,640</td>
<td>1,066,400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>April</td>
<td>121,276</td>
<td>83,672</td>
<td>205,948</td>
<td>543,210</td>
<td>597,800</td>
<td>1,141,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>133,691</td>
<td>89,866</td>
<td>223,557</td>
<td>649,600</td>
<td>749,800</td>
<td>1,399,400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June</td>
<td>131,721</td>
<td>76,721</td>
<td>208,442</td>
<td>765,680</td>
<td>824,080</td>
<td>1,589,760</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>July</td>
<td>131,059</td>
<td>78,576</td>
<td>209,635</td>
<td>893,340</td>
<td>913,320</td>
<td>1,806,660</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>August</td>
<td>160,168</td>
<td>78,507</td>
<td>238,615</td>
<td>755,120</td>
<td>885,920</td>
<td>1,640,040</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>September</td>
<td>140,538</td>
<td>69,763</td>
<td>210,301</td>
<td>867,880</td>
<td>916,720</td>
<td>1,784,600</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>October</td>
<td>136,087</td>
<td>98,748</td>
<td>235,835</td>
<td>851,040</td>
<td>970,520</td>
<td>1,821,560</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>122,224</td>
<td>95,308</td>
<td>217,532</td>
<td>737,560</td>
<td>854,560</td>
<td>1,592,120</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>121,645</td>
<td>89,629</td>
<td>211,274</td>
<td>961,560</td>
<td>1,041,800</td>
<td>2,003,360</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>1,598,860</td>
<td>984,187</td>
<td>2,583,056</td>
<td>8,248,000</td>
<td>9,006,960</td>
<td>17,345,960</td>
<td>$1,064,393.67</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Appendix

**Flight Schedule—Government Operated Routes**

New York, N. Y., to San Francisco, Calif., Including New York—Chicago Overnight

<table>
<thead>
<tr>
<th>Eastern Time</th>
<th>Transcontinental Daily</th>
<th>Effective Jan. 1, 1927</th>
<th>Transcontinental Daily</th>
<th>Overnight Daily</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 pm</td>
<td>11:00 am Lv. New York, N. Y., Ar. (P. R. R. Station)</td>
<td>6:00 pm 6:15 am</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:35 pm</td>
<td>12:15 pm New Brunswick, N. J. (Hadley Field)</td>
<td>4:15 pm 4:45 am</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:15 am</td>
<td>4:20 pm Cleveland, Ohio</td>
<td>12:15 pm 12:45 am</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:30 am</td>
<td>3:35 pm Chicago, Ill.</td>
<td>11:00 am 11:00 pm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7:30 pm</td>
<td>9:40 pm Iowa City, Iowa</td>
<td>1:45 am 8:00 am</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:20 am</td>
<td>1:25 am Des Moines, Iowa</td>
<td>1:00 am 12:45 am</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:35 am</td>
<td>2:50 am Omaha, Nebr.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:00 am</td>
<td>4:50 am Cheyenne, Wyo.</td>
<td>8:00 pm 7:45 pm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7:05 am</td>
<td>10:00 am Rock Springs, Wyo.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9:20 am</td>
<td>12:15 am Salt Lake City, Utah</td>
<td>2:15 pm 12:40 pm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:15 am</td>
<td>1:30 am Elko, Nevada</td>
<td>10:30 am 10:15 am</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1:15 pm</td>
<td>2:45 am Reno, Nevada</td>
<td>9:15 am 8:45 am</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:30 pm</td>
<td>1:40 pm Sacramento, Cal.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4:30 pm Concord Field</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4:30 pm Ar. San Francisco, Cal. Lv.</td>
<td>7:00 am</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Rate of Postage**

Effective February 1st, 1927, a flat rate of 10 cents per half ounce for Air Mail shall be in effect. This does away with the existing practice of "zoning" Air Mail matter over the trans-continental and overnight routes, and also the different rates applying to Contract Air Mail routes.

**CONTRACT AIR MAIL SERVICE**

At the time of publication, the Post Office Department, under authority of the Kelly law, the text of which is appended as amended June 3rd, 1926, had contracted for the private operation of sixteen air mail routes:

**A BILL**

To encourage commercial aviation and to authorize the Postmaster General to contract for Air Mail service.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that this Act may be cited as the Air Mail Act.

Sec. 2. That when used in this Act the term "air mail" means first class mail prepaid at the rates of postage herein described.

Sec. 3. That the rates of postage on air mail shall not be less than 10 cents for each ounce or fraction thereof.

Sec. 4. That the Postmaster General is authorized to contract with any individual, firm, or corporation for the transportation of air mail by aircraft between such points as he may designate, and to further contract for the transportation by aircraft of first-class mail other than air mail at fixed rates per pound, including equipment, under such rates, rules, and regulations as he may prescribe, not exceeding $3 per pound for air mail for the first 1,000 miles and not to exceed 30 cents per pound additional for each additional 100 miles or fractional part thereof for routes in excess of 1,000 miles in length, and not exceeding 60 cents per pound for first-class mail other than air mail for
the first 1,000 miles, and not to exceed 6 cents per pound additional for each additional 100 miles or fractional part thereof for routes in excess of 1,000 miles in length. Existing contracts may be amended by the written consent of the contractor and the Postmaster General to provide for a fixed rate per pound, including equipment, said rate to be determined by multiplying the rate hereinabove provided by a fraction, the numerator of which is the per cent of revenues derived from air mail to which the contractor was previously entitled under the contract, and the denominator of which is 80.

Sec. 5. That the Postmaster General may make such rules, regulations and orders as may be necessary to carry out the provisions of this Act: Provided, That nothing in this Act shall be construed to interfere with the postage charged or to be charged on Government operated air-mail routes.


Compensation: $3.00 per pound.


Schedule: Leave Boston .......... 2:45 p.m. Arrive New York .......... 6:00 p.m.

Arrive Boston .......... 7:15 a.m.

Service began July 1st, 1926.

No. C.A.M. 2. Chicago to Peoria and Springfield, Ill., to St. Louis, Mo., 278 miles.

Contractor: Robertson Aircraft Corporation, Anglum, Mo.

Compensation: $3.50 per pound.


Schedule: Leave Chicago 5:30 a.m. (daily except Sunday and Monday).

Leave Peoria .......... 7:35 a.m. Leave St. Louis daily except Saturday.

Leave Springfield .......... 8:15 a.m. Leave Kansas City, Mo., .......... 1:15 p.m.

Arrive St. Louis .......... 9:15 a.m. Sunday .............. 4:15 p.m.

Leave Peoria .......... 5:35 p.m. Arrive Chicago .......... 7:30 p.m.

(To connect overnight plane for New York.)

Service began April 15th, 1926.


Compensation: $3.00 per pound.

Equipment: 14 Planes, 10 Curtiss Carrier Pigeons, 440 h.p., 1 D.H-4 400 h.p., 1 Aerial Mercury, 400 h.p., 1 Travel Air, 200 h.p., and 1 Ford-Stout Trimotor, 200 h.p. (each motor).

Schedule: Leave Chicago daily .......... 5:30 a.m. Leave Dallas daily except Monday .......... 7:45 a.m.

Leave Moline .......... 7:35 a.m. Leave St. Joseph .......... 10:35 a.m.

Leave Kansas City .............. 11:18 a.m. Leave Oklahoma City .......... 10:10 a.m.

Leave Wichita .......... 11:18 p.m. Leave Wichita .......... 11:57 p.m.

Leave Oklahoma City .......... 3:05 p.m. Leave Kansas City .......... 1:57 p.m.

Leave Fort Worth .......... 5:15 p.m. Leave St. Joseph .......... 2:40 p.m.

Arrive Dallas .......... 5:35 p.m. Leave Moline .......... 5:40 p.m.

Arrive Chicago .......... 7:20 p.m.

Service began May 15th, 1926.

No. C.A.M. 4. Salt Lake City, Utah, by Las Vegas, Nev., to Los Angeles, Calif., 600 miles.

Contractor: Western Air Express, Inc., 891 W. M. Garland Bldg., Los Angeles, Calif.

Compensation: $3.00 per pound.


Schedule: Leave Salt Lake City ...... Leave Las Vegas .......... 2:25 p.m.

Daily .......... 9:10 a.m. Leave Los Angeles .......... 7:35 a.m.

Leave Las Vegas .......... 2:25 p.m. Leave Los Angeles .......... 7:35 a.m.

Arrive Los Angeles .......... 5:25 p.m. Leave Salt Lake City .......... 3:20 p.m.

Service began April 17th, 1926.


Contractor: Walter T. Varney, 1540 Pine St., San Francisco, Calif.

Compensation: $3.00 per pound.


Schedule: Leave Elko daily except Monday .......... 1:20 p.m. Leave Elko daily except Monday .......... 6:00 a.m.

Leave Boise .......... 3:50 p.m. Leave Boise .......... 8:30 a.m.

Arrive Pasco .......... 6:25 p.m. Leave Pasco daily except Monday .......... 11:05 a.m.

Service began April 6th, 1926.

No. C.A.M. 6. Detroit, Mich., to Cleveland, Ohio, 91 miles.


Compensation: 634 cents per ounce of mail carried.


Schedule: Leave Detroit 10:40 a.m. (daily except Sunday and Holidays). Leave Cleveland .......... 12:15 p.m.

Arrive Cleveland .......... 2:30 p.m. Arrive Detroit .......... 4:05 p.m.

Service began February 15th, 1926.
### Appendix

<table>
<thead>
<tr>
<th>No. C.A.M. 7</th>
<th>Detroit, Mich., to Chicago, Ill., 237 miles.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensation:</td>
<td>634 cents per ounce of mail carried.</td>
</tr>
<tr>
<td>Schedule:</td>
<td>Leave Detroit daily except Sunday and holidays</td>
</tr>
<tr>
<td></td>
<td>Leave Chicago 8:00 a.m.</td>
</tr>
<tr>
<td></td>
<td>Arrive Detroit 11:40 a.m.</td>
</tr>
</tbody>
</table>

- Service began February 15th, 1926.

<table>
<thead>
<tr>
<th>No. C.A.M. 8</th>
<th>Seattle, Wash., by Portland and Medford, Ore., San Francisco, Fresno, and Bakersfield to Los Angeles, Calif., 1,099 miles.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractor:</td>
<td>Vern C. Gorst, North Bend, Ore. (Pacific Air Transport, Inc.)</td>
</tr>
<tr>
<td>Compensation:</td>
<td>$2.8125 per pound for first 1,000 miles, $3.09375 per entire length of route.</td>
</tr>
<tr>
<td>Schedule:</td>
<td>Leave Seattle 3:45 a.m. (daily except Monday).</td>
</tr>
</tbody>
</table>

- Leave San Francisco 12:00 Noon
- Leave Los Angeles 12:02 a.m.
- Leave San Francisco 5:30 a.m.
- Leave Seattle 2:50 p.m.

- Service began September 15th, 1926.

<table>
<thead>
<tr>
<th>No. C.A.M. 9</th>
<th>Chicago, Ill., by Milwaukee and LaCrosse, Wis., to St. Paul and Minneapolis, Minn., 477 miles.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensation:</td>
<td>$3.00 per pound.</td>
</tr>
<tr>
<td>Schedule:</td>
<td>Leave Chicago 5:45 a.m.</td>
</tr>
</tbody>
</table>

- Leave St. Paul 2:40 p.m.
- Arrive St. Paul 10:14 p.m.
- Arrive Chicago 7:15 p.m.

- Service began June 7th, 1926.

<table>
<thead>
<tr>
<th>No. C.A.M. 10</th>
<th>Macon and Atlanta, Ga., by Jacksonville, Tampa and Fort Myers to Miami, Fla., 683 miles.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractor:</td>
<td>Florida Airways Corp., 50 E. 42nd St., New York, N. Y.</td>
</tr>
<tr>
<td>Compensation:</td>
<td>80 per cent of the revenue.</td>
</tr>
<tr>
<td>Equipment:</td>
<td>5 Planes—1 Ford-Stout all-metal, 400 h.p., 1 Stinson-Detroit, 200 h.p., 2 Travel Air, 150 h.p., 1 Curtiss Lark, 200 h.p.</td>
</tr>
<tr>
<td>Schedule:</td>
<td>Leave Jacksonville and Miami April 1st, 1926, and was extended to Atlanta September 15th, 1926.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. C.A.M. 11</th>
<th>Cleveland, Ohio, to Pittsburgh, Pa., 120 miles.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractor:</td>
<td>Clifford Hall, 1,503 Standard Life Bldg., Pittsburgh, Pa.</td>
</tr>
<tr>
<td>Compensation:</td>
<td>$3.00 per pound.</td>
</tr>
<tr>
<td>Schedule:</td>
<td>Service and date service begins not yet determined.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractor:</td>
<td>The Colorado Airways, Inc., 1227 Broadway, Denver, Colo.</td>
</tr>
<tr>
<td>Compensation:</td>
<td>$3.00 per pound.</td>
</tr>
<tr>
<td>Equipment:</td>
<td>12 Planes—3 Ryan M-1, 180 h.p., 4 Standards, 180 h.p., 2 J.N.D.'s, 180 h.p., 2 Woodson Express, 180 h.p., 1 Ansaldo, 150 h.p.</td>
</tr>
<tr>
<td>Schedule:</td>
<td>Leave Cheyenne 5:30 a.m.</td>
</tr>
</tbody>
</table>

- Leave Pueblo 4:15 p.m.
- Arrive Cheyenne 7:30 p.m.

- Service began May 1st, 1926.

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensation:</td>
<td>$3.00 per pound.</td>
</tr>
<tr>
<td>Equipment:</td>
<td>3 Fokker trimotor cabin planes, 200 h.p. (each motor).</td>
</tr>
<tr>
<td>Daily Service</td>
<td>July 6th, 1926, and was superseded by route C.A.M. 15 on October 10th, 1926.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. C.A.M. 14</th>
<th>Detroit to Grand Rapids, Mich., 137 miles.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractor:</td>
<td>Stout Air Services, Inc., General Motors Building, Detroit, Mich.</td>
</tr>
<tr>
<td>Compensation:</td>
<td>$3.00 per pound.</td>
</tr>
<tr>
<td>Schedule:</td>
<td>Service and date service begins not yet determined.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensation:</td>
<td>$3.00 per pound.</td>
</tr>
<tr>
<td>Equipment:</td>
<td>4 Fokker trimotor cabin planes, 200 h.p. (each motor).</td>
</tr>
<tr>
<td>Daily Service</td>
<td>October 10th, 1926, was temporarily suspended November 30th, 1926.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. C.A.M. 16</th>
<th>Cleveland, by Akron, Columbus, Dayton, Cincinnati, Ohio, to Louisville, Ky., 330 miles.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensation:</td>
<td>$2.30 per pound.</td>
</tr>
<tr>
<td>Schedule:</td>
<td>Service and date service begins not yet determined.</td>
</tr>
</tbody>
</table>
For the fiscal year, 1926, the committee had available $534,000, of which amount $528,227 was expended.

The office of Aeronautical Intelligence during the year distributed 39,207 technical reports; the heaviest distribution, by classes, was to aircraft manufacturers and to educational institutions.

Technical investigations undertaken by the committee included the following:

For the Air Corps of the Army

Full-scale investigation of different wings on the Sperry messenger airplane.
Investigation of the behavior of an airplane in landing and in taking off.
Investigation of the flat spin of the Douglas O-2 airplane.
Comparative wind-tunnel tests of the M-6, M-12, and Clark Y airfoils.
Investigation of pressure distribution over the wing section of a VE-7 airplane.
Investigation of pressure distribution and accelerations on a pursuit type airplane.
Investigation of performance characteristics of the aeromarine variable-thickness and variable-camber wing.
Acceleration readings on the PW-9 airplane.

For the Bureau of Aeronautics of the Navy Department

Investigation of the effect of fineness ratio on airship models.
Investigation and development of a solid-injection type of aeronautical engine.
Distribution of loading between wings of biplanes and triplanes.
Flight tests of superchargers.
Effect of varying the aspect ratio and area of wings on the performance of a fighter airplane with a supercharged air-cooled engine.
Investigation of aerodynamic loads on the U. S. S. Los Angeles.
Investigation of spoiler aileron control for TS airplane.
Investigation of performance characteristics of DT and CS seaplanes.
Investigation in the variable-density wind tunnel of standard propeller sections with various camber ratios.
Investigation of performance of five propellers in flight.
Investigation of water-pressure distribution on seaplane hulls.
Investigation of the forces on seaplane floats under landing conditions.
Investigation of autorotation on the NB-1 airplane.
Investigation of performance of model air propellers in a free air stream and in front of a VE-7 model.
Propeller tests on an SC-1 airplane.
Determination of the effect of polish on the surface of airfoil models.
Determination of stresses in aircraft in flight.
Effect of various forms of cowling on performance and engine operation of fighter airplane with supercharged air-cooled engine.

List of Technical Reports Issued During 1926

(For Previous Lists, See Aircraft Year Books, 1925 and 1926)
Appendix

No.
237. Tests on National Type Model Propellers. By W. F. Durand.
244. Aerodynamic Characteristics of Airfoils—IV. By National Advisory Committee for Aeronautics.
249. A Comparison of the Take-off and Landing Characteristics of a Number of Service Airplanes. By Thomas Carroll.
250. Description of the N. A. C. A. Universal Test Engine and Some Test Results. By Marsden Ware.

List of Technical Notes Issued During 1926

No.
261. The Resistance to the Steady Motion of Small Spheres in Fluids. By R. A. Castleman.
270. The N. A. C. A. CYH Airfoil Section. By George J. Higgins.
276. Test of a Model Propeller with Symmetrical Blade Sections. By E. P. Lesley.
Aircraft Year Book

List of Technical Memorandums Issued During 1926

No.
333. Concrete Airship Sheds at Orly, France. By Freysinet. Part II. Supporting Structure and Method of Moving; Mechanism for Moving and Centering; Apparatus for Handling the Materials; Remarks on Construction Details.
Appendix 323

No. 361. Metal Airplane Construction. Translation of paper read at the Third International Congress on Aeronautics held at Brussels in October, 1925.


List of Aircraft Circulars Issued During 1926


6. All-Metal Junkers Airplane, Type F 13. Translation from the German.


8. The Albatros L 724, A German Newspaper Carrier with Slotted Wings. From "Flight," April 15, 1926.


The Blackburn Sprat, A Training Airplane Convertible into Landplane or Seaplane. From "Flight," May 7, 1926.


DIPLOMATIC SERVICE OF THE UNITED STATES

Army


Rome .................................. Maj. Martin F. Scanlon, Assistant Military Attaché.

Navy


(Also accredited to Paris, The Hague, and Berlin.)


Brazil .................................. Lt. Comdr. Paul Cassara, U.S.N.

DIPLOMATIC SERVICE TO THE UNITED STATES

France .................................. Maj. Georges Thenault, Assistant Military Attaché for Aviation.

Great Britain .......................... Wing Comdr. T. G. Hetherington, Air Attaché.

Italy .................................. Comdr. Silvio Scaroni, Air Attaché.

Japan .................................. Lieutenant Miwa, Assistant Naval Attaché for Aviation.

HELIUM BOARD

Col. C. DeF. Chandler, A.C., U.S.A.

Com. Garland Fulton, C.C., U.S.N.

Alternates ............................... Maj. J. H. Jouett, A.C., U.S.A.

Engineers ................................ W. J. Barry, War Dept.

Progress during calendar year 1926: 7,157,354 cubic feet of helium of average purity of 94.6 per cent was produced during the year. Helium Production Plant No. 2 practically completed. Helium Tank Car completed and accepted by Army February 11, 1926; capacity, 208,000 cubic feet at 2000 pounds pressure. Army Helium Purification Unit mounted on a railway car was completed and is in operation; this plant has a capacity of 5000 cubic feet per hour, and may be run continuously.

THE AERONAUTICAL BOARD

On June 17, 1924, The Aeronautical Board, which had existed for some eight years prior thereto, was reorganized. For the first time a definite precept was assigned and its jurisdiction and mission made clear. The purpose of the Aeronautical Board, as set forth in the joint order signed by the Secretary of War and the Secretary of the Navy, is to prevent duplication of effort and to secure a more complete measure of cooperation and coordination in the development and employment of the Army Corps and Naval Aviation. The Board is required to investigate, study and report upon all major questions affecting jointly the development and employment of the Army Air Corps and Naval Aviation.

On January 21, 1927, the precept was amended in some respects in view of the establishment of the offices of the Assistant Secretary for Aeronautics in the War, Navy, and Commerce Departments.

Specific questions requiring the action of The Aeronautical Board are the following: Policies and plans for the tactical and strategical employment of aircraft. The location of air stations. Assignment of the development of new types of aircraft, motors, accessories, and weapons to the Army or the Navy. Rendering available to either service, whenever possible, training, repair, and other aviation facilities. Plans to prevent competition in procurement, and provide for use of surplus material. Consideration and recommendation in regard to all estimates for appropriations for the aeronautical programs of the Army and Navy.

The membership of The Aeronautical Board is as follows:

Army

Chief of Air Corps, Maj. Gen. M. M. Patrick; Chief of Training and Operations Division, Air Corps, Brig. Gen. J. E. Fechet; Member of War Plans Division, General Staff, Col. E. R. Stone, U.S.A.

Navy

Chief of the Bureau of Aeronautics, Rear Admiral William A. Moffett; Chief of Planning Division, Bureau of Aeronautics, Commander N. H. White, Jr.; Member of War Plans Division, Naval Operations, Captain R. M. Griswold, U.S.N.

Secretary, Jarvis Butler.
<table>
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<th>Year</th>
<th>Army</th>
<th>Navy</th>
<th>Air Mail</th>
<th>N.A.C.A</th>
<th>Forest Service</th>
<th>Total</th>
<th>Increase or Decrease</th>
<th>Net</th>
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<td>50,000</td>
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<td>†20,396,569</td>
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<td>1900,000</td>
<td>210,000</td>
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<td>1926-27</td>
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*Increase over preceding year.
†Decrease from preceding year.
‡Plus $2,150,000 "contract authorizations" for additional purchases of aircraft.
**Plus $4,100,000 "contract authorizations" for additional purchases of aircraft.
***Plus $6,250,000 "contract authorizations" for additional purchases of aircraft.
††For the contract Air Mail Service $500,000 was appropriated for 1926 and $2,000,000 was allowed for 1927.
### Aircraft Year Book

#### AIRCRAFT EXPORTS

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<thead>
<tr>
<th>Month</th>
<th>No.</th>
<th>Value</th>
<th>Value</th>
<th>No.</th>
<th>Value</th>
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<td>18</td>
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#### Aircraft and Aircraft Engine Exports by Countries

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<td>United Kingdom</td>
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<td>146</td>
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<td>855</td>
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Appendix

FLYING CLUBS

Alabama
Birmingham Flying Club.

Arkansas
Little Rock Chapter of N. A. A.
Pine Bluff Chapter of N. A. A.

California
Southern California Chapter of N. A. A.
San Francisco Chapter of N. A. A.
San Diego Chapter of N. A. A.
El Dorado Chapter of N. A. A.
Coalinga Chapter of N. A. A.
Woodland—Yolo Fliers Club.

Colorado
Denver Chapter of N. A. A.

Connecticut
New Haven Chapter of N. A. A.
New Haven—Yale Aeronautical Association.
Waterbury Light Plane Club.
District of Columbia
Washington Chapter of N. A. A.

Florida
Miami Chapter of N. A. A.
Jacksonville Chapter of N. A. A.
Jacksonville—Aeronautic Society of Florida.

Georgia
Atlanta Chapter of N. A. A.

Illinois
Chicago Chapter of N. A. A.
Chicago—Model Aero Club.
Chicago—Aviation Club of Chicago.
Peoria—Aircraft Club of Peoria.

Indiana
Fort Wayne Chapter of N. A. A.

Iowa
Des Moines Chapter of N. A. A.
Davenport Chapter of N. A. A.

Kansas
Kansas City Chapter of N. A. A.
Wichita Chapter of N. A. A.
Wichita Flying Club.
Wichita—Mississippi Valley Aviation Clubs Association.
Topeka Aero Club.

Kentucky
Louisville—Aero Club of Kentucky Chapter of N. A. A.

Louisiana
New Orleans Chapter of N. A. A.
New Orleans—Aero Club of Louisiana.

Maine
Bangor Chapter of N. A. A.
Augusta—State of Maine Chapter of N. A. A.
Portland Chapter of N. A. A.

Maryland
Cumberland Chapter of N. A. A.
Baltimore—The Flying Club of Baltimore.

Massachusetts
Boston Chapter of N. A. A.
Pittsfield Aero Club.
Worcester—Aero Club of Worcester.
Cambridge—Aeronautical Engineering Society.

Michigan
Battle Creek Chapter of N. A. A.
Saginaw Chapter of N. A. A.
Detroit Flying Club Chapter of N. A. A.
Detroit—Aero Club of Michigan.
Detroit—Air Service Veterans' Club.
Grand Rapids Aero Club.

Minnesota
Duluth—Head of the Lakes Aero Club.

Missouri
St. Louis Chapter of N. A. A.
Kansas City Chapter of N. A. A.
St. Joseph Chapter of N. A. A.
Anglo—Flying Club of St. Louis.
St. Louis—Missouri Aeronautical Society.

Montana
Helena—Aero Club of the Y. M. C. A.

Nebraska
Omaha—Chapter of N. A. A.
Omaha—Aero Club of Omaha.

New Jersey
Camden Chapter of N. A. A.
Paterson Chapter of N. A. A.
Camden—South Jersey Aviation Club.

New York
Peekskill Chapter of N. A. A.
New York Chapter of N. A. A.
Long Island City Chapter of N. A. A.
Schenectady Chapter of N. A. A.
Albany Chapter of N. A. A.
Rochester—Rochester Aero Club.
Buffalo—Buffalo Aero Science Club.
Rochester Aviation Club.
White Plains—Aero Club of the Y. M. C. A.

Ohio
Youngstown Chapter of N. A. A.
Cleveland Chapter of N. A. A.
Cincinnati Chapter of N. A. A.
Canton Chapter of N. A. A.
Akron (Woman's) Chapter of N. A. A.
Dayton University Chapter of N. A. A.
Dayton Chapter of N. A. A.
Akron (Men's) Chapter of N. A. A.
Columbus—Aero Club of Columbus.
Cleveland Aviation Club.
Cleveland Aero Club.
Cincinnati—Queen City Aero Club.
Dayton Aero Club.

Oklahoma
Tulsa Chapter of N. A. A.

Pennsylvania
Philadelphia Chapter of N. A. A.
McKeesport Chapter of N. A. A.
Philadelphia—Aero Club of Pennsylvania.
Lancaster Aero Club.
Philadelphia Aeronautical Recreation Society.
AERONAUTICAL MAGAZINES of the UNITED STATES

Aero Digest—220 West 42nd St., New York City.
Air Corps News Letter—Office of Chief of Air Corps, Washington, D. C.
Air Navigation—230 West 57th St., New York City.

FOREIGN AERONAUTICAL MAGAZINES

Aircraft Year Book

Hyphenation is not preserved, e.g., "Aero Digest—220 West 42nd St.

HOUSE ORGANS

Bee-Hive—Pratt & Whitney Aircraft Co., Hartford, Conn.

Wright Engine Builder—Wright Aeronautical Corporation, Paterson, N. J.

Great Britain
Flight—36, Great Queen St., London, Kingsway, W. C. 2.

Aircraft Year Book

AERONAUTICAL MAGAZINES

South Carolina
Charleston Chapter of N. A. A.
Tennessee
Aero Club of Memphis.
Texas
Houston Chapter of N. A. A.
Dallas Chapter of N. A. A.
Virginia
Norfolk Chapter of N. A. A.
Washington
Seattle Chapter of N. A. A.
Seattle—Pacific Northwest Model Aero Club.
West Virginia
Wheeling Chapter of N. A. A.
Moundsville Chapter of N. A. A.

Wisconsin
Milwaukee Chapter of N. A. A.
Madison Chapter of N. A. A.
Milwaukee—Badger Aeronautical Association.

Wyoming
Casper—Powder River Flying Club.

Foreign Chapters, N. A. A.

District of Columbia

Aeronautical Magazines

Austria
Oesterreichische Motor-Flug—Josef­ staderstrasse, 87, Vienna.

Belgium
La Gazette de l'Air—16, Rue Theresienne, Brussels.

Czecho-Slovakia
Flugzeuge—Prague.

Danmark
Motor—Vesterborgade, 3, Copenhagen.

France
L'Air—5, Rue de l'Isly, Paris.
Bulletin de la Chambre Syndicale des Industries Aeronautiques—9, Rue Anatole-de-la-Forge, Paris.

Germany
Deutsche Motor-Zeitschrift—Dresden.
Flugport—Frankfurtmain, Bahnhofsplatz 8, Germany.
Illustrierte Flug-Woche—Stein & Krohl, Schmidt-Ruhl Strasse 36, Leipzig.
Nachrichten fur Luftfahrer—Wilhelm­ strasse 86, Berlin.

Great Britain
Flight—36, Great Queen St., London, Kingsway, W. C. 2.

Hungary
Az Aero—Budapest.

Italy
L'Aerotechnia—Via delle Coppelle, 35, Rome, Italy.
L'Ala d'Italia—Via Valpetrosa, 2, Milan.
La Gazetta dell'Aviazione—Via Petrarca, 4, Milan.
Nel Cielo—Corso Porta Nuova, 19, Milan.
Notiziario Tecnico—Ministero dell' Aeronautica, Rome.
Rendiconti Tecnici—Ministero dell' Aeronautica, Rome.
Rivista Aeronautica—Rome.

South America
Aviation—Florida, 171, U. T. 33 Avenida 6o00, Buenos Aires.

Spain
Avces—Madrid.

Sweden
Svensk Motorforbund—Stockholm.

Switzerland
Aero-Revue—Zurich.
Appendix

ACCIDENTS IN AVIATION

Compared with the total amount of civil flying done during the year 1926, which, combining commercial flying operations with air mail statistics, amounted to 12,035,160 miles, there were few accidents and very few casualties. At the same time there were more accidents than in the previous year, when, however, the number of miles flown was considerably less.

In previous years, in discussing accidents in the Year Book, emphasis has been laid upon the importance of Government encouragement and control of civil flying as a means of reducing the number of accidents which, in the majority of cases, may be directly attributed to one of three causes, namely, faulty piloting, unsafe aircraft, and lack of airways and weather service. During the year 1926, the new Aeronautics Branch commenced to function and with its existence is expected a very material reduction in the number of flying accidents. No effect in the statistics can be expected, however, for the past year, for the regulatory control of the new branch of the Department of Commerce cannot function until the money is available under current appropriations. In the 1928 Year Book, the editors confidently anticipate being able to report a marked reduction in the number of civil flying accidents and fatalities during the latter part of this year.

In the meantime, the 1926 statistics may be reviewed for what they are worth, since they serve to give some indication of the lines along which improvement in operating conditions is most needed. For want of a better source (a condition which will be remedied next year through the statistical work of the Aeronautics Branch) newspaper reports are the basis upon which the appended table of air accidents has been compiled. This table indicates that the total number of accidents was 178, of which 161 resulted in injuries, while 19 resulted in fatalities.

Examining the itemized statistics closely, it is interesting to note that lack of weather data, engine trouble, and errors in piloting, in the order named, were the causes of the large majority of accidents. The significance of this point lies in the fact that it is in these factors that it has long been realized improvement is most needed. The control and airway work of the Aeronautics Branch will serve very greatly to minimize the first and last causes of accidents, while the development of engines of proved reliability is fast progressing as is well demonstrated in the 1,774,268 miles flown by commercial airplanes using the Wright Whirlwind, the most modern commercial engine in common use during the year 1926, with but three forced landings. When all civil operators are using engines of the standard of perfection of the Whirlwind, and this is likely soon to be the case, then at least 30 per cent reduction of the total number of accidents may be expected with resulting 70 per cent may be greatly reduced by the regulatory work of the Department of Commerce and the creation of airways.

In the following table are given the accident statistics for the year 1926 with figures divided under headings for the purpose of separating Government air mail operations from purely commercial flying carried out by private enterprise:

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<tr>
<th>GOVERNMENT AIR MAIL</th>
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<th>COMMERCIAL FLYING</th>
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<tbody>
<tr>
<td>Total number of accidents</td>
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<tr>
<td>Number of persons killed</td>
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<tr>
<td>Number of persons injured</td>
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<table>
<thead>
<tr>
<th>Errors in Piloting</th>
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<table>
<thead>
<tr>
<th>Faulty Aircraft</th>
<th>Faulty Fuel</th>
<th>Unknown Causes</th>
<th>Collisions on Field</th>
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<tbody>
<tr>
<td>6</td>
<td>0</td>
<td>1</td>
<td>36</td>
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| Total number of accidents | 163 |
| Number of persons killed | 75 |
| Number of persons injured | 154 |
REPORT OF THE INDUSTRY TO PRESIDENT COOLIDGE

The following letter to President Coolidge on the state of the Aircraft industry was based upon reports from more than one hundred manufacturers of aircraft and aeronautical equipment throughout the country. Following its delivery the Board of Governors of the Aeronautical Chamber of Commerce of America, met for a conference with President Coolidge at the White House on December 22nd, 1926.

AERONAUTICAL CHAMBER OF COMMERCE
OF AMERICA, INC.

300 MADISON AVENUE, NEW YORK

To the President,
White House,
Washington, D. C.

Sir:

The Aeronautical Chamber of Commerce includes within its membership more than two hundred responsible corporations and individuals interested in various phases of industrial aviation. Distributed throughout the entire country it includes manufacturers of flying equipment catering to the needs of the Army and Navy; similar manufacturers of commercial machines; manufacturers of aeronautical accessories for both military and commercial purposes; operators of air lines and aerial service companies, as well as designers, engineers, executives and pilots.

Because of the nature of the business in which we are engaged and because of the necessary close relations between our plans, ambitions, and day to day activities and those of various agencies of the Government handling aviation, we believe that you might welcome a report from us indicating the status of aviation in the United States as we see it today. We are encouraged to believe that such a report from the Chamber would be welcomed by you because of the interest which you have always evidenced in aviation, especially during the Session of Congress recently ended. Accordingly, we have within the last few days concluded a canvass of the entire industry. Through correspondence and conference, we have been able to determine the general views of the trade which may be summarized as follows:

A year ago, when Congress convened, the country was faced with the fact that the future course of aviation was uncharted and the part that we should play in it quite unknown because there had been no definite action on the part of the Government to serve as a guide. Commercial aviation was struggling along without direction, control or legal status. Service aviation in both the Army and the Navy was without a definite continuing plan. The imperative constantly increasing needs of the Services had to be met as best they could with a month to month policy.

The efforts of your Administration, culminating in the Acts passed at the last Session of Congress, have completely changed this picture. Uncertainty has been replaced by certainty; indefinite hope has been followed by renewed courage and positive assurance. The passing of the Air Commerce Act of 1926 has given commercial aviation legal status and assures stimulus and growth through proper direction and control. While the Department of Commerce has had but a short time in which to develop an organization for the work, it has within the past few weeks given complete cooperation with the industry and sympathetic understanding of the problems and its needs.

The Five-Year Aviation Program for the Army and Navy, together with the closer and more definite linking of the Air Corps and the Bureau of Aeronautics with the older branches of the Services, has already resulted in establishing a greatly improved understanding both within the Services and with the industry.

Engineering and manufacturing organizations, a year ago hesitating as to their plans for the future, are now arranging their resources and facilities to meet the requirements now evident through the enthusiastic cooperation of the Army, Navy, Post Office and Commerce Departments. In civil aviation a year ago there were a few contract air lines preparing for operation. These have been developed and with the cooperation of the Post Office Department and the aid of the Department of Commerce have been extended, so that it may be said for the first time that commercial aviation in America is a fact. Although it is as yet too early to make definite predictions as to the financial success or failure of these undertakings, those engaged in the operation of these lines are encouraged by the situation as it exists today, although none of them are yet able to show profitable operations. Public demand has not yet been sufficiently aroused. The public, with increasing realization that these Services are now controlled by the Government, through the license of machines and pilots, and operated over airways designated, equipped and controlled by the Department of Commerce, are slowly adjusting their business and social contacts upon the basis of practical use of air transport. Hours instead of miles or days now measure distances for many business men.
Thus far we have not been informed as to the policy of the Government with reference to the maintenance of our position in contests for international records.

We have noted with some regret the passing to other countries of these records, formerly held by machines designed and built by our industry. The recent loss of the world's seaplane record to the Italian Government has taken an important record from us. In considering this subject, we wish to express our confident belief that there exists within our aeronautical industry sufficient engineering skill, genius and ability to produce machines that will return to America many, if not all, of these coveted records, if it is the policy of the Government to encourage that sort of activity. It is the consensus of opinion of the technical men, not only of America, but also of England, France and Italy, that the admitted superiority of the speediest types of service planes now in use in these countries, is the direct and logical development of the racing machines produced a few years ago for contests. An indication from the Government as to its attitude at this time on this question would be very helpful and clarify this situation.

It has been suggested that consideration be given to a plan of special cooperation by the various agencies of the Government looking toward the development of a definite plan for the promotion of the sale of American aeronautical equipment in foreign markets. Such a plan has been effectively followed for a number of years by several of the European countries.

While the Around the World Flight and the proposed non-stop flight to Panama and around South America are of great value in emphasizing qualities of American aircraft, they do not take the place of the Official Aviation Missions sent out by European countries, with equipment and with a definite sales purpose to foreign markets.

Aside from the obvious advantages that would accrue to the industry in the carrying out of such a policy, our Government and people would likewise secure important benefits through lowering of costs that would follow increased production.

We are pleased to report that the entire industry and so far as we know, everyone else, has hailed the appointment of each of the three Assistant Secretaries with enthusiastic commendation and approval. In the selection of F. Trubee Davison, Edward P. Warner, and William P. MacCracken, Jr., as Assistant Secretaries for Aviation in the Departments of War, Navy, and Commerce, you have assured to us and the public generally that the immediate spirit of cooperation so essential to success and which has started out so admirably, continues and becomes more complete.

If all the officers of the Government in their administration of the present laws apply the principles of fostering, strengthening and establishing civil aviation in all of its phases which were so forcefully recommended by you and confirmed by Congress as a fundamental and guiding principle, our progress will now be certain and sure.

The main purpose of the present development within our industry is to provide aviation equipment second to none in safety, performance, cost of production, cost of operation and maintenance, either for the service of National Defense or for commercial air transportation; and to develop air transportation upon a basis of practical public service, giving to our business men and all others an economical, dependable nation-wide facility through the establishment of air lines under sound management and efficient operation.

We are pleased to give you our share of this cooperation. We also express to you our appreciation of your constant interest.

AERONAUTICAL CHAMBER OF COMMERCE OF AMERICA, INC.
PAUL HENDERSON, President.

LIST OF MUNICIPAL AND COMMERCIAL AIRPORTS

There are on record some four thousand fields in the United States on which landings may be made—owned by states, municipalities, corporations, clubs, commissions, and individuals. Many of these are constantly changing in character with the alternation of crops and for other reasons which make a permanent record of variable value.

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## Aircraft Year Book

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<td>Wheeling*</td>
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*Commercial.
DIRECTORY OF AIRCRAFT OPERATORS

Taxi, Sightseeing, Advertising, Photography, Dusting, Flying
Instruction, Etc.

Note:—The Aeronautical Chamber of Commerce prints the following list of operators upon authority of the operators themselves, hence assumes no responsibility for accuracy of statement. There are of course other operators who cannot be included in this tabulation because of their failure to report on their flying activities. The following condensation covers number of craft, miles flown, number of passengers (exclusive of pilots) and pounds of freight carried and indicates whether operator gives flying instruction and whether or not he is equipped for aerial photography. All operators, in 1926 flew cross country. This tabulation does not include statistics of Air Transport Operators flying on schedule, nor of the flying done by aircraft manufacturers in test or demonstration. For further information apply to Aeronautical Chamber of Commerce of America, 300 Madison Ave., New York.

Alabama

MOBILE
MOBILE AIRWAYS. Two planes.

Arizona

STAFFORD
C. W. MAYSE. Two planes. 21,000 miles. 2,059 passengers. Instruction.

Arkansas

LITTLE ROCK
ARKANSAS AIRCRAFT CO. Four planes. 30,000 miles. 2,000 passengers. Instruction. Aerial photography.

O. N. HOGUE. One plane. 2,000 miles. 25 passengers. Aerial photography.

California

ARCADIA
McDANIELD & SHELTON. Three planes. 86,000 miles. 2,500 passengers. Aerial photography.

ARLINGTON
PREST AIRPLANE & MOTOR CO. Two planes. 120,000 miles.

BAKERSFIELD
R. PEACOCK. One plane. 9,500 miles. 50 passengers. Instruction.

COMPTON
RAYMOND FRANCIS CARPENTER. One plane. 14,000 miles. 300 passengers. Aerial photography.

FRESNO
RALPH HALL. One plane. 12,000 miles. 700 passengers. H. L. MULLEN. Two planes. 36,000 miles. Instruction. Aerial photography.

GLENDALE
BOB STARKEY. Four planes. 8,600 miles. 302 passengers.

HUNTINGTON
J. M. SHANNON. One plane. 8,100 miles. 250 passengers.

IMPERIAL
CECIL G. MEADOWS. One plane. 16,500 miles. 95 passengers. J. W. STEVENSON. Four planes. 74,400 miles. 1,187 passengers. Instruction.

LONG BEACH
GLENN L. ARBGAST. One plane. 6,600 miles. 25 passengers. EARL S. DAUGHERTY. Six planes. 10,000 miles. 800 passengers. Instruction. T. A. WOOLSEY. Three planes. 12,000 miles. 150 passengers.

LOS ANGELES
AERO CORP. OF CALIF. Seven planes. 150,000 miles. 8,127 passengers. Instruction. Aerial photography. BURDETT AIR LINES, INC. Five planes. 27,660 miles. 2,312 passengers. Instruction.

CHARLES F. DYCER. Eight planes. 54,750 miles. 4,200 passengers. Instruction.

PACIFIC MARINE AIRWAYS. Two planes. 25,000 miles. 3,000 passengers. 10,000 lbs. exp. Instruction.

OAKLAND
ROYLE ROSE AIRLINES. Three planes. 3,000 miles. 70 passengers. Aerial photography.

ONTARIO
W. D. WATERMAN. Four planes. 25,000 miles. 1,000 passengers.

PARADISE
PENFIELD BROS. One plane. 900 miles. 25 passengers.

PETULUMA
WM. G. FLETCHER. Five planes. 13,000 miles. 266 passengers. Instruction.

PORTERVILLE
W. L. LAMKIN. Two planes.
Appendix

REDLANDS
RAY W. JOHNSON. Three planes. 18,000 miles. 250 passengers. Instruction.

RIVERSIDE
ROMAN C. WARREN. Four planes. 30,000 miles. 400 passengers. Instruction. Aerial photography.

SACRAMENTO
ANDREWS & NICHOLSON. Two planes. 17,000 miles. 1,112 passengers. Instruction. Aerial photography.

SACRAMENTO
ANDREWS & NICHOLSON. Two planes. 16,000 miles. 400 passengers. Instruction. IRWIN AIRCRAFT CO. Five planes. 18,250 miles. 750 passengers. Instruction. Aerial photography.

SACRAMENTO
ANDREWS & NICHOLSON. Two planes. 17,000 miles. 1,120 passengers. Instruction. Aerial photography.

INGVALD FAGERSKOG. Four planes. 16,000 miles. 400 passengers. Instruction. Aerial photography.

IRWIN AIRCRAFT CO. Five planes. 18,250 miles. 750 passengers. Instruction. Aerial photography.

SAN DIEGO
R. C. OELZE. Three planes. 18,000 miles. 3,728 passengers. Aerial photography.

SAN FRANCISCO
BRESSE VANCE. Two planes. 4,800 miles. 450 passengers. Instruction.

SAN MATEO
"SPEED" JOHNSON. Two planes. 38175 miles. 320 passengers. Instruction.

SAN PEDRO
F. W. FARRIS. One plane. 13,140 miles. 1,190 passengers. 4,000 lbs. exp.

SANTA ANA
EDDIE MARTIN. Five planes. 64,800 miles. 1,468 passengers. Instruction. Aerial photography.

SANTA BARBARA
EARLE OVINGTON. One plane. 600 miles. 48 passengers.

SANTA MONICA
OSCAR BAYER. Three planes. 5,000 miles. 200 passengers. LYLE-HOYT AIRCRAFT CORP. One plane.

STANFORD
ARTHUR AVYERES. One plane. 2,000 miles. 30 passengers.

WHITTIER
J. L. O'DONNELL. Two planes. 50 passengers.

DENVER
ALEXANDER AIRCRAFT CO. Four planes. 25,000 miles. 875 passengers. Aerial photography. EDDIE BROOKS. Two planes. 27,000 miles. 3,500 passengers. J. E. LIENINGER. One plane. 5,880 miles. 125 passengers. Instruction.

WRAY
J. B. WRAY VAUGHN. Two planes. 16,200 miles. 700 passengers. Instruction.

HARTFORD
HARRY D. COPELAND. One plane. 2,000 miles. 43 passengers. Instruction. Photography.

NEW ENGLAND AIRCRAFT CO., INC. Two planes. 25,500 miles. 1,750 passengers. Instruction. Photography.

NEW BRITAIN
CARL ASHTON DIXON. One plane. 7,000 miles. 1,100 passengers. Photography.

SAN FRANCISCO
BRESSE VANCE. Two planes. 4,800 miles. 450 passengers. Instruction.

SAN MATEO
"SPEED" JOHNSON. Two planes. 38,175 miles. 320 passengers. Instruction.

SAN PEDRO
F. W. FARRIS. One plane. 13,140 miles. 1,190 passengers. 4,000 lbs. exp.

CONNECTICUT

JACKSONVILLE
LAURIE YONGE. Three planes. 30,000 miles. 1,650 passengers. Instruction. 650 lbs. exp.

MIAMI
ROGERS AIR LINES, INC. See Garden City, N. Y.

OPALOCKA
FLORIDA AVIATION CAMP, INC. One plane. 20,000 miles. 1,000 passengers.

PALM BEACH
R. P. APPLEGATE. One plane. 11,000 miles. 1,000 passengers. Aerial photography.

ST. AUGUSTINE
C. W. SAGINOUS. Two planes. 10,800 miles. 395 passengers. Instruction.

SEBRING
OTIS A. HARDIN. Two planes. 75,000 miles.

TAMPA
A. B. McMULLEN. Six planes. 240,000 miles. 5,375 passengers. Instruction. Aerial photography.

WINTER HAVEN
H. E. CORNELL. One plane. 16,000 miles. 40 passengers.

GEORGIA

ATHENS
A. H. COMER. Two planes. 200 passengers. Instruction. BENT T. EPPS. Two planes. 300 miles.

ATLANTA

PAYETTE
INLAND AIRWAYS. One plane.

COLORADO

DENVER
ALEXANDER AIRCRAFT CO. Four planes. 25,000 miles. 875 passengers. Aerial photography. EDDIE BROOKS. Two planes. 27,000 miles. 3,500 passengers. J. E. LIENINGER. One plane. 5,880 miles. 125 passengers. Instruction.

IDAHO

PAYETTE
INLAND AIRWAYS. One plane.
Illinois

CHICAGO

AERIAL PHOTOGRAPHIC SERVICE, INC. One plane. 16,000 miles. Aerial photography.

HERBERT N. ANDERSON. One plane. 5,700 miles. 93 passengers. Instruction.

F. L. & J. D. BARCHARD. Four planes. 25,000 miles. 1,565 passengers. 2,000 lbs. exp. Instruction. Aerial photography.

BERT D. BURLEY. Two planes. 10,500 miles. 135 passengers.

LA FERRE CAVERNER. Two planes. 16,000 miles. 1,200 passengers. Instruction.

CHICAGO AERIAL SURVEY CO. One plane. 6,000 miles. Aerial photography.

CHICAGO AVIATION CO. 400 passengers.

CHICAGO AERONAUTICAL SERVICE CO., INC. Eight planes. 22,500 miles. 1,200 passengers. Instruction. Aerial photography.

CHICAGO FLYING CLUB. Two planes. 16,680 miles. 98 passengers. Instruction. ROY E. GUTHIER. Two planes. 6,000 miles. 100 passengers. Instruction.

HEATH AIRPLANE CO. Three planes. 28,350 miles. Aerial photography. Instruction.

JOHN LOGEMAN HUBER. One plane. 13,500 miles.

H. C. KELLER. Two planes. 41,720 miles. 330 passengers. Instruction. CHANCE LESSONG. One plane. 12,000 miles. 300 passengers. Instruction.

JOHN C. MILLER. One plane. 9,000 miles. 150 passengers.

OSTERGARD AIRCRAFT WORKS. Two planes. 2,500 miles. 125 passengers. Aerial photography.

PARTRIDGE, INC. Two planes. 310 passengers. Aerial photography. Instruction.

LESLEY E. ROSS. One plane. M. M. RUBNER. Two planes. 7,020 miles. 64 passengers.

R. F. SKOCZDOLE. Two planes. 33,000 miles. 153 passengers. Instructions. 150 lbs. exp.

STECKHAN AERIAL SERVICE. Three planes. 20,000 miles. 320 passengers. 20 lbs. exp.

WALLACE AIRCRAFT CO. Two planes. 13,800 miles. 900 passengers. 900 lbs. exp. Instruction.

DANVILLE

THOS. D. KETCHBOW. One plane. 14,000 miles.

HENRY F. PARKER. One plane. Instruction.

DECURUR

ROBERT L. WARD. Eight planes. 18,000 miles. 250 passengers. Instruction.

DIXON

ALBERT HECKMAN. One plane. 600 miles.

DOWNERS GROVE

ARTHUR C. CHESTER. One plane. 11,600 miles. 1,900 passengers. Instruction.

ELGIN

HELM & AAVANG. Three planes. Instruction.

FOREST PARK

YACKEE AIRCRAFT CO. Seven planes. 12,000 miles. 6,355 passengers. Instruction. Aerial photography.

HINCKLEY

EAGLE ROCK AIRPORT SCHOOL OF AVIATION. Four planes. 10,000 miles. 2,000 passengers. Instruction.

LA SALLE

TRICITY AIRCRAFT SERVICE. One plane. 20 miles. 20 passengers.

LONIX

NATIONAL AIRWAYS. Four planes. 12,000 miles.

LYONS

ART ROZA. Two planes. 400 passengers. Instruction.

METAMORA

CHAS. E. ROBINSON. One plane. 2,000 miles. 75 passengers.

MOLINE

CAMPBELL-DESCHEPPEP CO., INC. Twelve planes. 90,000 miles. 7,500 passengers. Instruction.

MOMENCE

JOHN L. BROWN. One plane. 6,000 miles. Aerial photography.

MONMOUTH

MID-WEST AIRWAYS CORP. Five planes. 33,600 miles. 1,619 passengers.

MORTON GROVE

FRED T. SONNE. One plane. 5,180 miles.

PEORIA

VARNEY AIRCRAFT CO. Four planes. 15,000 miles. 1,750 passengers.

PERU

EMIL FUSIANTE. One plane. 5,220 miles. 72 passengers.

SHELETON

SHELDON AIR LINE. Three planes. 4,000 miles. 700 passengers. Instruction. Aerial photography.

SPRINGFIELD

EARL SMITH. One plane. 12,000 miles. 480 passengers. Instruction.

LESLEY H. SMITH. One plane. 18,000 miles. 650 passengers. Instruction.

TONICA

MILO B. LOCKE. One plane. 4,500 miles. 13 passengers.

Indiana

ANDERSON

FARNAM PARKER. One plane. 11,410 miles. 517 passengers. Aerial photography.

FRED PARKER. Two planes. 1,740 miles. 784 passengers. Aerial photography.
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<td>RALPH READ</td>
<td>One</td>
<td>4,200</td>
<td>120</td>
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Aircraft Year Book

Kansas

BAXTER SPRINGS
ARCHIBALD RODENBURGER. One plane. 3,500 miles. 120 passengers.

BELLEVILLE
CHAS. H. BLOSSOR. 18,000 miles. 1,000 passengers.

BELOIT
E. PARK. One plane. Instruction.

CHANUTE
AUBREY BARNES. Two planes. 15,000 miles. 2,000 passengers. Photography. Instruction.
O. E. DIEKERHOFF. Two planes. 9,780 miles. 300 passengers.

CULVER
GEORGE E. HALSEY. Three planes. 35,000 miles. 1,300 passengers.

DODGE CITY
C. E. STEELE. One plane. 80,000 miles. 1,000 passengers. Instruction.

EUREKA
R. G. JACKSON. Three planes. 35,000 miles. Two passengers.

GARNETTE
RALPH HEIMER. 24,000 miles. 650 passengers.

IOLO
B. T. BARBER. Six planes. 4,000 miles. 800 passengers.
PAUL NEFF. Three planes. 14,000 miles.

LARNED
MERLE E. JOHNSON. One plane. 14,400 miles. 226 passengers.

LAWRENCE
L. M. ALLISON. Three planes. 700 miles. 350 passengers.

McPHerson
LAWRENCE D. RICH. 600 miles. 300 passengers.

VESPER
ROLLAND MIDDLEKOVFF. Three planes. 15,000 miles. Instruction.

WICHITA
A. E. MERRIAM. One plane. 14,000 miles.
TRAVEL AIR TRANSPORTATION. Two planes. 28,830 miles. 2,500 passengers.

Kentucky

ASHLAND
E. M. BURGESS. Two planes. Aerial photography.

CLAYTON
A. E. FARMIN. One plane. 1,200 miles. 85 passengers.

PIKESVILLE
OKAY BERINS. Three planes. 17,400 miles. 1,175 passengers.

Louisiana

NEW ORLEANS
ARTHUR E. CAMBAS. Seven planes. 47,840 miles. Aerial photography. Instruction. 96,000 lbs. mail and exp.

TALLULAH
SOUTHERN DUSTING CO. Four planes. 21,000 lbs. calcium arsenate.

Maine

ASHLAND
PERCY M. SNOW. One plane. 6,300 miles. 91 passengers.

BANGOR
R. H. W. LOWELL. Two planes. 3,600 miles. 90 passengers. Instruction.
CHAS. M. TREAT. One plane. 2,490 miles. 80 passengers. Instruction.

CAPE ELIZABETH
LEWIS J. CARNEY. One plane. 7,980 miles. 133 passengers. Instruction.

CARIBOU
G. W. SHAW. One plane. 3,900 miles. 46 passengers. Instruction.

CARMEL
FRANCIS E. FAHEY. One plane. 15,000 miles. 250 passengers. Instruction.

NORRIDGEWICK
ARCHIE E. RICKER. One plane. 8,880 miles. 124 passengers.

MARYLAND

BALTIMORE
CHESAPEAKE AIRCRAFT. Two planes. 20,000 miles. 50 passengers. Aerial photography. Instruction. 7,000 lbs. exp.

HAGERSTOWN
KREIDER-REISNER AIRCRAFT CO., INC. Two planes. 43,000 miles. 423 passengers. Instruction.

Massachusetts

BOSTON
AERIAL ADVERTISING, INC. Two planes. Instruction. BOSTON AIRPORT CORP. Four planes. 10,000 miles. 300 passengers. Instruction. Aerial photography.
Appendix

EAST TAUNTON
SQUAW BETTY FLYING SCHOOL. One plane. 8,400 miles. 337 passengers.

LOWELL
T. T. CLEGHORN & C. R. MERRILL. One plane.

Michigan

BATTLE CREEK
C. W. CLIFFORD. Two planes. 6,540 miles. 160 passengers. Instruction.
FRED C. DAVIS. Two planes. 12,000 miles. 1,038 passengers. DUPLEX AIR SERVICE. Three planes. 63,000 miles. 1,800 passengers.
E. A. GOFF, JR. One plane. 27,000 miles. 550 passengers.

CADILLAC
L. A. FERRIS. Four planes. 16,000 miles. 550 passengers.

CONCORD
DU'DEK BROS. One plane. 2,500 miles. 85 passengers.

DETOUR
X. C. W. ADAMS. Two planes. 2,500 miles.
BURNS FLYERS. Six planes. 24,000 miles. 1,000 passengers. Instruction. Aerial photography.
WM. H. CONNER. One plane. 3,000 miles. 155 passengers. DETROIT SCHOOL OF AVIATION. Seven planes. 20,000 miles. 400 passengers. Instruction. KALEE & FORSTER. Two planes. 4,400 miles. J. A. NOWICKI, M.D. One plane. 15,260 miles. 35 passengers. FRANK OVERCASHIER. Seven planes. 25,000 miles. 1,000 passengers. Instruction. MARION STERLING. One plane. 15,500 miles. 85 passengers. 500 lbs. exp. FLOYD W. WILLIAMS. Three planes. 16,200 miles. 675 passengers.

EAST LANSING
ARTHUR J. DAVIS. Three planes. 90,000 miles. 7,000 passengers. Instruction. Aerial photography. MICHIGAN AIRWAYS, INC. Five planes. 90,000 miles. 7,000 passengers. Instruction. Aerial photography.

FENTON
EDWARD G. KNAPP. Two planes. AUSTIN R. MARRIN. One plane. 1,500 miles. One passenger.

FLINT
EDWIN L. PRESTON. Two planes. 15,000 miles. 2,475 passengers. 600 lbs. exp. S. S. STEWART. One plane. 1,000 miles.

FT. SCOTT
M. S. MARSHALL. One plane.

FREELAND
KENNETH McKELLER. One plane. 9,000 miles. 300 passengers. Instruction.

GRAND RAPIDS
J. R. MURPHY. One plane. 45 miles. 23 passengers. Instruction.

JACKSON
LUTHE FLYING SERVICE. Two planes.

KALAMAZOO
GEO. T. TABRAHAM. Two planes. 24,000 miles. 1,600 passengers. Aerial photography.

LANING
A-B-C AIRLINE CORP. One plane. 11,220 miles.

MARYSVILLE
BUHL AIRCRAFT CO. One plane.

MENOMINEE
ALFRED O. SPARRER. Two planes. 6,500 miles. 100 passengers.

MUSKEGON
CONTINENTAL MOTORS CORP. Two planes. 30,500 miles. 1,152 passengers. Aerial photography.

NILES
NILES AIRWAYS. Four planes. 43,000 miles. 750 passengers. Instruction. 100 lbs. exp.

OWOSSO
B. T. HAMMOND. Two planes. 52,500 miles. 700 passengers. Instruction. Aerial photography.

Minnesota

COOK
NOEL WIEN. One plane. 4,080 miles. 85 passengers. 800 lbs. exp.

MINNEAPOLIS
WALTER R. BULLOCK. One plane. 9,240 miles. 1,229 passengers. EDDIE MIDDAGH. One plane. MARVIN A. NORTHROP. Five planes. 24,000 miles. 2,500 passengers. Aerial photography.

ST. PAUL
CHAUNCEY M. LARSON. Two planes. 15,000 miles. 500 passengers.

WASECO
H. F. DEICHEN. 8,000 miles. 250 passengers.

Mississippi

YAZOO CITY
S. F. WHITAKER. One plane. 200 miles. 2,000 passengers.

Missouri

ANGLUM
BRIDGETON AIRCRAFT CO. Five planes. 4,000 passengers. 6,000 lbs. exp. Instruction. Aerial photography.

COLUMBIA
M. E. DURHAM. Two planes. 13,500 miles. 3,000 passengers. Instruction.
HIGBIE
BRYON HEFLIN. Two planes. 6,000 miles. 225 passengers.

JOPLIN
LEE R. WALLACE. One plane. 10,500 miles. 525 passengers. Instruction.

KANSAS CITY
AIR TERMINAL ASS'N. One plane. GEORGE L. BENNETT. Five planes. 75,000 miles. 4,457 passengers. Instruction. 420 lbs. exp.
BENNETT EAGLEROCK SALES CO. Three planes. 51,500 miles. 4,100 passengers. Instruction. 420 lbs. exp.

KIRKSVILLE
ROY B. DODSON. One plane. 125 miles.

MACON
CHAS. L. FOWER. Two planes. 5,000 miles. 800 passengers. Aerial photography.

MARCELLE
R. W. SHROCK. Two planes. 2,500 passengers.

MARSHALL
NICOLAS-BEAZLEY. AIRPLANE CO. Four planes. 8,000 miles. 50 passengers. Instruction.

MEMPHIS
LEE R. BRIGGS. Three planes. 15,000 miles. 900 passengers. Instruction.

ST. JOSEPH
STANDARD AIRCRAFT CO. Five planes. 8,350 miles. 15,280 passengers. 500 lbs. exp. Instruction.

ST. LOUIS
ST. LOUIS AIRCRAFT CO., INC. Three planes. 700 passengers. Aerial photography.

WEBSTER GROVE
J. L. CAMPION. Three planes. 24,000 miles. 780 passengers. Instruction. 450 lbs. exp.

MONTANA
BUTTE
BUTTE, NAT. AIRPORT. Two planes. 24,000 miles. 225 passengers.

DILLON
MONTANA AIR SERVICE. One plane. 10,500 miles. 305 passengers. Instruction.

SIDNEY
EARL T. VANCE. One plane. 34,920 miles. 500 passengers. Instruction.

CHAPPELL
H. A. TALBOT. One plane. 1,980 miles. 182 passengers.

FAIRBURY
CON. CALLAWAY. Two planes. 7,500 miles. 125 passengers. Aerial photography.

HOLDREGE
F. A. BREWSTER. Two planes. Instruction.

LEXINGTON
LEXINGTON SCHOOL OF AVIATION. Two planes. 2,500 miles. 400 passengers. Instruction.

OGALLALA
JACK WESTFAHL. One plane. 2,500 miles. 200 passengers.

WISNER
ANDREW A. RISSER. One plane. 50,000 miles. 1,200 passengers.

WELLS
SUPP BROS. GARAGE. One plane. 720 miles. 14 passengers. Instruction.

CONCORD
GEORGE CURTIS RAND. One plane. 2,000 miles. 10 passengers.

NEW JERSEY
WRIGHT FLYING CO. Two planes. 18,015 miles. 50 passengers.

PERTH AMBOY
R. R. CURRAN. One plane. 800 miles. JOHN J. YELLEN. One plane. 8,000 miles. 850 passengers.

NEW MEXICO
DAWSON

LAS CRUCES
W. L. GULLETT. One plane. 9,000 miles. 100 passengers.
Appendix

New York

BATAVIA
RAYMOND HENRIES. One plane. 15,000 miles. 200 passengers. Flying instruction.

BINGHAMTON
RICHARD L. BENNETT. Two planes. 11,000 miles. LOOMIS AIRCRAFT CO. Two planes. Flying instruction.

BROOKLYN
F. G. VAN DE WATER. Two planes. 31,000 miles. 2,750 passengers. Flying instruction.

BUFFALO
E. M. RONNE. Four planes. Aerial photography.

COLLEGE POINT
EDO AIRCRAFT CORP. Two planes. 1,600 miles.

ELMIRA
ELMIRA AEROPLANE EXHIBITION COMPANY. One plane. Aerial photography.

FLUSHING
FRANK HARRIS, JR. Two planes. 15,000 miles. 350 passengers. Flying instruction.

GARDEN CITY
CURTISS FLYING SERVICE, INC. 18 planes. 175,000 miles. 3,800 passengers. Aerial photography. Flying instruction.

HAMILTON MAXWELL, INC. Four planes. 28,800 miles. Aerial photography. Flying instruction.

Hammondsport
AERIAL SERVICE CORP. Three planes. 8,326 miles. 350 passengers. Flying instruction.

HUNTINGTON
AL. BEARD. Three planes. 2,000 miles. 57 passengers. 7,000 lbs. exp.

JAMESVILLE
L. H. CORNELL. One plane. ERNEST B. HANNAM. One plane. 10,000 miles. 135 passengers.

MINEOLA
G. A. WIES, INC. Four planes. 15,000 miles. 315 passengers. Flying instruction.

NEW YORK CITY
ARTHUR W. BULL. One plane. 800 miles. S. M. FAIRCHILD FLYING CORP. Three planes. 25,000 miles. Aerial photography.

OZONE PARK
EDWARD J. DEVEREAUX. Two planes. 20,000 miles. 350 passengers. Aerial photography.

SCHENECTADY
VICTOR A. RICKARD. Two planes. 12,000 miles. 848 passengers. 750 lbs. exp.

STATEN ISLAND
RICHMOND AIRWAYS, INC. Four planes. 15,000 miles. 3,352 passengers. Flying instruction.

SYRACUSE
DR. HERBERT LUTHER. One plane. 10,000 miles. 500 passengers.

WASHINGTONVILLE
W. M. H. HALLOCK. One plane. 110 passengers. Flying instruction.

WESTBURY
HENRY NATTERER. Two planes. 12,000 miles. 150 passengers. Aerial photography. ROOSEVELT AERO SERVICE. Two planes. 24,000 miles. 1,000 passengers. Flying instruction.

WHITE PLAINS
WESTCHESTER AERIAL DISPATCH. Three planes. 33,000 miles. 1,500 passengers. Aerial photography. Flying instruction.

North Carolina

ASHEVILLE
STORMS AVIATION CO. One plane. 150 passengers. Flying instruction.

BISCOE
JOHN PHILLIPS. One plane. 12,000 miles. 650 passengers.

BREVARD
BREVARD AIRCRAFT CORP. Two planes. 18,000 miles. 840 passengers. Aerial photography. Flying instruction.

CHARLOTTE
FRANK ROBINSON. One plane. 6,780 miles. 118 lbs. exp.

COATS
ALTON STEWART. One plane.

LENOIR
AERO ENGINEERING CO. One plane. 22,500 miles. 727 passengers.

MONROE
H. S. ADAMS. One plane. 6,720 miles. 500 passengers.

PINEHURST
LLOYD C. YOST. Two planes. 20,000 miles. 1,800 passengers. Flying instruction.

North Dakota

FARGO
VERNON L. ROBERTS. One plane. 15,420 miles. 1,224 passengers. Flying instruction.
LINTON
NORTHWEST AIRCRAFT CO. Three planes. 1,200 miles. 125 passengers. Instruction.

MINOT
CHESTER J. JACOBSON. One plane.

SELF RIDGE
J. S. SAGMULLER. One plane. 175 miles. 50 passengers. Flying instruction.

STREETER
E. M. CANFIELD. One plane. 1,460 miles. 37 passengers.

TOWNER
J. J. BERTRAM. One plane. 9,800 miles. 638 passengers.

Ohio

AKRON
J. W. ESCH. Three planes. 18,000 miles. 300 passengers. Aerial photography. Flying instruction.

BABCOCK AIRPLANE CO. One plane. 730 miles. 420 passengers. 200 lbs. exp.

BLUE ASH
WATSON AIRPORT CO. Five planes. 35,000 miles. 3,960 passengers. Flying instruction.

BRYAN
WOODSON ENGINEERING CO. Three planes. 29,000 miles. Aerial photography. Flying instruction.

CAMBRIDGE
CLAYTON C. WEAVER. One plane. 5,200 miles. 268 passengers. Flying instruction.

CANAL WINCHESTER
F. K. CIERRY. Two planes. 14,500 miles. 660 passengers. Flying instruction.

RAYMOND METZGER. One plane.

CANTON
E. N. HART. One plane. 3,000 miles. 50 passengers.

CINCINNATI
EMBRY-RIDDLE CO. One plane. 65 miles. 1,500 passengers. 5,200 lbs. exp. Aerial photography.

CLEVELAND
IVON MILNE. Two planes. 3,600 miles. 140 passengers. 100 lbs. exp. Flying instruction.

WILLARD PARKER AIRCRAFT CORP. Five planes. 5,000 miles. 4,200 passengers. Aerial photography. Flying instruction.

COLUMBUS
COLUMBUS FLYING SERVICE CO. Three planes. 185,000 miles. 2,700 passengers. 275 lbs. exp. Aerial photography. Flying instruction.

CUYAHOGA FALLS

FRED F. SMITH. Seven planes. 10,000 miles. 1,000 passengers. Flying instruction.

DAYTON
FRANK F. HEITZ. Three planes. 10,000 miles. 850 passengers. Flying instruction.

JOHNSON FLYING SERVICE. Five planes. 36,000 miles. 3,050 passengers. 5,000 lbs. exp. Aerial photography.

RHINEHART WHELAN CO. Four planes. 25,000 miles. 2,000 passengers. Aerial photography.

EAST LIVERPOOL
W. EDWARD KAISER, JR. One plane. 350 miles. 130 passengers.

LAKEWOOD
J. DUNKEL. Three planes. 11,500 miles. 339 passengers. Flying instruction.

LIMA
H. W. WHEATLEY. One plane.

LORAIN
W. H. LONG. One plane. 21,000 miles. 350 passengers. Flying instruction.

MASSILLON
MAURICE KOHLER. One plane. 6,600 miles. 180 passengers.

RUSSELL'S POINT
INDIAN LAKE AVIATION CO. Two planes. 21,000 miles. 2,875 passengers.

SPRINGFIELD
W. B. LITTLE. Three planes. 1,500 miles. 731 passengers. Aerial photography. Flying instruction.

TOLEDO
OHIO AIRWAYS SERVICE. Three planes. 4,500 miles. 82 passengers. Aerial photography.

WARREN WRIGHT. Two planes. 12,000 miles. 1,200 passengers. Flying instruction.

WILLOUGHBY
SANBORN AVIATION CO. Three planes. 10,260 miles. 1,372 passengers. Flying instruction.

Oklahoma

ALTUS
B. H. HUFF. One plane. 3,090 miles. 100 passengers.

ARNETT
ALEX HOMOKY. One plane. (Pleasure only).

BARTLESVILLE
G. V. AERIAL TRANSPORTATION CO. Two planes. 19,280 miles. Aerial photography.

BILLINGS
M. L. SLOAN. One plane. 8,100 miles. 149 passengers.
Appendix

BRITTON

OKLAHOMA CITY

SOUTHWESTERN AIRPLANE SALES CORP. Three planes. Flying instruction.

OKMULGEE
WILLIAM A. BURKE. One plane. 15,000 miles.

PERRY
VERN H. BROWN. One plane.

PICHER
EAGLE PICHER LEAD CO. One plane. 10,000 miles. 120 passengers. R. D. NEWTON. One plane. 32,000 miles. 1,120 passengers. RICHARD WALSH. One plane. 3,500 miles. 80 passengers.

PORTLAND
HARRIS-RANKIN FLYING SERVICE, INC. Four planes. 37,745 miles. 3,589 passengers. Aerial photography. Flying instruction. JAMES C. RHINEHART. Two planes. 18,000 miles. 1,000 passengers. Flying instruction.

ALTOONA
W. L. STULTZ. Three planes. Flying instruction.

BRADFORD
W. H. EMERY, JR. One plane. 7,000 miles. 200 passengers.

BRIDGEVILLE
MAYER AIRCRAFT CORP. Four planes. 22,000 miles. 1,100 passengers. Films—400 lbs. Aerial photography. Flying instruction.

CLARION
CRAMER FLYING SERVICE. Three planes. 15,000 miles. 1,390 passengers. Flying instruction.

COALPORT
J. J. McGILL. Two planes.

CONYNGHAM
LOYD C. YOST. (See Pinehurst, N. C.).

ESSINGTON
FRANK MILLS. Three planes. 3,400 miles. 250 passengers. Flying instruction.

McKEESPORT
LOVEJOY FLYING SCHOOL. Four planes. 72,450 miles. 1,100 passengers. Flying instruction.

MEADVILLE
FRANK J. PAPPAS. One plane. 1,500 miles. 30 passengers.

PARKERSBURG
UNIVERSAL AIR SERVICE. Three planes. 30,000 miles. 4,500 passengers. Instruction.

PHILADELPHIA
AERO SERVICE CORP. One plane. 11,000 miles. Aerial photography. T. W. GURLEY. Three planes. 1,000 miles.

LUDINGTON. PHILADELPHIA FLYING SERVICE. Two planes. 16,940 miles. 600 passengers. Aerial photography. Flying instruction.

LUDINGTON EXHIBITION CO. Two planes. 13,080 miles. 266 passengers. 240 lbs. exp. Aerial Photography. Flying instruction.

AMERICAN AIRWAYS, INC. Three planes. 600 passengers.

PINE GROVE MILLS
ROY B. HENRY. Two planes. 2,500 miles. Aerial photography.

POTTSTOWN
J. P. JONES. Two planes. 300 passengers. Aerial photography.

PUNXSUTAWNEY
PENN. AERO SERVICE. Two planes. 8,000 miles. 500 passengers. Instruction.

RACINE
RALPH M. FOSTER. One plane. 2,100 miles. 65 passengers. Aerial photography. Flying instruction.

REPUBLIC
REDSTONE FLYING PARK, INC. Two planes. 12,340 miles. 292 passengers. Flying instructions.

YORK
KARL S. ORT. One plane. 7,000 miles. 150 passengers. Aerial photography.

Rhode Island
WARREN
PAUL A. WILCOX. One plane. 2,000 miles. 100 passengers.

South Carolina
FT. MILL
ELLIOT SPRINGS. Two planes.

South Dakota
FERNEY
DAKOTA AIRPLANE CO. Five planes. 40,000 miles. 1,500 passengers. Instruction.

OLE FAHLM. Three planes. 40,000 miles. 1,500 passengers. Instruction.
<table>
<thead>
<tr>
<th>Location</th>
<th>Name</th>
<th>Planes</th>
<th>Miles</th>
<th>Passengers</th>
<th>Additional Information</th>
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<tr>
<td>PLATTE</td>
<td>WILLIAM COOL</td>
<td>One plane</td>
<td>20,000</td>
<td>330 passengers</td>
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<td>RAY E. FULLER</td>
<td>One plane</td>
<td>25,000</td>
<td>1,600 passengers</td>
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<td>HERBERT M. HANSEN</td>
<td>One plane</td>
<td>14,586</td>
<td>458 passengers</td>
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<td>SIOUX FALLS</td>
<td>H. W. TENNANT</td>
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<td>SPEARFISH</td>
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<td>WATERTOWN</td>
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<td>WEST WATERTOWN</td>
<td>L. W. COOKE</td>
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<td>Tennessee</td>
<td>EAST CHATTANOOGA</td>
<td>OSCAR McELHANEY</td>
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<td>KNOXVILLE AERO CORP</td>
<td>Eight planes</td>
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<td>1,400 passengers</td>
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<td>COLE AIRPORT CO</td>
<td>Eight planes</td>
<td>15,000</td>
<td>860 passengers</td>
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<td>MEMPHIS AEROPORT CO</td>
<td>Seven planes</td>
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<td>1,000 passengers</td>
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<td>Texas</td>
<td>ALBANY</td>
<td>A. M. BRACKETT-J. Q. VANDIVER</td>
<td>Two planes</td>
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<td>200 passengers</td>
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<td>AMARILLO</td>
<td>ROBERT H. GRAY</td>
<td>One plane</td>
<td>10,800</td>
<td>1,950 passengers</td>
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<td>BOWIE</td>
<td>W. B. BRICE-F. G. KARR</td>
<td>Two planes</td>
<td>67,600</td>
<td>570 passengers</td>
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<td>CORSICANO</td>
<td>CHARLES F. PEDLEY</td>
<td>Three planes</td>
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<td>DALLAS</td>
<td>GOOD &amp; FOSTER</td>
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<td>INTERNATIONAL AIRWAYS</td>
<td>Five planes</td>
<td>110,520</td>
<td>1,439 passengers</td>
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<td>KINCAINON &amp; INGRAM</td>
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<td>JASPER LEE</td>
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<td>16,400</td>
<td>1,125 passengers</td>
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<td>FORT WORTH</td>
<td>GEO. F. BISCHOF</td>
<td>One plane</td>
<td>6,600</td>
<td>620 passengers</td>
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<td>PIERRE CHEVALIER</td>
<td>One plane</td>
<td>10,080</td>
<td>25 passengers</td>
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<td>J. H. MANGHAM</td>
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<td>475 passengers</td>
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<td>L. W. MENDEL</td>
<td>One plane</td>
<td>15,000</td>
<td>1,380 passengers</td>
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<td>HOUSTON</td>
<td>M. D. DICE</td>
<td>Five planes</td>
<td>30,000</td>
<td>500 passengers</td>
<td>Instruction</td>
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<td>R. W. MACKIE</td>
<td>One plane</td>
<td>12,000</td>
<td>900 passengers</td>
<td>Aerial photography</td>
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<td>QUICK AIRPLANE DUSTER</td>
<td>Two planes</td>
<td>20,000</td>
<td>40 passengers</td>
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<td>ROY ROSENBERGER</td>
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<td>SUPER RHONE ENGINE &amp; FLYING CORP</td>
<td>Ten planes</td>
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<td>116 passengers</td>
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<td>LONE OAK</td>
<td>LT. HENRY TONCRAY</td>
<td>Two planes</td>
<td>4,000 miles</td>
<td>265 passengers</td>
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<td>MIDLOTHIAN</td>
<td>BOYD FINDLE</td>
<td>One plane</td>
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<td>265 passengers</td>
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<td>SAN ANTONIO</td>
<td>E. EUGENE CONRAD</td>
<td>One plane</td>
<td>10,700</td>
<td>80 passengers</td>
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<td>W. C. KINGSBURY</td>
<td>One plane</td>
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<td>300 passengers</td>
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</tr>
<tr>
<td></td>
<td>SAN ANTONIO AVIATION &amp; MOTOR SCHOOL</td>
<td>Three planes</td>
<td>18,550</td>
<td>1,300 passengers</td>
<td>Instruction</td>
</tr>
<tr>
<td>TEMPLE</td>
<td>GEO. W. WILLIAMS</td>
<td>Two planes</td>
<td>25,000</td>
<td>20 passengers</td>
<td>Photograph</td>
</tr>
<tr>
<td>Virginia</td>
<td>FOUNT</td>
<td>R. V. SHORES</td>
<td>One plane</td>
<td>9,300 miles</td>
<td>900 passengers</td>
</tr>
<tr>
<td>RICHMOND</td>
<td>CHARLES FLYING SERVICE</td>
<td>One plane</td>
<td>19,800 miles</td>
<td>2,000 passengers</td>
<td>Instruction</td>
</tr>
<tr>
<td>ROANOKE</td>
<td>D. K. STEELE</td>
<td>Two planes</td>
<td>300</td>
<td>50 passengers</td>
<td>Instruction</td>
</tr>
<tr>
<td>SEATTLE</td>
<td>EDWARD HUBBARD</td>
<td>Two flying boats</td>
<td></td>
<td></td>
<td>No report</td>
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<tr>
<td>SPOKANE</td>
<td>MAMER FLYING SERVICE</td>
<td>Three planes</td>
<td>26,000 miles</td>
<td>800 passengers</td>
<td>Instruction</td>
</tr>
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Appendix

West Virginia

CHARLESTON
ORIN WELCH. Four planes. 1,800 miles. 200 passengers. 200 lbs. exp. Instruction. Aerial photography.

WHEELING
JACK R. ADAMS. Two planes. Aerial photography.

Wisconsin

ELLSWORTH
A. W. BAARLEY. Two planes.

GENEVA LAKE
ROY APPLEGATE. One plane. 10,500 miles. 1,150 passengers. Instruction. (See Palm Beach, Fla.)

KOHLER
ANTON F. BROTZ. One plane. 3,000 miles. Aerial photography.

MARSHFIELD
SKI-HI AIRWAYS, INC. Four planes. 20,000 miles. 500 passengers. Instruction.

MILWAUKEE
FRANCKE AIRCRAFT SERVICE. One plane. 10,000 miles. 100 passengers. Instruction.

WHITEWATER
HARVEY J. ANKOMEUS. Three planes. 1,500 miles.

WESTFIELD
J. CONANT. Three planes.

Casper
Wyoming Airways Corps. Four planes. 1,000 passengers. Aerial photography.

ROCK SPRINGS
RUDOLF STEFOIN. One plane. 19,280 miles. 789 passengers.

RECAPITULATION

<table>
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<tr>
<th>Operators reporting</th>
<th>Number of planes in service</th>
<th>Number of miles flown</th>
<th>Number of passengers carried</th>
<th>Pounds of express carried</th>
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<tr>
<td>420</td>
<td>969</td>
<td>7,686,492</td>
<td>380,201</td>
<td>182,508</td>
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ARMY FIVE-YEAR AVIATION PROGRAM

[PUBLIC—NO. 446—69TH CONGRESS]

[H. R. 10827]

An Act to provide more effectively for the national defense by increasing the efficiency of the Air Corps of the Army of the United States, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Act entitled "An Act for making further and more effectual provision for the national defense, and for other purposes," approved June 3, 1916, as amended, be, and the same is hereby, amended so that the Air Service referred to in that Act and in all subsequent Acts of Congress shall be known as the Air Corps.

SEC. 2. COMPOSITION OF THE AIR CORPS—That section 13a of the Act entitled "An Act for making further and more effectual provision for the national defense, and for other purposes," approved June 3, 1916, as amended, be, and the same is hereby, amended by striking out the same and inserting the following in lieu thereof:

"SEC. 13a. AIR CORPS—There is hereby created an Air Corps. The Air Corps shall consist of one Chief of the Air Corps, with the rank of major general; three assistants, with the rank of brigadier general; one thousand five hundred and fourteen officers in grades from colonel to second lieutenant, inclusive; and sixteen thousand enlisted men, including not to exceed two thousand five hundred flying cadets, such part of whom as the President may direct being formed into tactical units or bands, organized as he may prescribe: Provided, That the Chief of the Air Corps, at least two brigadier generals, and at least 90 per centum of the officers in each grade below that of brigadier general shall be flying officers: Provided further, That in time of war 10 per centum of the total number of officers that may be authorized for the Air Corps for such war may be immediately commissioned as nonflying officers: Provided further, That as soon as a sufficient number can be trained, at least 90 per centum of the total number of officers authorized for the Air Corps for such war shall be flying officers: Provided further, That hereafter in time of peace in order to insure that the commissioned officers of the Air Corps shall be properly qualified flying officers and, for the purpose of giving officers of the Army an opportunity to so qualify, the Secretary of War is hereby authorized to detail to the Air Corps officers of all grades and such officers shall start flying training immediately upon being so detailed, but hereafter such officers shall not remain detailed to the Air Corps for a period in excess of one year or be permanently commissioned therein unless they qualify as flying officers: Provided further, That any officer who is specifically recommended by the Secretary of War because of special qualifications other than as a flyer may be detailed to the Air Corps for a period longer than one year, or may be permanently commissioned in the Air Corps, but such officers, together with all flying officers who shall have become disqualified for flying, shall not be included among the 90 per centum of flying officers: And provided further, That nothing in this Act shall be construed to limit the number of officers in each grade below that of brigadier general allotted to the Air Corps for training as flying officers except that the total number of officers allotted to the Air Corps shall not be exceeded. Flying units shall in all cases be commanded by flying officers. Wherever used in this Act a flying officer is defined as one who has received an aeronautical rating as a pilot of service types of aircraft: Provided, That all officers of the Air Corps now holding any rating as a pilot shall be considered as flying officers within the meaning of this Act: Provided further, That hereafter in order to receive a rating as a pilot in time of peace an officer or an enlisted man must fly in heavier-than-air craft at least two hundred hours while acting as a pilot, seventy-five of which must be alone, and must successfully complete the course prescribed by competent authority: And provided further, That in time of war a flying officer may include any officer, who has received an aeronautical rating as a pilot of service types of air craft and also in time of war may include any officer who has received an aeronautical rating as observer. Officers and enlisted men of the Army shall receive an increase of 50 per centum of their pay when by orders of competent authority they are required to participate regularly and frequently in aerial flights, and when in consequence of such orders they do participate in regular and frequent aerial flights as defined by such Executive orders as have heretofore been, or may hereafter be, promulgated by the President: Provided, That nothing in this Act shall be construed as amending existing provisions of law relating to flying cadets. On and after July 1, 1925, and in time of peace, not less than 20 per centum of the total number of pilots employed in tactical units of the Air Corps shall be enlisted men, except when the Secretary of War shall determine that it is impractical to secure that number of enlisted pilots.

"Enlisted men of the fourth, fifth, sixth, and seventh grades in the Air Corps who have demonstrated their fitness and shown that they possess the necessary technical qualifications therefor and are engaged upon the duties pertaining thereto may be rated as air mechanics, first class, or air mechanics, second class, under such regulations as the Secretary of War may prescribe. Each enlisted man while holding the rating of
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air mechanic, first class, and performing the duties as such shall receive the pay of the second or third grade, and each enlisted man while holding the rating of air mechanic, second or third grade, and performing the duties as such shall receive the pay of the third grade:

Provided, That such number as the Secretary of War may determine as necessary, not to exceed five per centum of the total authorized enlisted strength of the Air Corps, shall be rated as air mechanics, first class, and performing the duties as such shall receive the pay of the third grade.

SEC. 3. TEMPORARY RANK FOR AIR CORPS OFFICERS—The Secretary of War is hereby authorized to assign, under such regulations as he may prescribe, officers of the Air Corps to flying commands, including wings, groups, squadrons, flights, schools, important air stations, and to the staffs of commanders of troops, which assignment shall carry with it temporary rank, including pay and allowances appropriate to such rank, as determined by the Secretary of War, for the period of such assignment:

Provided, That such temporary rank is limited to two grades above the permanent rank of the officer appointed:

Provided further, That no officer shall be temporarily advanced in rank as contemplated in this section unless the Chief of the Air Corps certifies that no officer of suitable permanent rank is available for the performance of the duties requiring the increased rank; and

Provided further, That no officer holding temporary rank under the provisions of this section shall be eligible to command outside of his own corps except by seniority under his permanent rank.

SEC. 4. CORRECTION OF PROMOTION LIST—That the Secretary of War be, and he is hereby, directed to investigate and study the alleged injustices which exist in the promotion list of the Army and to submit to Congress on the second Monday in December, 1926, this study together with his recommendations for changes, if any, in the present promotion list.

SEC. 5. AIR SECTIONS OF THE GENERAL STAFF—That section 5 of the Act entitled "An Act for making further and more effectual provisions for the national defense, and for other purposes," approved June 3, 1916, as amended, be, and the same is hereby, amended by adding the following paragraph at the end thereof:

Provided, That in the three years immediately following July 1, 1926, there is hereby created in each of the divisions of the War Department General Staff an air section to be headed by an officer of the Air Corps, the duties of which shall be to consider and recommend proper action on such air matters as may be referred to such division.

SEC. 6. FLYING PAY—That section 20 of the Act of June 10, 1922 (Forty-second Statutes, page 632), as amended, be, and the same is hereby, amended by striking out the third and the following in lieu thereof:

"SEC. 20. That all officers, warrant officers, and enlisted men of all branches of the Army, Navy, Marine Corps, and Coast Guard, when by orders of competent authority they participate regularly and frequently in aerial flights as defined by such Executive orders as have heretofore been, or may hereafter be, promulgated by the President, shall receive the same increase of their pay and same allowance for travel and subsistence expenses as are authorized for the performance of like duties in the Army, exclusive of the Air Corps, and student aviators and qualified aircraft pilots of the Navy, Marine Corps, and Coast Guard, the number of officers of any of the services mentioned in the title of this Act who may be required by competent authority to participate regularly and frequently in aerial flights as defined by such Executive orders as have heretofore been, or may hereafter be, promulgated by the President shall not at any one time exceed 1 per centum of the total authorized strength of the Army, exclusive of the Air Corps, and a like number of the Reserve Officers, warrant officers, and enlisted men of the National Guards participating in exercises or performing duties provided for by sections 92, 94, 97, and 99 of the National Defense Act, as amended, and of the Reserves of the services mentioned in the title of this Act who may be required by competent authority to participate regularly and frequently in aerial flights as defined by such Executive orders as have heretofore been, or may hereafter be, promulgated by the President, and when such flying involves travel they shall also receive the same allowances for travel and subsistence expenses as are or hereafter may be authorized for the Regular Army; Provided, That when aviators, warrant officers, and enlisted men of the National Guard are entitled to armory drill pay, the increase of 50 per centum thereof herein provided shall be based on the entire amount of such armory drill pay to which they shall be entitled for a calendar month or fractional part thereof, and the required aerial flights may be made at ordered drills of an Air Service organization, or at other times when so authorized by the President. Regulations in execution of the provisions of this section shall be made by the President and shall, whenever practicable in his judgment, be uniform for all the services concerned."

SEC. 7. APPOINTMENT OF CHIEF OF THE AIR CORPS—That the third sentence of section 40 of the Act entitled "An Act for making further and more effectual provision for the national defense, and for other purposes," approved June 3, 1916, as amended, be, and the same is hereby, amended by adding thereto the following:

"And provided further, That during the period of seven years immediately following July 1, 1926, any appointment as Chief of the Air Corps shall be made from among officers of any grade of not less than fifteen years' commissioned service, and from those who have demonstrated by actual and extended service in such corps that they are qualified for such appointment; and as assistants from among officers of not less than fifteen years' commissioned service of similar qualifications: Provided, That the Chief of the Air Corps shall make recommendations to the Secretary of War for the appointment of his assistants."
SEC. 8. FIVE-YEAR AIR CORPS PROGRAM.—For the purpose of increasing the efficiency of the Air Corps of the Army and for its further development the following five-year program is authorized:

PERSONNEL.—The number of promotion-list officers now authorized by law in the grade of second lieutenant of the Regular Army is hereby increased by four hundred and thirty, and the number of enlisted men now authorized by law for the Regular Army is hereby increased by six thousand two hundred and forty; Provided, That the increase in the number of officers and enlisted men herein authorized shall be allotted as hereafter provided. The present allotment of officers to the Air Corps is hereby authorized to be increased by four hundred and three officers distributed in grades from colonel to second lieutenant, inclusive, and the present allotment of enlisted men to the Air Corps is hereby authorized to be increased by six thousand two hundred and forty enlisted men. The President is authorized to call to active service, with their consent, such number of Air Corps reserve officers as he may deem necessary, not to exceed five hundred and fifty, 50 per centum of whom shall serve for periods of not more than one year, and not to exceed five hundred and fifty, 50 per centum of whom shall serve for periods of not more than two years: Provided, That nothing contained in this section shall affect the number of reserve officers that may be called to active duty for periods of less than six months under existing law.

SENIORITY.—The Secretary of War is hereby authorized to equip and maintain the Air Corps with not to exceed one thousand eight hundred serviceable airplanes, and such number of airships and free and captive balloons as he may determine to be necessary for training purposes, together with spare parts, equipment, supplies, hangars, and installations necessary for the operation and maintenance thereof. In order to maintain the number specified above, the Secretary of War is hereby authorized to replace obsolete or unserviceable aircraft from time to time: Provided, That the necessary replacement of airplanes shall not exceed approximately four hundred annually: Provided further, That the total number of airplanes and airships herein authorized shall be exclusive of those waiting salvage or undergoing experiment or service tests, those authorized by the Secretary of War for use in museums and those claimed to be obsolete: And provided further, That the total number of planes authorized in this section shall include the number necessary for the training and equipment of the National Guard and the training of the Organized Reserves as may be determined by the Secretary of War.

METHOD OF INCREASE.—The total increase in personnel and equipment authorized herein shall be distributed over a five-year period beginning July 1, 1926. Not to exceed one-fifth of the total increase during the first year shall be added during any one year in approximately equal increments. The President is hereby authorized to submit to Congress annually estimates of the cost of carrying out the five-year program authorized herein: Provided, That a supplemental estimate for the fiscal year ending June 30, 1927, may be submitted to cover the cost of the first annual increment.

SEC. 9. That section 58 of the National Defense Act, as amended, be, and the same is hereby, amended by adding at the end of said section 58 the following:

"To aid the Secretary of War in containing military expenditures, and to perform such functions as the Secretary may direct, there shall be an additional Assistant Secretary of War who shall be appointed by the President, by and with the advice and consent of the Senate, and whose compensation shall be fixed in accordance with the Classification Act of 1923."
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(c) Thereupon the said Secretary is authorized to contract with the winner or winners in such competition on such terms and conditions as he may deem most advantageous to the Government for furnishing or constructing all of certain features embodied in the designs and parts thereof if a fair and reasonable price can be agreed on with the winner, but not in excess of the price submitted with the designs.

(d) After contract is made, as authorized by any provision of this section, with a winner in such design competition for furnishing or constructing aircraft, aircraft parts, or aeronautical accessories in accordance with his designs and payment is completed under said contract, and after the purchase of and payment for the designs or separable parts thereof if a reasonable price can be agreed on with the winner, but not in excess of the price submitted with the designs.

(e) The competitors in design competition mentioned in this section shall submit with their designs a graduated scale of prices for which they are willing to construct any or all of the aircraft, aircraft parts, and aeronautical accessories for which designs are submitted and such stated prices shall not be exceeded in the awarding of contracts contemplated by this section.

(f) If the Secretary of War or the Secretary of the Navy shall find that in his judgment none of the designs submitted in said competition is of sufficient merit to justify the procurement of aircraft, aircraft parts, or aeronautical accessories, in accordance with his designs, then in either case any department of the Government shall have the right to purchase the winning or any other competitor's designs and parts thereof if a fair and reasonable price can be agreed on with the winner, but not in excess of the price submitted with the designs.

(g) If in case the Secretary of War or the Secretary of the Navy shall be unable to make contract as above authorized with a winner in said competition for furnishing or constructing aircraft, aircraft parts, or aeronautical accessories, or can within a reasonable time become able and equipped to furnish or construct satisfactorily all or part of the designs of such winner, or shall be unable to agree with a winner in the design competition for furnishing or constructing aircraft, aircraft parts or aeronautical accessories in accordance with his designs, then in either case any department of the Government shall have the right to purchase the winning or any other competitor's designs and parts thereof if a fair and reasonable price can be agreed on with the winner, but not in excess of the price submitted with the designs.

(h) If, within ten days after the announcement of the results of said competition, any participant in the competition shall make to the Secretary of War or the Secretary of the Navy a written showing in writing that error was made in determining the merits of said designs which was prejudicial to his interests, then the Secretary shall have the right to reject all bids and to advertise for other bids within one, and differing specifications as he may deem proper, so long as such designs have been made for furnishing or constructing aircraft, aircraft parts, or aeronautical accessories, in accordance with his designs, then in either case any department of the Government shall have the right to purchase the winning or any other competitor's designs and parts thereof if a fair and reasonable price can be agreed on with the winner, but not in excess of the price submitted with the designs.

(i) Any person, firm, or corporation that shall, directly or indirectly, have or control, directly or indirectly, or manufacture, and shall control, and shall solicit, and shall solicit, and shall advertise for other bids within one, and differing specifications as he may deem proper, so long as such designs have been made for furnishing or constructing aircraft, aircraft parts, or aeronautical accessories, in accordance with his designs, then in either case any department of the Government shall have the right to purchase the winning or any other competitor's designs and parts thereof if a fair and reasonable price can be agreed on with the winner, but not in excess of the price submitted with the designs.
members of the boards of directors are citizens of the United States, and having manu-
facturing plants located within the continental limits of the United States shall be eligible
to national election to furnish or construct aircraft, aircraft parts or aeronautical accessories for the United States Government, except that a domestic
corporation whose stock shall be listed on a stock exchange shall not be barred by the
provision until foreign ownership is reduced to a majority of its stock shall be known to the Secretary of War or the Secretary of the Navy, as
the case may be, and no aliens employed by a contractor for furnishing or constructing
aircraft, aircraft parts, or aeronautical accessories for the United States shall be per-
mits to have access to the plans or specifications or the work under construction or
to participate in the contract trials without the written consent of the Secre-
tary of War or the Secretary of the Navy

The Secretary of War or the Secretary of the Navy may at his discretion pur-
chase abroad or in the United States, with or without competition, by contract, or
otherwise, such designs, aircraft, aircraft parts, or aeronautical accessories as may be
necessary in his judgment for experimental purposes in the development of aircraft or
aeronautical accessories of the best kind for the Army or the Navy, as
the case may be, and if as a result of such procurement, new and suitable designs con-
sidered to be the best kind for the Army or the Navy are developed, he may enter into
contract for the procurement in quantity of such aircraft, aircraft parts, or aeronautical accessories without
regard to the provisions of paragraphs (a) to (e), inclusive, hereof.

The manufacturing plant, and books of any contractor for furnishing or con-
structing aircraft, aircraft parts, or aeronautical accessories, for the War Department or
the Navy Department, or such part of any manufacturing plant as may be so engaged,
shall at all times be subject to inspection and audit by any person designated by the
head of any executive department of the Government.

All audits and reports of inspection, made under the provisions of this section,
shall be presented to the Secretary of War of the Secretary of the Navy, as the case
may be, for a period of ten years, and shall be subject to inspection by any committee
of Congress, and the said Secretaries shall annually make a detailed and itemized report
to Congress of all the departments' operations under this section, the names and addresses
of all competitors, and of all persons having been awarded contracts and the prices paid
for aircraft purchased and the grounds and reasons for having awarded such contracts to
the particular persons, firms, or corporations, and all such reports shall be printed and
held subject to public distribution.

Every vendor of designs to the War Department or the Navy Department under
the provisions of this section, and every contractor for furnishing or constructing for
the War Department or the Navy Department, or both, aircraft or aircraft parts or aero-
nautical accessories, shall deliver to the Secretary of War or Secretary of the Navy, or
both, when required by either or both, a release in such form and containing such terms
and conditions as may be prescribed by the Secretary of War, the Secretary of the
Navy, or both, of claims on the part of such vendor or contractor against the United
States arising out of such sale or contract, or both.

All or any appropriations available for the procurement of aircraft, aircraft parts,
or aeronautical accessories, for the War Department or the Navy Department shall also
be available for payment of the purchase price of designs and the costs of arbitration as
authorized by this section.

Any collusion, understanding, or arrangement to deprive the United States Gov-
ernment of the benefit of full and free competition in any competition authorized by this
section, or which the Government of the United States or United States agencies
may enter into agreement with the Government of another nation for the purpose of
such designs with minor modifications thereof, the Secretary of War or the Secretary
of the Navy, when in his opinion the interests of the United States will be best served
thereby, may contract with said individual, firm, or corporation, at reasonable prices
for the procurement of said designs, aircraft parts, or aeronautical accessories, as he may
determine: Provided, That the action of the Secretary of War or the Secretary of the
Navy, in each such case shall be final and conclusive.

A board to be known as the patents and design board is hereby created, the three
members of which shall be an Assistant Secretary of War, an Assistant Secretary of
the Assistant Secretary of Commerce. To this board any individual, firm, or
corporation may submit a design for aircraft, aircraft parts, or aeronautical accessories,
and whether patented or unpatentable, the said board upon the recommendation of the
National Advisory Committee for Aeronautics shall determine whether the use of such
designs by the Government is desirable or necessary, and evaluate the designs so sub-
mitted and fix the worth to the United States of said design, not to exceed $75,000. The
said board, determined, may then be offered such design to the board for the ownership or a nonexclusive right of the United States to the use of the
design in aircraft, aircraft parts, or aeronautical accessories and upon the acceptance
thereof, shall execute complete assignment or nonexclusive license to the United States:
Provided, That no sum in excess of $75,000 shall be paid for any one design.
Appendix

(s) The terms “winner” or “winners” as used in this section shall be construed to include not more than three competitors having the highest figures of merit in any one competition.

(i) Hereafter whenever the Secretary of War, or the Secretary of the Navy, shall enter into a contract for or on behalf of the United States, for aircraft, aircraft parts, or aeronautical accessories, said Secretary is hereby authorized to award such contract to the bidder that said Secretary shall find to be the lowest responsible bidder that can satisfactorily perform the work or the service required to the best advantage of the Government; and the decision of the Secretary of the department concerned as to the award of such contract, the interpretation of the provisions of the contract, and the application and administration of the contract shall not be reviewable, otherwise than as may be therein provided for, by any officer or tribunal of the United States except the President and the Federal courts.

Sec. 11. Under such rules and regulations as he may prescribe, and notwithstanding the provisions of section 14 of this Act, the President is hereby authorized to present, but not in the name of Congress, a medal to be known as the soldier’s medal, of appropriate design, with accompanying ribbon, to any person who, while serving in any capacity with the Army of the United States, including the National Guard and the Organized Reserves, shall hereafter distinguish himself, or herself, by heroism not involving actual conflict with an enemy.

No more than one soldier’s medal shall be issued to any one person; but for each succeeding deed or act sufficient to justify the award of the soldier’s medal the President may award a suitable bar, or other suitable device, to be worn as he shall direct.

Sec. 12. Under such rules and regulations as he may prescribe, and notwithstanding the provisions of section 14 of this Act, the President is hereby authorized to present, but not in the name of Congress, a distinguished flying cross of appropriate design, with accompanying ribbon, to any person who, while serving in any capacity with the Air Corps of the Army of the United States, including the National Guard and the Organized Reserves, or with the United States Navy, since the 6th day of April, 1917, has distinguished, or who, after the approval of this Act, distinguishes himself by heroism or extraordinary achievement while participating in an aerial flight: Provided, That no person shall be eligible for the award of the distinguished flying cross for any act performed prior to November 11, 1918, except officers or enlisted men who have heretofore been recommended for but have not received the congressional medal of honor, the distinguished service cross, or the distinguished service medal and except those officers or enlisted men who displayed heroism while serving as instructors or students at flying schools. No more than one distinguished flying cross shall be issued to any one person, but for each succeeding act or achievement sufficient to justify the award of a distinguished flying cross the President may award a suitable bar or other suitable device to be worn as he shall direct. In case an individual who distinguishes himself shall have died before the making of the award to which he may be entitled, the award may nevertheless be made and the cross or the bar or other device presented to such representative of the deceased as the President may designate, but no cross, bar, or other device hereinbefore authorized shall be awarded or presented to any individual whose entire service subsequent to the time he distinguishes himself has not been honorable.

Sec. 13. Each enlisted or enrolled man to whom there shall be awarded the distinguished flying cross or the soldier’s medal shall be entitled to additional pay at the rate of $2 per month from the date of the act of heroism or extraordinary achievement on which the award is based, and each bar, or other suitable device, in lieu of the distinguished flying cross or the soldier’s medal, as hereinbefore provided for, shall entitle him to further additional pay at the rate of $2 per month from the date of the act of heroism or extraordinary achievement for which the bar or other device is awarded, and said additional pay shall continue throughout his active service, whether such service shall or shall not be continuous.

Sec. 14. That if any section or provision of this Act shall be held to be invalid, it is hereby provided that all other sections and provisions of this Act not expressly held to be invalid shall continue in full force and effect. No provision of this Act shall be retroactive and the provisions herein shall take effect upon date of approval thereof, except as otherwise provided for herein, and all Acts or parts of Acts contrary to the provisions of this Act or inconsistent therewith be, and the same are hereby, repealed.

Approved, July 2, 1936.
NAVY FIVE-YEAR AVIATION PROGRAM

[PUBLIC—NO. 422—69TH CONGRESS]

[H. R. 9690]

An Act To authorize the construction and procurement of aircraft and aircraft equipment in the Navy and Marine Corps, and to adjust and define the status of the operating personnel in connection therewith.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That, for the purpose of further developing and further increasing aeronautics in the Navy, the President of the United States is hereby authorized to undertake the construction and procurement of aircraft, spare parts, and equipment for the Navy as enumerated below:

PAR. 1. That the number of airplanes and the limit of cost herein specified for the fiscal year ending June 30, 1927, shall be in addition to the seventy-eight airplanes with spare parts and equipment for which the sum of $3,300,000 is included under the appropriation increase of the Navy in the Navy Department and Naval Establishment Appropriation Act for the fiscal year ending June 30, 1927.

PAR. 2. During the fiscal year ending June 30, 1928, not to exceed three hundred and thirteen airplanes with spare parts and equipment, to cost not to exceed $16,223,750.

PAR. 3. During the fiscal year ending June 30, 1929, not to exceed three hundred and fifty-five airplanes with spare parts and equipment, to cost not to exceed $17,582,500.

PAR. 4. During the fiscal year ending June 30, 1930, not to exceed three hundred and fifty-seven airplanes with spare parts and equipment, to cost not to exceed $18,941,250.

PAR. 5. During the fiscal year ending June 30, 1931, not to exceed three hundred and seventy-four airplanes with spare parts and equipment, to cost not to exceed $20,406,750.

PAR. 6. During the fiscal year ending June 30, 1932, and during each fiscal year thereafter, not to exceed three hundred and thirty-three airplanes with spare parts and equipment, to cost not to exceed $17,476,250.

PAR. 7. The number of airplanes, spare parts, and equipment thus authorized to be constructed or procured during the five fiscal years beginning July 1, 1926, and ending June 30, 1931, and the number authorized to be constructed or procured during the fiscal year ending June 30, 1932, and during each fiscal year thereafter is the number which it has been estimated will be required to increase, during a five-year period beginning July 1, 1926, the useful airplanes on hand or otherwise provided for on June 30, 1926, to one thousand and to maintain the number of useful airplanes at not less than this number which is hereby established as the authorized number of useful airplanes to be employed in the Navy: Provided, That, in the event satisfactory arrangements for the procurement of the authorized number of airplanes are not made in any fiscal year, such deficiency may be made up in the next ensuing year or years: Provided further, That "useful airplanes," as used in this Act, shall be those airplanes on the Navy list which are, or which after reasonable repairs can be made, in all respects safe to fly and fitted to take part in active military operations in time of war, and shall be exclusive of those airplanes classified as experimental or, with the approval of the Secretary of the Navy, declared obsolete: Provided further, That nothing herein shall be construed as more than an authorization for the procurement of aircraft within the limits enumerated in this Act, nor in any way to abridge the right of Congress to determine what numbers of aircraft may be appropriated for in any fiscal year within the limits so authorized.

PAR. 2. One experimental metalclad airship of approximately two hundred thousand cubic feet volume, at a cost not to exceed $300,000, chargeable to the appropriation provided in the Navy Department and Naval Establishment Appropriation Act for the fiscal year ending June 30, 1927, for continuing experiments and development work on all types of aircraft: Provided, That the metalclad airship herein authorized shall be procured under contract, only on such terms and subject to such restrictions as the Secretary of the Navy may prescribe: Provided further, That to expedite construction of the experimental metalclad airship, $300,000 of the sum of $1,928,000 included in the Navy
Department and Naval Establishment Appropriation Act for the fiscal year ending June 30, 1927, for continuing experiments and development work on all types of aircraft may be immediately available.

Par. 3. The Secretary of the Navy is authorized to build at any navy yard or naval factory any of the aircraft, spare parts, or equipment herein authorized should it reasonably appear that the persons, firms, or corporations, or the agents thereof, bidding for the construction of any of said aircraft, spare parts, or equipment have entered into any combination, agreement, or understanding the effect, object, or purpose of which is to deprive the Government of fair, open, and unrestricted competition in letting contracts for the construction of any of said aircraft, spare parts, or equipment, or should it reasonably appear that any persons, firm, or corporation, or the agents thereof, being solely or peculiarly in position to manufacture or furnish the particular type or design of aircraft, spare parts, or equipment required by the Navy, in bidding on such aircraft, spare parts, or equipment, have named a price in excess of cost of production plus a reasonable profit.

To provide for the construction of the heavier-than-air craft and the lighter-than-air craft herein described, except the experimental metal-laden airship, there is hereby authorized to be appropriated out of any money in the Treasury not otherwise appropriated, such sums as may be necessary, including, for the fiscal year ending June 30, 1927, toward the construction of the heavier-than-air craft program, the sum of not to exceed $12,850,000, and toward the construction of the two rigid airships, to be available until expended, $1,100,000, of which sum $100,000 may be made immediately available.

Section 3 (Personnel), Par. 1. That hereafter when the term "naval aviator" is used in this Act or any other Act it shall mean any commissioned officer or warrant line officer in the Navy or Marine Corps who has successfully completed the course prescribed by competent authority for naval aviators and who has been or may be designated or appointed a naval aviator by competent authority and who has flown alone in a heavier-than-air craft not less than seventy-five hours and who has flown in heavier-than-air craft a total of not less than two hundred hours or who has been in the air, under training in rigid airships not less than one hundred and fifty hours and successfully completed the course prescribed by competent authority.

Par. 2. That hereafter when the term "aviation pilot" is used in this Act or any other Act it shall mean any enlisted man in the Navy or Marine Corps who has successfully completed the course prescribed for aviation pilots and who has been or may hereafter be designated or appointed an aviation pilot by competent authority and who has flown alone in a heavier-than-air craft not less than seventy-five hours and who has flown in heavier-than-air craft a total of not less than two hundred hours.

The term "pilot" shall be construed to mean a naval aviator or an aviation pilot.

Par. 3. That hereafter when the term "naval aviation observer" is used in this Act or any other Act it shall mean any commissioned or warrant officer in the Navy or Marine Corps who has successfully completed the course prescribed for competent authority as a naval aviation observer and who has been in the air not less than one hundred hours and who has been or may hereafter be designated or appointed as a naval aviation observer by competent authority in the Navy.

Par. 4. That hereafter when a line officer of the Navy is to be detailed to the command of a Navy aviation school or of a Navy air station or of a Navy air unit organized for flight tactical purposes he shall be a naval aviator.

Par. 5. Line officers detailed to command of aircraft carriers or aircraft tenders shall be naval aviators or naval aviation observers who are otherwise qualified.

Par. 6. A line officer, line, or staff of the permanent rank or grade of commander or lieutenant commander, at the time of the passage of this Act who has specialized in aviation for such a period of time as to jeopardize his selection for promotion in accordance to the next higher grade or rank under existing provisions of law and whose service in aviation has been in the public interest shall be so notified by the Secretary of the Navy and at his own request be designated as an officer who will be carried as an additional number in the next higher grade or rank not above the grade of captain if and when promoted or advanced thereto: Provided, That selection boards in cases of such officers shall confine their consideration to the fitness alone of such officers for promotion, not the comparative fitness of such officers.

Par. 7. That hereafter when a line officer of the Marine Corps is to be detailed to the command of a Marine Corps aviation school or of a Marine Corps air station or of a Marine Corps air unit organized for flight tactical purposes he shall be a Marine Corps aviator.

Par. 8. On and after July 1, 1928, the number of enlisted pilots in the Navy shall not be less than 30 per centum of the total number of pilots employed in the Navy on aviation duty.

Appendix

Approved, June 24, 1926.
AIR COMMERCE ACT OF 1926

Passed by Congress andApproved by the President
MAY 20, 1926

The Act

The full text of the Air Commerce Act is reprinted herewith:

An Act To encourage and regulate the use of aircraft in commerce, and for other purposes.

Section 1. Promotion of Air Commerce.—It shall be the duty of the Secretary of Commerce to foster air commerce in accordance with the provisions of this Act, and for such purposes:

(a) To encourage the establishment of airports, civil airways, and other air navigation facilities.

(b) To make recommendations to the Secretary of Agriculture as to necessary meteorological service.

(c) To study the possibilities for the development of air commerce and the aeronautical industry and trade in the United States and to collect and disseminate information relative thereto and also as regards the existing state of the art.

(d) To advise with the Bureau of Standards and other agencies in the executive branch of the Government in carrying forward such research and development work as tends to create improved air navigation facilities. The Secretary of Commerce is authorized to transfer funds available for carrying out the purposes of this subdivision to any such agency for carrying forward such research and development work in cooperation with the Department of Commerce.

(e) To investigate, record, and make public the causes of accidents in civil air navigation in the United States.

(f) To exchange with foreign governments through existing governmental channels information pertaining to civil air navigation.

Sec. 2. Regulatory Powers.—The Secretary of Commerce shall by regulation:

(a) Provide for the granting of registration to aircraft eligible for registration, if the owner requests such registration. No aircraft shall be eligible for registration unless it is a civil aircraft owned by a citizen of the United States and not registered under the laws of any foreign country, or unless it is a public aircraft of the Federal Government, or of a State, Territory, or possession, or of a political subdivision thereof. All aircraft registered under this subdivision shall be known as aircraft of the United States.

(b) Provide for the rating of aircraft of the United States as to their airworthiness. As a basis for rating, the Secretary of Commerce may require, before the granting of registration for any aircraft first applying therefor more than eight months after the passage of this Act, full particulars of the design and of the calculations upon which the design is based and of the materials and methods used in the construction; and (2) may in his discretion accept in whole or in part the reports of properly qualified persons employed by the manufacturers or owners of aircraft; and (3) may require the periodic examination of aircraft in service and reports upon such examination by officers or employees of the Department of Commerce or by properly qualified private persons. The Secretary may accept any such examination and report by such qualified persons in lieu of examination by the employees of the Department of Commerce. The qualifications of any person for the purposes of this section shall be demonstrated in a manner specified by and satisfactory to the Secretary. The Secretary may, from time to time, re-rate aircraft as to their airworthiness upon the basis of information obtained under this subdivision.

(c) Provide for the periodic examination and rating of airmen serving in connection with the use of aircraft of the United States as to their qualifications for such service.

(d) Establish air traffic rules for the navigation, protection, and identification of aircraft, including rules as to safe altitudes of flight and rules for the prevention of collisions between vessels and aircraft.

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Licenses and Certificates

(1) Provide for the issuance and expiration, and for the suspension and revocation, of registration, aircraft, and airman certificates, and such other certificates as the Secretary of Commerce deems necessary in administering the functions vested in him under this Act. Within 20 days after notice that application for any certificate is denied or that a certificate is suspended or revoked, the applicant or holder may make a written request with the Secretary of Commerce for a public hearing thereon. The Secretary upon receipt of the request shall forthwith (1) arrange for a public hearing to be held within 20 days after such receipt in such place as the Secretary deems most practicable and convenient in view of the place of residence of the applicant or holder and the place where evidence bearing on the cause for the denial, suspension, or revocation is most readily obtainable, and (2) give the applicant or holder at least ten days notice of the hearing, for an earlier hearing is consented to by him. Notice under this subdivision may be served personally upon the applicant or holder or sent him by registered mail. The Secretary, or any officer or employee of the Department of Commerce designated by him in writing for the purpose, may hold any such hearing and for the purposes thereof administer oaths, examine witnesses, or the production of books, papers, documents, and other evidence, or the taking of depositions before any designated individual competent to administer oaths, and issue subpoenas or whose depositions are taken shall receive the same fees and mileage as witnesses in courts of the United States. All evidence taken at the hearing shall be recorded and forwarded to the Secretary for decision in the matter to be rendered not later than ten days after the completion of the hearing. The decision of the Secretary, if in accordance with law, shall be final. The denial, suspension, or revocation shall be invalid unless opportunity for hearing is afforded, notice served or sent, and decision rendered within the respective times prescribed by this subdivision.

Sec. 3. Aids to Air Navigation.—(a) Whenever at any time the Postmaster General and the Secretary of Commerce by joint order so direct, the airways under the jurisdiction and control of the Postmaster General, together with all emergency landing fields and other air navigation facilities (except airports and terminal landing fields) used in connection therewith, shall be transferred to the jurisdiction and control of the Secretary of Commerce, and the established airports and terminal landing fields may be transferred to the jurisdiction and control of the municipalities concerned under arrangements subject to approval by the President. All unexpended balances of appropriations which are available for and which have been allotted for expenditure upon such airways, emergency landing fields, and other facilities, except airports and terminal landing fields, shall thereafter be available for expenditure under the direction of the Secretary of Commerce, in lieu of the Postmaster General, for the purposes for which such appropriations were made. No part of such unexpended balances of appropriations shall be used for the purchase or establishment of airports or terminal landing fields.

(b) The Secretary of Commerce is authorized to designate and establish civil airways and, within the limits of available appropriations hereafter made by the Congress, (1) to establish, operate, and maintain along such airways all necessary air navigation facilities except airports; and (2) to chart such airways and arrange for publication of maps of such airways, utilizing the facilities and assistance of existing agencies of the Government so far as practicable. The Secretary of Commerce shall grant no exclusive right for the use of any civil airway, airport, emergency landing field, or other air navigation facility under his jurisdiction.

(c) Air navigation facilities owned or operated by the United States may be made available for public use under such conditions and to such extent as the head of the department or other independent establishment having jurisdiction thereof deems advisable and may by regulation prescribe.

(d) The head of any Government department or other independent establishment having jurisdiction over any airport or emergency landing field owned or operated by the United States may provide for the sale to any aircraft of fuel, oil, equipment, and supplies, and the furnishing to it of mechanical service, temporary shelter, and other assistance under such regulations as the head of the department or establishment may prescribe. But if such action is by reason of an emergency necessary to the continuance of such aircraft on its course to the nearest airport operated by private enterprise. All such articles shall be sold and such assistance furnished at the fair market value prevailing locally by such department or establishment. All amounts received under this subdivision shall be covered into the Treasury; but that part of such amounts which, in the judgment of the head of the department or establishment, is equivalent to the cost of the fuel, oil, equipment, supplies, services, shelter, or other assistance so sold or furnished shall be credited to the appropriation from which such cost was paid, and the balance, if any, shall be credited to miscellaneous receipts.
(e) Section 3 of the Act entitled "An Act to increase the efficiency and reduce the expense of the Signal Corps of the Army, and to transfer the Weather Service to the Department of Agriculture," approved October 1, 1890, is amended by adding at the end thereof a new paragraph to read as follows:

"Within the limits of the appropriations which may be made for such purpose, it shall be the duty of the Chief of the Weather Bureau, under the direction of the Secretary of Agriculture, (a) to furnish such weather reports, forecasts, warnings, and advice as may be required to promote the safety and efficiency of air navigation in the United States and above the high seas, particularly upon civil airways designated by the Secretary of Commerce under authority of law as routes suitable for air commerce, and (b) for such purposes to observe, measure, and investigate atmospheric phenomena, and establish meteorological offices and stations."

Nothing in this Act shall be construed to prevent the Secretary of War from designating routes in the navigable airspace as military airways and prescribing rules and regulations for the use thereof on routes which do not conform to civil airways established hereunder, or to prevent the Secretary of Commerce from designating any military airway as an airway not subject to the requirements of section 3, unless exempt under subdivision (c) of this section.

(c) If a foreign nation grants a similar privilege in respect of aircraft of the United States, and/or airmen serving in connection therewith, the Secretary of Commerce may authorize aircraft registered under the law of the foreign nation and not a part of the armed forces thereof to be navigated in the United States, and may by regulation exempt such aircraft, and/or airmen serving in connection therewith, from the requirements of section 3, other than the air traffic rules; but no foreign aircraft shall engage in interstate or intrastate air commerce.

Status of Foreign Aircraft

Sec. 6. Foreign Aircraft.—(a) The Congress hereby declares that the Government of the United States has, to the exclusion of all foreign nations, complete sovereignty of the airspace over the lands and waters of the United States, including the Canal Zone. Aircraft a part of the armed forces of any foreign nation shall not be navigated in the United States, including the Canal Zone, except in accordance, with an authorization granted by the Secretary of State.

(b) Foreign aircraft not a part of the armed forces of the foreign nation shall be navigated in the United States only if authorized as hereinafter in this section provided; and if so authorized, such aircraft and airmen serving in connection therewith, shall be subject to the requirements of section 3, unless exempt under subdivision (c) of this section.

(c) If a foreign nation grants a similar privilege in respect of aircraft of the United States, and/or airmen serving in connection therewith, the Secretary of Commerce may authorize aircraft registered under the law of the foreign nation and not a part of the armed forces thereof to be navigated in the United States, and may by regulation exempt such aircraft, and/or airmen serving in connection therewith, from the requirements of section 3, other than the air traffic rules; but no foreign aircraft shall engage in interstate or intrastate air commerce.

Sec. 7. Application of Existing Laws Relating to Foreign Commerce.—(a) The navigation of the United States, including any definition of "vessel" or "vehicle" found therein and including the rules for the prevention of collisions, shall not be construed to apply to seaplanes or other aircraft or to the navigation of vessels in relation to seaplanes or other aircraft.

(b) The Secretary of the Treasury is authorized to (1) designate places in the United States as ports of entry for civil aircraft arriving in the United States from any place outside thereof and for merchandise carried on such aircraft, (2) detail to ports of entry for the inspection of the customs and employees of the customs service, and to confer or impose upon any officer or employee of the United States stationed at such port of entry (with the consent of the head of the Government department or other independent establishment under whose jurisdiction the officer or employee is serving) any of the powers, privileges, or duties conferred or imposed upon officers or employees of the customs service, and (3) by regulation to provide for the application to civil air navigation of the laws and regulations relating to the administration of the customs and public health laws to such extent and upon such conditions as he deems necessary.

(c) The Secretary of Commerce is authorized by regulation to provide for the application to civil aircraft of the laws and regulations relating to the entry and clearance of vessels to such extent and upon such conditions as he deems necessary.

(d) The Secretary of Labor is authorized to (1) designate any of the ports of entry for civil aircraft as ports of entry for aliens arriving by aircraft, (2) detail to such ports of entry such officers and employees of the immigration service as he may deem necessary, and to confer or impose upon any employee of the United States stationed at such port of entry (with the consent of the head of the Government department or other independent establishment under whose jurisdiction the officer or employee is serving) any of the powers, privileges, or duties conferred or imposed upon officers or employees of the immigration service, and (3) by regulation to provide for the application to civil air navigation of the laws and regulations relating to the administration of the immigration laws to such extent and upon such conditions as he deems necessary.

Sec. 8. Additional Assistant Secretary of Commerce.—To aid the Secretary of Commerce in fostering air commerce and to perform such functions vested in the Secretary under this Act the Secretary may designate there under an additional Assistant Secretary of Commerce, who shall be appointed by the President, by and with the advice and consent of the Senate, and whose compensation shall be fixed in accordance with the Classification Act of 1923. Except as otherwise specifically provided, the Secretary of
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Commerce shall administer the provisions of this Act and for such purpose is authorized (1) to make such regulations as are necessary to execute the functions vested in him by this Act; (2) to make such expenditures (including expenditures for personal services and rent at the seat of government and elsewhere and for law books, books of reference and periodicals) as may be necessary for such administration and as may be provided for by the Congress from time to time; (3) to publish from time to time a bulletin setting forth such matters relating to the functions vested in him by this Act as he deems advisable, including air navigation treaties, laws, and regulations and decisions thereunder; and (4) to operate and for this purpose to acquire within the limits of the available appropriations hereafter made by the Congress, such aircraft and air navigation facilities, except airports, as are necessary for executing the functions vested in the Secretary of Commerce by this Act.

Definitions

Sec. 9. Definitions—As used in this Act—

(a) The term "citizen of the United States" means (1) an individual who is a citizen of the United States or its possessions, or (2) a partnership of which each member is an individual who is a citizen of the United States or its possessions, or (3) a corporation or association created or organized in the United States or under the law of the United States or of any State, Territory, or possession thereof, of which the president and two-thirds or more of the board of directors or other managing officers thereof, as the case may be, are individuals who are citizens of the United States or its possessions, and in which at least one per centum of the voting interest is controlled by persons who are citizens of the United States or its possessions.

(b) The term "United States," when used in a geographical sense, means the territory comprising the several States, Territories, possessions, and the District of Columbia (including the territorial waters thereof), and the overlying airspace; but shall not include the Canal Zone.

(c) The term "aircraft" means any contrivance now known or hereafter invented, used, or designed for navigation or flight in the air, except a parachute or other contrivance designed for such navigation but used primarily as safety equipment.

(d) The term "public aircraft" means an aircraft used exclusively in the governmental service.

(e) The term "civil aircraft" means any aircraft other than a public aircraft.

(f) The term "aircraft of the United States" means any aircraft registered under this Act.

(g) The term "airport" means any locality, either of water or land, which is adapted for the landing and taking off of aircraft and which provides facilities for shelter, supply, and repair of aircraft; or a place used regularly for receiving or discharging passengers or cargo by air.

(h) The term "emergency landing field" means any locality, either of water or land, which is adapted for the landing and taking off of aircraft, is located along an airway, and is intermediate to airports connected by the airway, but which is not equipped with facilities for shelter, supply, and repair of aircraft and is not used regularly for the receipt or discharge of passengers or cargo by air.

(i) The term "air navigation facility" includes any airport, emergency landing field, light or other signal structure, radio directional finding facility, radio or other electrical communication facility, and any other structure or facility, used as an aid to air navigation.

(j) The term "civil airway" means a route in the navigable airspace designated by the Secretary of Commerce as a route suitable for interstate or foreign air commerce.

(k) The term "airman" means any individual (including the person in command and any pilot, mechanic, or member of the crew) who engages in the navigation of aircraft while under way, and any individual who is in charge of the inspection, overhauling, or repairing of aircraft.

Sec. 10. Navigable Airspace—As used in this Act, the term "navigable airspace" means airspace above the minimum safe altitudes of flight prescribed by the Secretary of Commerce under section 3, and such navigable airspace shall be subject to a public right of freedom of interstate and foreign air navigation in conformity with the requirements of this Act.

Sec. 11. Penalties—(a) It shall be unlawful, except to the extent authorized or exempt under section 6—

(1) To navigate any aircraft within any airspace reservation otherwise than in conformity with the Executive orders regulating such reservation.

(2) To navigate any aircraft (other than a foreign air craft) in interstate or foreign air commerce unless such aircraft is registered as an aircraft of the United States; or to navigate any foreign aircraft in the United States.

(3) To navigate any aircraft registered as an aircraft of the United States, or any foreign aircraft, without an aircraft certificate or in violation of the terms of any such certificate.

(4) To serve as an airman in connection with any aircraft registered as an aircraft of the United States, or any foreign aircraft, without an airman certificate or in violation of the terms of any such certificate.

(5) To operate any aircraft otherwise than in conformity with the air traffic rules.

(b) Any person who (1) violates any provision of subdivision (a) of this section or any entry or clearance regulation made under section 7, or (2) any customs or public
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health regulation made under such section, or (3) any immigration regulation made under such section, shall be subject to a civil penalty of $500 which may be remitted or mitigated by the Secretary of Commerce, the Secretary of the Treasury, or the Secretary of Labor, respectively, in accordance with such proceedings as the Secretary shall by regulation prescribe. In case the violation is by the owner or person in command of the aircraft, the penalty shall be a lien against the aircraft. Any civil penalty imposed under this section may be collected by proceedings in personam against the person subject to the penalty and in case the penalty is a lien, by proceedings in rem against the aircraft. Such proceedings shall conform as nearly as may be to civil suits in admiralty; except that either party may demand trial by jury of any issue of fact, if the value in controversy exceeds $20, and facts so tried shall not be reexamined other than in accordance with the rules of the common law. The fact that in a libel in rem the seizure is made at a place not upon the high seas or navigable waters of the United States, shall not be held in any way to limit the requirement of the conformity of the proceedings to civil suits in rem in admiralty. The Supreme Court of the United States, and under its direction other courts of the United States, are authorized to prescribe rules regulating such proceedings in any particular not provided by law. The determination under this section as to the remission or mitigation of a civil penalty imposed under this section shall be final. In case libel proceedings are pending at any time during the pendency of remission or mitigation proceedings, the Secretary shall give notice thereof to the United States attorney prosecuting the libel proceedings.

(c) Any aircraft subject to a lien for any civil penalty imposed under this section may be summarily seized by and placed in the custody of such persons as the appropriate Secretary may by regulation prescribe and a report of the case thereupon transmitted to the United States attorney for the judicial district in which the seizure is made. The United States attorney shall promptly institute proceedings for the enforcement of the lien or notify the Secretary of his failure so to act. The aircraft shall be released from such custody upon (1) payment of the penalty or so much thereof as is not remitted or mitigated, (2) seizure in pursuance of process of any court in proceedings in rem for enforcement of the lien, or notification by the United States attorney of failure to institute such proceedings, or (3) deposit of a bond in such amount and with such sureties as the Secretary may prescribe, conditioned upon the payment of the penalty or so much thereof as is not remitted or mitigated.

(d) Any person who fraudulently forges, counterfeits, alters, or falsely makes any certificate authorized to be issued under this Act, or knowingly uses or attempts to use any such fraudulent certificate shall be guilty of an offense punishable by a fine not exceeding $1,000 or by imprisonment not exceeding three years, or by both such fine and imprisonment.

(e) Any person (1) who, with intent to interfere with air navigation in the navigable airspace or waters of the United States, exhibits within the United States any false light or signal at such place or in such manner that it is likely to be mistaken for a true light or signal required by regulation under this Act, or for a true light or signal in connection with an airport or other air navigation facility, or (2) who, after due warning from the Secretary of Commerce continues to maintain any false light or signal, or (3) who knowingly removes, extinguishes, or interferes with the operation of any such true light or signal, or (4) who without lawful authority knowingly exhibits any such true light or signal, shall be guilty of an offense punishable by a fine not exceeding $5,000 or by imprisonment not exceeding five years, or by both such fine and imprisonment.

(f) All penalties paid under this Act, shall be covered into the Treasury as miscellaneous receipts.

Sec. 12. Separability—If any provision of this Act is declared unconstitutional or the application thereof to any person or circumstance is held invalid, the validity of the remainder of the Act and the application of such provision to other persons and circumstances shall not be affected thereby.

Sec. 13. Time of Taking Effect—This Act shall take effect upon its passage; except that no penalty shall be enforced for any violation thereof occurring within 90 days thereafter.

Sec. 14. Short Title.
This Act may be cited as the "Air Commerce Act of 1926."
Approved May 20, 1926.
AIR COMMERCE REGULATIONS
DEPARTMENT OF COMMERCE
AERONAUTICS BRANCH
Effective December 31, 1926

CHAPTER 1
Licensing of Aircraft

Sec. 1. Licensing Law—"Air commerce" means transportation in whole or in part by aircraft of persons or property for hire, navigation of aircraft in furtherance of a business, or navigation of aircraft from one place to another for operation in the conduct of a business (Sec. 1, air commerce act.).

"Interstate or foreign air commerce" means air commerce between any State, Territory, or possession, or the District of Columbia and any place outside thereof; or between points within the same State, Territory, or possession, or the District of Columbia, but through the air space over any place outside thereof, or wholly within the air space over any Territory or possession or the District of Columbia." (Sec. 1.)

"The Secretary of Commerce shall, by regulation . . . provide for the granting of registration to aircraft eligible for registration, if the owner requests such registration . . ." (Sec. 3 (a).)

"It shall be unlawful . . . to navigate any aircraft . . . in interstate or foreign air commerce unless such aircraft is registered as an aircraft of the United States."

"To navigate any aircraft registered as an aircraft of the United States . . . without an aircraft certificate, or in violation of the terms of any such certificate." (Sec. 11 (a) (2).)

"Any person who (1) violates any provision of subdivision (a) of this section . . . shall be subject to a civil penalty of $500 . . ." (Sec. 11 (b).)

Air commerce means "any contrivance now known or hereafter invented, used, or designed for navigation or flight in the air, except a parachute or other contrivance designed for such navigation but used primarily as safety equipment." (Sec. 9 (c).)

Aircraft of the United States means "any aircraft registered" under the air commerce act. (Sec. 9 (D).)

Sec. 2. Application of the Law—Aircraft must be licensed before engaging in—

(a) Carrying persons or property for hire or reward, or the United States mails—
1. Between two or more States, or to or from foreign countries; as from Chicago to Dallas, Tex., or from New York or Portland, Me., to Montreal, Canada.
2. Between two points in one State if a part of the flight is over another State, as from Buffalo to New York via Susquehanna, Pa.; or from Buffalo, thence over any part of Pennsylvania, and thence back to Buffalo.
3. Between two points in one State if it is a part of a through carriage between points in different States, or countries, as from Los Angeles to San Francisco, Calif., as a part of the carriage between Los Angeles and Seattle, Wash., or from San Antonio, Tex., to Laredo, Tex., as a part of the carriage between San Antonio and Monterrey, Mexico.
4. Within the air space over the District of Columbia or any Territory or possession of the United States.

(b) Flying between points in different States, the District of Columbia, or Territories or possessions of the United States, or to or from any foreign country, for the operation in the conduct of a business, as where the aircraft is used in a business in one State, Territory, or possession of the United States or the District of Columbia and is flown to another State, Territory, or possession for use in the business in that State, Territory, or possession. Applied to concrete facts, it includes the aircraft which is used in State A for exhibition purposes, or the carriage there of persons or property for hire or reward, and is flown to State B for exhibition purposes or for the carriage there of persons or property for hire or reward.

Sec. 3. Aircraft Belonging to the United States—Aircraft belonging to the United States will be licensed by the Secretary of Commerce if the operating agency so requests.

Sec. 4. Aircraft Belonging to States, Territories, or political subdivisions, will be licensed by the Secretary of Commerce and rated as to airworthiness in the same manner as other craft if request for licensing is made and such aircraft are used exclusively in governmental service.
Sec. 5. Foreign Aircraft—Where civil aircraft of the United States are permitted to fly in or over a foreign country without registration and rating and licensing of their airmen, the aircraft of such foreign country, not a part of its armed forces, and the airmen serving in connection therewith, may operate in the territory over which the United States has jurisdiction without licensing. Such foreign aircraft shall not engage in interstate or intrastate air commerce.

Sec. 6. Prerequisite to License—An aircraft will be licensed after it is registered and found airworthy.

Sec. 7. Registration, Meaning of—Registration means entry in an official registry of the Secretary of Commerce as an aircraft of the United States.

Sec. 8. Requisites of Registry—An aircraft to be entitled to registration must be owned by—

(A) A citizen of the United States; or
(B) A partnership of which each member is a citizen of the United States; or
(C) A corporation organized under the laws of the United States, a State, Territory, or possession of the United States, and of which the President and at least two-thirds of the directors or managing officers are citizens of the United States, and of which at least 51 per cent of the voting interest in the corporation is controlled by citizens of the United States; or
(D) The Government of the United States, a State, Territory, or possession, or a political subdivision thereof, and used exclusively in the governmental service; and
(E) Must not be registered under the laws of any foreign country. (Secs. 3(a) and 9(a).)

Sec. 9. Airworthiness, Law of—"The Secretary of Commerce shall by regulation provide for the rating of aircraft of the United States as to their airworthiness. The Secretary may from time to time re-rate aircraft as to their airworthiness upon the basis of information obtained under this subdivision." (Sec. 3(b).)

"It shall be unlawful to navigate any aircraft registered as an aircraft of the United States without an aircraft certificate or in violation of the terms of any such certificate." (Sec. 11(a) (f).)

"Any person who violates any provision of subdivision (a) of this section shall be subject to a civil penalty of $500." (Sec. 11(b).)

Sec. 10. Airworthy, Meaning of—Airworthy means a condition meeting the minimum requirements of this chapter.

Sec. 11. Airworthiness Factors—In determining airworthiness, consideration will be given to the following:

(A) The structural strength of wings, ailerons, tail surfaces, fuselage including engine mount, and landing gear.
(B) Cockpit, cabin, and control arrangements.
(C) Power plant and power plant installation.
(D) Equipment and instruments.
(E) Propellers.
(F) Fittings.
(G) Materials and workmanship.
(H) Flying characteristics and qualities.

Sec. 12. Structural Strength Requirements for Airworthiness—(A) Classification.—To determine structural strength requirements airplanes shall be classified according to gross weight in pounds, as follows:

<table>
<thead>
<tr>
<th>Class</th>
<th>High incidence</th>
<th>Low incidence</th>
<th>Inverted flight</th>
<th>Nose dive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.5</td>
<td>4.5</td>
<td>2.5</td>
<td>2.0</td>
</tr>
<tr>
<td>2</td>
<td>5.8</td>
<td>4.0</td>
<td>2.2</td>
<td>2.0</td>
</tr>
<tr>
<td>3</td>
<td>5.2</td>
<td>3.6</td>
<td>2.0</td>
<td>1.8</td>
</tr>
<tr>
<td>4</td>
<td>4.8</td>
<td>3.3</td>
<td>1.8</td>
<td>1.6</td>
</tr>
<tr>
<td>5</td>
<td>4.0</td>
<td>2.8</td>
<td>1.6</td>
<td>1.6</td>
</tr>
</tbody>
</table>

(C) Aileron and tail surface strengths.—The fixed and movable control surfaces, as when new, shall be designed to withstand at least the following loads:
Suitable ventilation.

conditions of dynamic equilibrium.

strength to the fuselage under landing conditions.

at least constructed or arranged as to withstand the forces produced on the control surfaces by loadings.

assume the airplane to be resting on the wheels.

constructed to afford-

that the probability of such an accident is remote. To simulate this condition assume the airplane to be resting on the wheels and the center of the propeller hub or that portion of the primary structure of the fuselage that would strike the ground first. Assume the gross weight of the airplane to act at the center of gravity and perpendicular to the ground. The load factor required shall be that for the three-point landing condition.

Strength of landing gear.—The landing gear shall be designed to carry a side load of 1.5 times the weight of the airplane acting in either direction and applied to one wheel at its axle. The landing gear shall be constructed, as when new, to correspond in strength to the fuselage under landing conditions. The landing-gear assembly shall be designed to withstand without failure, fall of the fully loaded airplane, with its thrust line horizontal, from the heights listed below, the whole landing shock being taken on the principal wheels:

<table>
<thead>
<tr>
<th>Class</th>
<th>Ailerons and horizontal tail surfaces, pounds per square foot</th>
<th>Vertical tail surfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30</td>
<td>75 per cent of the load required for horizontal tail surfaces.</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

(D) Control system strength.—The control system strength shall be designed to withstand at least 300 pounds pressure in a fore-and-aft direction and 150 pounds in a lateral direction, on a stick control, and 250 pounds, applied tangentially, on a wheel control, and 300 pounds on the rudder or foot pedal, the forces being considered as acting at the points where usually applied by the pilot. If gearing ratios and the area and disposition of the control surfaces are such that they can not at their maximum loading offer resistance equivalent to the above forces, the control system, comprising horns, cables, pulleys, etc., between the control surfaces and the stick, wheel, or rudder bar, shall be designed to withstand the forces produced on the control surfaces by loadings 25 per cent more than the loadings given in section 1: (C).

(E) Fuselage strength.—The fuselage shall be designed for—

1. High incidence conditions, with the same load factors as for the wings, and under conditions of dynamic equilibrium.

2. Low incidence conditions, with the same load factors as for the wings, and under conditions of dynamic equilibrium.

3. To withstand the loads on the vertical tail surfaces as in section 1: (C).

4. Three point and level landing, with following load factors:

<table>
<thead>
<tr>
<th>Class</th>
<th>Load factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.5</td>
</tr>
<tr>
<td>2</td>
<td>6.0</td>
</tr>
<tr>
<td>3</td>
<td>5.5</td>
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<tr>
<td>4</td>
<td>5.0</td>
</tr>
<tr>
<td>5</td>
<td>4.5</td>
</tr>
</tbody>
</table>

5. Nosing over: The front parts of the fuselage shall be designed to resist the forces to which they would be subjected in nosing over, unless the landing gear is of such construction that the probability of such an accident is remote. To simulate this condition assume the airplane to be resting on the wheels and the center of the propeller hub or that portion of the primary structure of the fuselage that would strike the ground first. Assume the gross weight of the airplane to act at the center of gravity and perpendicular to the ground. The load factor required shall be that for the three-point landing condition.

(F) Strength of fittings.—The strength of all fittings shall correspond to the strength of that part of the structure with which they are incorporated.

Sec. 13. Construction of Cockpit, Cabins, and Controls.—(A) The cockpit must be constructed to afford—

1. Suitable ventilation.

2. Adequate vision to pilot under normal flying requirements.

3. Reasonable protection to pilot and passengers against possible propeller breakage.

(B) Closed cabins on airplanes carrying passengers for hire or reward must have not less than two exits affording maximum ease of operation.

(C) Dual controls on airplanes carrying passengers for hire or reward shall be so constructed or arranged as to prevent passengers from interfering with the course of flight of the airplane.

Sec. 14. Power-plant Requirements.—(A) The power plant must be equipped with—

1. Fire wall, or equivalent protection, insulating engine section from other parts of
the airplane in case of fire, and provided with glands or gaskets when pierced by pipes or wires.
2. Carburetor air intakes opening outside the fuselage, and must be suitably drained.
3. Throttle control and ignition switches on multi-engine airplanes arranged to permit separate and simultaneous control.
4. Suitable ventilation for engine compartments.
5. No air-pressure gasoline feed system, except with special approval of the Secretary of Commerce.
6. For airplanes carrying passengers for hire or reward adequate reserve gasoline supply tank or satisfactory and reliable apparatus for indicating to pilot a depletion of the gasoline supply.

(B) 1. An engine of new type and design must be bench tested for not less than 50 hours, of which at least 5 hours must be at full throttle. A log of such test must be filed with the Secretary of Commerce.
2. A newly constructed engine of a type and design which has been tested in accordance with the provisions of subparagraph (A) hereof must not be installed in an airplane until bench tested for at least two hours, during at least one-half hour of which the engine must be run at full throttle.
3. An engine which has been in storage for more than one year must not be installed in an airplane unless it has been reconditioned in accordance with accepted safety practices.
4. A reconditioned engine must be run for at least 20 minutes at full throttle before it shall be used in propelling registered aircraft carrying persons or property for hire or reward.

Sec. 15. Equipment and Instrument Requirements—The equipment and instruments required, which must be serviceable and in operating condition, are:

(A) Equipment—
1. Fire-extinguishing equipment, of design approved by the Secretary of Commerce.
2. First-aid kits on airplanes carrying passengers for hire or reward.
3. Safety belts or equivalent apparatus for pilots and passengers in open-cockpit airplanes carrying passengers for hire or reward.

(B) Instruments—
1. Tachometer for each engine.
2. Oil-pressure gauge where oil-pressure systems are employed.
3. Water thermometer for water-cooled engines and oil thermometer for air-cooled engines.
4. Altimeter.

Sec. 16. Propellers—(A) Propellers must have—
1. Ground clearance of at least 6 inches when plane is in horizontal position.
2. At least 3 inches of clearance on multiengined land and sea planes, between tips of the outboard propellers and the fuselage or any of the plane structure.

(B) Propellers must be of a type design approved by the Secretary of Commerce.

(C) Propellers must be of a type design approved by the Secretary of Commerce.

Sec. 17. Materials and Workmanship—The materials used in airplanes and engines must be of accepted standards and clearly adapted to the purpose for which used, and the workmanship must be good.

Sec. 18. Seaworthiness of Seaplanes—Seaplanes, including amphibians, must also be seaworthy.

Sec. 19. Formulas or Flight Test—(A) Except as provided in subparagraph (B), all airplanes other than seaplanes, whether constructed before or after these regulations take effect, must meet the calculations of both of the following formulas:

\[
\text{Horsepower} \times \frac{\text{Gross weight}}{\text{Wing area}} = 200 \text{ or less.}
\]

\[
\frac{\text{Gross weight}}{\text{Wing area}} + \frac{\text{Horsepower}}{\text{Gross weight}} = 30 \text{ or less.}
\]

(B) If either calculation is in excess of the figures stated above, the airplane must pass the following flight tests with full load:
1. Take-off within 1,000 feet.
2. Climb at least 250 feet the first minute after taking off.
3. Land, coming to full stop without external aid, within 1,000 feet from point where wheels first touch the landing area.

Tests are to be calculated upon the basis of a specific weight of 0.7635 and of wind velocity not exceeding 10 miles per hour.

Sec. 20. Manufacturer's Number and Date—The date of manufacture or date of remodeling and the name of the manufacturer or remodeler, together with the serial or other number, must be permanently affixed to a visible and protected part of the licensed aircraft in order that it may be distinguished from other aircraft.

Sec. 21. Manufacturers' Approved Type Certificates for Airplanes—(A) Application—
A manufacturer of airplanes in quantities and of an exact similarity of type, structure,
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materials, assembly, and workmanship may, at the option of the manufacturer, file with the Secretary of Commerce an application for an approved type certificate.

(B) Accompanying information.—The application must be accompanied, under oath, by:

1. Three view drawings of the airplane with main dimensions, aerodynamical and other characteristics, accompanied by a balance diagram for varying conditions of load to be employed.
2. Description of power plant and power-plant installation with illustrative diagrams.
3. Description of wings, fuselage, including engine mount, landing gear and tail surfaces, materials employed, and drawings or dimensioned sketches of main structural members.
4. Stress analysis, with signature of the responsible engineer. The information furnished by the manufacturer under subparagraphs (A) and (B) will be treated as confidential.

(C) Inspection and tests of specimen.—If the Secretary of Commerce approves the submitted design and the aircraft meets the requirements of section 19, it will be inspected for exact similarity with the submitted design and specifications. Upon passing such inspection the airplane must undergo the flight tests prescribed in section 26. If such tests are passed the Secretary of Commerce will issue to the manufacturer an approved type certificate.

(D) Duration and conditions of approved type certificate.—The approved type certificate will be issued upon the conditions that each quarter the manufacturer will file its affidavit with the Secretary of Commerce showing the number of airplanes constructed under the approved type certificate during the quarter, with a statement that no airplane is being constructed under the approved type certificate deviating from the terms thereof.

(E) Changes.—Changes in airplanes constructed under an approved type certificate are permissible, with the approval of the Secretary of Commerce, if the airplane meets the requirements of section 26. If the airplane is found to be an eligible owner of aircraft of the United States and—

1. The application is accompanied by the manufacturer’s affidavit and the flight certificate, and
2. The airplane is delivered (assembled) to the applicant either at the factory or by air under its own power, the aircraft license will be issued to the applicant without additional inspections or tests, provided the airplane is equipped in accordance with these regulations.

Sec. 24. Licensing of Airplanes Not Constructed Under Approved Type Certificates—

(A) If the airplane is of standard design and not constructed under an approved type certificate, the application shall be made on the form for nonapproved type airplanes and accompanied by a statement of the history of the operations, remodeling, and replacements of the airplane and engine and their general condition. Statements in the application shall show whether they are made upon the applicant’s own knowledge or upon information and belief. If the airplane is constructed after July 1, 1927, the application shall be accompanied by the additional information that is required by section 21 (B).

(B) Tests—

1. For the airplanes constructed after July 1, 1927, in conformity to the airworthy requirements of these regulations and which pass the flight tests specified in section 26, aircraft licenses will be issued by the Secretary of Commerce by the Secretary of Commerce.
2. For airplanes constructed prior to July 1, 1927, and found by the Secretary of Commerce to be of proper design, assembly, and workmanship, and of suitable materials and equipped in accordance with these regulations, aircraft licenses will be issued after such airplanes have passed the flight tests specified in section 26 (B).
Sec. 25. Licensing of Special Classes of Airplanes—Racing and experimental airplanes and airplanes of unusual design will be granted special aircraft licenses and shall be operated only in accordance with the conditions imposed in such licenses by the Secretary of Commerce.

Sec. 26. Flight Tests—The flight tests referred to in this chapter are of two kinds:
(A) General flight, which is a one-half hour flying test with full load to determine stability; and
(B) General maneuverability, which includes, among other things, a flight with full load around two pylons or buoys 1,500 feet apart, making five successive figure 8's at 800 feet without varying more than 200 feet in height and in a radius not to exceed the following:
1. Five hundred feet for airplanes of full load not in excess of 4,200 pounds;
2. Seven hundred and fifty feet for airplanes of full load over 4,200 pounds add not in excess of 13,500 pounds; and
3. One thousand feet for all other airplanes.
The applicant must provide the person to make the flight tests, but the inspector will pilot the airplane during such parts of the tests as shall be deemed necessary.

Sec. 27. Places for Airworthiness Tests—The Secretary of Commerce will fix the time and place for all inspections and tests for airworthiness.

Sec. 28. Licenses—Contents—Aircraft licenses will be issued for a period of one year, and will identify the airplane, specify the authorized type of the engine, and state the authorized gross weight, and will be granted subject to compliance with those regulations.

Sec. 29. Sale of Licensed Aircraft—Upon the sale or transfer of title of licensed aircraft the licensed owner must report to the Secretary of Commerce the date and place of sale or transfer and the name and residence of the vendee. If the sale is to an ineligible owner of aircraft, the aircraft license immediately terminates. If to an eligible owner, the license terminates 30 days after such sale or transfer, during which time the vendee may file a "purchaser's renewable" application and have the aircraft relicensed in his name for the unexpired term of the existing license. Between the sale and the said relicensing the aircraft will be considered as licensed in the name of the purchaser if the purchaser's renewable application is filed within the time provided herein. If the application for the relicensing is not made within the time aforesaid, the license of the aircraft will be governed by the regulations applying to original licenses.

Sec. 30. Relicensing of Aircraft—Upon the expiration of the term of an existing aircraft license the aircraft will be relicensed for additional periods of one year upon the application of the owner for relicensing and the finding of the Secretary of Commerce that the aircraft is airworthy and is owned by an eligible owner.

Sec. 31. Canceling Licenses Upon Request—Upon the request of the licensed owner the aircraft license will be canceled by the Secretary of Commerce.

Sec. 32. Revocation and Suspension of Licenses—Law—"The Secretary of Commerce shall by regulation . . . provide for the . . . suspension and revocation of registration (and) aircraft certificates." (Sec. 3(f).)

Sec. 33. Ground for Revocation or Suspension—Aircraft licenses will be suspended or revoked for—
(A) Violating the air commerce act or any of these regulations.
(B) Failing to make proper and seasonal reports.
(C) Making false statement in application or information accompanying the application for the license, or in any report required under these regulations.
(D) Equipping the airplane with a type of engine not specified in the license or approved by the Secretary of Commerce.
(E) Remodeling the engine and using it to propel licensed aircraft without the aircraft having been first rerated as airworthy by the Secretary of Commerce.
(F) Remodeling the airplane structure and flying the airplane without having it rerated as airworthy by the Secretary of Commerce.

Sec. 34. Display and Surrender of License—The aircraft license must be carried in the craft whenever it is in service and must be conspicuously posted where it may be readily seen by passengers or inspectors. Whenever the craft is found to be unairworthy the license must be removed from the craft, and when the license is suspended or revoked, or when it is no longer in force, it shall be surrendered to the Secretary of Commerce. The license must be presented for inspection upon the demand of any passenger or of any authorized official or employee of the Department of Commerce.

Sec. 35. Licensing of Airships and Balloons—Until otherwise provided by regulations, the licensing of airships and balloons shall be in accordance with special orders of the Secretary of Commerce.

Sec. 36. Meaning of Airplane—Except as otherwise specifically shown, the word "airplane" as used in this chapter includes seaplane.
Appendix

CHAPTER 2

Marking of Licensed and Unlicensed Aircraft

Sec. 37. Marking of Aircraft, Law of—"The Secretary of Commerce shall by regulation . . . establish air traffic rules for the . . . identification of aircraft . . . ." (Sec. 3 (e).)

Sec. 38. Identification Marks for Government and Special Classes of Aircraft—(a) For aircraft belonging to the Government of the United States identification marks or symbols will be assigned in accordance with arrangements to be made with the affected departments.
(b) Licensed airplanes engaged in racing or experimental work, or specially licensed for other purposes, will be assigned special identification numbers or symbols.

Sec. 39. Identification Marks for Licensed Aircraft—A licensed aircraft shall bear an identification mark consisting of the license number of the aircraft preceded by—
(a) The roman capital letter C (meaning commercial) for craft engaged in the carriage of persons or property for hire or reward, or the United States mails, or in the furtherance of a business, or navigation from one place to another for operation in the conduct of a business;
(b) The roman capital letter S (meaning State) for craft used solely for governmental purposes and belonging to States, Territories, possessions, or municipalities; and
(c) The roman capital letter P (meaning private) for all other licensed aircraft.

The mark will be assigned to the aircraft upon the issuance of the aircraft license.

Sec. 40. Identification Marks for Unlicensed Aircraft—An unlicensed aircraft, except an aircraft belonging to the Government of the United States, shall not be flown without displaying an identification mark. The Secretary of Commerce will assign to such aircraft the proper identification mark upon application. The mark will consist of a number only. Where an airplane is purchased from the manufacturer thereof and it is not registered or identified prior to or at the time of purchase, it may be flown to the usual station of the purchaser provided it prominently displays a ferrying number which will be assigned by the manufacturer. Such number shall not be thereafter used, and immediate application for either a license or a permanent identification mark must be made. An unlicensed airplane, delivered to a purchaser by other than the manufacturer, may be flown under the identification mark assigned to the vendor, provided the vendee, within 30 days after the date of sale, transmits to the Secretary of Commerce the original bill of sale or a certified copy thereof.

Sec. 41. Places and Dimensions of Marks—Except as may be authorized under sections 40 and 42, identification marks shall be located as follows:
(a) On airplanes.—On the lower surface of the lower left wing and the upper surface of the upper right wing, the top of the letters or figures to be toward the leading edge, the height to be at least four-fifths of the minimum chord. If the lower left plane is less than one-half the length of the upper left plane, the letter or figures shall be on the upper surface of the upper left plane, as far to the left as possible. The height of the letters or figures shall be at least four-fifths of the minimum chord. The marks shall also appear on both sides of the rudder, of size as large as the surface will permit, leaving a margin of at least 2 inches.
(b) On airships.—On both sides near the maximum cross section and on the lower surface of the nose, the height to be equal to at least one-twelfth of the circumference at the maximum transverse cross section of the airship.
(c) On balloons.—Twice, near the maximum horizontal circumference, as far as possible from one another, the height to be equal to at least one-twelfth of the circumference of the balloon.
The width of the letters and figures of all marks shall be at least two-thirds of the height and the width of the stroke shall be at least one-sixth of the height. The letters and figures shall be painted in plain black type on a white background or in any color on any background, but there must be a strong contrast between the two. The letters and numbers must be uniform in shape and size. A space equal to at least one-half of the width of a letter shall be left between each figure or letter.

Sec. 42. Other Symbols and Marks—Except with the approval of the Secretary of Commerce, no design, mark, symbol, or description shall be placed upon aircraft if it modifies, adds to, subtracts from, or impairs or destroys the visibility of the identification mark assigned by the Secretary of Commerce.

Sec. 43. Identification Plate—The identification mark, with the name and residence of the owner, will be inscribed upon a metal plate furnished by the Secretary of Commerce. It must be affixed to the fuselage in a prominent place, but this section shall not apply to public aircraft of the United States.

CHAPTER 3

Requirements in the Operation of Aircraft

Sec. 44. Continuous Duty as to Flying Condition—After an aircraft is licensed and between the times that it is inspected for airworthiness by an inspector, the owner is
charged with the continuous duty of maintaining the aircraft in a good and proper state of repair and flying condition. For violation of this duty or of the inspections required in the next succeeding section the aircraft license will be suspended or revoked.

Sec. 45. Daily and Periodic Inspections—A licensed airplane shall be given a line inspection by the owner at least once within each 24 hours preceding flight, and the result thereof shall be entered in the log under the signature of the person making such inspection. The line inspection must be made to ascertain the working condition and state of repair of the—

1. Open control wires, all control wires and pulleys open to inspection through apertures, and all hinges on control surfaces.
2. Landing gear, wheels, fittings, and shock absorbers.
3. Fuselage parts open to visual inspection.
4. Main plane external bracing, including fittings and struts, external wires, cables, turnbuckles, and fabric or covering.
5. Control surface fabric or covering.
6. Engine exhaust manifolds and exhaust pipe extensions. The engine shall be given a warming-up test, during which the proper functioning of the engine instruments shall be ascertained.
7. Carburetors and fuel-feed lines open to visual inspection to insure proper functioning.
8. Cooling system and connections.
9. Cowling, to insure that the cowlings are properly secured and safetied.
10. Propellers, as to condition.

(B) After each 100 hours of flight, in addition to the line inspection, the airplane must be given a "periodic inspection" by the owner, and the result thereof must be entered in the log by the person making such inspection. This inspection must be made to ascertain the working condition and state of repair of the—

1. Engine installation.
2. Control systems throughout.
3. Propeller alignment.
4. Fuselage, including fittings, tail skid, and tail-skid shock absorbers.

Sec. 46. Government Inspections—The inspector or other authorized officer of the Secretary of Commerce shall be permitted by the owner or operator to inspect the licensed aircraft at any time and place for the purpose of determining its flying condition and state of repair. For such purposes the owner or operator shall give to such inspector or officer free and uninterrupted access to the aircraft and the field or shelter where the craft is located.

Sec. 47. Solo Flights with Passenger Planes—In addition to the requirements of section 14(B), licensed airplanes with newly installed engines, old, new, or reconditioned, and airplanes upon which major repairs have been made to the plane structure, must be first test flown by a licensed pilot without passengers for hire or reward.

Sec. 48. Carrying Passengers in Various Classes of Airplanes—A licensed pilot must not carry passengers for hire or reward in an airplane of any one of the classes specified in section 12(A) unless he has piloted an airplane of that class for at least two hours within the last preceding 90 days, except where he makes practice flights in the airplane of such class for at least one-half hour and takes it off and lands it at least ten times. At least three of the landings must be to a full stop.

Sec. 49. Seaplane Piloting—A licensed pilot must not carry passengers for hire or reward in a seaplane unless he has piloted a seaplane for at least two hours within the last preceding 90 days, except where he makes practice flights in the seaplane for at least one-half hour and takes it off and lands it at least ten times. At least three of the landings must be to a full stop.

Sec. 50. Pilot's Night Flying Qualifications—A transport pilot who has not had at least one hour of night solo flying within the last preceding 90 days must not pilot an airplane with passengers for hire or reward between one-half hour after sunset and one-half hour before sunrise, except where he makes night solo flights for at least one-half hour, and takes off and lands at night at least ten times. At least three of such landings shall be to a full stop.

Sec. 51. Carrying Passengers at Night—Licensed aircraft when engaged in carrying passengers for hire any time between one-half hour after sunset and one-half hour before sunrise must be equipped with landing lights, navigation lights, and Very's pistol (or approved equivalent).

Sec. 52. Compass Requirements—An airplane flying cross country 100 or more miles and an airplane, including a seaplane, operating over large bodies of water beyond the sight of land, must be equipped with a compass.

Sec. 53. Supplies and Equipment for Flights Over Water—An airplane flying over large bodies of water must be provided with an adequate supply of food and potable water, and if engaged in carrying passengers for hire or reward it must be equipped with a Very's pistol, or approved equivalent, and lights and life preservers or other flotation devices approved by the Secretary of Commerce.

Sec. 54. Repairs After Accident Reports—After repairs have been made on licensed aircraft which has been seriously damaged, the licensed owner shall make full report to the Secretary of Commerce of the kind and extent of repairs made to the craft.
Appendix

Sec. 55. Flying Seriously Damaged Airplanes—A licensed airplane which is seriously damaged must not be flown with passengers for hire or reward until it has been fully repaired and its flying condition approved by an inspector.

Sec. 56. Accident Reports—Where serious injury to person or property is suffered or death results in operating licensed aircraft, the owner of such aircraft shall immediately report, by telegram or telephone, to the Secretary of Commerce, the license number of the aircraft, and the time and place of the accident. All accidents in the operation of licensed aircraft which result in injury to the aircraft shall be reported without delay on the form shown in the form registry.

Sec. 57. Logs and Navigation Reports—The owner or operator of every licensed aircraft shall keep a navigation and engine log book, and shall quarterly transmit to the Secretary of Commerce a navigation summary report, in duplicate, showing the number of hours and the approximate number of miles the aircraft has flown during the quarter, the duration of the use of each engine, the engine installation and repairs, and the plane structure and rigging changes and repairs.

Sec. 58. Foreign Air Commerce—Until otherwise provided, the laws of the United States and regulations made thereunder with respect to the entry and clearance of vessels engaged in foreign commerce are hereby made applicable to aircraft engaged in foreign air commerce.

CHAPTER 4

Licensing of Pilots and Mechanics

Sec. 59. Pilots and Mechanics, Law of.—The Secretary of Commerce shall by regulation—

1. "Provide for the periodic examination and rating of airmen serving in connection with aircraft of the United States as to their qualifications for such service." (Sec. 3 (C).)

2. "The term 'airman' means any individual (including the person in command and any pilot, mechanic, or member of the crew) who engages in the navigation of aircraft while under way, and any individual who is in charge of the inspection, overhauling, or repairing of aircraft." (Sec. 9 (k).)

3. "It shall be unlawful . . . to serve as an airman in connection with any aircraft registered as an aircraft of the United States . . . without an airman's certificate or in violation of the terms of any such certificate." (Sec. 11 (a) (4)).

4. "Any person who violates any provision of subdivision (a) of this section . . . shall be subject to a civil penalty of $500." (Sec. 11 (b)).

Sec. 60. Application of the Law—For the purpose of this chapter, persons in command of licensed airplanes in flight will be classed as pilots, and persons repairing or adjusting licensed aircraft in flight and persons in charge of the ground inspection, overhauling, or repairing of licensed aircraft will be classed as mechanics. A workman or mechanic may engage in the repair or overhaul of licensed aircraft without being licensed if such repair or overhaul is in charge of a licensed mechanic.

Sec. 61. Classification of Pilots and Mechanics—Licensed pilots are classified as private pilots and commercial pilots. Commercial pilots are classified as transport pilots and industrial pilots. Licensed mechanics are classified as engine mechanics and airplane mechanics. A qualified person may hold a plurality of licenses. For example, a person may hold both classes of mechanics' licenses or both a pilot's and mechanic's license.

Sec. 62. Limitation of Pilots' Authority—(A) A transport pilot shall not pilot an unlicensed airplane carrying persons or property for hire or reward.

(B) An industrial pilot shall not pilot a licensed or unlicensed airplane carrying persons for hire or reward or an unlicensed airplane carrying property for hire or reward.

(C) A private pilot shall not pilot a licensed or unlicensed airplane carrying persons or property for hire or reward.

Sec. 63. Applications of Pilots and Mechanics—A candidate for a pilot's or mechanic's license must file an application for the license with the Secretary of Commerce. Blank forms will be sent to the applicant upon his request. He must also appear for physical examination before a physician designated or approved by the Secretary of Commerce.

Sec. 64. Character, Age, and Citizenship Qualifications—All applicants for pilot's licenses must be of good moral character. The minimum age requirements are 16 years for private pilots and 18 years for industrial and transport pilots. Private pilots may be citizens of any country. Industrial and transport pilots must be citizens of the United States or of a foreign country which grants reciprocal commercial piloting privileges to citizens of the United States on equal terms and conditions with citizens of such foreign country.

Sec. 65. Flying Experience Requirements—An applicant must have at least the following flying experience:

(A) Transport pilots.—One hundred hours of solo flying, of which at least five hours must have been within the last preceding 60 days prior to the filing of the application.

(B) Industrial pilots.—Fifty hours of solo flying, of which at least five hours must have been within the last preceding 60 days prior to the filing of the application.
Sec. 66. Pilots' Physical Qualifications—The physical qualifications for pilots are as follows:

(A) Private pilots.—Absence of organic disease or defect which would interfere with safe handling of an airplane under the conditions of private flying; visual acuity of at least 20/40 in each eye; less than 20/40 may be accepted if the pilot wears a correction; good judgment of distance; no diplopia in any position; normal visual fields and color vision; no organic disease of eye or internal ear.

(B) Industrial pilots.—Absence of any organic disease or defect which would interfere with the safe handling of an airplane; visual acuity of not less than 20/30 in each eye, although in certain instances less than 20/30 may be accepted if the applicant wears a correction to 20/20 in his goggles and has good judgment of distance without correction; good judgment of distance; no diplopia in any field; normal visual fields and color vision; absence of organic disease of the eye, ear, nose, or throat.

(C) Transport pilots.—Good past history; sound pulmonary, cardiovascular, gastrointestinal, central nervous and genito-urinary systems; freedom from material structural defects or limitations; freedom from disease of the ductless glands; normal central, peripheral, and color vision, normal judgment of distance; only slight defects of ocular muscle balance; freedom from ocular disease; absence of obstructive or diseased conditions of the ear, nose, and throat; no abnormalities of equilibrium that would interfere with flying.

(D) Waivers.—In the case of trained, experienced flyers, the Secretary of Commerce may grant waivers for physical defects designated as disqualifying by these regulations when in his opinion the experience of the pilot will compensate for the defect. A waiver once granted will hold indefinitely so long as the defect for which it was granted has not increased or unless canceled by the Secretary of Commerce.

Sec. 67. Exemptions from Physical Examination—Any applicant for a pilot's license or any pilot desiring renewal of his license who presents a properly certified copy of a Physical Examination for Flying made in the United States Army, Navy, or Marine Corps will be exempt from the physical examination prescribed in these regulations for a period of six months in the case of a transport pilot and for one year in the cases of industrial and private pilots, provided his physical qualifications, as shown by that physical examination, are not less than those required by these regulations for the class of license for which he applies.

Sec. 68. Pilots' Examinations and Tests—Unless exempt under these regulations, candidates must pass the following examinations and tests:

(A) Transport pilots.—
  1. Examination on the air-traffic rules.
  2. Practical and theoretical examination in elementary engine and plane mechanics and rigging and a theoretical examination in the fundamentals of meteorology and air navigation.
  3. Practical flight test, as follows:
     (a) Glide from 1,500 feet and land, in normal landing attitude, by wheels touching ground in front of and within 200 feet of a point designated by the examining officer. The engine shall idle from 1,500 feet, but the throttle may be used to clear the engine down to the 500-foot height.
     (b) Glide from 1,500 feet and land, in normal landing attitude, by wheels touching ground in front of and within 75 feet of a point designated by the examining officer.
  The free use of the engine is optional.
  (C) Maneuver at 800 feet around two pylons or buoys 1,500 feet apart, making a series of five figure 8 turns.
  (d) Fly over a triangular or rectangular course at least 100 miles, landing at place of take-off within at least five hours. This flight shall also include two obligatory landings, not at point of departure, when craft must come to rest. The course will be designated and the candidate will be furnished with route information by the examining officer at time of departure and the examining officer will determine whether the course was correctly followed and whether the obligatory landings were satisfactory. Upon the presentation of satisfactory proof that the candidate has engaged in solo cross-country flights a distance of at least 100 miles within one year preceding the date of his application, the flight specified in this subsection will be omitted.
  (e) Fly in emergency maneuvers, doing spirals, side slips, and recovering from stalls.

(B) Industrial pilots.—
  1. Examination on the air-traffic rules.
  2. The practical flight tests prescribed for transport pilots, except the distance for the cross-country flight shall be 60 miles.

(C) Private pilots.—
  1. Examination on the air-traffic rules.
  2. The practical flight test specified in subparagraph 3 (c) of section 68 (A) and three satisfactory landings to a full stop.

Where seaplanes are used in the flight tests prescribed for transport pilots, except the distance for the cross-country flight shall be omitted.

Sec. 69. Pilots' Exemptions—Candidates for pilots' licenses who make claim in their applications for and produce satisfactory proof of their right to the following exemptions will not be required to pass any of the examinations specified in section 68, except
he examination on the air-traffic rules, and will be licensed as follows, if they possess
the requisite physical qualifications:

(A) As transport pilots.—Persons who have had an average of at least five hours of
solo flying per month during the six months immediately prior to filing their applica-
tions, and who are—
1. Holders of airplane pilot ratings or certificates in the United States Army Air
Corps, who are on active-duty status in the Regular Army Establishment; or,
2. Holders of naval aviators or naval aviation pilots’ certificates in the United States
Navy or Marine Corps who are on active-duty status in the regular naval establish-
ment; or,
3. Persons actively engaged as pilots for not less than six months within the year
preceding the date of application in carrying the United States mail for the Post Office
Department of the United States or contractors thereof.

(B) As industrial pilots.—
1. Holders of Fédération Aéronautique Internationale Aviators’ certificates, issued
prior to May 20, 1926, provided the holders have had at least 100 hours of solo flying
during the year last preceding the filing of their applications with the Secretary of
Commerce.
2. The persons mentioned in subparagraph (A) who have not had the solo flying
required therein, but who have had at least 15 hours of solo flying in the six months
immediately prior to the filing of their application with the Secretary of Commerce.

(C) As private pilots.—
1. Holders of pilots’ ratings in the United States Army, Navy, or Marine Corps,
including the reserve organizations of such establishments, provided such holders have had
at least 50 hours of solo flying since the granting of such ratings;
2. The persons mentioned in subparagraph (B) who have had 50 hours of solo
flying since the granting of their certificates; or
3. Persons who have had 50 hours of piloting of airplanes carrying the United
States mails for the United States Post Office Department or a contractor thereof; or
4. Persons qualified as transport or industrial pilots and who elect to be licensed
as private pilots only.

All of the exemptions specified in this section are inapplicable to persons whom the
Secretary of Commerce finds have unsatisfactory piloting records, and all of these
exemptions shall cease at midnight of December 31, 1927.

Sec. 70. Place, etc., of Examinations.—Examinations for pilots’ licenses will be held
at such times and places as the Secretary of Commerce shall designate. Such exami-
 nations and tests will be conducted by an examining officer designated by the Secretary of
Commerce. Candidates for pilots’ licenses must furnish the airplanes in which the flight
tests are to be made, unless the Secretary of Commerce makes other provisions therefor.

Sec. 71. Duration and Renewal of Pilots’ Licenses.—(A) Unless sooner revoked, trans-
port pilots’ licenses shall remain in force for six months and industrial and private
pilots’ licenses one year from date of issuance.

(B) Licenses will be renewed for like periods where the prescribed physical condition
of the holder is shown by the same method as when the original license was issued,
except that a transport pilot must prove that he has had at least 10 hours of solo flying
within the last 60 days, industrial pilots at least 25 hours within the last year, and
private pilots at least 10 hours within the last year.

(C) If an applicant for renewal has not had the required solo flying and applies
for a renewal within six months after the expiration of his last license, a new license
will be issued to him upon proof of his physical qualifications and the passing of the
flight tests required for the class of license he last held.

(D) Upon application and for good cause shown a pilot’s license may be extended
by the Secretary of Commerce for a period of not more than 60 days.

Sec. 72. Mechanics’ Qualifications and Examinations.—(A) An engine mechanic will
be licensed upon passing an examination showing that he has sufficient knowledge of
inner-combustion engines, electricity, and power plant of airplane types, and can
properly inspect, repair, and overhaul airplane engines.

(B) An airplane mechanic will be licensed upon passing an examination showing that
he is qualified in plane structure, rigging, and control and can properly inspect,
repair, and overhaul airplane structures.

(C) The examinations for both classes of licenses will be both theoretical and prac-
tical, and the candidate must attain an average of at least 70 per cent. A citizen of
any country may be licensed if found qualified.

Sec. 73. Duration and Renewal.—Mechanics’ licenses, unless sooner suspended or
revoked, will remain in force for two years after date of issue and will be renewed for
additional two-year periods upon proof that during the term of the license the
holder has rendered services under his license during at least one-half of the term
thereof. Upon application and good cause shown, the Secretary of Commerce may extend
the license for a period of not more than 60 days.

Sec. 74. Suspension or Revocation of Licenses—Pilots’ and mechanics’ licenses will
be suspended or revoked for—

(A) Violating any provision of the air commerce act of 1926 or these regulations.

(B) Carelessness or inattention to duty.

(C) Unsound physical condition or any demonstration of incompetency in the opera-
tion or repair of aircraft.
Aircraft Year Book

(D) Being under the influence, or using, or having personal possession of intoxicating liquor, cocaine, or other habit-forming drugs while on duty.

(E) Refusal to exhibit license upon proper demand.

(F) Violating air traffic rules.

Sec. 75. Personal Possession of Pilot's Licenses—The pilot's license shall be kept in his personal possession when he is piloting aircraft, and must be presented for inspection upon the demand of any passenger or any authorized official or employee of the Department of Commerce.

Sec. 76. Pilots' Flight Records—A licensed pilot must keep an accurate record of his flying time.

Sec. 77. Meaning of Solo Flying—As used in these regulations, a person is engaged in solo flying when he is the sole operator of the controls and is in command of aircraft, in flight.

CHAPTER 5

Air Traffic Rules

Sec. 78. Law—"The Secretary of Commerce shall by regulation establish air traffic rules for the navigation, protection, and identification of aircraft, including rules as to safe altitudes of flight and rules for the prevention of collisions between vessels and aircraft engaged in commerce or noncommercial, or in foreign, interstate, or intrastate navigation in the United States, and whether or not the aircraft is registered or is navigating in a civil airway." (Statement of managers accompanying conference report, air commerce act of 1926.)

Sec. 79. Application of the Law—"In order to protect and prevent undue burdens upon interstate and foreign air commerce the air traffic rules are to apply whether the aircraft is engaged in commerce or noncommercial, or in foreign, interstate, or intrastate navigation in the United States, and whether or not the aircraft is registered or is navigating in a civil airway.

Sec. 80. Take-off Rules—The take-off shall not be commenced until there is no risk of collision with landing aircraft and until preceding aircraft are clear of the field.

Sec. 81. Flying Rules—(A) Right-side traffic—Aircraft flying in established civil airways, when it is safe and practicable, shall keep to the right side of such airways.

(B) Giving-way order—Craft shall give way to each other in the following order:

1. Airplanes.
2. Airships
3. Balloons, fixed or free.

An airship not under control is classed as a free balloon. Aircraft required to give way shall keep a safe distance, having regard to the circumstances of the case. Three hundred feet will be considered a minimum safe distance.

(C) Giving-way duties—If the circumstances permit, the craft, which is required to give way shall avoid crossing ahead of the other. The other craft may maintain its course and speed, but no engine-driven craft may pursue its course if it would come within 300 feet of another craft, 300 feet being the minimum distance within which aircraft engaged in military maneuvers and commercial aircraft engaged in local industrial operations, may come within proximity of each other in flight.

(D) Crossing—When two engine-driven aircraft are on crossing courses the aircraft with the other on its right side shall keep out of the way.

(E) Approaching—When two engine-driven aircraft are approaching head-on, or approximately so, and there is risk of collision, each shall alter its course to the right, so that each may pass on the left side of the other. This rule does not apply to cases where aircraft will, if each keeps on its respective course, pass more than 300 feet from each other.

(F) Overtaking—

1. Definition: An overtaking aircraft is one approaching another directly from behind or within 70° of that position, and no subsequent alteration of the bearing between the two shall make the overtaking aircraft a crossing aircraft within the meaning of these rules or relieve it of the duty of keeping clear of the overtaken craft until it is finally past and clear.

2. Presumption: In case of doubt as to whether it is forward or abaft such position it should assume that it is an overtaking aircraft and keep out of the way.

3. Altering course: The overtaking aircraft shall keep out of the way of the overtaken aircraft by altering its own course to the right, and not in the vertical plane.

(G) Height over congested and other areas—Exclusion of taking-off and landing, and except as otherwise permitted by section 86, aircraft shall not be flown—

1. Over the congested parts of cities, towns, or settlements except at a height sufficient to permit of a reasonably safe emergency landing, which in no case shall be less than 1,000 feet.

2. Elsewhere at height less than 500 feet, except where indispensable to an industrial flying operation.

(H) Height over assembly of persons—No flight under 1,000 feet in height shall be made over any open-air assembly of persons, except with the consent of the Secretary of Commerce. Such consent will be granted only for limited operations.

(I) Acrobatic flying—

1. Acrobatic flying means intentional maneuvers not necessary to air navigation.
2. No person shall acrobatically fly an aircraft—
(a) Over a congested area of any city, town, or settlement.
(b) Without the approval of the Secretary of Commerce, over any open-air assembly of persons, or below 2,000 feet in height over any established civil airway, or at any height over any certified airport or landing field, or within 1,000 feet horizontally thereof.
(c) No person shall acrobatically fly any airplane carrying passengers for hire or reward.

(Dropping objects.—Nothing which may endanger life or damage property shall be dropped or released from an airplane in flight except when necessary to the personal safety of pilot or passengers. In proper cases special permission will be granted by the Secretary of Commerce for dropping objects or material from aircraft engaged in industrial operations.

(K) Seaplanes on water.—Seaplanes on the water shall maneuver according to the laws and regulations of the United States governing the navigation of water craft, except as otherwise provided herein.

Sec. 82. Landing Rules.—(A) Up wind.—Landings shall be made up wind when practicable.

(B) Course.—If practicable, when within 1,000 feet horizontally of the leeward side of the landing field the airplane shall maintain a direct course toward the landing zone.

(C) Right over ground planes.—A landing plane has the right of way over planes moving on the ground or taking off.

(D) Giving way.—When landing and maneuvering in preparation to land, the airplane at the greater height shall be responsible for avoiding the airplane at the lower height, and shall, as regards landing, observe the rules governing overtaking aircraft.

(E) Distress landings.—An aircraft in distress shall be given free way in attempting to land.

Sec. 83. Lights.—(A) Angular limits.—The angular limits laid down in these rules will be determined as when the aircraft is in a normal flying position.

(B) Airplane lights.—Between one-half hour after sunset and one-half hour before sunrise airplanes in flight must show the following lights:

1. On right side a green light and on left side a red light, showing unbroken light between two vertical planes whose dihedral angle is 110° when measured to the right and left, respectively, from dead ahead and to be visible at least 2 miles.

2. At the rear and as far aft as possible a white light shining rearward, visible in a diagonal plane 140° bisected by a vertical plane through the line of flight and visible at least 3 miles.

(C) Airship lights.—Between one-half hour after sunset and one-half hour before sunrise airships shall carry and display the same lights that are prescribed for airplanes, excepting the side lights shall be doubled horizontally in a fore and aft position, and the light showing unbroken light between two vertical planes whose dihedral angle is 110° when measured to the right and left, respectively, from dead ahead and to be visible at least 2 miles.

3. At the rear and as far aft as possible a white light shining rearward, visible in a diagonal plane 140° bisected by a vertical plane through the line of flight and visible at least 3 miles.

(D) Balloon lights.—A free balloon, between one-half hour after sunset and one-half hour before sunrise, shall display one white light not less than 20 feet below the car, visible for at least 2 miles. A fixed balloon, or airship, shall carry three lights—red, white, and red—in a vertical line, one over the other, visible at least 2 miles. The top red light shall be not less than 20 feet below the car, and the lights shall be not less than 7 nor more than 10 feet apart.

(E) Lights when stationary.

1. Between one-half hour after sunset and one-half hour before sunrise all aircraft which are on the surface of water and not under control, or which are moored or anchored in navigation lanes, shall show a white light visible for at least 2 miles in all directions.

2. Balloon and airship mooring cables between one-half hour after sunset and one-half hour before sunrise shall show groups of three red lights at intervals of at least 100 feet measured from the basket, the first light in the first group to be approximately 20 feet from the lower red balloon lights. The object to which the balloon is moored on the ground shall have a similar group of lights to mark its position.

Sec. 84. Day Marks of Masts, etc.—By day, balloon and airship mooring cables shall be marked with tubular streamers not less than 8 inches in diameter and in the colors red, white, and red, with a horizontal space of 20 feet between colors. The object to which the balloon or airship is moored on the ground shall have the same kind of streamers, which must be in the same position as the lights specified herein.

Sec. 85 Signal.—(A) Distress.—The following signals, separately or together, shall, where practicable, be used in case of distress:

1. The international signal, S O S, by radio.

2. The international code flag signal of distress NC.

3. A square flag having either above or below it a ball, or anything resembling a ball.

4. A succession of white Very's pistol lights fired at short intervals.

(B) Weather signals.—At certificated lighted airports and fields and at emergency fields operated by the Secretary of Commerce, one red fusee, or approved equivalent, is a warning of approach of unfavorable flying weather, and two red fusees, or approved equivalents, are a definite signal that the weather conditions make it imperative that aircraft should proceed no farther.

(C) Signal when compelled to land.—When an aircraft is forced to land at night at a lighted airport it shall signal its forced landing by firing a red Very's light or making a series of short flashes with its navigation lights if practicable to do so.

(D) Fog signals.—In fog, mist, or heavy weather an aircraft on the water in navi-
gation lanes, when its engines are not running, shall signal its presence by a sound device emitting a signal for about five seconds in two-minute intervals.

Sec. 86. Deviation from Air-traffic Rules—The air-traffic rules may be deviated from when special circumstances render a departure necessary to avoid immediate danger or when such departure is required because of stress of weather conditions or other unavoidable cause.

CHAPTER 6
Miscellaneous

Sec. 87. Penalties—The Secretary of Commerce will notify all persons of the incursion of such penalties, and the person charged with the penalty may transmit to the Secretary of Commerce two copies of an affidavit stating the facts upon which the penalty was incurred, with a request for mitigation or remission. The Secretary of Commerce will then determine whether or not the penalty will be mitigated or remitted, and the persons making the request will be notified accordingly.

Sec. 88. Waiver of Regulations—The Secretary of Commerce may waive any of the requirements of these regulations when, in his discretion, the particular facts justify such waiver.

Sec. 89. Savings Clause—These regulations shall take effect midnight, December 31, 1926. Aircraft and airmen subject to these regulations may continue to operate without a license until July 1, 1927, if the application for the license is filed with the Secretary of Commerce prior to March 1, 1927, and the Secretary of Commerce has not acted thereon.

NOTE—Operators, in their own interests, should seek information from the aeronautics branch of the Department of Commerce, at Washington, or their field representatives, as to changes or amendments to the Air Commerce Regulations.
OFFICIAL WORLD AND AMERICAN AIR RECORDS

Established under Rules and Regulations of the

FEDERATION AERONAUTIQUE INTERNATIONALE

JANUARY 1, 1927

WORLD RECORDS

Confirmed by the

Federation Aeronautique Internationale


CLASS A—BALLOONS

1ST CATEGORY (600 CUBIC METERS)

<table>
<thead>
<tr>
<th>Duration</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>(France) Cormier</td>
<td>(France) Cormier</td>
</tr>
<tr>
<td>Aug. 10-11, 1924</td>
<td>July 1, 1922</td>
</tr>
<tr>
<td>22h. 31m.</td>
<td>864.173 km.</td>
</tr>
<tr>
<td>499.69 miles.</td>
<td></td>
</tr>
</tbody>
</table>

2ND CATEGORY (601-900 CUBIC METERS)

<table>
<thead>
<tr>
<th>Duration</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>(France) Dubois</td>
<td>(France) Cormier</td>
</tr>
<tr>
<td>May 14-15, 1922</td>
<td>July 1, 1922</td>
</tr>
<tr>
<td>23h. 28m.</td>
<td>864.173 km.</td>
</tr>
<tr>
<td>499.69 miles.</td>
<td></td>
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3RD CATEGORY (901-1200 CUBIC METERS)

<table>
<thead>
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<th>Duration</th>
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<tbody>
<tr>
<td>(France) Dubois</td>
<td>(France) Cormier</td>
</tr>
<tr>
<td>May 14-15, 1922</td>
<td>July 1, 1922</td>
</tr>
<tr>
<td>23h. 28m.</td>
<td>864.173 km.</td>
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<td>499.69 miles.</td>
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4TH TO 8TH CATEGORIES, INCLUSIVE

<table>
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<tr>
<th>Duration</th>
<th>Distance</th>
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</thead>
<tbody>
<tr>
<td>(Germany) Kaulen</td>
<td>(Germany) Berliner</td>
</tr>
<tr>
<td>Dec. 13-17, 1913</td>
<td>Feb. 8-10, 1914.</td>
</tr>
<tr>
<td>87 hours.</td>
<td>3052.7 kms.</td>
</tr>
<tr>
<td>1896.9 miles.</td>
<td>10,880 feet.</td>
</tr>
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<td>35,421 feet.</td>
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CLASS B—AIRSHIPS

RETURNING TO POINT OF DEPARTURE

<table>
<thead>
<tr>
<th>Duration</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Italy) Castracane&amp; Castruccio</td>
<td>(Italy) Castracane&amp; Castruccio</td>
</tr>
<tr>
<td>15 hours.</td>
<td>810 kms.</td>
</tr>
<tr>
<td>503.3 miles.</td>
<td>3080 meters.</td>
</tr>
<tr>
<td>10,102 feet.</td>
<td></td>
</tr>
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</table>

CLASS C—AIRPLANES

RETURNING TO POINT OF DEPARTURE WITHOUT REFUELING

<table>
<thead>
<tr>
<th>Duration</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>(France) Drouhin&amp; Landry</td>
<td>(France) Drouhin&amp; Landry</td>
</tr>
<tr>
<td>Farman biplane, Farman 450 h.p., Etampes-Chartes, Aug. 7-8-9, 1925.</td>
<td>Farman biplane, Farman 450 h.p., Etampes-Chartes, Aug. 7-8-9, 1925.</td>
</tr>
<tr>
<td>45h. 11m. 59s.</td>
<td>4400 kms.</td>
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<tr>
<td>2734 miles.</td>
<td></td>
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<table>
<thead>
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<tr>
<td>5396 kms.</td>
<td>3313 miles.</td>
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<td>12,442 meters.</td>
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<table>
<thead>
<tr>
<th>Duration</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>448.171 k.p.h.</td>
<td>278.480 m.p.h.</td>
</tr>
</tbody>
</table>

373
### SPEED FOR SPECIFIED DISTANCES

<table>
<thead>
<tr>
<th>Speed for 100 Kilometers</th>
<th>Speed for 500 Kilometers</th>
</tr>
</thead>
<tbody>
<tr>
<td>401.79 k.p.h.</td>
<td>306.66 k.p.h.</td>
</tr>
<tr>
<td>249.342 m.p.h.</td>
<td>196.567 m.p.h.</td>
</tr>
</tbody>
</table>

### CLASS C—WITH USEFUL LOAD OF 500 KILOGRAMS (1102.31 lbs.)

- **RETURNING TO POINT OF DEPARTURE**
- **Duration** (Switzerland) W. Mittelholzer and G. Zinsmaier, Merkur-Dornier, 6 B.M.W., 460 h.p. ea., at Dubendorf, June 24, 1926. 14h. 43m. 29.28.
- **Distance** (Switzerland) W. Mittelholzer and G. Zinsmaier, Merkur-Dornier, 6 B.M.W., 460 h.p. ea., at Dubendorf, June 24, 1926. 2301 k.ms. 1479.7 miles.
- **Altitude** (United States) Lt. H. R. Harris, U.S.A.S., U.S. Army TP-1, Liberty 400 h.p., at McCook Field, Dayton, Ohio, May 21, 1924. 8528 meters. 28,143 feet.

### CLASS C—WITH USEFUL LOAD OF 1000 KILOGRAMS (2204.62 lbs.)

- **RETURNING TO POINT OF DEPARTURE**
- **Duration** (Switzerland) W. Mittelholzer and G. Zinsmaier, Merkur-Dornier, 6 B.M.W., 460 h.p. ea., at Dubendorf, June 29, 1926. 10h. 5m. 0.8s.
- **Distance** (Switzerland) W. Mittelholzer and G. Zinsmaier, Merkur-Dornier, 6 B.M.W., 460 h.p. ea., at Dubendorf, June 29, 1926. 869.9 miles.
- **Altitude** (France) Lucien Coupé, Breguet Sesquiplane, Type 19, Farman 500 h.p., at Toussus-le-Noble, March 17, 1926. 6540 meters. 21,457 feet.

### CLASS C—WITH USEFUL LOAD OF 2000 KILOGRAMS (4409.24 lbs.)

- **RETURNING TO POINT OF DEPARTURE**
- **Duration** (France) Robert Bajac and de Lamothe, Liore and Olivier biplane, Type 21, 2 Jupiter 420 h.p., Sept. 16, 1926. 4h. 4m. 13.2s.
- **Distance** (France) Robert Bajac and de Lamothe, Liore and Olivier biplane, Type 21, 2 Jupiter 420 h.p., Sept. 16, 1926. 500 kms.
- **Altitude** (France) L. Bossoutrot, super Farman-Goliath, 4 Farman 500 h.p., at Le Bourget, Nov. 12, 1925. 310.68 miles. 16,371 feet.

### CLASS C—REFUELED IN FLIGHT

- **RETURNING TO POINT OF DEPARTURE**
- **Duration** (United States) Lieutenants Smith and Richter, U.S.A., DH-4B, Liberty 400 h.p., at Rockwell Field, San Diego, Calif., Aug. 27-28, 1923. 37h. 15m. 14.8s.

### CLASS C-2—SEAPLANES

- **RETURNING TO POINT OF DEPARTURE WITHOUT REFUELING**
- **Distance** (United States) Lts. F. W. Weed and J. D. Price, U.S. Navy CS-2 seaplane, Wright 585 h.p., at Washington, D. C., July 11-12, 1924. 1600 kms. 994.19 miles.
Appendix

DISTANCE

DURACI0N

ALTITUDE

SPEED FOR SPECIFIED DISTANCES

SPEED FOR 100 KILOMETERS

SPEED FOR 500 KILOMETERS

SPEED FOR 1000 KILOMETERS

CLASS C-2—WITH USEFUL LOAD OF 500 KILOGRAMS

(1102.31 lbs.)

RETURNING TO POINT OF DEPARTURE

DURATION

DISTANCE

ALTITUDE

SPEED FOR 100 KILOMETERS

SPEED FOR 200 KILOMETERS

SPEED FOR 500 KILOMETERS

SPEED FOR 1000 KILOMETERS

CLASS C-2—WITH USEFUL LOAD OF 1000 KILOGRAMS

(2204.62 lbs.)

RETURNING TO POINT OF DEPARTURE

DURATION

DISTANCE

ALTITUDE

SPEED FOR 100 KILOMETERS

SPEED FOR 500 KILOMETERS

SPEED FOR 1000 KILOMETERS

CLASS C-2—WITH USEFUL LOAD OF 2000 KILOGRAMS

(4409.24 lbs.)

RETURNING TO POINT OF DEPARTURE

DURATION

DISTANCE

ALTITUDE

(2204.62 lbs.)

(4409.24 lbs.)

(United States) Maj. Mario de Bernardi, Macchi S-39, Fiat 800 h.p., at Hampton Roads, Norfolk, Va., Nov. 17, 1926.

(United States) Maj. Mario de Bernardi, Macchi S-39, Fiat 800 h.p., at Hampton Roads, Norfolk, Va., Nov. 17, 1926.

(United States) Maj. Mario de Bernardi, Macchi S-39, Fiat 800 h.p., at Hampton Roads, Norfolk, Va., Nov. 17, 1926.

(United States) Maj. Mario de Bernardi, Macchi S-39, Fiat 800 h.p., at Hampton Roads, Norfolk, Va., Nov. 17, 1926.


(Italy) A. Passaleva, Savoia Marchetti S-55, seaplane, Isotta Fraschini 500 h.p. ea., at Sesto Calende (Lac Majeur), Dec. 23, 1926.

(Italy) A. Passaleva, Savoia Marchetti S-55, seaplane, Isotta Fraschini 500 h.p. ea., at Sesto Calende (Lac Majeur), Dec. 23, 1926.

(Italy) A. Passaleva, Savoia Marchetti S-59, seaplane, Isotta Fraschini 350 h.p. ea., at Sesto Calende (Lac Majeur), Dec. 23, 1926.

(Italy) A. Passaleva, Savoia Marchetti S-55, seaplane, Isotta Fraschini 500 h.p. ea., at Sesto Calende (Lac Majeur), Dec. 23, 1926.

(Italy) A. Passaleva, Savoia Marchetti S-55, seaplane, Isotta Fraschini 500 h.p. ea., at Sesto Calende (Lac Majeur), Dec. 23, 1926.

(Italy) A. Passaleva, Savoia Marchetti S-55, seaplane, Isotta Fraschini 500 h.p. ea., at Sesto Calende (Lac Majeur), Dec. 23, 1926.

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(Italy) A. Passaleva, Savoia Marchetti S-55, seaplane, Isotta Fraschini 500 h.p. ea., at Sesto Calende (Lac Majeur), Dec. 23, 1926.

(Italy) A. Passaleva, Savoia Marchetti S-55, seaplane, Isotta Fraschini 500 h.p. ea., at Sesto Calende (Lac Majeur), Dec. 23, 1926.

(United States) Lt. H. E. Halland, Curtiss S-5 seaplane, Liberty 500 h.p., at St. Raphael, May 13, 1926.

(Italy) A. Passaleva, Savoia Marchetti S-55, seaplane, Isotta Fraschini 500 h.p. ea., at Sesto Calende (Lac Majeur), Dec. 23, 1926.

(Italy) A. Passaleva, Savoia Marchetti S-55, seaplane, Isotta Fraschini 500 h.p. ea., at Sesto Calende (Lac Majeur), Dec. 23, 1926.

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SPEED FOR 100 KILOMETERS

SPEED FOR 500 KILOMETERS

SPEED FOR 1000 KILOMETERS

CLASS C-2—SEAPLANES

GREATEST PAY LOAD CARRIED TO AN ALTITUDE OF 2000 METERS (6561.7 feet)

CLASS D—GLIDERS

CLASS G—HELICOPTERS

AMERICAN RECORDS

Confirmed by the

CONTEST COMMITTEE

NATIONAL AERONAUTIC ASSOCIATION OF U. S. A.

CLASS A—BALLOONS

1ST CATEGORY (600 CUBIC METERS)

2ND CATEGORY (601-900 CUBIC METERS)

3RD CATEGORY (901-1200 CUBIC METERS)

4TH TO 8TH CATEGORIES, INCLUSIVE (GRAND FREE-FOR-ALL RECORD)

CLASS B—AIRSHIPS

RETURNING TO POINT OF DEPARTURE
Appendix

CLASS C—AIRPLANES
RETURNING TO POINT OF DEPARTURE WITHOUT REFUELING

<table>
<thead>
<tr>
<th>Duration</th>
<th>Distance</th>
<th>Altitude</th>
<th>Maximum Speed (Km.)</th>
<th>Speed for 1000 Kilometers</th>
</tr>
</thead>
</table>

<p>| CLASS C—WITH USEFUL LOAD OF 500 KILOGRAMS (1102.31 lbs.) RETURNING TO POINT OF DEPARTURE |</p>
<table>
<thead>
<tr>
<th>Duration</th>
<th>Distance</th>
<th>Altitude</th>
<th>Maximum Speed (Km.)</th>
<th>Speed for 1000 Kilometers</th>
</tr>
</thead>
</table>

<p>| CLASS C—WITH USEFUL LOAD OF 1000 KILOGRAMS (2204.62 lbs.) RETURNING TO POINT OF DEPARTURE |</p>
<table>
<thead>
<tr>
<th>Duration</th>
<th>Distance</th>
<th>Altitude</th>
<th>Maximum Speed (Km.)</th>
<th>Speed for 1000 Kilometers</th>
</tr>
</thead>
</table>

<p>| CLASS C—WITH USEFUL LOAD OF 2000 KILOGRAMS (4409.24 lbs.) RETURNING TO POINT OF DEPARTURE |</p>
<table>
<thead>
<tr>
<th>Duration</th>
<th>Distance</th>
<th>Altitude</th>
<th>Maximum Speed (Km.)</th>
<th>Speed for 1000 Kilometers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class</td>
<td>Speed for 100 Kilometers</td>
<td>Speed for 500 Kilometers</td>
<td>Speed for 1000 Kilometers</td>
<td>Speed for 2000 Kilometers</td>
</tr>
<tr>
<td>-------</td>
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<td>--------------------------</td>
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<td>---------------------------</td>
</tr>
<tr>
<td>Class C—With Useful Load of 500 Kilograms (1,023 lbs.) Returning to Point of Departure</td>
<td>(No Record)</td>
<td>(No Record)</td>
<td>(No Record)</td>
<td>(No Record)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class</th>
<th>Duration</th>
<th>Altitude</th>
<th>Distance (Airline)</th>
<th>Speed</th>
<th>Speed for Specified Distances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class C—Refueled in Flight Returning to Point of Departure</td>
<td>(No Record)</td>
<td>(No Record)</td>
<td>37h. 15m. 14.8s.</td>
<td>377.82 &lt; k.p.h. 234.772 m.p.h.</td>
<td></td>
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<thead>
<tr>
<th>Class</th>
<th>Duration</th>
<th>Altitude</th>
<th>Distance</th>
<th>Speed</th>
<th>Speed for Specified Distances</th>
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<th>Altitude</th>
<th>Distance</th>
<th>Speed</th>
<th>Speed for Specified Distances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class C2—With Useful Load of 500 Kilograms (1,023 lbs.) Returning to Point of Departure</td>
<td>Lt. H. E. Halland, U.S.N., F-5-L, flying boat, 2 Liberty 400 h.p., at San Diego, Calif., June 6, 1923.</td>
<td>7h. 35m. 54s.</td>
<td>576 kms. 358 miles.</td>
<td>259.328 k.p.h. 161.14 m.p.h.</td>
<td></td>
</tr>
</tbody>
</table>
**Appendix** 379

**Speed for 100 Kilometers**  
179.497 k.p.h.  
111.534 m.p.h.

**Speed for 500 Kilometers**  
(No Record)

**Speed for 1000 Kilometers**  
(No Record)

---

**CLASS C-2—WITH USEFUL LOAD OF 1000 KILOGRAMS**  
(2204.62 lbs.)

**Returning to Point of Departure**

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>5h. 28m. 43s.</td>
</tr>
</tbody>
</table>
248.5 miles.  
7979 feet. |
| Speed for 100 Kilometers | (No Record)  
2 Wright T-2 535 h.p., at Bay Shore, Baltimore, Md., Oct. 25, 1924. |
| Speed for 500 Kilometers | (No Record) |
| Speed for 1000 Kilometers | (No Record) |

---

**CLASS C-2—WITH USEFUL LOAD OF 2000 KILOGRAMS**  
(4409.24 lbs.)

**Returning to Point of Departure**

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance</td>
<td>1h. 49m. 11.9s.</td>
</tr>
</tbody>
</table>
| Altitude | Lt. H. E. Halland, U.S.N., F-3-L, flying boat, 2 Liberty 400 h.p., at San Diego, Calif., June 7, 1923.  
4885 feet. |
| Speed for 100 Kilometers | (No Record)  
2 Wright T-2 535 h.p., at Bay Shore, Baltimore, Md., Oct. 25, 1924. |
| Speed for 500 Kilometers | (No Record) |
| Speed for 1000 Kilometers | (No Record) |

---

**CLASS C-2—SEAPLANES**

**Greatest Pay Load Carried to an Altitude of 2000 Meters (6561.7 feet)**

| Duration | (No Record) |
| Distance | (No Record) |
| Altitude | (No Record) |

---

**CLASS D—GLIDERS**

**CLASS G—HELICOPTERS**

| Distance (Airline) | (No Record) |

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