The AIRCRAFT YEAR BOOK

For 1934

HARRISON BRAND, JR.
AIRCRAFT INDUSTRIES ASSOCIATION
SHOREHAM BUILDING
WASHINGTON 5, D. C.

AIRCRAFT YEAR BOOK, 1934

PITTSBURGH
from the Pennsylvania Air Lines.

The
AIRCRAFT
YEAR BOOK

(Registered U. S. Patent Office)

For 1934

VOLUME SIXTEEN

Published by

the

AERONAUTICAL CHAMBER OF COMMERCE
OF AMERICA, INC.
22 EAST FORTIETH STREET, NEW YORK

MANUFACTURED COMPLETE BY
THE COLONIAL PRESS INC., CLINTON, MASS.

ENGRAVINGS BY TRI-ART PHOTO ENGRAVING CO. INC., NEW YORK

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AERONAUTICAL POLICY

Increased Speed and Efficiency—United States Leads World in Technical Development—The National Aviation Policy—Need for New Government Programs.

MORE than 30,000 airplanes and 50,000 aircraft engines have been built in the United States since the Wright brothers invented the flying machine 30 years ago; yet at no time has there been such notable development in flying equipment as that of the last year in American aviation.

The airplane and all its parts were subjected to greater technical improvement in 1933 than during any similar period in the history of flight. The commercial transport plane was made 60 miles an hour faster, more reliable, more efficient and more comfortable, assuring it a position of lofty eminence above all other agencies of transportation, the symbol in fact of a new era of speed in travel and trade across the country and between the nations. At the same time the military airplane was developed to fly much faster than ever before and, type for type, perform with far greater efficiency at salient heights in fight, raid or patrol.

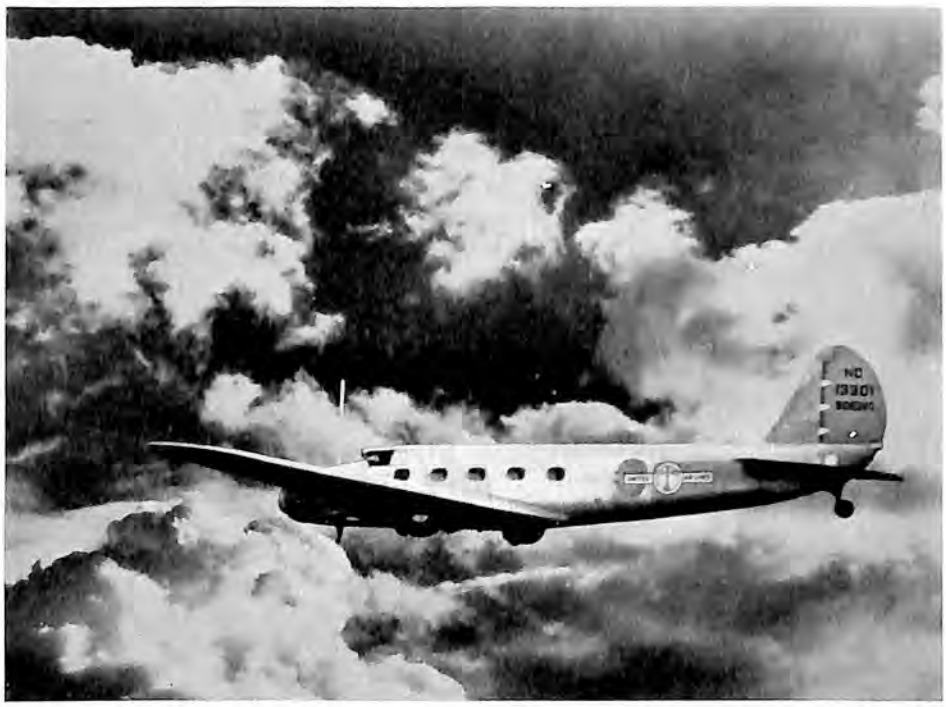
That gratifying technical development in the United States was generally admitted to be more advanced than elsewhere in the world; and it was attributed not so much to superior engineering genius as to other conditions which fostered more rapid growth.

It was not the result of one year's planning or building. It was the fruit of a clearly defined national policy established over the years of experimentation which followed the World War. It was based on recognition of the need for continuous effort in the design, construction and operating branches of both commercial and military aviation. The national policy grew out of official investigation and research into all phases of aeronautics.

The American Aviation Mission after studying European aeronautic plans in 1919 reported to President Wilson that it is impossible to suddenly create aerial equipment to meet a national emergency, that the "training of personnel, including engineering, production, inspection, maintenance and operating forces—covering some 50 distinct trades and some 75 industries—has proved itself a stupendous task when undertaken upon the basis of the war emer-

gency alone. Past experience and every economic consideration point to the vital need for the formulation by the United States of a definite, comprehensive and continuing policy for the development of every phase of the aircraft art."

The Lassiter Board of the Army in a confidential report dated October 11, 1923, said in part: "The aircraft industry in the United States at present is entirely inadequate to meet peace and war requirements; it is rapidly diminishing and under present conditions will soon practically disappear."



THROUGH SCENIC WONDERS

One of the new Boeing, twin Wasp-powered, transport planes used in the New York-Chicago, coast-to-coast service and on other divisions of United Air Lines.

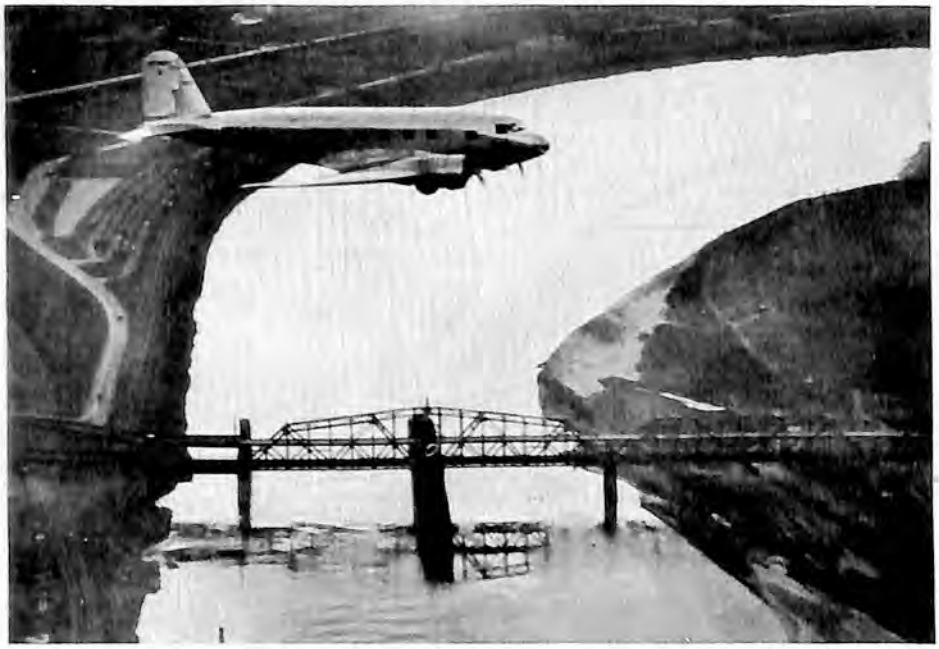
The National Advisory Committee for Aeronautics in its annual report for 1924 recommended that among other steps, "the Army, Navy and postal air services should agree upon a balanced program setting forth from time to time the probable requirements of the Government," etc.

The Lampert Committee of Congress following an exhaustive investigation reported in 1925 that "the aviation industry is an essential part of national defense and must be maintained," and

further, recommended 23 changes in the Government's methods of dealing with aviation.

At approximately the same time the President's Aircraft Board, known as the Morrow Committee, reported the results of its hearings, and recommended immediate adoption of several programs. Thus the national aviation policy became established. It remained for Congress to act.

Congress translated the policy into definite programs in 1926 when it passed the Air Commerce Act, the Navy 5-Year Aircraft



WATERWAY, RAILWAY, HIGHWAY AND AIRWAY

One of Transcontinental & Western Air's Wright Cyclone-powered Douglas air liners over three kinds of surface traffic arteries at Kansas City, Mo.

Program Act and the Army 5-Year Aircraft Program Act.

The Air Commerce Act of 1926 was designed, in conjunction with policies of the Post Office Department and contract air mail legislation, to lay the foundation of a great nation-wide civil aeronautics system. It established an Aeronautics Branch in the Department of Commerce, with powers of regulation, licensing and supervision over all interstate flying. The Branch was also charged with the development of the Federal Airways System.

The Army and Navy program acts of 1926 were in accord

with the national policy of maintaining the air forces at an authorized strength, which at the time seemed adequate when compared to the air force programs of other nations. They authorized 1,800 serviceable planes for the Army Air Corps and 1,000 serviceable planes for the Bureau of Aeronautics of the Navy. They provided the legal machinery for a continuous construction program, the orders for military equipment, together with the development of business from air transport and private flying, promising to maintain the aircraft factories in a healthy state.

It was recognized that the aircraft plants must be encouraged

COMFORT IN A MODERN TRANSPORT

Men, women and children enjoying their ride in one of the new Cyclone-powered Curtiss-Wright Condor transports operated by American Airways on its New York-Chicago and southern transcontinental routes.

to maintain design staffs and up-to-date construction facilities through the medium of a reasonable number of military orders. The air line network was to be developed to a state which would render it of service to all the people and in time enable it to be self-supporting. Air mail contracts were to help defray the cost of developing the air transport system. Private flying was to be encouraged by the Department of Commerce.

The programs established in 1926 were successful in so far as they were carried out. The Army and Navy started to build

its equipment to the authorized strength. The Navy succeeded temporarily. The Army Air Corps was handicapped by lack of funds. Gradually both branches of the defense establishment fell behind because Congress did not make the necessary appropriations. Yet the Army and Navy had the most efficient aircraft in the world. Their trouble was that they did not have enough.

The Aeronautics Branch of the Department of Commerce established the Federal Airways System which even now is a model

NEW OCEAN AIR LINER

The new Sikorsky S-42, with four Pratt & Whitney Hornet engines, first of the Pan American Airways new fleet of over-water transports. It has accomodations for 32 passengers and a half ton of mail.

for the world. Under the supervision of the Post Office Department, the contract air mail system had encouraged the growth of the air transport network to a point where the mail lines, on January 1, 1934, were doing about 150,000 miles of flying every 24 hours, nearly half of it at night. They were carrying increasing loads of passengers and express and were capable, under a new method of payment, of flying the mails at a profit to both the operators and the Post Office Department.

Private flying had shown considerable promise prior to the depression. The Aeronautics Branch and the industry had cooperated to the fullest extent in fostering the use of planes by business organizations and other private owners. Despite the fact that the depression retarded normal growth the United States at the beginning of the year had more private pilots and more privately owned planes than all other nations combined.

Those familiar with the progress and failures of the last eight years were convinced of the immediate need for a new and official examination of the national aviation policy, with the idea of setting up new programs more in accord with present conditions. They knew that eight years elapsing since the formation of the old programs had brought forth extraordinary technical development, a general change in aviation programs of other nations and a more clearly defined perspective of the significance of aviation in the near future. While the fast and practical airplane had been only a promise eight years ago, it had now become an accomplished fact, a vital thing which had demonstrated its usefulness in peace and war. An examination of the national aviation policy would determine the weak spots in the old programs and point the way for immediate improvements.

The year 1934 promised to bring about a restatement of the national policy, through new programs authorized by Congress providing for expansion of the air mail service, promotion of private flying, encouragement of the manufacturing industry and development of the air forces to a numerical strength at least equal to those of other nations.

THE MARTIN BOMBER

One of the mystery planes developed for the Army Air Corps.

CHAPTER II

AIR POWER

Comparative Combat Airplane Strength—Air Force Development Programs—Struggle for Supremacy—Reserve Air Power—Aircraft Production and Sales—A National Institution—The Aeronautical Chamber—Outlook for 1934—Delay in Manufacturers Code—American Society of Mechanical Engineers—Institute of the Aeronautical Sciences—Manufacturers Aircraft Association—National Aeronautic Association—Society of Automotive Engineers.

AMONG the air powers of the world at the end of 1933 the United States ranked first in technical development, first in military and naval aircraft performance, first in air transport operations and fourth in numbers of combat planes in its air forces. At the same time there was every indication that the year 1934 would witness accelerated growth of national aviation, air forces and reserve air strength throughout the world.

The most logical and satisfactory method of determining the relative combat air strength of nations is to compare what they have on hand in the form of combat planes readily available on the first day of a possible emergency, including in the combat categories, pursuit-fighters, bombers, patrol and observation machines, because those types are equipped with armament. While it is impossible to be specific because foreign powers try to conceal their true figures, reliable sources of information have provided the following approximate totals which are accurate enough for purposes of comparison.

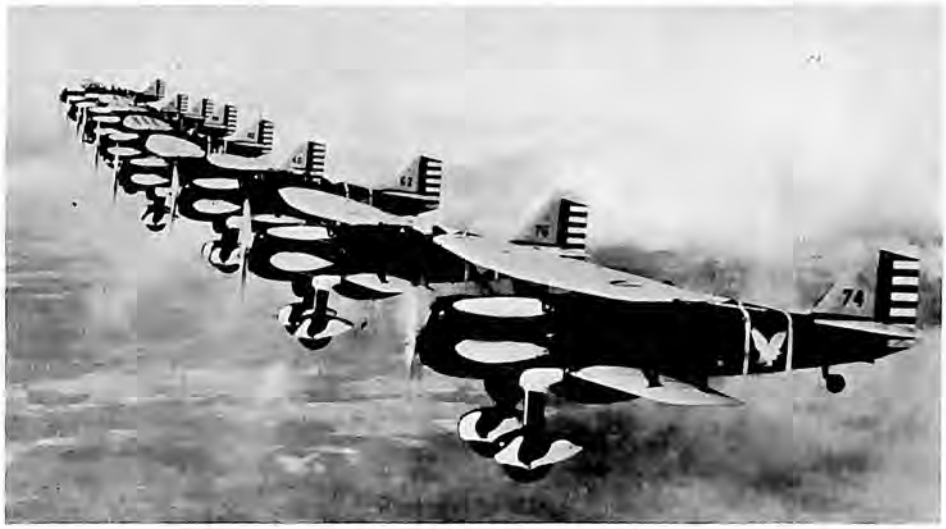
Early in 1934, France possessed the greatest number of combat planes, approximately 4,000, including first and secondary reserves at home and in the colonies. The French system of maintaining 100 per cent reserve equipment with the squadrons and a secondary reserve in the warehouses accounted for the relatively large number of machines available as compared to those in actual service.

Great Britain had the second most powerful air force in the world at the end of 1933, with approximately 2,500 combat planes, including 800 in active service, 100 per cent reserves and 900 modern machines distributed among the air forces in the British possessions.

Italy ranked third in air strength, numerically, with approximately 2,300 combat machines, including reserves in several categories such as seaplane fighters, bombers and long distance reconnaisance planes.

The United States ranked fourth, numerically, with approximately 1,700 combat planes in the military and naval services. In both speed and performance, the American combat machines in service were superior to those of all other powers. The air forces of the United States lagged behind only in numbers.

Russia was the fifth air power early in 1934. The Soviet Red Air Fleet had approximately 2,200 combat planes, which would



HAWKS ON THE WING

Air Corps formation of Curtiss Conqueror-powered Hawks near Selfridge Field, Mich.

make Russia rank above the United States, except for the fact that 1,200 of the Russian machines were not modern enough in performance qualities to warrant inclusion in the same category with the first-class fighting equipment of other powers. Thus Russia was behind the United States. Her obsolete machines would be effective, however, if used against an enemy lacking better planes.

Japan ranked next, very close to the United States, numerically, with approximately 1,500 combat planes, including 100 per cent reserves. About 300 of the Japanese planes, like Russia's 1,200 obsolete machines, could not be compared favorably with the others.

A disputed point in any consideration of air power was Germany's position in 1934. The Hitler Government in 1933 had embarked

upon an air force program designed to give the Reich parity among her neighbors. The German aircraft factories were producing machines which were as fast and efficient as any in Europe, though there was no record of pure military types having been flown publicly. The fact that Germany had an excellent air transport system, a Government development program and the technical and plant facilities to make it effective really gave her the status of a first-class air power.

In actual air force strength Poland and Czechoslovakia had

A FLYING WEDGE

Training and dependable equipment are requisites of this wedge formation flown by the 27th Pursuit Squadron of the Air Corps with Wasp-powered Boeings at Selfridge Field, Mich. PHOTO COPYRIGHT BY THE DETROIT NEWS.

enough first-class combat planes to classify them as secondary air powers. Each had about 400 combat planes. However, in reserve air power, which implies ability to increase aircraft production after a declaration of war, both nations were relatively weak, because of their geographical positions and the fact that their aircraft production facilities, though efficient, were limited to only a few plants.

Air Force Development Programs

France planned to spend nearly a billion francs for late model

combat planes, beginning her new construction program in 1934. The French, having numerical supremacy, were to concentrate on performance; and all the designers and manufacturers late in 1933, working under Government subsidies, set out to produce in each category combat equipment which would out-maneuver the best of other nations.

Great Britain's plan was precisely the reverse of the French, in that the British had already reached a stage of efficiency and performance unequaled in Europe. The Air Ministry had concentrated on high speed and climb since 1931. Speed had been combined with armament capacity and range during the last three years. The

A NEW NAVY SCOUT

The Grumman two-place Navy scout biplane with Wright Cyclone engine and retractable wheels.

new British plan called for numerical strength; and the factories were to start on large production orders in 1934.

Italy was quite satisfied with her numerical strength in 1933; but her policy did not contemplate the slightest halt in efforts to have the fastest and most efficient air squadrons in Europe.

Russia planned to produce 1,000 additional planes for the Red Air Fleet during 1934. The technical departments of the Soviet Government were concentrating on speed and cruising range of large bombers, the tactical requirements of the air force demanding long range operations to concentrate the maximum strength upon

an objective in any military activity conceived as possible with Russia.

Japan's aircraft factories had been producing equipment along the lines of an air force expansion program started in 1932. The army air force was being equipped with long range bombers and pursuit planes for an emergency in Asia. The naval aviation units were provided with new fighters during 1933. The program for 1934 contemplated replacing with new types all planes in the fleet, including the flying boat squadrons, seaplane bomber units and the planes aboard all battleships, cruisers and carriers. The Japanese aviation program was expanded during 1933 to include additional units for regular service in Manchukuo.

The situation in the United States is summarized in the chapters on army and naval aviation. The advisability of adopting aircraft

FLYING FORTRESS FOR THE AIR CORPS

First of the fast all-metal Curtiss A-12 attack monoplanes, with 700 horsepower Wright Cyclone engine, delivered to the Air Corps, it carries five machine guns and a large bomb.

procurement programs more in keeping with the universal unrest and uncertain conditions prevailing in various quarters of the world was receiving attention among increasing numbers of officials and others who recognized the apparent hopelessness of any constructive disarmament plan at the present time. Plans drawn up by foreign governments and presented to the League of Nations were invariably nationalistic, sacrificing the strength of other nations in the cause of a so-called peace, but showing no real will to disarm or limit armaments at home. The proposals so far as they concerned the United States could not find the slightest favor among Americans familiar with the true conditions.

The posts of Assistant Secretary of War and Assistant Secretary of the Navy for aeronautics, charged with developing aviation in

those departments according to the laws passed during 1926, were abolished by the new Administration which took office on March 4, 1933.

Toward the end of 1933 it became apparent to all trained observers that American aviation was to be scrutinized through the medium of official investigations as it had been on two former occasions, after the war and in 1925. Those familiar with the facts hoped for constructive results, but they were mindful of other factors which, to say the least, were ominous.

Past experience has shown that European competitors of American aircraft manufacturers have never been slow to take advantage of such investigations, particularly when they might use statements made by irresponsible witnesses to discredit the competing American aeronautical equipment in foreign markets.

TWO-PLACE PURSUIT SHIP

The Consolidated Y1P-25, with Curtiss G1V-1570 Conqueror engine, for the Air Corps, carries its wheels in the wings.

The Struggle for Supremacy

As early as 1917 the larger industrial nations of Europe had based their national policies on the fact that commercial aviation is the heart and soul of air power. They recognized that 80 per cent of all aviation is on the ground, in the shops, laboratories, engineering and drafting rooms. They set out to create this form of air power; and they have adhered consistently to that policy. It has taken several forms. There have been many avenues of approach, but the objective has been the same—to create the best possible national aviation structure.

Great Britain, France, Italy and Germany have been in direct competition with the United States for the markets in all the non-

industrial countries of the earth, including those in Europe, South America and Asia. Foreign sales of planes and engines, both military and commercial, would help defray the cost of maintaining their aircraft industries ready for war production. Their plants could afford the cost of more constant technical experimentation and development. The European powers have also wanted to control the international air routes both to secure for themselves the fastest possible transport systems as a basis for increasing their entire foreign trade generally and as a further sales outlet for their own aeronautical products.

A NAVY BOEING FIGHTER

In operation on the aircraft carriers these Wasp-powered fighters are equipped with radio, flotation bag in the upper wing, life raft, deck arresting gear, two machine guns and, when needed, a load of bombs.

Their incentive was more readily apparent than ever before, because during 1933 the United States produced the world's best airplanes, engines and accessories. New American military and naval planes excelled similar types brought out abroad.

The American air transport network not only surpassed in size the systems of all other nations combined, but it was better equipped, better managed and was operated at far less cost to the taxpayers and the public that patronized it in growing numbers month by month. The international air transport system of the United

States was making customers for all American business and industry throughout Latin America and in China.

In 1933 American aircraft products were sold and delivered in practically every independent country on earth. England, France, Germany, Holland and Japan received shipments of American planes and engines. Italy received engines. The list of actual exports in the appendix will show that large deliveries were made in China, Brazil, Colombia, Hongkong, Argentina, Mexico, Peru, Russia, Poland and Siam. Spain, Portugal, Sweden and Chile, among others, received smaller shipments.

American exports in 1933 aggregated 407 airplanes valued at $5,423,991, a total of 2,895 aircraft engines valued at $1,452,861 and spare parts and accessories, except tires, valued at $2,350,969. That total aeronautical export business of $9,227,821 as compared to $7,633,070 in 1932 was a matter of grave concern in Europe, apparent by published comments.

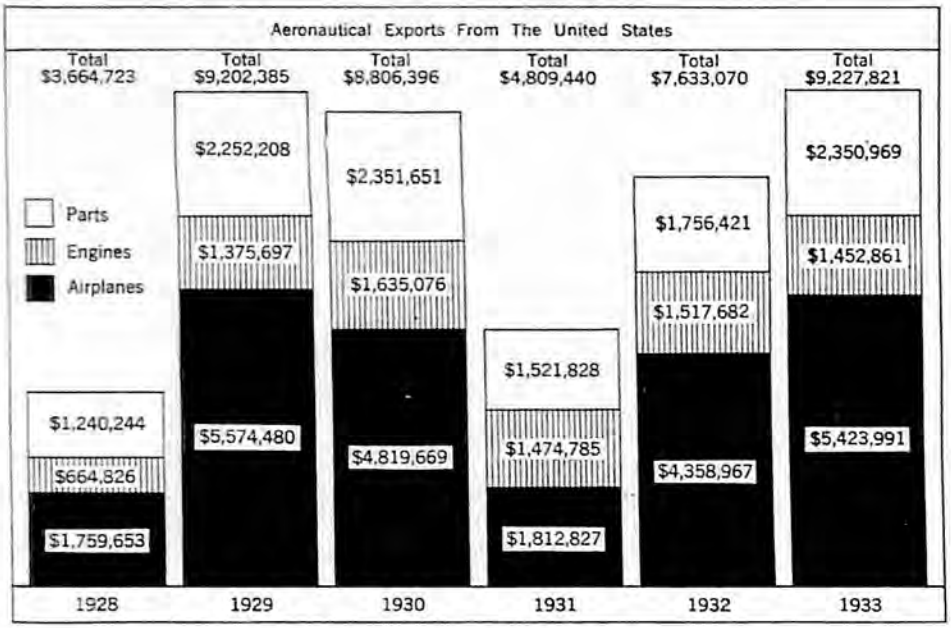
At the end of the year the representatives of no less than fifteen foreign governments or foreign subsidized aviation companies were in the United States negotiating purchases or manufacturing rights to the new planes and engines produced during 1933.

The technicians in all countries knew that the airplane had not yet attained the maximum speed possible even with present-day knowledge and experience. While the fastest military machines in 1933 approached speeds of 250 miles an hour and commercial transports developed in the United States would cruise at from 180 to 200 miles an hour, it was known that military machines can be built to fly at 300 and commercial planes at 250 miles an hour. Obviously, that nation with a weakened industry, with aircraft manufacturing and air line development hampered, if only for a few years, soon would be at a disadvantage in foreign markets and therefore practically impotent to protect its political or economic independence.

Reserve Air Power

The European and Asiatic Governments since the World War, as previously noted, have devoted to reserve air power more political thought than to their active air strength. They base their plans on the principle that very early in any war the air forces would be depleted, whereupon commercial airports and flying centers would become the nucleus for the wartime training system. The aircraft factories would start working on new equipment the day that war was declared. The commercial air lines would be to the air forces what railways are to armies.

The United States possessed the world's greatest reserve air strength at the end of 1933. The 30 aircraft and 12 engine manufacturing plants employed about 9,000 and 3,000 skilled wage-earners respectively, and there were thousands in the accessory plants devoting time and thought to aviation. The American industry had made real technical progress throughout the depression, and looked forward to 1934 with confidence. Despite the general loss of commercial business during the year and lack of a continuing Government procurement program the industry expected the early formula-



Practically every nation in the world was using American airplanes or engines at the end of 1933.

tion of policies which would stimulate inventive activity and at the same time justify the management in maintaining laboratories and engineering facilities for further development.

Aircraft Production and Sales

The 466 military aircraft produced by the industry for the army and navy services in 1933 represented a 22 per cent loss when compared to the 593 built in 1932. The values aggregating $9,784,643 in 1933 against $10,389,316 in 1932 represented a six per cent

loss, the difference in ratio being due to the fact that more multi-engined planes were sold last year.

In actual orders from the services the total of 468 units was 24 per cent less than the 618 units sold in 1932. The value of $9,470,517 was 12 per cent less than the $10,791,343 reported the previous year. In 1932 the value of deliveries exceeded production values by $400,000. In 1933 the production value exceeded the value of deliveries.

Military aircraft engine production in 1933 totaled 860 units, 21 per cent fewer than the 1,085 in 1932; while the value was $4,986,181, 22 per cent less than $6,370,678 in 1932. The sales of 867 units represented a loss of 21 per cent over 1932 with 1,090 units. Their value of $5,024,281 was 21 per cent less than the former value of $6,376,451.

Total commercial production of 591 planes in 1933 represented a seven per cent increase over the 549 commercial machines produced in 1932. Their value, however, increased 164 per cent, because of the production of more than a hundred large passenger-cargo planes built for the air lines.

Commercial airplane sales decreased numerically by 19 per cent in 1933, from 748 to 604. The value was 122 per cent greater, being $6,235,419 as against $2,807,775 the previous year.

An increase of 37 per cent in commercial aircraft engine production brought the number of units to 1,120 as compared to 813 in 1932. The value increased 63 per cent from $2,898,371 to $4,724,441 partly because of heavier engines. Commercial sales increased 33 per cent, from 852 to 1,135 in 1933. The value rose 66 per cent to $4,624,566 as compared to $2,778,876 in 1932.

The military and commercial airplanes and engines produced in 1933 had an aggregate sales value of $25,676,165, which was 17 per cent more than the $21,996,264 in 1932 and about two-thirds of the totals for 1930 and 1931.

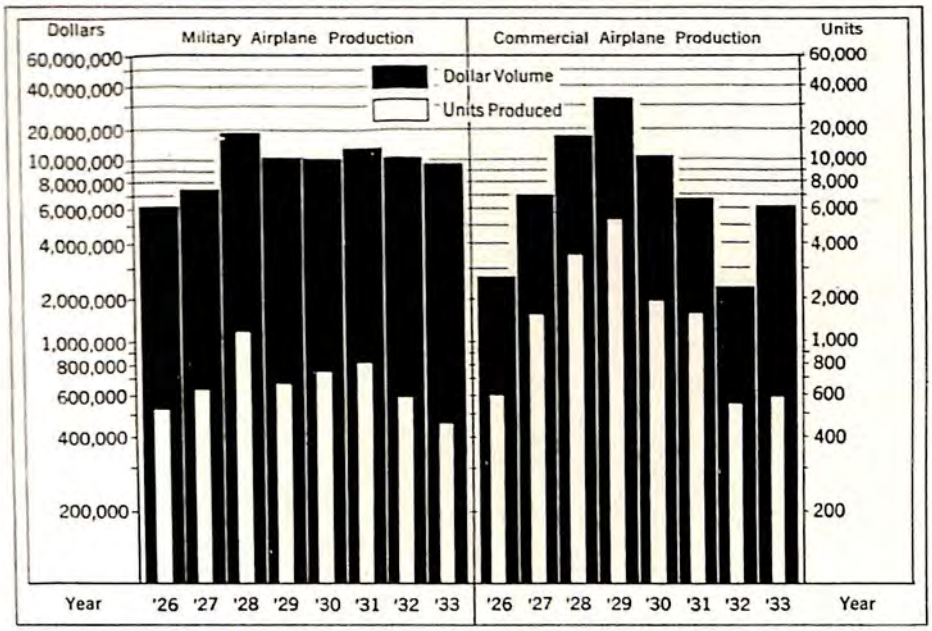
With their aggregate value of $10,905,341 the commercial planes and engines produced in 1933 represented an increase of 108 per cent over 1932 with its total of $5,236,270. This large increase in the value of commercial production was responsible for the 17 per cent increase in total values of all production, because the military production of planes and engines showed a 12 per cent decrease for the year, from $16,759,994 in 1932 to $14,770,824 in 1933.

Military and commercial plane and engine production have reversed positions twice since 1929 when 73 per cent was commercial. In 1930 it was 44 per cent, the military production predominating; likewise in 1931 when the commercial fell to 32 per cent, and

1932, still lower to 24 per cent. Equipment orders from the air lines in 1933 raised the commercial production to 42 per cent.

Actual deliveries of military and commercial planes and engines in 1933 amounted to $25,354,783, or 11 per cent more than in 1932 and about 62 per cent more than in 1930 or 1931. The commercial sales reported to the Aeronautical Chamber of Commerce of America totaled $10,859,985, nearly twice the $5,586,651 of 1932, because of orders from the air lines. At the same time military sales dropped off 16 per cent, from $17,167,794 in 1932 to $14,494,798 in 1933, caused by the economy program in Washington.

Since 1930, excepting the abnormal year 1932, spare parts have



accounted for about one-fourth of the aggregate sales of aeronautical products. The decline of 22 per cent, from $10,040,417 in 1932 to $7,809,411 in 1933, was caused by lighter sales of military plane and engine parts. Sales of commercial parts increased $100,000 in 1933.

A National Institution

In a statement presented before the National Recovery Administration in Washington, on December 20, 1933, in support of the proposed code for the aircraft manufacturing industry, the Aero-

nautical Chamber of Commerce of America pointed out that "aviation is an indispensable national institution, a business vested with a public interest that transcends all considerations of private gain."

Further: "Our companies are not built upon common industrial foundations. Our foundations lie deep in the national welfare. As manufacturers we invent, design and build a very intricate machine which is absolutely essential to our national defense. Since the World War some 20 Congressional and official committees have established incontrovertible proof that this is a fact."

Outside Governmental departments, the activities of which are discussed in another chapter, there were many factors contributing to the continued development of aviation in the United States.

The Aeronautical Chamber

As a trade association the Aeronautical Chamber of Commerce on January 1, 1934, represented the entire industry in fact, its members accounting for nearly all the manufacturing and scheduled air transport operations.

Among all the companies known to be in production during 1933 the Chamber membership represented 59.4 per cent of the aircraft manufacturers and 72.7 per cent of the aircraft engine builders. On a basis of cash value of products the members of the Chamber were responsible for 94.7 per cent of the 1933 aircraft and 99.6 per cent of the aircraft engine production. Members produced 84 per cent of the airplanes and 98.4 per cent of the engines. Wage-earners employed by members of the Chamber represented 87.1 per cent of the total in aircraft and 99.6 per cent of the total in aircraft engine production.

The Chamber membership represented 95 per cent of the scheduled daily flying operations of American air transport companies, more than 98 per cent of their revenues and more than 96 per cent of the wage-earners employed in that branch of the industry.

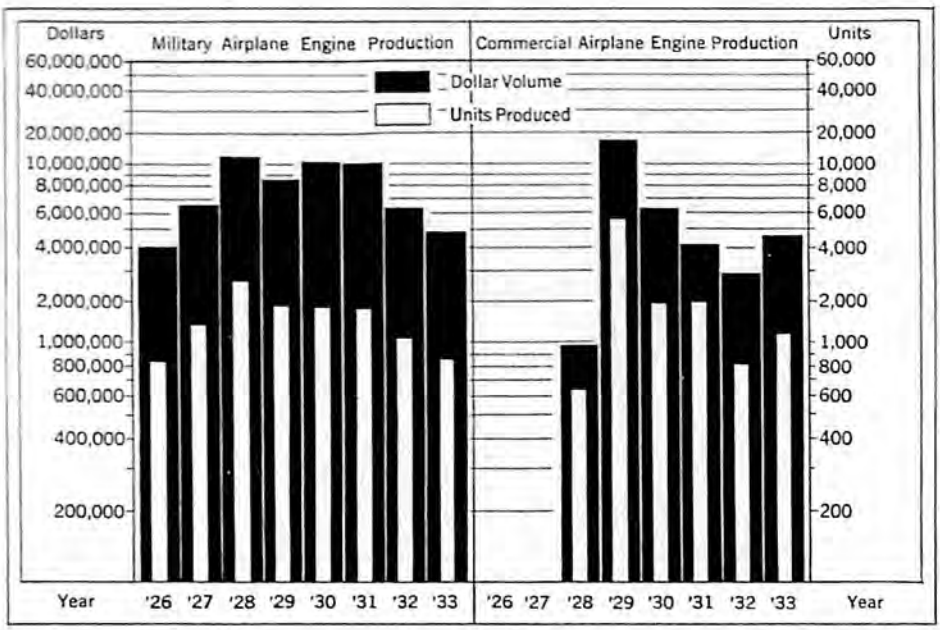
Outlook for 1934

Reviewing the position of the American aviation industry on January 1, 1934, Thomas A. Morgan, president of the Aeronautical Chamber, made the following statement:

"Despite the generally uncertain business conditions and a rigid system of Government economy in Federal aeronautical expenditures which has cut deeply into revenues of the manufacturing and transportation branches of the industry, commercial aviation in the United

States during 1933 made considerable progress in technical improvement and popularity with the public. Among the immediate problems there is none that cannot be solved satisfactorily by judicious thought and cooperation among the interests most concerned with the steady development of the flying art.

"Financially, the manufacturing companies have held their own during 1933. They have kept inventories at an absolute minimum, building planes and engines either to order or to meet the immediate demands of the private owner market which has been limited. Nowhere in industry will there be found a greater reduction in unnecessary overhead than that which the manufacturers have imposed



upon themselves since 1929. They have made no false starts toward expanding their sales market during the last three years, therefore production costs have been reduced to an absolute minimum consistent with technical requirements and the ever-present need for maximum care in producing every part of a speedy passenger vehicle.

"The manufacturers have not relaxed their vigilance in respect to reliability, which is publicly demonstrated every day and night in scheduled air line operations, and further, in the remarkable flights by the Lindberghs in their recent tour, during which they flew about 30,000 miles, and Wiley Post's flight around the world

in a week, using the same engine and navigational instruments, which marked the year's progress in technical achievement.

"During the 30 years which have elapsed since the Wright brothers made the first flight, more than 30,000 airplanes and 50,000 aircraft engines have been manufactured in the United States; and today their reliability is such that it is recognized abroad, the air lines of 25 other countries using American-built planes or engines.

"During the last year the chief problem of the manufacturer has been the question of making sales. He has not had a market which would permit him to employ mass production methods. His principal sales outlets have been the army and navy air forces for military equipment, and in the commercial field, relatively small orders of planes for the air transport lines.

"At present the revenues from passengers and express are not sufficient to offset the cost of the steady development necessary if this nation is to have the perfected air transport system to which it is entitled and which it needs. The air lines are still dependent upon the money which the Post Office Department pays them for flying the mail.

"The air mail payments form from 60 to 80 per cent of present air line revenues. And yet, during the present fiscal year the money alloted for that purpose has been reduced to $14,000,000, a cut of 31 per cent below the appropriations for the previous twelve months.

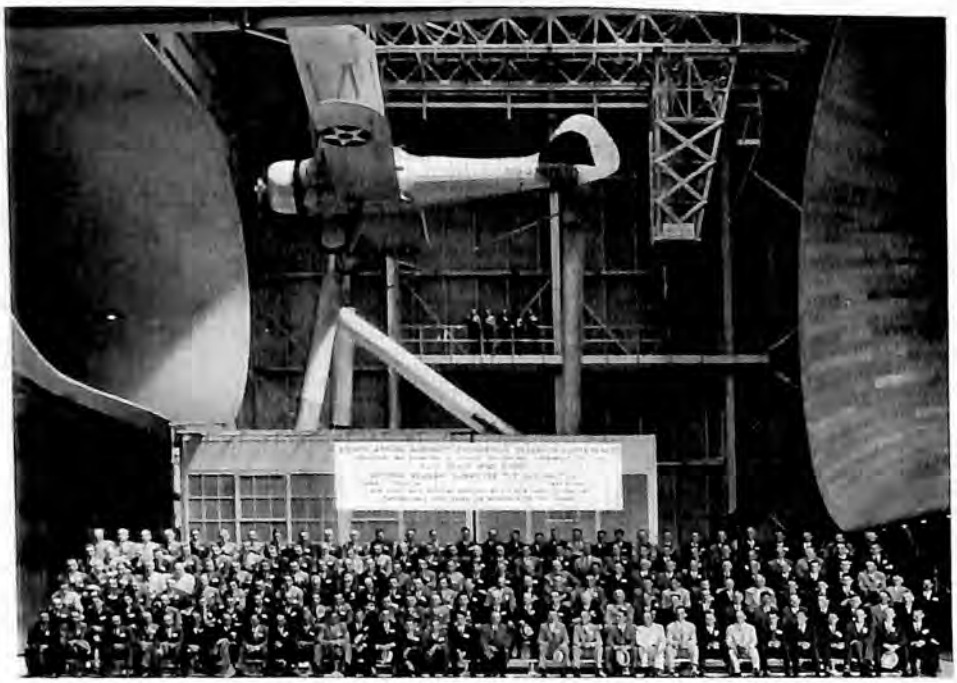
"Notwithstanding that drastic limitation to about two-thirds of their former mail payments the air lines during this fiscal year are scheduled to fly 36,500,000 miles with mail, an average rate of 38 cents a mile, as compared to 54 cents in 1932 and 62 cents in 1931. They also are operating under the air transport code which has automatically increased the number of employees by 15 per cent and expanded their payrolls 20 per cent.

"The military orders have formed the greater part of the manufacturer's gross revenues during the last two years; and yet the money alloted for the present fiscal year will neither permit the industry to maintain the necessary progress in engineering development nor will it provide sufficient equipment for our air forces to make them the equal of other powers in numerical strength. The real danger lies there. Our technical development has been somewhat faster than that of any other nation; but the larger powers have embarked on extensive programs calculated to increase their efficiency both numerically and technically; and we know that if this development is permitted to lag here, the other nations will

surpass us in efficiency within two years, just as four or five of them now outnumber the United States in defensive air force equipment."

Delay in Manufacturing Code

The aircraft manufacturing code was not completed in 1933. In its projected draft submitted to the NRA the industry inserted certain clauses believed essential to the elimination of unfair trade



THE SCIENTIFIC SIDE OF FLYING

Government officials and leaders of the aircraft industry meet with the National Advisory Committee for Aeronautics under its wind tunnel at Langley Field, Va.

practices, among them the safeguarding of unpatented design rights. Some problems in the code involved basic changes in aircraft procurement; and as there were indications that Congress might change the law, work on the code was temporarily halted by agreement between NRA officials and the industry, pending the outcome of Congressional action. Because the purpose of the NRA is so fundamentally based upon the principle of relieving industry from unfair competition, it was believed the code would materialize early in 1934.

American Society of Mechanical Engineers

The Aeronautic Division of the American Society of Mechanical Engineers in 1933 held technical meetings in many local sections, notably those at Boston in April, Los Angeles in July and San Antonio in December. The national meeting was held in Chicago in June when 17 technical papers were presented and Juan de la Cierva, inventor of the autogiro was awarded the Daniel Guggenheim Aeronautic Medal. At the annual meeting in New York in December a technical session was held on the year's development in airships.

Institute of the Aeronautical Sciences

Organized to promote the application of science in the development of aircraft the Institute of the Aeronautical Sciences held its founders' meeting at Columbia University on January 26, 1933, with Dr. Jerome C. Hunsaker as the first president and Lester D. Gardner as secretary in active charge of the organization work. Charles L. Lawrance is the Institute's president for 1934.

In November, 1933, The Skyport was opened on the 54th floor of the R.C.A. Building at Rockefeller Center, New York, as a clubroom and headquarters for the Institute.

By including in its membership the leading aeronautical specialists in the United States and all other countries—with 136 foreign members—the Institute makes possible an international exchange of ideas and information. By grading the 673 members according to their qualifications recognition is given to outstanding professional work, and further incentive is provided younger members for investigation of new aeronautical problems. Through the publication of the Journal of the Aeronautical Sciences members are provided with an opportunity for an interchange of thought and knowledge in this highly specialized field.

Manufacturers Aircraft Association

A hundred per cent increase in the number of inventions seeking improvement of the airplane was reported for 1933 by the Manufacturers Aircraft Association, members of the organization having acquired during the year a total of 99 patents, of which 48 were reported with claims for compensation and 51 without claims. Frank H. Russell remained as president of the Association and S. S. Bradley was re-elected general manager for 1934.

The Association was organized under the direction of the Government in 1917 to act as agent or attorney-in-fact for owners

of patents through the administration of a cross-licensing agreement for the purpose of preventing wasteful patent litigation. The report of the Association for 1933 indicates that 31,137 airplanes had been licensed under the 605 patents owned or controlled by its members up to January 1, 1934. No suits for infringement were filed on any of these patents, nor were any suits claiming infringement filed against members during the year.

National Aeronautic Association

With former Senator Hiram Bingham as president and Ray

THE NEW CURTISS NAVY FIGHTER

This single seater, with a Wright Cyclone engine, has retractable landing gear.

Cooper as general manager, the National Aeronautic Association, as the American representative of the Fédération Aéronautique Internationale, in 1933 sanctioned 18 air races and shows, the cash prizes of which aggregated more than $113,000. Under the rules of the N.A.A. the events were conducted in a manner which safeguarded the interests of the participants, particularly with respect to guaranteeing the prize money prior to the event.

Seventeen record trials were held under the supervision of the contest committee. Other activities of the Association centered

around the N.A.A. governor in each State and the chapters in 200 counties. Following the annual convention a new type of junior membership was established.

Society of Automotive Engineers

The Society of Automotive Engineers held two aviation meetings in 1933, one at Detroit in January and another at Chicago in September. Eighteen technical aeronautical papers were presented on as many phases of the art. The Manly Memorial Medal, an award of the Society, was presented to A. H. R. Fedden of England for his paper on power plants. E. N. Jacobs of the National Advisory Committee for Aeronautics was awarded the Wright Brothers Medal for his contribution in aerodynamics of wing sections.

The new planes, engines and accessories as described in other chapters indicate that technical progress was great during 1933 and that the real significance of aviation lies in what it promises to be in the near future.

THE DOUGLAS AIR LINER

First of the Transcontinental & Western Air fleet of new transports for three mile-a-minute coast-to-coast service. It is powered with two Wright Cyclone engines.

CHAPTER III

AIR TRANSPORTATION

Increase in Speed—A Nation-wide Service—The Contract Air Mail —Average Daily Flying with Mail—Reduced Appropriations— Increased Labor Costs Under NRA—Pennsylvania Railroad's Policy—Other High Postal Deficits in 1933— Statement by General Foulois—Opinion of Admiral King—A Letter from the White House—Operations of Each Line—International Operations.

THE air transport industry of the United States during 1933 made progress in speed, reliability and comfort. Other nations undertook to reorganize their own air lines on the American system. Faster service, better schedules and more comfortable equipment developed a steadily growing patronage in passenger and express traffic. It would have been most encouraging had not a series of attacks and reverses late in the year threatened the industry with virtual extinction.

At the end of 1933, the fourth year of the depression, the air lines had a record for achievement unparalleled in the history of transportation. They had increased their average daily flying from 29,242 miles in 1928 to 158,537 miles in 1933. Their annual scheduled flying had mounted from an aggregate of 10,472,024 miles in 1928 to 50,800,705 miles during the calendar year 1933. That was an increase of 2,456,347 miles over 1932.

They carried 546,235 passengers in 1933 as compared to 504,575 in 1932, and flew a total of 183,695,784 passenger miles against 143,169,682 miles the previous year. Express showed even greater development, being 1,884,545 pounds in 1933, as compared to 1,324,428 pounds in 1932. Such progress despite universally poor business conditions could be attributed to only one chief factor; the air line operators had made their service so attractive to the public that it was becoming indispensable.

Increase in Speed

Flying millions of miles, nearly half the time at night, in all kinds of weather, over every conceivable kind of country, month

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after month, year after year, the lines had the opportunity for practical testing, experimentation and development. Thus the higher speed of from 150 to 200 miles an hour, steady cruising, which distinguished four new types of transport planes during the year, was made possible by refinement in design, better streamlining and more efficient engines obtained through exacting requirements and knowledge gained from actual experience on the lines.

The operators spent a large part of their revenues developing improved aircraft and aids to flying. Approximately $10,000,000 worth of equipment orders were placed by the lines in 1933. At the end of the year they had in operation 615 transport planes, one for every nine Pullman cars. If the number of planes in service fell below the total of 655 operated in 1932, it was not because of curtailed service on the major lines, but because a number of smaller operators had learned that they could not do a profitable business without first class, new equipment.

They had discovered through bitter experience that no airplane as yet is capable of paying its own way in regular operations without air mail cargoes. The relatively low rates for passenger and express traffic, which are absolutely essential to compete successfully with surface transportation, would not provide sufficient revenues for profitable operations. Thus many of the non-mail operators went out of business in 1933.

The larger companies replaced old equipment with planes of greater cargo and seating capacity, so that fewer machines actually accommodated the increased traffic.

A Nation-wide Service

At the same time the American lines were doing more flying and providing a greater public service than those of all other nations combined. They had increased the number of station stops from 23 cities in 1926 to 178 at the end of 1933, when they were serving communities which are trading areas for 75,000,000 persons, or 60 per cent of the population, areas also including about 90 per cent of all the manufacturing facilities in the country.

The great Pan American Airways System linked these industrial and commercial centers with 104 cities in 32 countries to the south, and served trading areas having an aggregate population of 86,000,000 persons outside the United States.

Breakfast at home and dinner in any large city halfway across the continent, 19 hours and 30 minutes between New York and San Francisco, from the United States to any commercial center

in the Caribbean within two and a half days, or to the most distant capital in South America within seven days—such were some of the highlights of air transport developed during the year, the result of years of tireless effort, a vast outlay of capital and constant attention to all the elements which make up the good will of any traveling public.

To do all that, to operate regularly and on schedule day and night in all weather, the lines maintained a corps of trained personnel at flying bases in 162 airport centers in the United States and at 147 airports in the countries and colonies of Latin America. They

ABOUT TO LEAVE MIAMI

A Sikorsky, four Hornet-powered, 44-passenger "clipper ship," largest air transport in service anywhere, one of the Pan American Airways fleet of 144 liners in America's merchant marine of the air.

operated their own two-way radio facilities, under constant development, however expensive, their own weather tabulation departments, their own experimental stations, constantly testing devices calculated to make flying ever more efficient, safe and comfortable.

One of the most interesting and important developments of the year was the work of physicists in meteorology which assumed international significance because weather forecasts must be conducted on an international scale to be accurate. New methods developed out of pure science here and abroad promise soon to

render flying weather forecasts 90 per cent accurate. At the same time the young physicist specializing in meteorology must become an important executive in air line, military and all other point-to-point flying operations. Under the new scientific methods being developed he will be able to tell the pilot precisely what weather, winds and cloud formations he will encounter, and at what altitudes to fly on each section to provide the greatest speed, efficiency and safety throughout his flight.

Employing about 700 pilots and co-pilots, the lines out of their vast experience required that before a pilot took charge of a plane in regular service he first must have had at least 1,200 hours flying as an aviator, and a thorough knowledge of all his instruments as well as experience in blind flying. For every pilot employed on the lines there were six persons on the ground to see that he made his trip swiftly and efficiently. After every flight flying equipment was inspected by a trained crew of mechanics, each charged with a definite list of things to check and report upon. The planes were in the care of specialists two hours for every hour spent in the air.

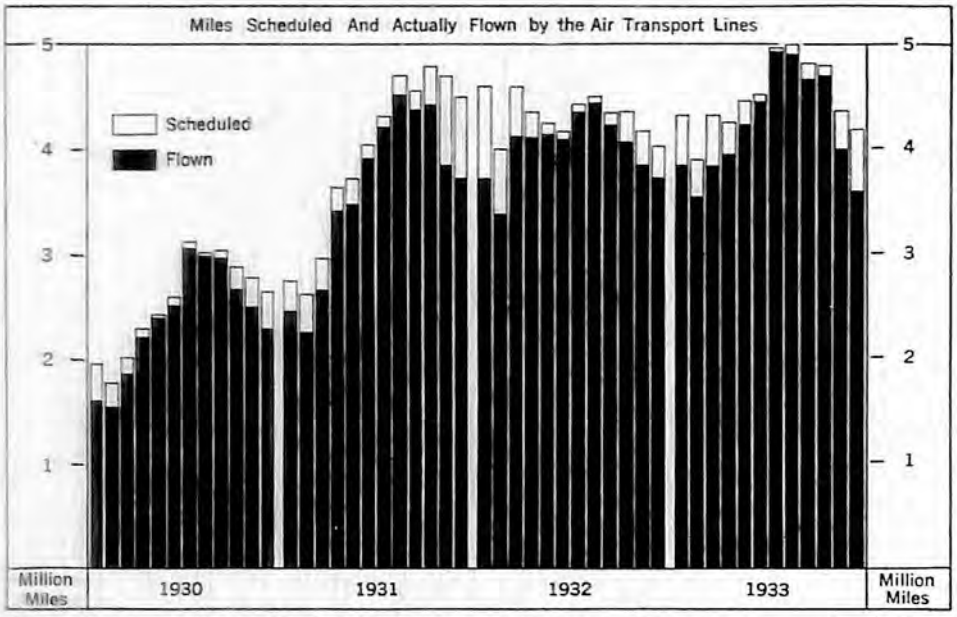
It was this minute attention to detail which so distinguished American air transport operations that the British Parliament at the end of the year adopted a plan to reorganize and develop the Imperial Airways on the American system. The fast, luxurious transports which appeared on the American lines during the year brought the purchasing agents of other nations flocking to the United States to buy those same planes, engines and accessories. Nearly all the air lines of the world at the end of the year were either acquiring American equipment or adopting American air transport operating methods.

The lines of other nations never lacked money for the best equipment because they, by and large, are heavily subsidized by their respective governments. Foreigners arriving in the United States to study operations here were amazed to find that the American system was radically different, having been founded on the principle of individual and private initiative, the investment of private capital, assisted by a liberal Government policy to foster with air mail contracts the development of key trunkline systems which one day would become self-supporting and fly the mails at a profit to the Post Office Department.

The Contract Air Mail

The growth of American air transport is synonymous with the

development of the contract air mail system as authorized by successive acts of Congress providing for the Federal airways system and payments for flying mail. Never looked upon as a final, perfected program, the contract air mail was subjected to the severest scrutiny by Congress on each occasion that it was called upon to provide appropriations; and Congress apparently kept pace with developments, because as the air transport network expanded year by year, gradually increasing in efficiency and scope of operations, the funds allotted for mail payments were gradually reduced. In other words, the Government received more for its money every



The air lines of the United States complete more than 95 per cent of their scheduled trips.

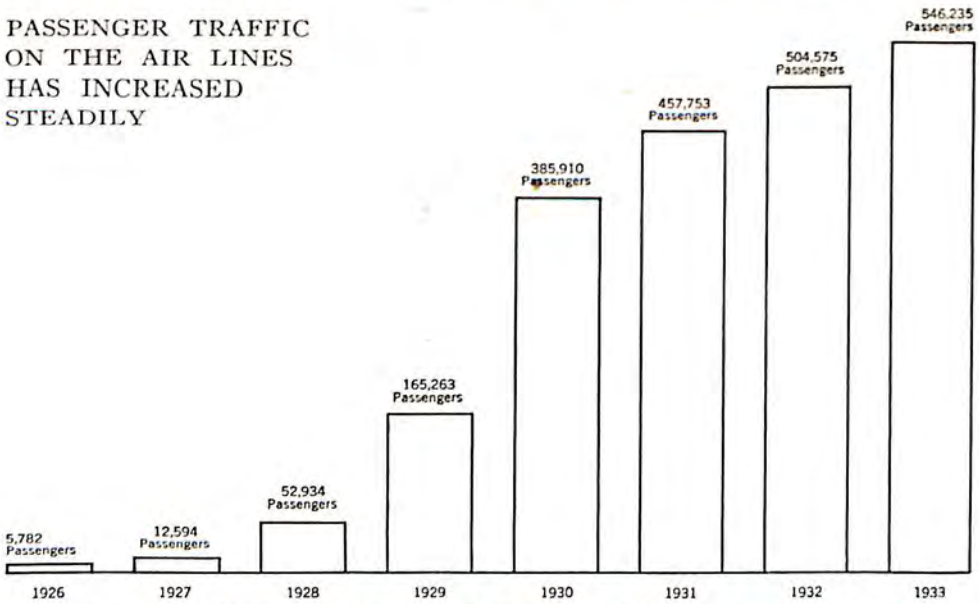
year; and so did the public, as the accompanying tables and graphs will show.

Air mail showed no material increase in volume during 1933. The reason is obvious. Ill-advised increases in the air mail postage rate on July 6, 1932, from five to eight cents for the first ounce and 13 cents for each additional ounce, and that at a time when everybody was carefully avoiding any unusual expenditure, reduced the volume of air mail. From 9,351,195 pounds in 1931, it fell to 7,658,332 pounds in 1932 and again dropped to 7,644,646 pounds in 1933. Surveys conducted by the Aeronautical Chamber of Commerce of America proved conclusively that the excessively

high postage rate was responsible for failure of the air mail to keep pace with the growth of passenger and express traffic.

The contract air mail lines were responsible for all the major developments in scheduled operations, because they derived revenues from three kinds of traffic and were willing to invest money with the hope of soon making profits. But the experienced executives realized that they could not make operations profitable for the Government until the volume increased. No less than six different plans were submitted, first to the outgoing Administration and then, after March 4, 1933, to the officials of the new Administration charged under the law with developing a self-sustaining commercial

PASSENGER TRAFFIC ON THE AIR LINES HAS INCREASED STEADILY



There has been a consistent growth in the number of passengers flown by American air lines every year.

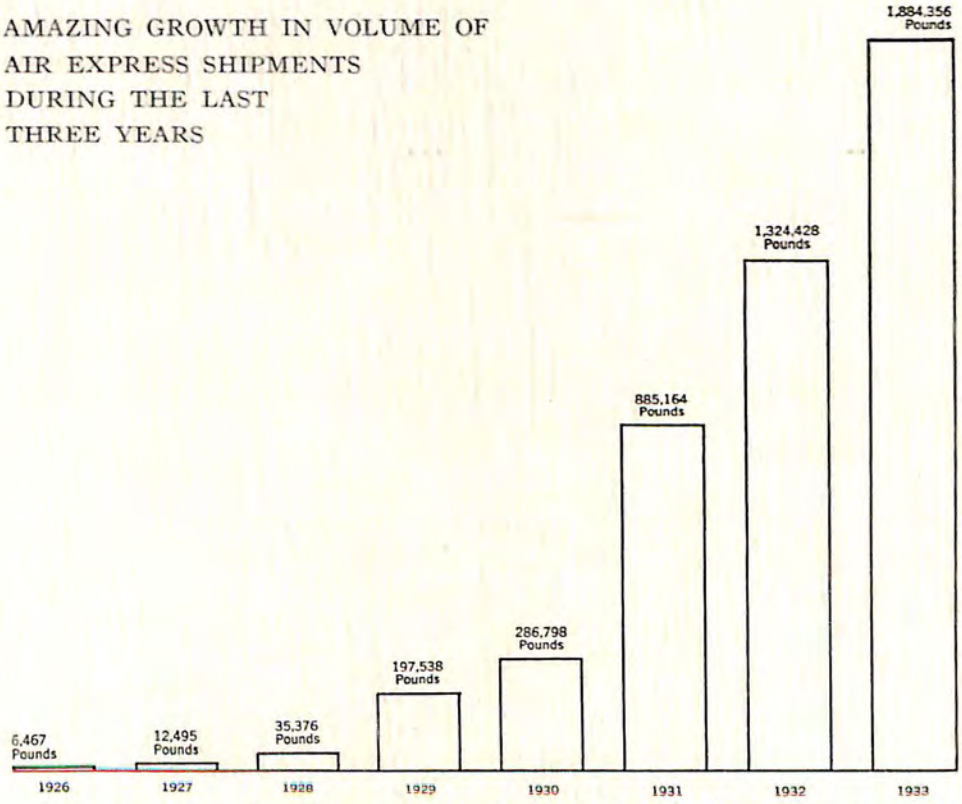
aviation, not only for its commercial value but also for its vital importance in national defense.

The plans varied with respect to the formulae for paying the lines; but they were unanimous as to the urgent necessity for reducing postage rates. At least one plan contemplated three classes of air mail, the five-cent air mail letter, the three-cent lettergram, with letter and envelope in one sheet, and the two-cent air postcard.

The operating executives of the lines, basing their calculations on new equipment acquired or about to be procured early in 1934, submitted cost sheets to show that they could carry the mail at certain definite rates, which within a year or two, if volume increased

sufficiently, would return profits to the Post Office Department. Not only could they do this, said the operators, but they could continue to maintain two-way radio, co-pilots, the latest navigational devices and other auxiliaries to assure increasingly fast flying with reliability of schedules and safety to passengers and cargoes. They had been completing more than 95 per cent of their scheduled flights, and they intended to better that record.

AMAZING GROWTH IN VOLUME OF AIR EXPRESS SHIPMENTS DURING THE LAST THREE YEARS

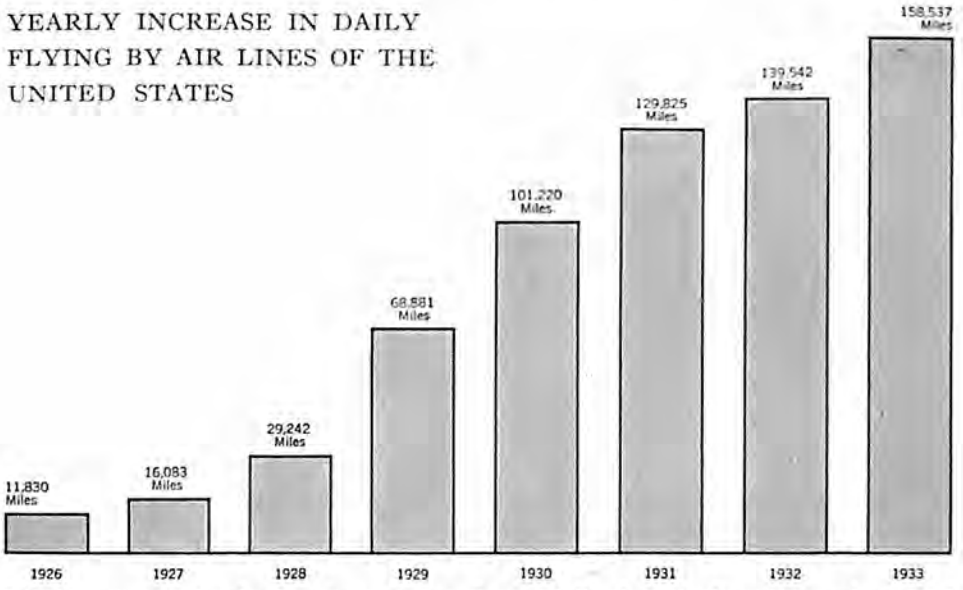


Because of speedy delivery the domestic and international air express services of the United States are gaining in popularity every year.

Average Daily Flying with Mail

The contract air mail operators could speak with confidence based on experience. Of the average of 158,537 miles flown daily by American lines in and out of the United States during 1933 (the figures based on September as an average traffic month) the contract mail lines averaged 151,019 miles daily, including 124,154 miles flown with mail. They did 26,865 miles of flying daily with

YEARLY INCREASE IN DAILY FLYING BY AIR LINES OF THE UNITED STATES



Of the average total of 158,537 miles flown daily by air lines in and out of the United States (based on figures for Sept. 1933) the air mail lines averaged 151,019 miles daily, including 124,154 miles with mail. The mail lines did 26,865 miles of daily flying with passengers and express for which they received no mail payments. Non-mail operators averaged 7,518 miles of flying daily.

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The contract mail lines and their average daily flying with mail, nearly half of it at night, were:

American Airways	29,087 miles
Eastern Air Transport	9,905 miles
Kohler Aviation Corporation	1,116 miles
National Parks Airways	2,036 miles
Northwest Airways	4,424 miles
Pan American Airways System	10,938 miles
Pennsylvania Air Lines	2,996 miles
Transcontinental & Western Air	19,903 miles
United Air Lines	38,398 miles
United States Airways	1,120 miles
Western Air Express	4,231 miles
Total average daily flying with U. S. mail	124,154 miles

An average of 1,500 men, women and children, the equivalent of 670,000 letters and 5,160 pounds of express were flown over the American lines every 24 hours during 1933; and most of that passenger and express traffic was handled by lines having air mail contracts.

Reduced Appropriations

The contract mail operators had every reason to believe that their fast service was necessary as an adjunct to business in speeding the nation back toward recovery, when the old Congress passed the appropriation bills—signed March 3, 1933—and cut the funds for air mail payments from $19,400,185 for the fiscal year 1933 to $15,000,000 for the new fiscal year ending June 30, 1934. In July the Director of the Budget took off another million dollars, leaving only $14,000,000 for air mail operations. The 31 per cent reduction in air mail payments for the new fiscal year, in view of the fact that those payments constituted from 50 to 65 per cent of the gross revenues, afforded not the slightest opportunity for normal expansion to meet the demands of the nation's business when and if it should recover.

Increased Labor Costs Under NRA

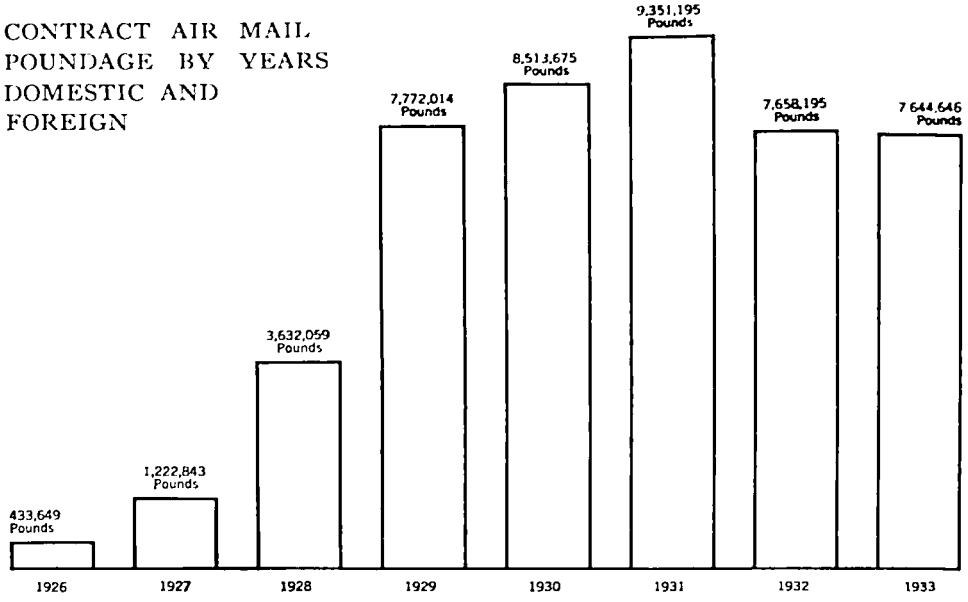
The Air Transport Code went into effect late in 1933. In negotiating the code the operators agreed to cooperate with the President in his recovery program by increasing personnel 15 per cent and payrolls 20 per cent. At the same time investigators for a special Senate Committee were examining the records of the former Administration and the files of the air mail operators in preparation for public hearings to start in January, 1934. Simultaneously, there began to appear in the newspapers intermittent statements and discussions criticising the so-called air mail "subsidies." In many instances these attacks on air transportation came from executives of competing surface transport systems and from others with personal, selfish motives.

Pennsylvania Railroad's Policy

Many of the important railroad systems of the country, however, continued to look upon air transportation not as a rival but as a complement to rail service. The Pennsylvania Railroad, which joined in the original organization of the present Transcontinental

& Western Air system, expressed its attitude in the following statement prepared especially for the Aircraft Year Book:

"Active cooperation by various railroads in promoting coordinated air transport service was pushed with renewed vigor in 1933. The issuance of joint tickets was extended, the sale of air and rail-air tickets at railroad offices was broadened, and additional time-tables and joint literature and advertising were distributed, describing the two services and their relations with each other.



The volume of mail poundage in 1933, as shown above, equals that of 1929, although normal growth was affected by the increase in domestic air mail postage rates in effect since July 1, 1932.

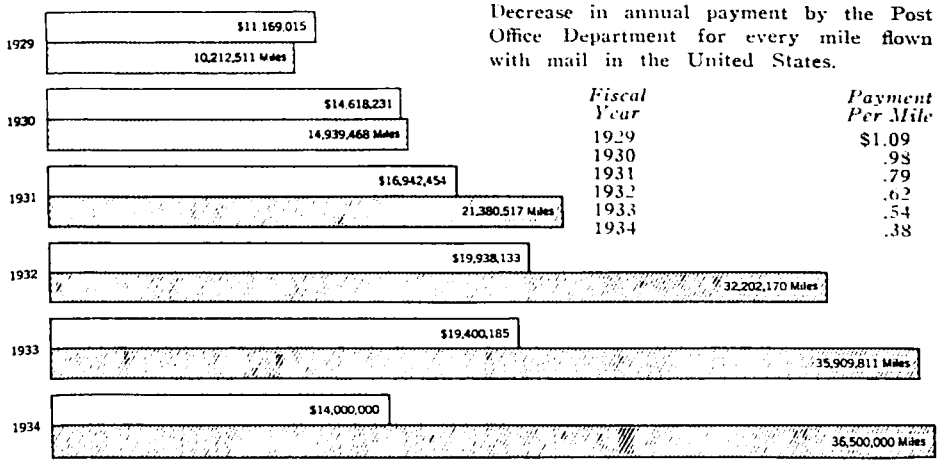
"The activities of the Western Union and Postal Telegraph Companies and the Railway Express Agency in selling air transport for both passengers and merchandise, and in reserving space and arranging trips were carried on in an accelerated degree. Much progress was made during the year, and there has now been firmly established in this manner a most valuable countrywide selling organization for air transport service. This is particularly helpful to all railroads interested in coordinated service and to their air affiliates.

"The Pennsylvania Railroad, which was the pioneer in

linking rail and air service through the first transcontinental rail-air line in 1929, greatly advanced these relationships in 1933. In the opinion of the management, the year was one of most important progress.

"The Pennsylvania Railroad management has more faith than ever in the future of commercial aviation, which it now feels has made a secure place for itself as an indispensable part of the facilities for carrying on the country's business. In the view of both the Transcontinental and Western Air and the Pennsylvania executives, however, aviation for some years will continue to require Governmental appropriations for carrying

BETTER AIR MAIL SERVICE AT DECREASING COST TO THE GOVERNMENT



Decrease in annual payment by the Post Office Department for every mile flown with mail in the United States.

Fiscal Year	*Payment Per Mile*
1929	$1.09
1930	.98
1931	.79
1932	.62
1933	.54
1934	.38

This graph shows the increased number of miles of flying with mail compared to the payments made by the Post Office Department for that service in the United States year by year.

the mails, as it has not yet reached the state of development where it can exist on passenger and merchandise traffic alone."

In preparing to reply to the charges that the air mail payments constituted unusual subsidies a number of important trade organizations outside the aviation industry assembled data to show that a deficit between air mail expenditures and revenues from the sale of air mail postage was not exclusive with this relatively new service. The Post Office cost ascertainment report for the fiscal year 1932 lists the cost of maintaining the Rural Free Delivery at $106,355,922.

Other Postal Deficits in 1933

The Congressional Record of January 25, 1934, page 1345, lists high Post Office Department deficits for the fiscal year 1933, as follows:

Cost of penalty, franked and free for blind service, without income				$8,002,604
Deficit in Second Class Mail Service				102,268,660
Daily newspapers,	expenditures	$38,392,155,	revenue	7,910,637
Weekly newspapers,	expenditures	11,216,898,	revenue	1,503,446
Magazines, etc.,	expenditures	32,746,179,	revenue	7,582,950
Publications free in county,	expenditures	8,271,232,		no revenue
Advertising matter,	expenditures	16,349,390,	revenue	1,707,283
Total Second Class expenditures for publications		106,975,856,	revenue	18,761,667
Deficit in Third Class Mail Service				28,296,562
Deficit in Fourth Class Mail Service				32,014,401

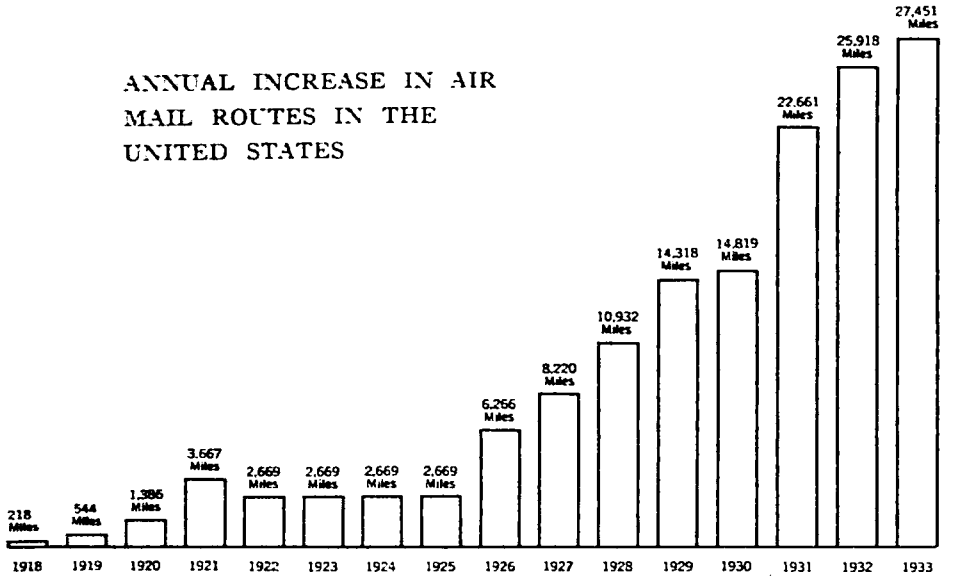
Contract payments for domestic air mail were $19,400,185 for the fiscal year 1933. In its cost ascertainment report the Post Office Department fixed additional incidental expenditures at $3,633,671, making total expenditures $23,033,856. In that case the deficit was $16,917,414. But as Congressman Clyde Kelly of Pennsylvania pointed out, (Page 1423 of the Congressional Record for January 26, 1934):

"Representatives of the Department stated, as shown by the hearings, that revenues derived from domestic air mail service were $6,500,000. The Committee on the Post Office and Post Roads of the House have made a thorough investigation of this matter and are convinced that on the present amount of mail, which is reduced on account of the depression, the revenues are approximately $9,000,000.

"Now, providing only $6,500,000 for a year's service means absolute destruction of the air mail system. We have spent $73,000,000 over the entire life of the air mail service, and never was there a better expenditure in the history of Congress. Five hundred millions of dollars of private money has been invested in aviation. Without the air mail service there would be no private aviation industry whatever in this nation. We have built up, besides, a reservoir of men and materials, a corps of trained pilots who may be used for national defense at any moment. We have established a service which is an astounding exhibition of what can be done by efficient organization aided by the helping hand of the Government."

As 1933 drew to a close business organizations and others interested in the development of the air mail service believed that the

Government should continue to look upon air mail deficits, if any, in precisely the same light as other deficits are considered, worthwhile for the services rendered. At the same time the air line operators, including those without mail contracts, believed that the Government would realize the absolute necessity for expanding commercial aviation if only for its value in any modern system of national defense.



Statement by General Foulois

In that regard the following statement prepared especially for this edition of the Aircraft Year Book by Major General Benjamin D. Foulois, Chief of the Army Air Corps, is of particular interest:

"The United States cannot have too much transportation in time of war.

"Air transport service at present is more than three times faster than the railroads. The greater share of the hundreds of planes now in use can be mobilized for any emergency and sped from one end of the country to another within 18 hours. They would not be dependent upon railroad tracks or tortuous rights of way winding up and down and around mountains, valleys or waterways; but instead, could be sent on virtually

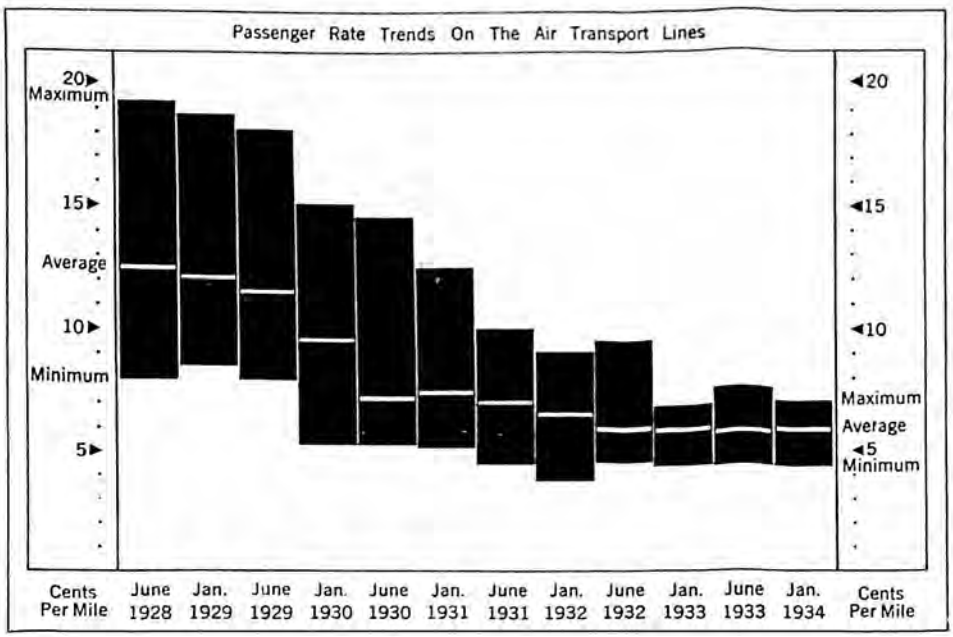
a bee-line course straight to their destination, with anything needed in an emergency.

"An efficient airways system will, in time of an emergency, permit the quick transfer of tactical units from various parts of the United States to air defense frontier strategical points, thus greatly increasing the potential strength of these units.

"Young as it is, air transport, better than all the surface facilities, could meet the two main requirements for war-time transportation—speed and mobility.

"Major General Benjamin D. Foulois
Chief of the Air Corps
U. S. Army."

December 20, 1933.



The average fare on January 1, 1934, was 6 cents a mile.

Opinion of Admiral King

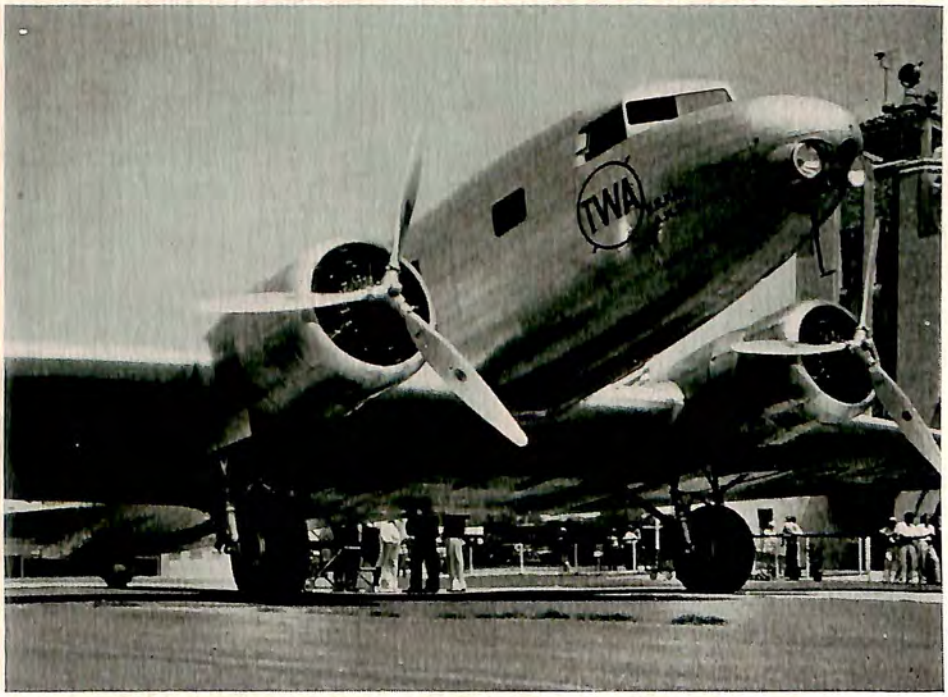
In another expression of opinion prepared for this edition of the Aircraft Year Book, Rear Admiral Ernest J. King, Chief of the Bureau of Aeronautics of the Navy, said:

"The transport airplane manufacturing plants are practically

dependent upon the air lines to supply a market for cargo and passenger planes and support the constant engineering research and development. Thus the air lines help maintain an important branch of the aircraft industry which would be called upon for the greatest possible number of planes in the event of war, and so are potential reserves for the national defense. If war were declared, the contract air mail lines would provide the fast, reliable transport service needed from the first day of the emergency, for mobilization and thereafter for movement of troops and indispensable military (naval) supplies.

"Rear Admiral Ernest J. King,
Chief of Bureau of Aeronautics,
U. S. Navy."

December 1, 1933.



THE END OF A PERFECT DAY

One of Transcontinental & Western Air's fleet of new Douglas high speed liners lands passengers and cargo at the Grand Central Air Terminal, Glendale, Calif.

A Letter from the White House

In reply to a request for an expression of opinion for publication in this edition of the Aircraft Year Book, Colonel Louis McHenry Howe, Secretary to the President, wrote as follows:

"THE WHITE HOUSE
Washington

December 26, 1933

"The Aeronautical Chamber of Commerce of America,
22 East 40th Street,
New York

"Gentlemen:—

"I am pleased to learn of the whole-hearted cooperation which the branches of the aviation industry are extending to the administrative departments of the Government. I know that yours is an important industry, because I was in a position to realize the urgent need for it as a Reserve of the National Defense during the World War.

"Air transportation very appropriately enters upon its career of greatest development and usefulness in this new era of our national life. I desire to see this progress continued, not only in scheduled air line operations, but in the development of military and naval aviation as important arms of our national defense, and further, improvement in aircraft for private flying, the common heritage of all, if the airplane is destined to reach the ultimate in usefulness.

"Your organization, the Aeronautical Chamber of Commerce of America, has my cordial wishes for continued success in your work for aviation.

"Very sincerely yours,
(signed) Louis McH. Howe
"Secretary to the President."

American Airways

American Airways, Inc., during 1933 added 2,169 miles to the 9,037 miles of routes in operation on January 1, 1933. During the year 1,891 miles of routes were discontinued, leaving the system with 9,315 miles of routes on January 1, 1934. Improved service and additional schedules installed during the year increased flying

operations by 1,667,665 miles. During 1933 American Airways planes flew 10,479,490 miles with passengers, 10,513,030 miles with mail and 11,830,034 miles with express.

Beginning January 1, 1933, the operations of Transamerican Airlines Corporation became part of the American Airways System. Two operating divisions were established, the eastern division at Chicago, and the southern division at Forth Worth, Texas, where new buildings were put up during the year.

American Airways acquired a fleet of the 1933-type Curtiss-Wright Condors, and opened one of its most important routes,

UP WITH AMERICAN AIRWAYS

One of the fleet of Stinson tri-motored transports, Lycoming powered, operated by American Airways.

that between Chicago and New York by way of Detroit and Buffalo, a service which immediately became popular. Passenger service was started over the system's routes between Chicago and Atlanta and between Boston and Albany. Late in 1933 passenger service was started between Washington, D. C., and Chicago.

American Airways also installed a fleet of Lockheed Orions for mail and express service at speeds of about 200 miles an hour. The company planned further important changes in equipment and schedules during 1934.

Bowen Lines

Bowen Air Lines, Inc., operating a passenger service between cities in Texas and Oklahoma, flew 694,912 miles in 1933, using Lockheed Vega and Orion planes.

Braniff Airways

Braniff Airways, Inc., during 1933 flew 1,222,958 miles with passengers over its line between Oklahoma City and Chicago, an

ALL ABOARD FOR THE SOUTH

One of Eastern Air Transport's Curtiss-Wright Condor planes, powered by two Wright Cyclone engines, takes on passengers at Newark.

increase of 200,000 plane miles over the previous year. The traffic represented 11,009 passengers and 3,254,133 passenger miles. The company eliminated excess baggage charges in 1933 and developed its repair base at Oklahoma City. Lockheed Vegas were used in all traffic operations. Plans for 1934 included expansion of the passenger service.

Eastern Air Transport

Eastern Air Transport, Inc., during 1933 flew 4,295,916 miles with passengers, mail and express, as compared to 3,730,815 miles in 1932. Passenger traffic was more than doubled, from 34,359 revenue passengers in 1932 to 70,768 in 1933. During the latter period 87,787 pounds of express were flown over the company's routes between New York, Washington, Atlanta and Miami.

During 1933 Eastern Air Transport started night passenger schedules between New York and Atlanta, put into service the first regular air line flying sleeper, opened a 12-hour service between New York and Miami, and acquired a fleet of 1933-type Curtiss-Wright Condors, the first of the luxury class air liners to embody the noise-reduction features developed by the Sperry Gyroscope Company.

The new Condors permitted a general quickening of service throughout the Eastern Air Transport line, an hour being cut from the New York-Atlanta run, and New York and Miami joined by a through schedule for the first time. The night service between New York and Atlanta became instantly popular.

Because of the radically curtailed air mail appropriations during the latter half of the year, Eastern Air, on January 1, 1934, was operating over 340 fewer route miles than twelve months previously; although as stated above, its scheduled flying mileage was about 15 per cent greater in 1933.

Gorst Air Transport

Gorst Air Transport, Inc., during 1933 maintained its passenger-express service between Seattle and Bremerton, Wash., flying 30,510 miles on 1,017 trips during which it carried 4,235 passengers and 4,051 pounds of express.

Kohler Aviation Corporation

Kohler Aviation Corporation during 1933 maintained scheduled service between Milwaukee and Detroit, taking a direct air line across Lake Michigan and saving 117 miles of surface traveling between the two cities. Passengers, mail and express were carried in the Wright Cyclone-powered Loening amphibions. Water landings were made at the two terminals, with field landings at Muskegon, Grand Rapids and Lansing. During the year the line flew a total of 310,524 miles, of which 275,094 miles included flights

with mail and 35,430 miles were limited to passengers and express.

Licon Airways

Licon Airways, Inc., on January 1, 1934, was operating a fleet of Travelair 6-place cabin planes on a daily schedule between New Haven and Bridgeport, Conn., to Roosevelt Field, L. I., Floyd Bennett Field, Brooklyn and Newark Airport. Another schedule provided for daily trips between Islip, L. I., Roosevelt Field and Newark.

National Airways

National Airways, Inc., the operating company for the Boston-Maine Airways, Inc., which in turn is a subsidiary of the Boston and Maine Central Railroad, began operations on August 11, 1933, with five round trips daily between Boston and Portland, two of them later extended through Waterville to Bangor, Me. On November 1, the schedules were reduced to two round trips between Boston and Bangor. The line used Lycoming-powered Stinson tri-motor 11-place cabin monoplanes.

On November 26, 1933, Central Vermont Airways, Inc., was formed as a subsidiary of the Central Vermont Railway; and National Airways contracted with that company to operate an air line from Boston to Montpelier and Barre, Vt., through Concord and White River Junction—one round trip a day. That schedule over 155 airway miles, combined with 215 miles between Boston and Bangor, gave National Airways a total of 370 route miles. The company flew approximately 120,000 miles during 1933. Plans for 1934 contemplated an extension northward from Montpelier to Burlington, Vt.

National Parks Airways

National Parks Airways, Inc., operating between Salt Lake City and Helena, Mont., during 1933 flew 723,766 miles with mail, 512,787 miles with passengers and 427,476 miles with air express. More than 98 per cent of its scheduled mileage was completed. During the summer the company extended its service to include one daily round trip between Great Falls and Havre and another between Butte and Billings, adding 600 miles of flying daily. The company planned to install a number of new, fast planes early in 1934.

Northwest Airways

Northwest Airways, Inc., during 1933 flew 1,622,603 miles with passengers, mail and express on its routes out of Chicago. In March the company extended its service from Bismarck, N. D., to Billings, Mont.; and later made other extensions which took it to Spokane. At the end of the year Northwest Airways was planning further extensions to Tacoma by way of Seattle, Wash.

TO THE NATIONAL PARKS BY AIR

A National Parks Airways passenger ship in front of the new administration building at Salt Lake City Airport.

Pennsylvania Air Lines

Pennsylvania Air Lines during 1933 put new planes in service between Washington, Pittsburgh and Cleveland. An additional round trip schedule for passengers and express was added. The night schedules, which formerly carried only mail, were expanded to include passengers and express. The line further improved its service by assigning co-pilots to all planes. At the end of the year

Pennsylvania Air Lines was maintaining ten daily scheduled trips between its terminals.

Reed Airline

Reed Airline at the end of the year was operating its passenger service between Wichita Falls, Tex., and Oklahoma City, making one round trip a day over the 124-mile route.

Transcontinental & Western Air

Transcontinental & Western Air, Inc., during 1933 flew 7,000,000

A FULL LOAD OF MERCHANDISE

Air express goes into the cargo compartment of this speedy TWA Northrop to be whisked across the continent in less than 24 hours, a routine method of making fast deliveries to nearby, as well as distant, cities.

miles with passengers, mail and express on its divisions between New York and the Pacific coast. About half of that mileage was flown at night. The mileage represented an increase of about one million miles over 1932. The number of passengers increased 31 per cent over the previous year. Express poundage increased three-fold in 1933. Passenger miles increased 6,000,000, making a total of 19,500,000, the greatest in the company's history. Only six per cent of its scheduled flights were cancelled. TWA completed more than 96 per cent of its mail schedules where mail only was flown.

During 1933 TWA added a daily round trip between New York and Chicago by way of Pittsburgh, put on a night round trip schedule for passengers, mail and express between New York and Kansas City, a night round trip schedule between Kansas City and Los Angeles, making another coast-to-coast schedule; and also added a "blue ribbon" night mail schedule between Kansas City and Los Angeles, with only one stop, at Albuquerque, N. M. The above schedules added to TWA's mileage 6,782 miles a day.

QUIET LUXURY IN A DOUGLAS

Meals in flight from an iced buffet, and thermostatic heat control in a sound-proofed cabin feature Transcontinental & Western Air's new service from coast to coast.

Late in 1933 TWA acquired the first of the new Douglas transports; and the company planned to equip its entire system with 41 of the new planes in 1934, involving an expenditure of $3,500,000. The top speed of more than 200 miles an hour and a cruising speed of more than three miles a minute, which are features of the Douglas, were to reduce TWA's passenger, mail and express time between New York and Los Angeles to about 16 hours; at the same time permitting more schedules.

United Air Lines

United Air Lines during 1933 placed in operation a fleet of 60 new, high speed, all-metal Boeing low-wing monoplanes which involved an investment of $4,000,000 for that equipment alone. The new Boeings, however, justified the line's confidence because they immediately attracted a much larger volume of business. Revenue passengers increased from 6,345 in April to 17,538 in August; and the usual winter slump in traffic was materially checked by the new ships and aggressive promotion.

United Air Lines during the year increased its daily schedules between New York and Chicago from six to 11, with frequent extra sections. Three daily coast-to-coast schedules were maintained

AIR-RAIL EXPRESS SERVICE

Transferring cargoes between a United Air Lines Boeing transport and a Union Pacific express car at Omaha.

between New York and San Francisco. On the Pacific coast, where the new Boeings were also operated, service was speeded up between Seattle and Portland, Los Angeles and San Francisco. Throughout the year United Air Lines maintained the fastest coast-to-coast service with multi-engined planes. The 27 hour schedule was cut to 20½ hours, and toward the end of 1933, the time was further reduced to 19½ hours eastbound and 21 hours westbound. Chicago and New York were brought closer, 4 3/4 hours eastbound and 5½ hours westbound. The Chicago-Dallas division also had faster schedules.

United Air Lines during 1933 added to its routes 230 miles between Seattle and Spokane, and 383 miles between Philadelphia

and Cleveland, making a total of 6,909 route miles operated by this company.

United Air Lines during 1933 flew 14,500,000 miles with passengers, mail and express, as compared to 13,099,954 the previous year. Revenue passengers totalled 125,000 for 1933 as compared to 88,933 in 1932. Express poundage was doubled. Of 1,457 scheduled trips between Chicago and San Francisco only 172 were late two hours or more.

LUXURY IN THE AIR

Interior of one of the new low-wing twin Wasp-powered Boeing transports on the routes of United Air Lines. Upholstered adjustable chairs prevent fatigue on the long flights day or night.

United States Airways

United States Airways, Inc., operating between Kansas City, Salina, Goodland and Denver, installed in its planes new Wasp engines which increased their cruising speed 20 miles an hour. The company averaged 1,120 miles of daily flying with mail. On many occasions when surface traffic was blocked by floods or storms the

line provided fast service for important General Air Express shipments between its terminals.

Wedell-Williams Air Service

Wedell-Williams Air Service Corporation at the end of the year was operating passenger and express service between New Orleans and Laredo, Tex., by way of Houston and San Antonio, its schedule over the 650-mile route being one round trip daily.

Western Air Express

Western Air Express, Inc., during 1933 flew 1,776,326 miles with passengers, mail and express, as compared to 1,611,653 miles in 1932. Its efficiency in maintaining schedules rose to 97.54 per cent for 1933 as compared to 96.51 per cent the previous year. Passenger traffic increased 55.9 per cent, and express jumped from 19,325 pounds in 1932 to 53,110 pounds the next year, a gain of 174.8 per cent. Modern two-way radio telephone equipment was installed on the company's lines from San Diego to Los Angeles and Salt Lake City, and from Cheyenne to Albuquerque.

Western Air Express planned to replace some of its machines with five new, all-metal General Aviation monoplanes designed to cruise at 190 miles an hour.

Wilmington-Catalina Airline

The Wilmington-Catalina Airline continued to operate its passenger and express service over the 31 miles of route between the mainland and Avalon on Catalina Island, with five scheduled round trips daily.

INTERNATIONAL AIR LINE OPERATIONS

During a year in which far reaching advances were made toward equipping the chief trade routes of the world with fast air service in the keenly competitive race of industrial nations for a greater share of foreign markets, and the principal European air lines were completing final plans to span the south Atlantic and link the great South American commercial centers more closely to Europe, America's air service in the foreign field advanced to a key position of leadership among the world's international air line systems.

Pan American Airways System

Adding 4,330 miles of operating airways to its basic system during 1933, Pan American Airways, the international air transport system of the United States, entered 1934 with highly developed mail, passenger and express transport service over a network of 30,982 miles of airways, linking the United States on direct aerial trade routes to every country, except two, in the western hemisphere, and with important outposts firmly established in Alaska and in the strategic center of Far East trade, China.

Pan American greatly advanced a program of intensive research looking toward the early establishment of American air transport

UNITED STATES AIRWAYS HURDLES FLOOD

When flood cut off surface transport in August, 1933, the United States Airways flew this General Air Express shipment of yeast into Denver.

service across the Pacific to the Far East and across the Atlantic to Europe, climaxed by the spectacular 30,000 mile flight of Colonel and Mrs. Charles A. Lindbergh, undertaken by Lindbergh in his capacity as technical adviser to the Pan American Airways System.

A Merchant Marine of the Air

In the inter-American field the year's activities graphically demonstrated the important part this "merchant marine of the air" is playing in the recovery of American trade and commerce beyond

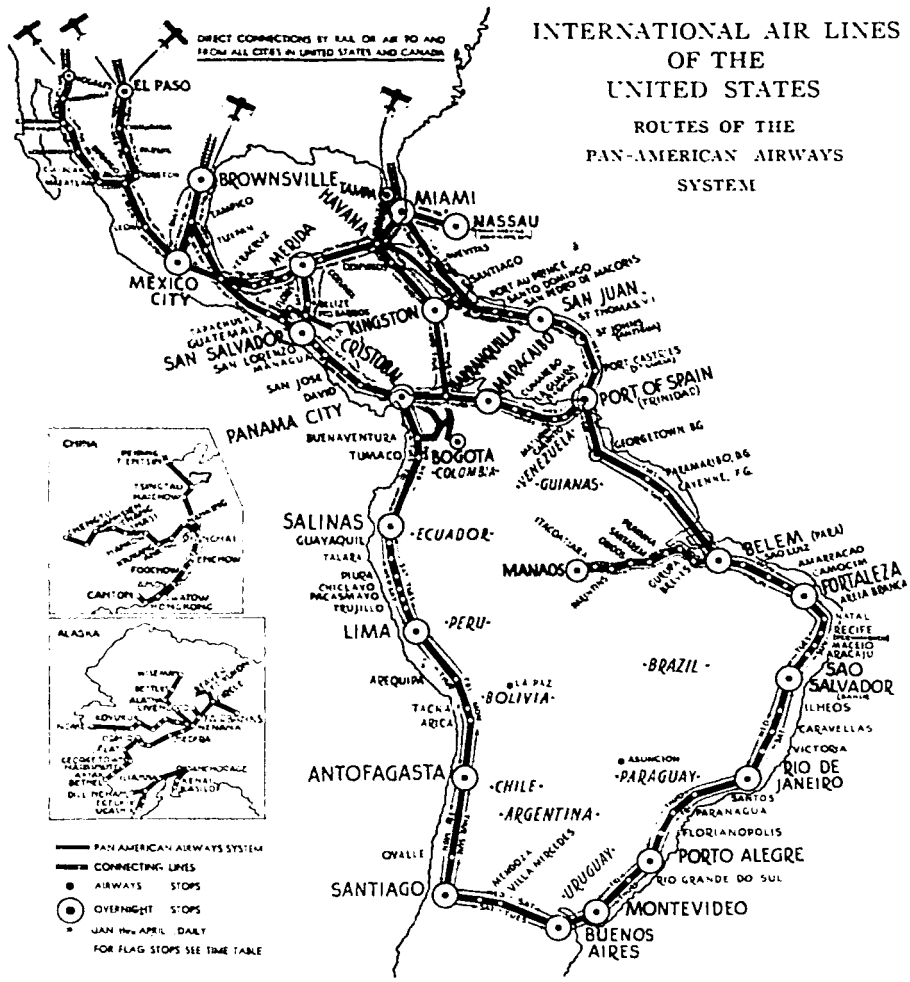
the borders of the United States. At the Pan American Conference in Montevideo, Uruguay, late in 1933, much attention was directed toward further improvement of communications, particularly air communications, between the sister American republics and the United States. Special instructions on that subject were issued by President Roosevelt to the American delegates before they left Washington. Representatives of those countries served by the American air line network were enthusiastic subscribers to plans for simplification of clearance formalities and international regulations to facilitate arrival and dispatch of scheduled transport aircraft at national frontiers.

Further emphasizing the vital service the Pan American Airways System is rendering in the international field, and by which it is importantly increasing good-will for all American interests in these foreign countries, was its heroic work in several national emergencies during the year. The famous "Hurricane Watch" maintained by the network of Pan American's radio and weather stations about the Caribbean again proved of inestimable value in locating and charting the course of tropical storms and in providing minute-by-minute authentic reports for the warning of communities and shipping which lay in the path of the hurricane.

During the two hurricanes which successively struck and almost destroyed the important city of Tampico, Mexico, in October with all other communications cut off, the Pan American station at the Tampico Airport successfully maintained communication with the outside world during the storms; and one of its planes was used as an auxiliary station for relief work. Flights were made with serum, antitoxin and doctors to isolated and stricken communities in a number of countries. There were several "ambulance" cases where lives were saved by means of rapid transportation to hospital centers for proper medical care, one case flying all the way from Lima, Peru, to the United States.

Aid to Foreign Trade

Reducing to a fraction the communication, shipping and travel time between the United States and the 32 countries and colonies of the West Indies, Central and South America, the international air line became the means by which exporters were able to take advantage of the first improvement in foreign markets. It became one of the recognized forces behind the President's recovery program for the rehabilitation of trade among the sister republics of the three Americas.



Although at the end of 1933 just completing its pioneer work in linking the Americas, Pan American Airways provided American commerce with its first time-advantage over foreign competitors in the South American markets. Latin American statesmen and business leaders on a number of occasions expressed to the Government in Washington their regard for this service as an outstanding contribution to improvement of international commercial and cultural relations.

New Records for Traffic

Traffic over the Pan American Airways System mounted to new

high records in all departments during 1933. Despite postal rates nearly twenty times above that for ordinary postage to the major countries of South America, the air mail volume increased 11 per cent over 1932, compared with a loss of 30 per cent in surface letter mail volume. Approximately 74 per cent of the international air mail represented business correspondence, the remaining 16 per cent being equally divided between governmental correspondence and personal mail.

Unlike Europe's system of subsidy and mail payment, whereby its international lines not only receive direct cash subsidies from the Governments but also keep the revenue derived from postage, Pan American Airways receives a straight mileage payment for flying mail from and to the United States, all revenue derived from such postage reverting directly to the United States Treasury.

The Postmaster General's Comments

Decrease in cost to the Government of this important service was marked. In commenting on the air line volume reports for June, 1933, Postmaster General James A. Farley pointed out that the foreign air mail service of the Post Office Department is playing a vital part in the rehabilitation of trade with Latin America. During that month, according to the records of the Post Office Department, the line returned to the Government an actual profit on its foreign air mail disbursements.

During June, usually a slow month for export activity, the records show, northbound mail over the trans-Caribbean trunkline of the Pan American Airways System between North and South America turned back to the United States Treasury over and above the contract cost to that department for the service, a profit of 12 cents a mile flown on this line. The record for air mail routes operated by Pan American, all of which are returning a substantial share of their operating cost, was cited by the Postmaster General as an encouraging indication of the self-liquidating nature of the Government's foreign air mail service.

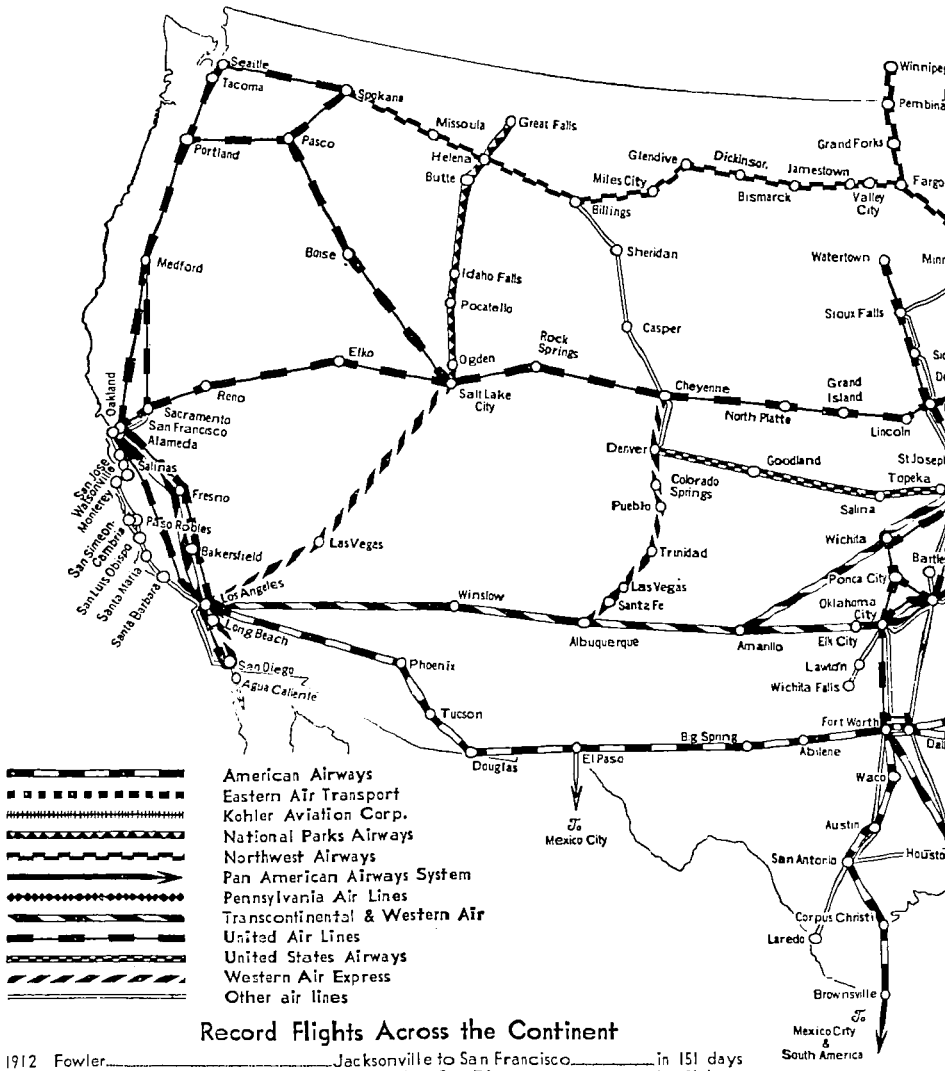
These international routes will return to the United States Treasury approximately $1,750,000 for the year 1933. The figures, showing a substantial gain over the 1932 rate of return, directly reflect the current upswing in trade activity as indicated by the increased business correspondence. As all revenue derived from foreign air mail postage, both from and to this country, reverts to the United States Treasury, increased commercial activity should soon place the foreign air mail service upon a self-sustaining basis, returning substantially all its cost to the Government.

SCHEDULED AIR TRANSPORT OPERATORS

U. S. Department of Commerce—Aeronautics Branch

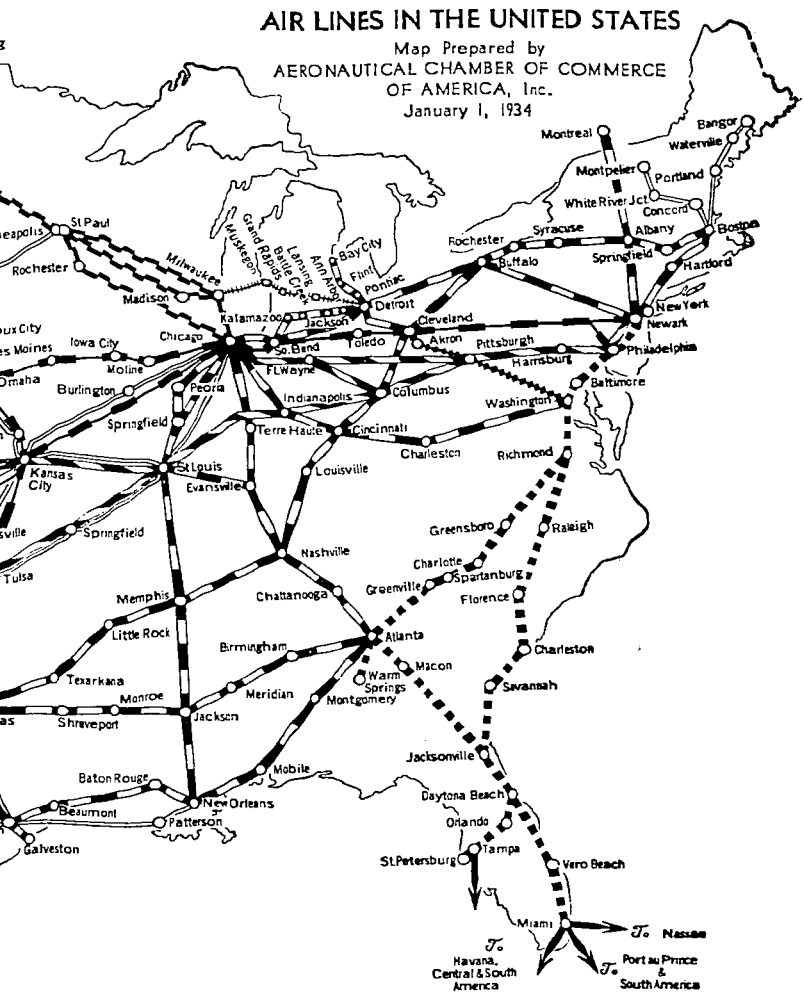
Report of January 15, 1934

Operator	Routes Operated	Route Mileage	Class of Service
American Airways, Inc.	New York to Boston	192	MPE
	Cleveland to Boston	589	MPE
	New York to Albany (and Montreal)	134	MPE
	New York to Buffalo	292	MPE
	Detroit to Buffalo	218	MPE
	St. Louis to Chicago	273	MPE
	St. Louis to Evansville	145	ME
	Atlanta to Chicago	623	ME
	Cincinnati to Chicago	261	ME
	Cincinnati to Washington	416	PE
	Fort Worth to Cleveland	1,159	MPE
	New Orleans to St. Louis	599	MPE
	Fort Worth to Atlanta	780	MPE
	Dallas to Los Angeles	1,323	MPE
	Brownsville to Dallas	546	MPE
	Galveston to Dallas	318	MPE
	Houston to New Orleans	319	MPE
	New Orleans to Atlanta	432	MPE
	Cleveland to Detroit (via Toledo)	152	MPE
	Cleveland to Bay City	251	ME
	Chicago to Detroit	265	MPE
Bowen Air Lines, Inc.	Dallas–Ft. Worth to Oklahoma City	218	P
	Dallas-Ft.Worth to Tulsa	269	P
	San Antonio to Ft. Worth	286	P
	Houston to Fort Worth	255	P
Braniff Airways, Inc.	Oklahoma City to Chicago (via Kansas City)	724	P
	Oklahoma City to Chicago (via St. Louis)	713	P
Eastern Air Transport, Inc.	Atlanta to New York	793	MPE
	Jacksonville to New York	866	MPE
	Jacksonville to Washington	667	ME
	Miami to Atlanta	616	MPE
	Washington to New York	209	PE
Eastern Air Transport	St. Petersburg to Daytona Beach	147	MPE
G. & G. Airlines Co. Ltd.	San Diego to Los Angeles	114	P
Gorst Air Transport, Inc.	Seattle to Bremerton	15	P
Hanford's Airlines, Inc.	Omaha to St. Paul	328	P
Kohler Aviation Corp.	Milwaukee to Grand Rapids	119	MPE
	Detroit to Grand Rapids	140	MPE
Licon Airways	Islip, L.I. to New Haven (via Bridgeport)	72	PE
National Airways, Inc.	Boston to Montpelier, Vt.	155	PE
	Boston to Bangor	204	PE
National Parks Airways	Salt Lake City to Great Falls	483	MPE
Northwest Airways Inc.	Chicago to St. Paul (via Rochester)	378	MPE
	Chicago to Twin Cities (via Milwaukee)	398	MPE
	St. Paul to Pembina, N.D.	369	MPE
	Fargo to Billings	580	MPE
Pennsylvania Air Lines, Inc.	Washington to Cleveland	317	MPE
Rapid Air Transport, Inc.	St. Louis to Omaha	406	PE
Reed Airline	Wichita Falls to Oklahoma City	124	P
Transcontinental & Western Air, Inc.	Los Angeles to San Francisco	372	MPE
	Amarillo to St. Louis	699	MPE
Transcontinental & Western Air, Inc.	Kansas City to New York	1,140	MPE
	Los Angeles to Kansas City	1,427	MPE
	Columbus to Chicago	283	MPE
	Columbus to New York	493	MPE
United Air Lines	San Francisco to Chicago	1,930	MPE
	Omaha to Watertown	259	MPE
	Kansas City to Omaha	168	MPE
	Pasco to Seattle (via Portland)	322	MPE
	Pasco to Spokane	127	MPE
	Salt Lake City to Pasco	525	MPE
	Pasco to Portland	178	MPE
	Dallas to Chicago (via Wichita)	1,009	MPE
	Dallas to Kansas City (via Tulsa)	492	MPE
	Kansas City to Chicago	411	MPE
	Tulsa to Ponca City	72	MPE
	Chicago to New York	717	MPE
	San Diego to Seattle	1,164	MPE
	San Francisco to San Jose	42	ME
United States Airways	Kansas City to Denver (via Salina)	566	MPE
	Laredo to New Orleans	655	PE
Wedell Williams Air Service			
Western Air Express	Los Angeles to Salt Lake City	588	MPE
	Pueblo to Cheyenne	199	MPE
	Denver to Cheyenne	96	MPE
	Albuquerque to Pueblo	248	MPE
Wilmington Catalina Air Line	Wilmington to Avalon	31	PE
Wyoming Air Service	Denver to Billings	476	P



Record Flights Across the Continent

1912	Fowler	Jacksonville to San Francisco	in	151 days
1923	Macready-Kelly	New York to San Diego	in	26 hours
1924	Maughan	New York to San Francisco	in	21 hours
1928	Goebel	Los Angeles to New York	in	18 hours
1930	The Lindberghs	Los Angeles to New York	in	14 hours
1930	Hawks	Los Angeles to New York	in	12 hours
1931	Doolittle	Los Angeles to New York	in	11 hours, 16 min.
1932	Haizlip	Los Angeles to New York	in	10 hours, 19 min.
1933	Turner	Los Angeles to New York	in	10 hours, 5 min.
1934	?			



Growth of Coast-to-Coast Speed by Scheduled Air Transport

1921	60 hours	Air Mail time
1924	31 hours, 35 minutes	Air Mail time
1926	30 hours, 45 minutes	Air Mail time
1930	29 hours, 30 minutes	Air Mail, Passengers, Express
1932	24 hours, 42 minutes	Air Mail, Passengers, Express
1933	19 hours, 30 minutes	Air Mail, Passengers, Express
1934	18 hours, 30 minutes	Air Mail, Passengers, Express
1935	7	

Growth of Passenger Traffic

Passenger traffic for the year showed an increase of 17 per cent over 1932. In the five years since the international service was extended beyond Cuba, nearly 250,000 passengers have traveled some 76,000,000 passenger miles over the Pan American Airways System. During the first nine months of 1933, passenger traffic exceeded the total for the previous year and by December 31 had reached a figure of 73,000 as against 62,500 for 1932. Traffic records indicate that 78 out of every 100 passengers are business travelers, executives, salesmen or others on business missions.

Many American firms now route their salesmen by air through Latin America on the same closely coordinated schedules as their salesmen are routed through the United States, at a saving of two-thirds the time and half the former cost. More than twenty of the leading American export firms contract a year in advance for the transportation of their field representatives over the airways.

To stimulate tourist travel over the international airways, Pan American introduced several innovations, including all-expense air cruises, similar to those operated so successfully by the steamship lines, between Texas and Mexico and between Florida, Cuba, the Bahamas and the West Indies. A second type of cruise was operated specifically for teachers and students, throughout the Caribbean area and around the entire South American continent. Special week-end excursions were also operated over several sections of the international routes. In the political field, presidents, government ministers and officials from many countries used the air service, and delegates from nearly every country in the Pan American Union traveled over the Pan American Airways to or from the conference at Montevideo.

Increased Express Traffic

During 1933 Pan American Airways concluded negotiations with 30 governments for a high-speed express shipping service for international commerce. A new procedure of international shipping was established. With the cooperation of other governments international regulations were generally unified, formalities simplified and a means established for the expeditious clearance and delivery of express merchandise carried by air.

As the result of improvements in shipping facilities, in a field where no "express" service has ever before been available to American trade, Pan American made possible on a time basis sales of

American products which otherwise would have been lost to competitors. The air express also provided a means of shipping perishable goods, light weight manufactures and other similar articles for the first time in international commerce, thereby opening a new field for American trade expansion. Air express shipments in 1933 on the Pan American Airways System showed an increase of 131 per cent over 1932.

Improved Schedules

On the western division (Brownsville, Mexico, Central America, Panama Canal Zone) a new service was established across Central America from the Pacific to the Caribbean on the new route to Guatemala City to Flores and northern Guatemala to Tela, Caribbean seaport of Honduras. Operating schedules were increased from two trips to three trips a week between Guatemala City and Cristobal, Canal Zone, to care for increasingly heavy traffic over this section. Additional schedules, for the same reason, were added to the service around the Gulf from Mexico City and Vera Cruz to Merida, Yucatan.

To link this western division network directly to the Pacific coast, Aerovias Centrales, an affiliated company to which Pan American's technical experience was made available, as well as the use of radio weather and machine shop facilities in Mexico, had conducted experimental operations for over a year between Mexico City, Central and Western Mexico and the Pacific coast in the United States.

On the Caribbean division (Miami, West Indies, Para, Brazil-Miami, Nassau-Miami, Havana, Jamaica, Colombia, Cristobal-Miami, Merida, Salvador) a connecting shuttle line between Jamaica and Puerto Rico was revised to provide service between Kingston, Jamaica, Santiago, Cuba, hence to Port au Prince, Santo Domingo City and San Juan, Puerto Rico.

A new service was started between Tampa, Fla., and Havana, Cuba, at the request of the Gulf Coast States for a direct connecting service with the international system. Tri-weekly schedules were instituted on a 90-day trial basis during which Pan American would have an opportunity to determine the importance of a year-round service should sufficient traffic be developed. The city of Tampa provided an operating seaplane base and made available other facilities for the use of the Pan American Airways System in that area.

On the Brazilian division (Para, Brazil, Rio de Janeiro, Monte-

video, Buenos Aires) a new feeder line was placed in operation from Para up the Amazon River 932 miles to Manaos. Providing interior Brazil with a direct service to the coast the weekly schedule is flown in nine hours with Sikorsky Wasp-powered S-38 amphibions.

Benefits derived from the air service in that section were seriously restricted by the once-a-week frequency and it was hoped that more schedules would soon be added by the Post Office Department to enable the American line to offset twice-weekly service available between South America and Europe by the subsidized French and German air services competing with Pan American in that area.

On the South American west coast division operated by Pan American-Grace Airways, increased passenger traffic made it necessary to step up the schedule on the 1,500 mile stretch between Talara and Arequipa and on the trans-Andean route from Buenos Aires

A FLEETSTER FOR ALASKA

A Consolidated Fleetster monoplane with a Wright Cyclone engine for operation on the Pacific Alaskan Airways Division of the Pan American Airways System.

to Santiago from twice a week to three times a week. On this division, due to the increased schedules, about 22,591 more miles were flown than in 1932.

Expanding its ticketing facilities for international air travel within the United States, Pan American Airways concluded important traffic arrangements with International Mercantile Marine and associated companies, United Fruit Company, the Colombian Line and the Alaskan Steamship Line, whereby their offices became agencies for the system in a cooperative booking service.

New Equipment Ordered

During 1933, in response to President Roosevelt's call for increased employment and industrial activity for national recovery,

the Pan American Airways System adopted a major development program for aircraft and other equipment for the international air transport service. At a time when many manufacturers were inactive, the Pan American orders, distributed through six States, provided employment for more than 3,100 technicians and artisans.

In addition to orders covering the construction of three transatlantic type Sikorsky flying boats and three Martin transocean flying boats at a cost of $1,700,000, a third type of marine aircraft, a single engined high-speed amphibion transport, was developed by Fairchild and Pan American engineers. Six of the new amphibions were placed under construction at the Kreider-Reisner plant of the Fairchild Corporation to be used in the coastal or sheltered water operations of Pan American and its affiliated companies in South America, and possibly in China.

Later in the year contracts were placed with the Douglas Aircraft Corporation for a fleet of six of the new 14-passenger, twin-engined Douglas transports and for a fleet of six Lockheed twin-engined 10-passenger machines. A Northrop Delta single engined transport was placed in experimental service on the Aerovias Centrales routes in central and western Mexico; and a new Clark type General Aviation single motored high-speed transport was being developed for a similar trial service on the routes of a second Pan American affiliate in South America.

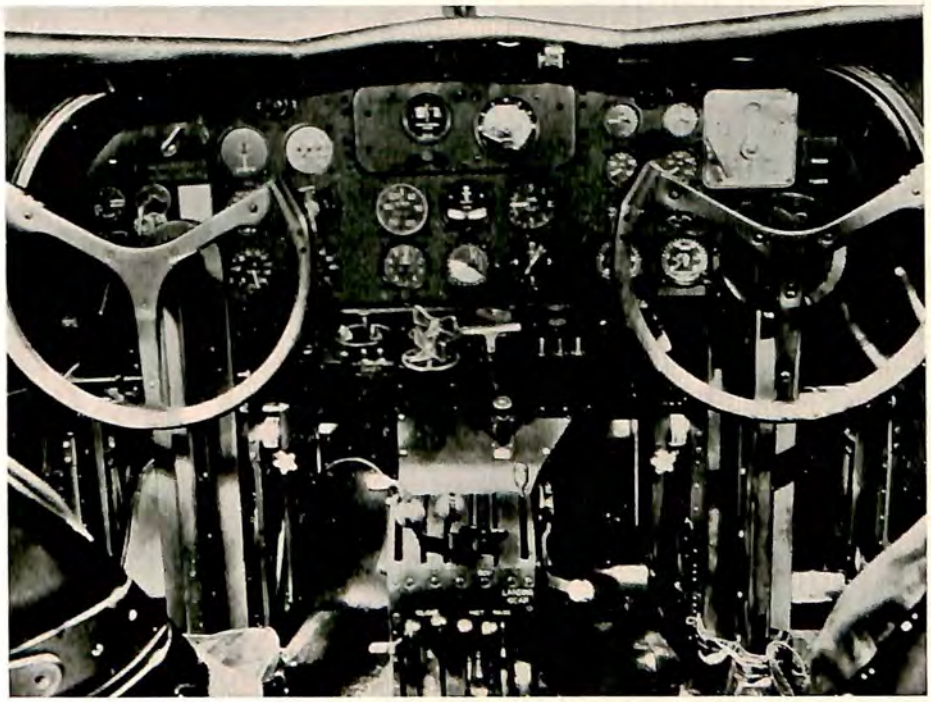
That new equipment, for both marine and land service, was to be available for use on the Pan American Airways System during 1934 to revolutionize transport schedules between the American continents. The Douglas transports were for the western division routes between Texas and Panama Canal Zone and on the Pan American-Grace Airways routes between northern Peru, Chile and over the Andes to Buenos Aires. The high-speed Lockheed planes were to be employed by Aerovias Centrales to provide a one day service between California cities and the Mexican capital, through connections with the domestic air lines at Nogales or Tijuana.

As a part of its development program Pan American advanced construction plans for a major seaplane base and operating terminal at Miami, Fla., the terminal port for its eastern trunkline operations to South America and the Panama Canal Zone.

Operations in Asia

The program for American service on the principal transoceanic trade routes of the world was greatly advanced by the transfer to the Pan American Airways System of the American interests in

the national air lines in China, which until 1933 had been held by an operating subsidiary of North American Aviation. At a time when the position of American air service in the Far East was seriously threatened by the rapidly advancing routes of European air lines, the entrance of Pan American in the Orient secured for American interests leadership in that important field. Thus the Pan American Airways System became a partner of the Chinese Na-



THE BRIDGE OF AN AIR LINER

The instrument board before the pilot and co-pilot on one of the new Boeing, Wasp-powered, passenger planes operated by United Air Lines. The Sperry artificial horizon (upper right center) shows whether the plane is on an even keel, and the Sperry directional gyro (upper left center) guides the pilot on a true course.

tional Government for development of important routes within the Chinese Republic and on the strategic coastal line between Shanghai and Hongkong, the key route to the trade markets of the Far East.

Through the China National Aviation Corporation, the operating company, Pan American and the Chinese Government placed on a sound operating basis the internal routes on the Yangtse River from Shanghai to Chengtu and from Shanghai north to Peiping. In

October, 1933, after a series of survey and test flights, the 1,000 mile coastal route was placed in operation. During exploratory flights in connection with this service a survey flight was also made from Hongkong to Manila, with a view to an American service between the Philippine Islands and China.

In the Chinese operations 14 American planes are used, manned by American flight personnel; and 19 radio and weather stations have been established over the Sino-American air routes. About 3,072 miles of routes are operated by China National Aviation Corporation.

Alaskan Operations

On the other end of a possible aerial trade route to the Far East, Pan American consolidated its service in Alaska and extended operations to provide a complete service for passengers, mail and express, generally throughout the territory. Standard Pan American radio and weather facilities, overhaul and maintenance methods and operations routine were installed during the year. On 2,040 miles of scheduled routes in operation during 1933 the service was maintained with only one schedule failure under the sub-zero flying conditions encountered. Pan American also carried on field research regarding possible transpacific operations.

At the end of the year Pan American was cooperating with Imperial Airways of Great Britain, Air France and the German Lufthansa in negotiating with several countries and colonies regarding operating rights and legal status in the projected transatlantic service.

CHAPTER IV

THE AIR TRANSPORT CODE

General Johnson's Opinion—The Industry's Statement—Conditions in the Industry—Full Text of the Code—Subscribers to the Code.

THE air lines of the United States were definitely placed under the National Industrial Recovery Act of 1933 when on November 14, 1933, President Franklin D. Roosevelt signed the Code of Fair Competition for the Air Transport Industry. It became operative on November 27, 1933; and automatically increased air line employment by 15 per cent and pay roll expenditures by 20 per cent.

In his letter to the President transmitting the Code for approval of the Chief Executive, General Hugh S. Johnson, administrator, said in part:

"The Air Transport Industry represents an exception in the present depression in that it has added to its personnel and expanded steadily from year to year. Its personnel increased from about 1,861 in 1929 to about 4,260 in June 1933. Under the recommended Code the Industry will show an additional increase in personnel of about 14.5 per cent. The total increase in pay roll will be about 20 per cent. It is considered that this is a substantial contribution to the Reemployment Program in view of the fact that the Post Office Department's mail payments which form the largest item of the air line income have been reduced approximately 28 per cent for 1933.

"Through the provisions of this Code the Industry has an opportunity to provide for the control of new operations so that it will not be subject to uneconomic paralleling of lines and the destructive competition experienced during the course of development by the railroads and bus lines.

"It is believed that the provisions in this Code permit adequate control and at the same time insure development and sound expansion."

The first draft of the code was submitted to the National Recovery Administration by the Aeronautical Chamber of Commerce of America, because its members represented 89 per cent of the air transportation industry.

At the public hearing before Deputy Administrator Malcolm

Muir on August 31, 1933. Lester D. Seymour, president of American Airways, in behalf of the Aeronautical Chamber of Commerce of America, presented the following statement supporting that first draft:

The Industry's Statement

"This is a statement of fact presented on behalf of the air transportation companies which are members of the Aeronautical Chamber of Commerce of America, Inc., with offices at 22 East Fortieth Street, New York.

"Our member companies at present account for 89 per cent of the scheduled daily flying operations of American air transport companies. Their average daily scheduled mileage is 118,304 miles of the total of 132,925 miles flown every 24 hours. During the first 6 months of this year our member companies flew 21,294,655 of the total of 23,926,535 miles of scheduled flying by American lines.

"Our member air lines on July 1, 1933, were operating 42,191 miles of routes of a total of 48,357 miles then in operation, as follows:

Miles of Routes in Operation on July 1, 1933

American Airways	9,902 miles of route
Eastern Air Transport	2,464 miles of route
National Parks Airways	509 miles of route
Pan American Airways System	15,916 miles of route
Pennsylvania Airlines	326 miles of route
Transcontinental & Western Air	4,747 miles of route
United Air Lines	6,021 miles of route
United States Airways	544 miles of route
Western Air Express	1,762 miles of route
By Members of the Aeronautical Chamber	42,191 miles of route
By Non-Members	6,166 miles of route
TOTAL	48,357 miles of route

"Our member lines and the executives in active charge of operations, almost without exception, have been in this business from the beginning. Our conclusions are based on facts and experience.

"We are wholeheartedly in favor of the President's program for industrial recovery. We are eager to contribute to that program in every possible way. We are especially eager to do our part to in-

crease employment and buying power. But, unlike other industries, air transport has no re-employment problem.

"Ours is a very young industry. It is just beginning to emerge from the experimental stage. Prior to 1918 it was entirely a military experiment. From 1918 to 1929 it was still an experiment, partly Governmental and partly civil, in that the air mail service, still very much of an experiment, was being developed. Since 1929, when passenger and express services were added to that of the air mail, we have made considerable progress. Although this progress has been slowed up by the depression, we have not lost ground. Our employees have not been thrown out of their jobs because of business conditions, as figures presented here show:

Wage Earners in Air Transport

"The number of wage earners employed in the entire air transportation industry (based on "Wages and Hours of Labor," U. S. Department of Labor, Bulletin No. 575, page 14, from 1927 to 1931, incl., and the Aeronautics Branch of the Department of Commerce Announcement for the year 1932 and the first six months this year) are as follows:

462 in 1927
1,496 in 1928
2,345 in 1929
3,475 in 1930
4,290 in 1931
5,461 in 1932
5,997 on July 1, 1933

"This shows that the air transport industry has kept on its payrolls throughout the depression not only its own people, but has employed more. Against the possible assertion that there are numbers of pilots unemployed, we would point out that although it may be true that many unemployed pilots hold transport licenses from the Department of Commerce, these are either amateur pilots or pilots who have never been employed in regular air transport operations. Practically none of them hold scheduled air transport ratings, the latter being a Federal requirement on inter-state air lines. Similarly with mechanics, their situation is the result of the prevailing over-enthusiasm in 1929 and succeeding years when it was popularly believed that aviation would expand with ever-increasing rapidity. These persons are potential employees. Their preparation and eagerness for employment in air line operations are most desirable; and they eventually will be given opportunities in this business in the course of its normal development, provided that it be permitted to develop in normal fashion.

"This record shows that we have taken care of our employees. One reason is that we are entrusted with the safety of human life; and we have heeded the demands of safety and reliability requisite to continued public confidence and growth in our operations. For that reason we have kept our trained employees during a period when we might have adopted the example set by some other industries, in which case we might now be giving an indifferent sort of service and make only a pretense of efficiency with reduced personnel.

"We have continued to give more air transport service despite declining revenues during the last two years.

Growth of Air Transport Service

"Since 1928, the American air transport industry has been, we believe, unique among transport industries, in that it has developed an increasing amount of passenger and express traffic every year, as follows:

	Passengers	*Pounds of Express*
1928	52,934	35,376
1929	165,263	197,538
1930	385,910	286,798
1931	457,753	885,164
1932	504,575	1,324,428
6 Months of 1933	229,075	813,353

"Recently we have not flown an increased quantity of mail, a fact not attributable to lack of service or even the depression, but solely to a 60 per cent increase in the air mail postage rate, from 5 to 8 cents an ounce, which became effective July 8th, 1932. An immediate drop of 24 per cent resulted.

"For the record we insert the mail poundage by fiscal years, as follows:

Fiscal Year	*Mail Poundage*
1928	1,861,800
1929	5,635,680
1930	7,719,698
1931	8,579,422
1932	8,845,967
1933	6,741,788

"Nevertheless we are offering greater facilities for air mail patrons as well as passenger and express traffic.

"We have improved equipment. Average seating capacity of our aircraft has increased 75 per cent over 1929. Improvements in aids to navigation, instruments, radio and refinement of equipment in general have added greatly to the safety and usefulness of our service to the public.

"Despite improved and increased service our industry has sustained drastic reductions in air mail payments during this period of general business depression when we could not hope for any overwhelming increase in revenues from passenger and express traffic.

Decreased Air Mail Payments

"The Post Office Department payments for domestic air mail service by fiscal years are as follows:

Fiscal year 1932	$20,000,000
Fiscal year 1933	19,460,000
Fiscal year 1934 (this year)	14,000,000

"It is seen that these mail lines are operating on a 28 per cent reduction from last year's payments.

"The air mail payments are the backbone of this industry. They form the greater portion of the total revenues of all the domestic air lines. The major air transport companies receive from the Post Office Department from 60 to 80 per cent of their total revenues. If our operations under the National Recovery Administration are to mean additional expense disproportionate to the ability of our companies to pay, many of our companies will be threatened with extinction, or at best, severe curtailment of operations in order to conserve their remaining resources. Rather than risk throwing our people out of employment, it seems logical to permit reasonable absorption of new employees under the terms of this code, together with additional employees which will be absorbed if a continued normal growth is permitted.

"That is what we have contemplated in the draft of the code which we have submitted. It should be noted that the code to which this statement refers is the revised draft containing certain suggestions of the Administrator at our recent informal discussion.

Salaries of Pilots

"For pilots the minimum rate of $250 a month is not intended to establish a prevailing rate of pay. We point to the fact that on the major air lines the salaries of pilots average from $6,000 to

$11,000 a year. We question strongly whether the National Recovery Act was designed to involve individuals enjoying such a salary range.

"The responsibility of pilots varies between the delivery of mail cargoes and care for the safety of passengers. The pilot responsible for the safety of aerial passengers finds that responsibility limited to the small capacity of an airplane, although his salary is far in excess of that received by the masters of our largest ocean liners.

"For purposes of comparison we submit herein a tabulation of monthly rates of pay received by master mariners, as follows:

Shipping Board:	
Motor ships	$300
Steamships	290
Panama-Pacific Line	405
U. S. Line	375
American Merchant Line	350
Baltimore Mail Line	325
S. S. Leviathan	625

"Economically the latter is responsible for vastly more in human lives, cargo and company property. The minimum guarantee, as stated, is so fixed with consideration for the smaller operators, at least one of whom now pays his pilots as low as $100 a month. In addition, our $250 minimum will permit the creation of entirely new services, such as the transport of freight by air at low rates with resultant employment for additional pilots, a forward industrial step which would promote the purpose of the N. R. A. This would be prevented were the minimum to be placed at a higher figure, because it would require establishment of prohibitive rates for shippers. A majority of the mileage flown for 2 years has been on the basis of an hourly or monthly rate of pay.

"Today a majority of the air lines have a base pay for pilots ranging from $600 to $3,000 a year, depending on length of service. This base pay is designed to compensate the pilot for ground service preparatory to flight, test flights and bad weather delays on a trip which is beyond the control of the operator. This base pay plus the flying pay now brings a pilot's salary to an average of $6,500 a year for most lines.

"We submit that pilots are career men, each with an opportunity for advancement to top positions in his organization as our new industry continues to expand, if it is permitted to do so. Many examples of such promotions are to be found within the industry.

"We come now to the co-pilot, whose minimum pay in our proposed code is $150 a month. Those who fear that this may become the prevailing rate are misinformed. We value our co-pilots. We want to employ them. We want to give them the experience and the opportunity to become chief pilots on our lines as we expand operations, if, we repeat, such growth is to be permitted. The co-pilot is a student chief pilot training himself for the responsibility of being in charge of a plane, just as the first officer of a ship is the master's assistant. The co-pilot's salary today compares more than favorably with that of a first officer on an ocean liner, which varies

DWARFING THE ROCKY MOUNTAINS

As the passengers see the rocks from this Wasp-powered monoplane on the Western Air Express route between Cheyenne, Wyo., and Albuquerque, New Mexico.

from $170 to $215 a month, the latter figure being the monthly salary of the first officer on the S. S. Leviathan. Prevailing rates for co-pilots range between $190 for beginners to $225 for men with one year's time.

"The law requires the code to fix maximum hours of labor and minimum wages. This our code does specifically. The minimum wages cited therein are not the average wages which any substantial group of personnel is now receiving. For example, under pilots' wages, the absolute minimum is an hourly or monthly rate for flying with a guaranteed minimum of $60 per week. Most of the pilots

employed on major lines receive upward of twice the minimum of $3,000 a year.

Hours for Pilots

"In its code the industry has fixed 35 as the maximum number of hours per week for pilots, this to include the full time that pilot is on duty, whether flying or not, with full knowledge that the flying cannot exceed the 110 hours per month stipulated by Department of Commerce safety regulations in a bulletin known as Aeronautics Bulletin No. 7-E, Section 4 (b), paragraph eight, page 9:

> "A first pilot shall not be on flight duty more than 110 hours in any one month. In reaching this maximum a pilot shall not be on flight duty in excess of the scheduled 30 hours in any seven-day period or more than the scheduled eight hours in any 24-hour period, provided, however, that relief from flight duty for not less than 24 consecutive hours shall be arranged for each pilot for each seven-day period."

"The wisdom of these regulations of the Department of Commerce, may be supported by the opinions of flight surgeons of the U. S. Army Air Corps and the Bureau of Aeronautics of the Navy.

"Moreover, despite the definite requirements of these regulations, the industry rarely causes its pilots to fly the full 110 hours per month.

"Pilots of larger air lines now average 90 hours or less flying per month, which is 20 hours less than the maximum limit established by Federal Regulation. Flying time includes taxiing for take-off and taxiing after landing.

"Increased speed of equipment has no bearing on the hours a commercial pilot should work per month. There is no sensation of speed at altitudes where 90 per cent of the flying is done. The medical examiners for the Army and Navy will confirm this statement: Fatigue is in proportion to time and not miles.

"High speed equipment in the air promotes safety and reliability in that it permits the pilot to more easily circumvent bad weather areas, etc. Facility and safety in landing is in no wise impaired because of improvements now available which bring landing characteristics well within Department of Commerce requirements.

"Cabin attendants are women, who have chosen this service as offering a career to their liking. We submit that the minimum salary of $100 a month and a maximum of 150 hours a month compare

favorably with the pay and hours of duty for similar services in other industries.

Hours and Wages of Mechanics

"The hours and wages of the different classes of mechanics employed in the air transport industry are subject to one outstanding influence, namely, the intermittent nature of the work. Everybody must recognize the newness of the industry, its requirement of continuous operation, emergency maintenance, repair work and irregular hours of duty.

"The demand of the industry arising from its traditional obligation in the carriage of United States mail, and moral obligation for the safe transportation of persons trusting themselves to its care, cannot be treated in the same manner as the demands of a manufacturing industry. For example, there are three general types of mechanics involved. One is the flight mechanic who, on some air lines, accompanies the airplane in flight. Second, the shop mechanic and his helpers, who work on the overhaul and maintenance of aircraft and engines and accessories within the shops established at necessary points along the air line, and whose work is of a comparatively scheduled nature. Third, the service mechanic and his helpers employed on fields, either at main base stations or intermediate fields. Their hours of actual work are intermittent, depending upon the arrival, departure and condition of airplanes, which, in turn, are subject to weather and other circumstances beyond control of the operators.

"The average rate of pay for these three types of mechanics in our industry is higher than the minimum rates as set forth in the code.

"Flight mechanics are provided primarily as a safety measure. They frequently are qualified as co-pilots and as such are career students. At the same time they have definite ground duties in servicing and inspecting aircraft.

"Shop mechanics and helpers in the air transport industry must maintain some flexibility of hours if they are to receive steady employment. We submit that their hours and rate of pay in our code are fair, because repair and overhaul are subject to traffic demands and emergencies. An even flow of work cannot be maintained, as is the case with other transportation facilities in which the greater volume of traffic and revenues warrants maintaining large shifts of mechanics on duty constantly.

"Service mechanics and helpers are engaged primarily in the

servicing, inspection and maintenance of aircraft as distinguished from overhaul. Their hours of duty are determined largely by schedules. Here much flexibility of hours of actual work is imperative because of frequent delays to flights caused by delayed connections.

"The maximum hours and minimum pay specified in our code for these three types of mechanics are, in the case of flight mechanics 40 hours per week, shop mechanics and helpers 40 hours averaged on a 26-week basis with a maximum of 48 hours in any one week; and for service mechanics and helpers, 48 hours per week averaged on a 26-week basis with a maximum of 56 hours in any one week.

"The hours in our code are lower than the 48.5 average fulltime hours per week for all male ground employees in 1931, as set forth on page 12, Bureau of Labor Statistics bulletin No. 575, containing a comprehensive survey of the American air transportation industry for 1931. Therefore, the reduction in hours specified by this code, from the average in 1931, amounts to 8.5 fewer hours in the case of shop mechanics and helpers, and slightly less for service mechanics and helpers, and 8.5 fewer hours in the case of flight mechanics.

"The minimum wages specified in the code for the three classes of mechanics are:

$35 a week for flight mechanics
40c an hour for shop mechanics and 30c an hour for helpers
40c an hour for service mechanics and 30c an hour for helpers.

"Hours of labor and rates of pay for radio operators, field clerks and all other employees as specified in our code are justified in the light of our experience with the intermittent work and flexibility of duty periods.

"We submit that these minimum rates are fair under the conditions created by the relatively small size of the industry and the intermittent nature of the work until such time as volume of traffic makes that work continuous.

No Discrimination in Employment

"As specified in our code, the air transport industry makes no discrimination in employment against membership or non-membership in a labor organization. The code in this respect complies with the law.

"In addition our code provides that:

> Employers in this industry may exercise their right to select, retain or advance employees on the basis of individual merit without regard to their membership or non-membership in any organization.

"This provision is necessary because of the vital factor in air transport operation which concerns the safety of human life. The purpose of the operators is to obtain services of the most experienced, most highly qualified employees because of the severe penalties which otherwise might result from inexperience.

"Besides the reductions in air mail payments our lines now are being subjected to curtailed revenues and increased costs of operation in other ways.

"The Department of Commerce, which operates the airways over which these lines fly, under the influence of the economy program has been forced to notify the operators that the ground facilities on a certain number of routes will have to be curtailed, involving the turning out of many beacons and the abandonment of certain radio and teletype services, all of which tend to restrict the operations of the air lines, unless they provide their own. That adds to the expense of operations and maintenance.

"The greatly decreased passenger fares, from 12 cents a mile in 1929 to an average of 6 cents today, has been brought about by the depression and the knowledge born of experience that this lower rate, approximating that charged for surface transport, is essential to continued growth of traffic. Here again, the lines are limited in their revenues until such time as the traffic increases materially.

"Again, and most important, the major lines which hold air mail contracts have based their operations and their future plans upon a virtual mandate from Congress and the present Administration.

"This mandate imposes upon the mail carrying lines the specific obligation to devote all possible revenues toward the development of aircraft, planes and engines, instruments, including two-way radio, airport facilities and other innumerable adjuncts tending to make flying faster, more reliable and increasingly safe. Without exception our major air lines have spent and are now committed to spend large portions of their revenues for this technical improvement.

"As we see it, there can be only one result, increased popularity resulting from enhanced usefulness, more passengers, more express

and more mail, a greater number of planes in service and a growing number of employees in every department of our industry.

"The continued growth of our new industry is of the utmost importance to the trained employees in it at the present time. Unlike many other industries, the pilots and mechanics now employed have made commercial aviation their careers. It is to their interest to work with the management in developing and expanding this business, and not permit themselves to be lured into destructive demands for higher pay and unreasonable hours by a promise of immediate, though temporary, gain.

A Safeguard to Fair Trade Practice

"With reference to trade practices, our code has only one stipulation, namely, Article VII, as follows:

> "Members of the Code agree not to initiate service between cities already served by another member over an identical route."

"This is necessary during this period of pioneering and development because of the high percentage of revenue which the air lines receive from the Government. The operators considered that to permit two companies, drawing payment from the Post Office Department for the carriage of mail, to operate over one route in competition would not constitute a proper use of Government funds.

An Agency for Self-Regulation

"Because the Aeronautical Chamber of Commerce represents 80 per cent of American air line operations we feel justified in urging that our trade association be authorized to act as the agent for self-regulation within the industry and cooperation with the NRA. We are prepared to provide the most efficient and effective machinery, which will meet with the approval of the Administrator. Therefore, in our code as filed, we have provided for this machinery to be set up by the Code Committee of the Aeronautical Chamber of Commerce of America, Inc., in cooperation with the Administrator.

"In conclusion, we point out that air transport now promises much to the country at large. It is rendering two vitally important services:

"1. A fast mail service for business, with the nucleus of a passenger service;

"2. A unique and essential reserve for the national defense.

Still in the Development Stage

"We have faith that the President's Program for reviving industry will succeed. We are prepared to do our part.

"Our industry is still young. It is small. Its practices and the conditions under which it operates and its equipment are largely in the growing stage. Let us not do anything here to interrupt this important national development."

The final code as signed by the President follows:

ALL ABOARD FOR POINTS NORTH

One of the Stinson tri-motored air liners, powered by Lycoming and operated by American Airways on its northern routes out of New York.

Text of Transport Code

Article I—Purpose: To effectuate the policies of Title I of the National Industrial Recovery Act the following provisions are established as a Code of Fair Competition for the Air Transport Industry, and upon approval by the President shall be the standard of fair competition for such Industry and shall be binding upon every member thereof.

Article II—Definitions: As used in this Code:

(1) The term "President" means the President of the United States.

(2) The terms "Act" and "Administrator" mean respectively the National Industrial Recovery Act, and the Administrator of Title I of said Act.

(3) The term "Industry" includes all public carriers for hire by aircraft for passengers, and/or mail, and/or cargo on scheduled operations and services incidental thereto within the several States of the United States, the District of Columbia, and the territory of Alaska and such branches or sub-divisions thereof as may from time to time be included by the President under the provisions of this Code, but does not include scheduled operations and/or services incidental thereto not within the several States of the United States, the District of Columbia, and the territory of Alaska.

(4) The term "employee" includes any person engaged in any phase of the Industry in any capacity, receiving compensation for his services, irrespective of the method of payment of such compensation.

(5) The term "employer" includes anyone engaged in the Industry by whom any employee is compensated or employed.

(6) The term "member of the Industry" includes anyone engaged in the Industry as above defined, either as an employer or on his own behalf.

(7) The term "Chamber" means the Aeronautical Chamber of Commerce of America, Inc., a trade association organized under the laws of the State of New York.

Article III—Hours: 1. No employee in the Industry shall be permitted to work in excess of forty (40) hours in any one week except as follows:

a. Shop mechanics and shop mechanics' helpers not more than forty (40) hours per week averaged over a period of four (4) weeks, with a maximum of forty-eight (48) hours in any one week.

b. Service mechanics and service mechanics' helpers not more than forty-eight (48) hours per week averaged over a period of eight (8) weeks with a maximum of fifty-four (54) hours in any one week.

c. Ground radio operators and field clerks not more than forty-eight (48) hours in any one week.

d. Watchmen not more than fifty-four (54) hours in any one week.

e. Chauffeurs not more than forty-eight (48) hours in any one week averaged over a period of six (6) weeks, with a maximum of fifty-four (54) hours in any one week.

f. The number of employees classified as ground radio operators, field clerks, and watchmen shall not exceed fifteen per cent (15%) of the total number of employees of any employer.

2. No employee shall be permitted to work for a total number

of hours in excess of the number of hours prescribed herein whether employed by one or more employers.

3. No employee shall be regularly employed more than six (6) days in any seven (7) day period.

4. The provisions of this Article shall not apply to any employee on emergency maintenance or emergency repair work involving accidents endangering life or property, nor to persons who receive more than $35.00 a week employed in a managerial, executive or professional capacity, or as pilots or co-pilots.

Article IV—Wages: 1. No employee shall be paid less than at the rate of $15.00 a week.

2. The rates of pay of all employees included in Article III whose hours of employment have been reduced by the provisions of this Code but whose wages have not been increased by the foregoing section of this Article, shall be increased by a readjustment so that equitable differentials in earnings will be maintained, and the rates of pay of such employees included in Article III whose hours have not been reduced shall not be decreased.

3. Those employees included in paragraph (a) Article III above who work in excess of eight (8) hours per day, or in excess of forty (40) hours per week, and those employees included in paragraph (b) Article III above who work in excess of forty-eight (48) hours per week, shall be compensated by not less than one and one-third times the normal rate of pay for such excess. All other employees on emergency maintenance or emergency repair work involving accidents endangering life or property shall receive at least time and one-third pay per hours work in excess of the maximum hours herein provided.

4. Any employee shall be classified according to the classification of his occupation existing on June 16, 1933, provided he is still performing the same duties. If he is performing other duties, he shall be classified as to occupation on the basis of such duties as of said date.

Article V—Labor Provisions: 1. Employees shall have the right to organize and bargain collectively through representatives of their own choosing, and shall be free from the interference, restraint, or coercion of employers of labor, or their agents, in the designation of such representatives or in self-organization or in other concerted activities for the purpose of collective bargaining or other mutual aid or protection.

2. No employee and no one seeking employment shall be required as a condition of employment to join any company union or

to refrain from joining, organizing, or assisting a labor organization of his own choosing.

3. Employers shall comply with the maximum hours of labor, minimum rates of pay, and other conditions of employment, approved or prescribed by the President.

4. No person under sixteen (16) years of age shall be employed in the Industry nor anyone under eighteen (18) years of age at operations or occupations hazardous in nature or dangerous to health. The Code Authority shall submit to the Administrator before March 1, 1934, a list of such occupations. An employer shall be deemed to have complied with these provisions if he shall have on file a certificate or permit duly issued by the Authority in such state empowered to issue employment or age certificates or permits showing that the employee is of the required age.

5. Within each State this Code shall not supersede any laws of such State imposing more stringent requirements regulating the age of employees, hours of work, or general working conditions than under this Code, nor shall it supersede the provisions of the Air Commerce Act of 1926, or any regulations issued thereunder or pursuant thereto.

Article VI—Administration: To effectuate further the purposes of the Act, a Code Authority is hereby set up to cooperate with the Administrator in the administration of this Code.

1. The Code Authority shall be composed of seven (7) voting members and one or more non-voting members. Not more than five (5) voting members shall be chosen by the Chamber. Not more than two (2) voting members may be chosen by those assenting to the Code who are not members of the Chamber. One or more non-voting members may be appointed by the Administrator to serve without cost to the Industry. The method of selection of the voting members of the Code Authority shall be subject to the approval of the Administrator.

2. Any trade or industrial association participating in the selection of or activities of the Code Authority, shall comply with the following requirements: (a) it shall impose no inequitable restrictions on membership, (b) it shall not violate any rule or regulation prescribed by the President under the Act, and (c) it shall submit to the Administrator true copies of its articles of association, by-laws, regulations, and amendments when made thereto, together with such other information as to membership, organization, and activities as the Administrator may require to effectuate the policies of this Act.

3. The Administrator may provide such hearing as he may

deem proper for those claiming the right to be represented on the Code Authority, and may thereafter change the method of selection and the organizations selecting the members of the Code Authority, in order that the Code Authority shall be truly representative of the Industry.

4. An appeal from any action by the Code Authority affecting the rights of any employer or employee in the Industry may be taken to the Administrator.

5. Only employers assenting to this Code shall be entitled to participate in the selection of the Code Authority and to share in its activities as hereinafter set forth.

6. The Code Authority shall have the following powers and duties to the extent permitted by this act subject to review by the Administrator:

a. To elect officers and assign to them such duties as it may consider advisable, and to provide reasonable rules for its own procedure.

b. To receive complaints of violations of this Code, make investigations thereof, provide hearings thereon and adjust such complaints, and bring to the attention of the Administrator for prosecution, recommendations and information relative to unadjusted violations.

c. To require periodical reports from the members of the Industry with respect to revenues, expenses, and other charges, wages, hours of labor, conditions of employment, number of employees, and other matters pertinent to the purposes of this Code, in order that the President may be kept informed with respect to the observance thereof. In addition to the information required to be submitted to the Code Authority as set forth in this Article there shall be furnished to government agencies such statistical information as the Administrator may deem necessary for the purposes recited in Section 3 (a) of the National Industrial Recovery Act.

d. To recommend to the Administrator a uniform system of accounting which upon his approval shall be used in furnishing the aforesaid reports.

e. To initiate, consider, and submit proposals for amendments or modifications to this Code, which upon approval by the President, after such hearings as he may prescribe, shall be incorporated herein with the same force and effect as if originally made a part hereof.

f. To determine and collect with the approval of the Administrator, from those assenting to the Code their equitable and propor-

tionate shares of the expense of maintaining the Code Authority and its activities.

g. To cooperate with the Administrator in regulating the use of the N. R. A. insignia solely by those who have agreed to and do comply with this Code.

7. Nothing contained in this Code shall constitute the members of the Code Authority partners for any purpose. Nor shall any member of the Code Authority be liable in any manner to anyone for any act of any other member, officer, agent or employee of the Code Authority. Nor shall any member of the Code Authority be liable to anyone for any action or omission to act under the Code, except for his own willful misfeasance or non-feasance.

8. The Code Authority shall have the powers and duties elsewhere provided in this Code, subject to the right of the Administrator, on review, to disapprove or modify any action taken by the Code Authority.

Article VII—Trade Practices: Within sixty (60) days from the date of approval of this Code with respect to existing routes, and within thirty (30) days after the establishment of any extension of an existing route, and prior to the establishment of any new route or service, each member of the Industry shall file with the Code Authority the following:

1. A certified copy of a letter or certificate of authority to operate, issued by the United States Department of Commerce permitting service over such route or extension thereof.

2. Such information in respect to routes, schedules, tariffs, working conditions, and other matters pertinent to the purpose of this Code as the Code Authority with the approval of the Administrator may from time to time prescribe in order to inform the President as to the observance of this Code.

3. Evidence of compliance with such standards and conditions of operation, other than those required by the Department of Commerce, as the Administrator upon the recommendation of the Code Authority after such notice and hearing as he shall prescribe, may approve as reasonable and in the interests of fair competition.

Article VIII—General: 1. This Code and all the provisions thereof are expressly made subject to the right of the President, in accordance with the provisions of sub-section (b) of Section 10 of the National Industrial Recovery Act, from time to time to cancel or modify any order, approval, license, rule or regulation issued under Title I of said Act and specifically, but without limitations to the right of the President to cancel or modify his approval of this Code

or any conditions imposed by him upon his approval thereof.

2. Nothing in this Code shall permit monopolies or monopolistic practices or eliminate or oppress or discriminate against small enterprises.

3. Each member shall post in a conspicuous place in each workshop a full copy of this Code.

4. This Code shall become effective on the second Monday after it shall have been approved by the President of the United States.

Air Transport Code Authority

The organization meeting of the Air Transport Code Authority for the Air Transport Industry was held in the offices of the Aeronautical Chamber of Commerce of America, Inc., at 22 East 40th Street, New York, on December 19, 1933.

The members of the Air Transport Code Authority, chosen or appointed in accordance with the provisions of Section 1 of Article VI of the Code, are as follows:

Voting Members: Designated by the Aeronautical Chamber of Commerce: E. R. Breech, North American Aviation, Inc.: H. S. Martin, Pennsylvania Air Lines, Inc.: W. A. Patterson, United Air Lines; L. D. Seymour, American Airways, Inc.; and J. T. Trippe, Pan American Airways System.

Elected by air line operators assenting to the Code, who were not members of the Aeronautical Chamber of Commerce: Temple Bowen, Bowen Air Lines; and T. E. Braniff, Braniff Airways.

Non-Voting Members: W. W. Howes, Second Assistant Postmaster General; E. E. Hughes, Deputy Administrator of the NRA; Eugene L. Vidal, Director of Aeronautics of the Department of Commerce.

Leighton W. Rogers, executive vice president of the Aeronautical Chamber of Commerce of America, was appointed by the Code Authority to act as executive officer of the Code Authority without vote.

On January 1, 1934, the following scheduled air transport operators had filed assents to the Code:

Members of the Aeronautical Chamber of Commerce who have assented to the Code:

American Airways, Inc., Eastern Air Transport, Inc., National Parks Airways, Inc., Pacific Alaska Airways, Inc., Pan American Airways System, Pennsylvania Air Lines, Inc., Transcontinental &

Western Air, Inc., United Air Lines, United States Airways, Inc., and Western Air Express.

Non-members of the Aeronautical Chamber of Commerce who have assented to the Code:

Bowen Air Lines, Inc., Braniff Airways, Inc., Gilpin Air Lines, Gorst Air Transport, Inc., Hanford Air Lines, Kohler Aviation Corporation, Licon Airways, National Airways, Inc., Northwest Airways, Inc., Pacific Seaboard Air Lines, Inc., Rapid Air Transport, Reed Air Line, Wyoming Air Service, Inc.

MORE SPEED FOR MAIL AND EXPRESS

One of the American Airways fleet of new mail and express planes, a Wasp-powered Lockheed Orion, fast enough to fly its cargo a thousand miles in five or six hours.

CHAPTER V

GOVERNMENTAL ACTIVITIES

Aeronautics Branch, Department of Commerce—The Aeronautical Board—Department of Agriculture—Bureau of Reclamation—Bureau of Standards—U. S. Coast Guard—Bureau of Customs—Federal Radio Commission—U. S. Forest Service—National Advisory Committee for Aeronautics—Public Health Service—U. S. Weather Bureau.

AS A NATIONAL institution aviation is used in one way or another by many branches of the Federal Government. Their activities during 1933 are summarized in this chapter.

Aeronautics Branch, Department of Commerce

The Aeronautics Branch of the U. S. Department of Commerce, under the Air Commerce Act of 1926 charged with supervision and regulation of all interstate commercial and civil aviation activities, made substantial progress during 1933. The Aeronautics Branch was reorganized. The office of Assistant Secretary of Commerce for Aeronautics was not filled. Assistant Secretary of Commerce Ewing Y. Mitchell was in charge of all transportation. Eugene L. Vidal was appointed Director of Aeronautics in active charge of aviation activities. Under Mr. Vidal the Aeronautics Branch was separated into two main divisions, with J. Carrol Cone as Assistant Director in charge of the Air Regulation Division and Rex Martin as Assistant Director in charge of the Air Navigation Division.

Project for a Low-Priced Plane

In November, 1933, Mr. Vidal announced that the Department of Commerce was taking the initiative in seeking a method whereby airplanes might be made available to the general public at a price low enough to make possible widespread private ownership. A market survey undertaken by the Aeronautics Branch included questionnaires sent to all licensed pilots asking if they would buy planes priced at about $700, provided quantity production permitted that

low price. The Branch reported that of 18,000 replies to the questionnaire approximately 10,000 definitely stated that they were in the market for such a plane. An additional 3,000 contemplated purchases under various conditions, and 5,000 were negative.

Assured that a substantial potential market now exists for such a plane the Department applied to the Public Works Administration for assistance, and that bureau announced on December 28, 1933, that $500,000 had been set aside for development of the low-priced plane. At the end of the year a committee representing both the Government and the industry had the project under serious consideration.

Members of that committee were: Mr. Vidal, chairman; Mr. Cone, representing the National Aeronautic Association; Amelia Earhart, Dr. George W. Lewis, National Advisory Committee for Aeronautics; Robert B. Renfro, editor "The Sportsman Pilot"; Leighton W. Rogers, Aeronautical Chamber of Commerce; Fred L. Smith, National Association of State Aviation Officials; Edward P. Warner, Society of Automotive Engineers; and Alford J. Williams, American Petroleum Institute.

A technical subcommittee of three from the Department of Commerce was appointed to make a special survey of engines for the proposed low-priced plane. The members were: Luther Harris, John H. Geisse and Richard C. Gazley.

At a meeting called by the Aeronautical Chamber of Commerce of America representatives of twenty-two of the nation's leading aircraft manufacturing companies conferred with Mr. Vidal regarding the small plane project. They included: Aeronautical Corporation of America, Amphibions, Inc., Bellanca Aircraft Corporation, B/J Aircraft Corporation, Boeing Airplane Company, Chance Vought Corporation, Consolidated Aircraft Corporation, Curtiss Aeroplane & Motor Company, Inc., Curtiss-Wright Airplane Company, Don Luscombe, Fairchild Aviation Corporation, Fleet Aircraft Company, General Aviation Manufacturing Corporation, Grover Loening Aircraft Company, Inc., Kellett Autogiro Corporation, Kreider-Reisner Aircraft Company, Pitcairn Autogiro Company, Sikorsky Aviation Corporation, Stearman Aircraft Company, Stinson Aircraft Corporation, Taylor Aircraft Company and Waco Aircraft Company.

Manufacturers Adopt Resolution

At that meeting the manufacturers adopted the following resolution:

"Resolved, that the aeronautical industry wholeheartedly endorses the proposal of the Director of Aeronautics of the Department of Commerce for the development of a new safe, low-priced quantity production airplane with the assistance of funds provided by the Public Works Administration; and

"That the industry appoint a committee of five to assist the Government in working out the technical details of the proposed airplane, and

"That the industry appoint another committee of five to determine with the Government the legal and economic practicability of organizing a corporation among the industry to do this development."

EMERGENCY PORTS OF THE AIR

Airways keepers' quarters and beacon on a Department of Commerce intermediate landing field at Beowawe, Nevada.

Under that resolution the Aeronautical Chamber of Commerce formed two committees. The first committee was to cooperate with the Aeronautics Branch in working out the technical details and complete performance specifications of the new airplane and its engine. Members of that committee were: Chairman, R. S. Damon, president of the Curtiss-Wright Airplane Company; C. J. Brukner, president of the Waco Aircraft Company; B. D. DeWeese, general manager of the Stinson Aircraft Corporation; R. H. Fleet, president of the Consolidated Aircraft Corporation; and C. G. Taylor, president of the Taylor Aircraft Company.

The second committee was to cooperate with the Aeronautics Branch in determining the legal and economic practicability of or-

ganizing a corporation within the industry to undertake development and production of the plane. Members of that committee were: Chairman, S. M. Fairchild, president of the Fairchild Aviation Corporation; E. R. Breech, president of North American Aviation, Inc.; P. G. Johnson, president of the United Aircraft & Transport Corporation; T. A. Morgan, president of the Curtiss-Wright Corporation; and Taylor Stanley, president of the Aeronautical Corporation of America.

It was explained that the resolution limited the committees to five members each, that they were chosen because of their individual technical and organization experience, and therefore were qualified to coordinate the thought of the entire industry in its efforts to work out a plan of cooperation with the Government in any project seeking the development of low-priced planes during 1934.

Other Activities of Aeronautics Branch

During the year the Aeronautics Branch was active in many branches of aviation aside from its routine regulatory and promotional duties. The chapter on airports details the manner in which the Aeronautics Branch cooperated with the Civil Works Administration in establishing hundreds of new municipal airports and developing others already in existence. The chapter on legislation and regulation gives in detail the achievements of the Aeronautics Branch in revising the rules governing non-commercial flying, thus encouraging private ownership. The airways chapter details the work of the Aeronautics Branch in establishing five new airways and relocating facilities on existing routes in cooperation with the Public Works Administration.

The Aeronautics Branch also conducted experiments for blind landing with aircraft, and advanced the new science to a stage where public demonstrations proved the absolute practicability of this important development. Reports on crash-resistant fuel tanks and a radio direction finder were published during the year, further details of which will be found in the chapter on technical progress. Airworthiness requirements for aircraft received considerable attention. The Aeronautics Branch held conferences with representatives of the industry which resulted in material changes in the requirements, which were to be issued in revised form during 1934.

The Aeronautical Board

On June 17, 1924, the Aeronautical Board, which had existed for some eight years, was reorganized. For the first time its juris-

diction and mission were 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 Air 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.

Specific questions requiring the action of the Aeronautical Board involve policies and plans for the tactical and strategical employment of aircraft; the location of air stations; assignment to the Army or Navy of the development of new types of aircraft, motors, accessories and weapons; rendering available to either service, whenever possible, training, repair and other aviation facilities; plans to prevent competition in procurement and provisions for use of surplus material; and consideration and recommendation in regard to all estimates for appropriations for the aeronautical programs of the Army and Navy.

Department of Agriculture

The U. S. Department of Agriculture used planes for official travel more extensively in 1933 than during former years. Planes were employed also in certain lines of research and regulatory work.

A plant pathologist of the Bureau of Plant Industry made several flights to collect plant disease spores high in the air as part of an investigation on the movement of such spores through the atmosphere and on the danger of the spread of plant disease by spores carried along on air currents. The investigator made trips on the airship "Los Angeles" and in Army Douglas, Navy observation planes, Coast Guard Douglas amphibions, Viking seaplanes, and Naval Reserve training planes.

Biological Survey officials used planes to study water fowl conditions, administer wild-life refuges and enforce laws. A biologist in the Illinois River region used a plane to survey the duck-hunting areas. The protector on the Niobrara big-game preserve, near Valentine, Nebr., used a plane to enumerate and observe big game animals. In connection with planning improvements under the recovery program, the protector of the Clear Lake Bird Refuge, Calif., made an airplane survey of the refuge, mainly to plan fencing for the protection of birds from trespassers. One of the Alaska game wardens owns an airplane in which he patrols a large district

to enforce the game laws. He flew more than 7,000 miles in 1933.

Department of Agriculture entomologists tested the efficacy of dusting fields from the air with calcium arsenate to control the pea weevil by sending down clouds of dust from a plane. Department engineers made flights in Indiana, Ohio and Kentucky to locate badly eroded areas, near which soil erosion camps might be established to best advantage. Soil experts made use of aerial photographs to obtain preliminary data for base maps in surveys of several counties in New York and Illinois.

The War Department made an aerial survey of the Animal Husbandry experiment farm at Beltsville, Md., to determine the area in pasture, field crops and woodlands. Agricultural experts reported that such aerial surveys save much valuable time as compared to surface methods.

Bureau of Reclamation

The Bureau of Reclamation of the Department of the Interior has jurisdiction over the development of the Columbia River reclamation project. The first report of the Columbia Basin Commission shows the value of aerial surveys in work of that character:

"On October 20, 1933, the Commission authorized the Wallace Aerial Surveys of Spokane to make an aerial survey of the lands along the Columbia River from the Grand Coulee dam site to Hunters, a distance of approximately 50 miles. The estimated cost of this survey is $4,000, or approximately $20 a square mile. A recent contract let for similar work in this State is costing $60 a square mile. This air survey of the region that will be flooded by the first unit of the Grand Coulee dam was necessary in order to expedite the engineering, and it will materially reduce the cost thereof. It will also prove invaluable to the appraisers in their work."

U. S. Bureau of Standards

The Bureau of Standards in 1933 continued its investigation of materials, fabricated parts and aeronautical instruments in cooperation with the Army, Navy, Aeronautics Branch, and National Advisory Committee for Aeronautics.

Several failures of materials in service were referred for study. These included failures of propeller blades, wire loops and crankshafts. Many were found to be fatigue failures, caused by stresses produced by vibration in service. A simple method of exciting

resonant vibrations in non-rotating propellers, of sufficient intensity to cause fatigue failures, was devised. The stress distribution was measured with a Tuckerman optical strain gage. Apparatus was constructed for the application of the magnetic dust method to the inspection of hollow steel propeller blades, and it proved effective in the location of hidden defects.

The bureau also made type tests of all kinds of aeronautic instruments, principally for the Navy Department and for manufacturers. Considerable attention was given to the development of instruments, apparatus and materials. A monograph on aircraft powerplant instruments was completed. (N.A.C.A. Tech. Report No. 466). A study was made of synthetic resins and cellulose derivations in dopes, the cellulose acetate dopes being found most satisfactory in tautness and fire resistance.

The system of radio aids for blind landing was perfected. An installation was made at Newark, N. J., for practical service tests, and many completely blind landings were made during the year. The radio range beacons were made more reliable by improvements in the TL antenna system which was developed to reduce course fluctuations. In cooperation with the Airways Division of the Aeronautics Branch means were devised to secure simultaneous visual and aural operation in an airways radio range beacon. An improved airplane direction finder with visual indicator was developed and flight-tested.

The study of the strength of welded joints in tubular members was extended to cover tests on heat-treated welds and on welds of thin-walled tubing. A number of experimental designs of metal wing beams built for the Navy were tested under different loading conditions, thus supplying data upon which to base the design of improved types of military aircraft. The investigation of the corrosion of aluminum alloy sheets when exposed to the weather and the effectiveness of protective coatings was being continued in 1934.

U. S. Coast & Geodetic Survey

The U. S. Coast & Geodetic Survey, operating under the Department of Commerce, in 1933 used air photographs in preparing parts of its nautical charts. All these air photographs are taken by army observers in army planes, in compliance with specific requests.

Under the Air Commerce Act of 1926, the production of aviation maps was delegated to the U. S. Coast & Geodetic Survey,

which was equipped for such work. The first strip airway map was issued June 27, 1927. There are now 22 strip maps still on sale. Covering an area 80 miles wide along an established airway, these are gradually being supplanted with the newer sectional airway maps.

The sectional maps are planned to embrace an area within 2 degrees of latitude and 6 degrees longitude, thereby including much important territory off the regular air routes. Present plans contemplate a series of 87 sectional airways maps of the United States. Of the 20 already published, the first was issued December 27, 1930. Revised editions of all airway maps are issued frequently with the accumulation of important changes.

An observer of the U. S. Coast & Geodetic Survey was engaged throughout 1933 in flight checking, using a cabin-type plane from the Aeronautics Branch of the Department of Commerce. This flight checking is done, not alone to verify details shown on the proof sheets of new and revised editions of the specialized maps, but also to locate, that they may be emphasized, all outstanding objects or landmarks not shown on existing maps.

U. S. Coast Guard

The U. S. Coast Guard aviation service operating from three air stations—Gloucester, Mass., Cape May, N. J., and Miami, Fla.—accomplished 184,965 miles of flying in 1933. Activities included the saving of life and property, law enforcement and assisting in the national defense. The Coast Guard made 33 actual rescues with airplanes in 1933. Smuggling of contraband, narcotics and aliens was continually suppressed by the use of Coast Guard planes. Menaces to navigation were located from the air and reported to surface vessels. Schools of fish were spotted from the air, and fishing fleets were notified. Land and water areas were surveyed for mapping and new communication lines. Various Governmental agencies were aided, using Coast Guard planes to study the control of plant diseases.

During the year numerous calls were received at the air stations for assistance from vessels without medical personnel. To contact the vessel requesting aid Coast Guard planes were flown from 150 to 175 miles offshore. The sick or injured men were transferred by life-boat from the vessel to the plane and then were flown to the nearest hospital. In several cases the rapidity with which the injured men were hospitalized meant the difference between life and death. Officers of the service report that the ad-

BOSTON AT A SINGLE GLANCE

This birdseye view of Boston was taken at 15,000 feet with a Fairchild five-lens camera for the Harvard University Geographical Institute. The Charles River is seen in the upper right corner. The white footprint is a reservoir.

vantages of using planes in Coast Guard operations are becoming more evident every year.

Several years ago the Coast Guard established an aircraft checking system along the Atlantic seaboard. This service to any pilot is available upon request. Planes are checked, if desired, from the time of leaving the airport until destination is reached. As a plane passes over a Coast Guard station, the man on lookout checks the passage of the plane and the next station is notified of the time of passing and description of the plane. More than 12,000 reports were made by Coast Guard stations in 1933.

At the end of 1933 the Coast Guard had in active service five General Aviation seaplanes, three Douglas amphibions, and three other smaller seaplanes particularly adapted for inshore work. The planes were equipped with radio transmitting and receiving sets and radio direction finders, as well as other modern instruments to assist the pilot. Ten pilots were on active duty, and ten student pilots were in training at Pensacola, Fla.

Bureau of Customs

The Bureau of Customs, operating under the U. S. Treasury Department, in 1933 maintained air patrol units along the Canadian and Mexican borders in the Customs collection districts of Buffalo, Tampa, San Antonio and San Diego.

The air patrol units cooperating with the customs officers on the surface waged continual war upon smugglers. They seized 20 airplanes in 1933. Approximately half of them had been used in smuggling activities. The others were seized for violations of regulations relating to aircraft entries from foreign ports. The air patrol used the confiscated planes. They included Curtiss-Wright Falcons and Robins, Travelair, Ryan, New Standard, Waco and Fairchilds.

Federal Radio Commission

The Federal Radio Commission is charged by law with the licensing of all radio stations coming under the jurisdiction of the United States. The Commission in 1933 made a survey of the needs and requirements of radio stations used in the aeronautical service, both ground stations and stations on aircraft. Rules and regulations of the Commission relating to this particular service provide strict methods of operation. Two specific provisions of general interest are quoted here:

"Only one airport station will be permitted at an airport. The use of the station shall be open to any and all aircraft operators. In case one or more aircraft licensees operate regularly from such airport, control lines to the station shall be permitted upon request in order that each operator may, if he desires, use the station under the supervision of the licensee for the handling of his own aircraft. If airport stations are installed at adjacent airports, arrangements must be made between the licensees for a system to prevent interference being caused by simultaneous operation. In case of

disagreement between the various interests as to the operation of airport stations, the Commission will specify the arrangements.

"At all times the licensee of an aeronautical point-to-point service shall be required to transmit, without charge or discrimination, all necessary messages in times of public emergency which involve the safety of life or property."

U. S. Forest Service

Having demonstrated year after year that the airplane is the most economical instrument in saving the national parks from destruction by fire, the Forest Service of the U. S. Department of Agriculture in 1933 continued to employ aircraft, although handicapped by the Federal economy measures. Planes were used for reconnaisance of fires already under way, for detection purposes during hazy periods and for emergency transportation of men and supplies. Some aerial mapping was done.

Army and Navy planes were placed at the disposal of forest officers on occasion. In general, however, the work was carried on by private concerns under contract, and was limited to the California, Pacific Northwest, Northern Rocky Mountain and Lake States regions and Alaska.

About 540 flying hours were spent on fire patrol or mapping. The aerial fire patrol cost only $11,925, while the vast saving in national and private property as a result of that small expenditure cannot be estimated.

A total of 994 men and 185,000 pounds of equipment and supplies were transported by air during the year. In many instances fire and other emergencies were met within a few hours by air when a week or more would have been lost by pack train. In routine national forest transportation airplanes were used on several occasions when they proved cheaper per pound carried as compared with pack train service to isolated sections.

The forest officers reported splendid cooperation from scheduled air transport pilots in detecting and reporting fires along their routes.

National Advisory Committee for Aeronautics

The National Advisory Committee for Aeronautics, under the direction of Dr. George W. Lewis in charge of research, in 1933 used airplanes for the following purposes:

To determine the pressure distribution over the wings and tail surfaces of a diving bomber.

To determine the effect of the propeller on the terminal velocity of an airplane in a vertical dive.

To determine accelerations and stick forces required in a pull-out from a vertical dive.

To determine the full flight performance of high-lift and lateral-control devices to increase safety at lower landing speeds, applicable to all types of airplanes.

To determine vibrations in airplane structures.

To investigate in the full-scale wind tunnel:

The performance of the controllable-pitch propeller;
The cooling of the two-row radial engine;
The lift, drag, and pitching moments of an airplane;
The effect of flaps.

The machines employed were Boeing fighters, Curtiss fighters and observation planes, a Martin experimental diving bomber, a Fairchild F-22, Consolidated training planes, the McDonnell "Doodlebug" and a Pitcairn autogiro.

The remarkable advance in airplane performance and efficiency accomplished in 1933 was attributed in no small degree to the cumulative result of years of organized scientific research conducted by the National Advisory Committee for Aeronautics under the technical direction of Dr. Lewis. The N. A. C. A. laboratory at Langley Field, Va., was generally regarded as the equal, and in many instances the superior, of similar institutions maintained by foreign governments at much greater cost. At the same time the aviation industry had come to recognize in it a source of ever-increasing technical results capable of practical application.

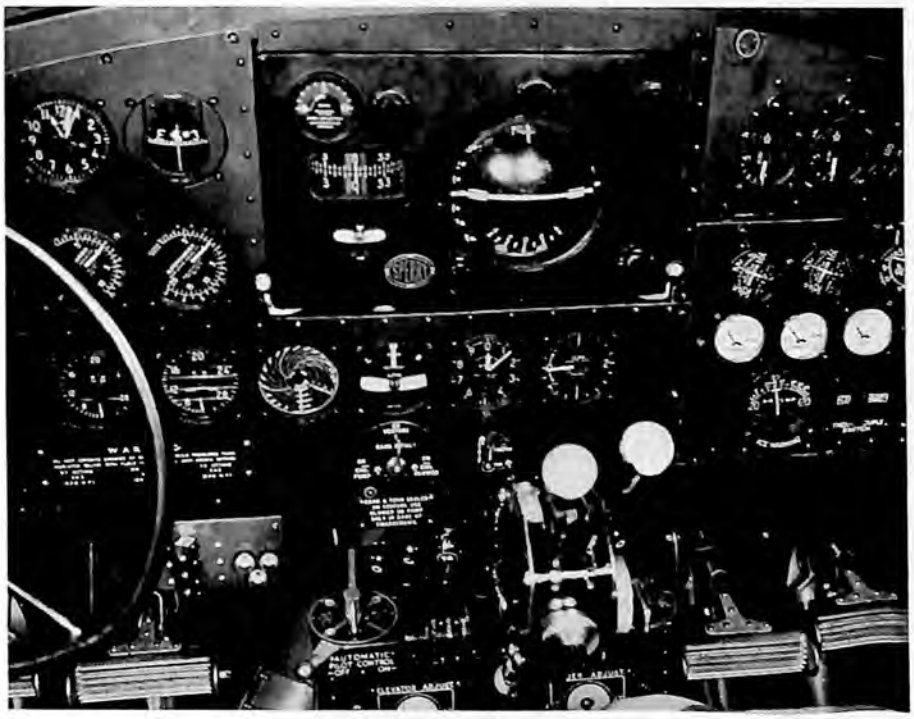
President Roosevelt had that in mind when, in transmitting to Congress the 1933 N. A. C. A. report, he said in part:

"The principal underlying cause of this remarkable progress has been the efficient functioning of the National Advisory Committee for Aeronautics in coordinating and planning for the research needs of aviation, civil and military, and in conducting the necessary fundamental scientific researches to serve the needs of all agencies. The continuous prosecution of fundamental research in aeronautics is essential to the national defense and to the future of air transportation upon a sound economic basis."

Public Health Service

The U. S. Public Health Service, of the Treasury Department, is charged with the inspection of airplanes and air passengers arriving from foreign countries. During the fiscal year 1933, 4,186

airplane arrivals at airports of entry in the United States from foreign ports required quarantine inspection. The planes carried 25,767 persons. On 2,209 arrivals, 20,396 persons, of whom 2,327 were aliens, were examined by medical officers of the Public Health Service prior to entry. The others, 1,977 arrivals with 5,371 persons, entered without medical examinations, having had permission to arrive at airports at which medical officers were not available.



SPERRY AUTOMATIC PILOT

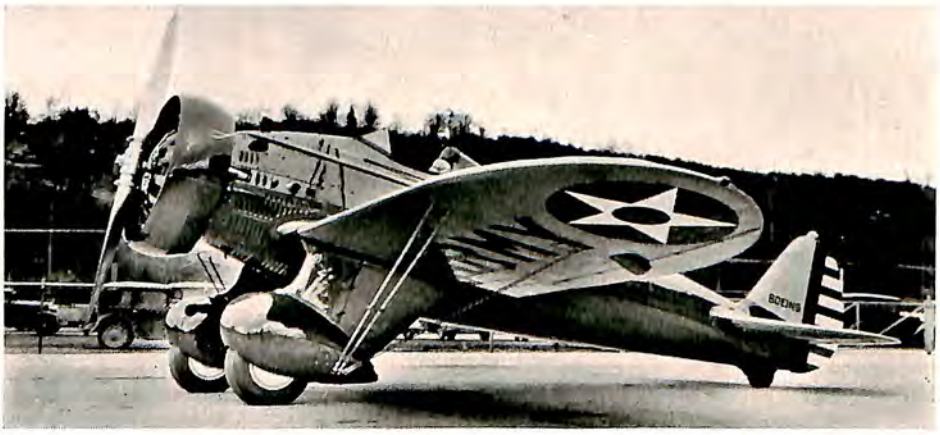
The instrument panel of the new Wright Cyclone-powered Douglas air liners for Transcontinental & Western Air. Upper center shows the Sperry automatic pilot installation.

The draft of the International Sanitary Convention for Air Navigation, adopted by the Permanent Committee of the Office International d'Hygiene Publique in Paris in 1932, was formally submitted to the United States for ratification. The Government had signified its willingness to sign, with certain reservations, and it was anticipated that final ratification would be made in 1934.

U. S. Weather Bureau

Like other Government activities, the U. S. Weather Bureau in 1933 had been compelled to economize; but it continued to provide continuous 24-hour service along about 13,000 miles of airways and partial service, meeting the needs of scheduled flying, over some 12,000 additional miles; aggregating 25,000 miles in all. Certain intermediate stations were discontinued; upper wind observations were decreased in number at various points; and surface observations, although regularly made at all stations, were not transmitted from some stations during periods of favorable weather conditions.

The bureau on December 31, 1933, had 65 stations at the larger terminal airports, where close contact was maintained with pilots. At those points reports of surface conditions, especially of ceiling and visibility, were received from a network of more than 500 observing stations, and reports of upper winds from about 70 stations. Shore period forecasts based on those reports, and on weather maps prepared several times daily, were issued regularly for all airways. Planes were used at a few stations to make observations of upper air temperature, humidity and pressure.



NEW TERROR OF THE SKIES

The Army Air Corps all-metal, low-wing single-seater Boeing pursuit plane with a 525 horsepower Pratt & Whitney Wasp engine.

CHAPTER VI

ARMY AVIATION

The Need for a Development Program—Air Corps Equipment—Public Works Funds—Air Corps Activities—Report of General Foulois.

AT THE annual meeting of the Society of Mechanical Engineers in New York on December 7, 1933, Major Clinton W. Howard, then Chief of the Materiel Division of the Army Air Corps at Wright Field, Dayton, Ohio, pointed out that, due to restrictions placed upon expenditures at the beginning of the fiscal year, the Air Corps was delayed in laying down experimental projects for the current year, and that aircraft manufacturers likewise were faced with an economical situation preventing them from spending much money on the development of military types of planes. The Materiel Division had not been in a position to encourage the building of so-called "speculation airplanes," because there was no definite assurance that funds would be available from the 1935 appropriations, or that the restrictions on the funds appropriated for the current year would be removed. As a result, at the end of 1933 only three military types were being designed to meet the requirements of existing Air Corps directives, whereas two years ago there were 18 types.

The seriousness of the situation cannot be over-emphasized, Major Howard stated, in view of the developments going on abroad. He referred to design competitions for pursuit planes in France and England, and also a program for the development of a new type of bombardment plane laid down in the latter country. He said that experimental all-metal airplanes being used for tactical types require at least three years for design, construction and testing; and that the enforced idleness of military constructors during this period threatened to place the Air Corps in an unfavorable position in two or three years, because some of the new models produced in foreign countries would result in a marked increase in performance over the standard planes to be placed in service here. For that reason the development of a new and continuing procurement program to be authorized by Congress was awaited with intense interest.

Air Corps Equipment

On January 1, 1934, the Air Corps had a total of about 1,800 airplanes. They included 367 pursuit, 159 bombers, 88 attack, 370 observation, 73 transport, six photographic, 229 primary training, 205 basic training and 167 National Guard. The total number was to be reduced by 122 before June 30, 1934.

Public Works Funds

An allocation of $7,500,000 from the Public Works Administration provided for construction of 100 planes, while the Army appropriation bill to be presented early in 1934 carried an item of $8,000,000 to cover the cost of 348 planes. But even that additional number, aggregating 448 machines, would not accomplish the increase in strength deemed necessary by the General Staff, it was stated, and Congress was to be asked for a larger appropriation. Immediate need for funds with which to provide at least 1,000 new planes for the tactical branches of the Air Corps and 900 others for a proposed General Headquarters Air Force would be stressed before Congress, it was said. At the same time additional appropriations would be sought for spare parts and replacements; in brief, sufficient funds to maintain 1,900 additional planes in effective combat condition. Under that plan the Army would have a total of about 2,600 planes in five years.

Proposal for a General Headquarters Air Force was developed from the reorganization of the Army tactical units into four combat armies. It was stated that the new arrangement had materially altered the status of Army air forces, particularly showing the need for a headquarters force of two wings of several groups each, which, because of mobility and immediate responsiveness to direct orders from the commander-in-chief, would form a valuable adjunct to the nation's frontier defenses.

Air Corps Activities

Confronted with a substantial reduction in the appropriation of funds incident to operations, Army Air Corps activities during 1933 were not on a par with those of preceding years. Flying activities were carried out on a smaller scale, not only because of reduced funds for fuel, but also because many officers were detailed to duties not connected with Air Corps functions. This shortage in personnel necessitated the temporary consolidation of a number of below-strength squadrons into provisional organizations for tactical training purposes.

Report of General Foulois

In his annual report Major General Benjamin D. Foulois, Chief of the Air Corps, pointed out that although seven years have elapsed since the enactment, on July 2, 1926, of the Air Corps five-year expansion program, the Air Corps is still below the requirements laid down by that legislation, both in personnel and serviceable planes. The Act authorized a total strength for the Air Corps of 1,650 commissioned officers and 15,000 enlisted men. At one period during 1933 the Air Corps was below authorized strength to the extent of 358 officers and about 1,500 enlisted men.

A total of 268 students graduated from the Advanced Flying School at Kelly Field, San Antonio, Texas, during the calendar

NEW BOMBER

The Curtiss-Wright Cyclone-powered Condor bomber, equipped with five machine guns, and capable of carrying 4,000 pounds of bombs.

year 1933, among whom were 42 officers of the Regular Army, four Air Corps noncommissioned officers and 220 flying cadets. These students were given the rating of "Airplane Pilot." Those student officers who belonged to other branches of the military service were transferred to the Air Corps. The flying cadets were commissioned second lieutenants in the Air Reserve and placed on extended active duty with Air Corps organizations. Tactical training was carried out to the extent permitted by available funds. During May, combined Air Corps anti-aircraft exercises were held at Fort Knox, Ky., for two weeks. Anti-aircraft troops, using wide intelligence nets and supported by the 1st Pursuit Group from Selfridge Field, Mich., defended Fort Knox from the attack of an air force composed of attack and bombardment planes based at

Patterson Field, Fairfield, Ohio. The attacking force used the latest types of airplanes available, and the exercises, which were of a technical rather than tactical nature, produced excellent results.

Early in February, two officers of the 11th Bombardment Squadron, March Field, Calif., accompanied by two enlisted mechanics volunteered their services on a hazardous errand of mercy, flying a bombing plane to the Gold Range Mountains and dropping packages of food, aggregating more than 500 pounds, to a party of miners who were snowbound some 117 miles north of Las Vegas, Calif., with their food supply exhausted and with no hopes of receiving aid other than by air for weeks.

High Altitude Photography

During an experimental high altitude photographic flight from

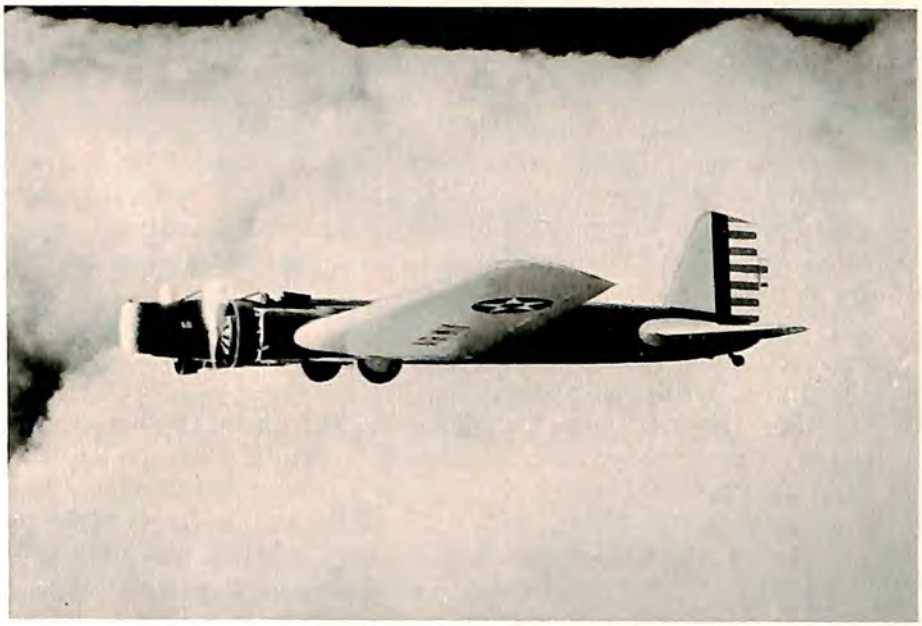
ARMY OBSERVATION MONOPLANE

The Douglas Y10-43 high-wing two-place monoplane, with Curtiss Conqueror V-1570 engine.

Bolling Field, D. C., to New York City on March 5, for the purpose of making a thorough test of the latest type aerial camera used by the Army Air Corps, Capt. Albert W. Stevens, photographer, and Lieut. Charles D. McAllister, pilot, encountered the coldest weather in their flying careers. Hovering over Staten Island for several hours at altitudes ranging from 24,000 to 26,300 feet, the two Army flyers conducted their work under a temperature registering 37 degrees below zero. Although flying in a Fairchild cabin photographic plane, the necessity for keeping a window open in

order to take oblique photographs made their work in the air anything but comfortable. Remarkably clear conditions on that day enabled them to obtain a clear view of the Hudson River as far as West Point, N. Y., as well as the snow-capped Catskill Mountains beyond, also the whole length of Long Island, Long Island Sound, and in other directions, Philadelphia, Pa., Trenton, Atlantic City and Lakehurst, N. J. Both officers used compressed oxygen while working in the rarefied atmosphere.

Sergeant Ralph Bottriell, premier practice parachute jumper, on March 18 was presented with the Distinguished Flying Cross for



THE BOEING ARMY BOMBER

This low wing, all-metal Boeing monoplane bomber powered by two Pratt & Whitney Hornet engines, carries a crew of five and more than a ton of bombs.

his pioneer work in connection with parachute development. Sergeant Bottriell has made over 700 practice parachute jumps from airplanes and balloons.

The Mackay Trophy for the most meritorious flight in the Air Corps for the year 1932 was awarded on May 26 to Lieut. Charles H. Howard, commanding officer of the 11th Bombardment Squadron, March Field, Calif., in behalf of his organization which he led on a hazardous mission to the Navajo Indian reservation in January, 1932, to drop food supplies to a band of Indians snowbound and helpless in one of the worst storms on record. The

food supplies dropped by the bombers averted what might have developed into a tragedy.

The Distinguished Flying Cross was awarded to Capt. Donald L. Bruner for his exceptional services in developing and perfecting night flying equipment, thus making it possible for military and commercial planes to traverse the length and breadth of the United States during the hours of darkness.

Private Arden M. Farley received the Cheney Award for 1932 for his heroic conduct in rescuing from an overturned airplane, which had crashed and caught fire, Lieut. Wm. H. Dum, Air Reserve, who was unable to extricate himself from his perilous position.

Air Corps personnel from March Field, Calif., rendered valuable services during the month of March, 1933, in relieving distress among the residents of Long Beach, Calif., and vicinity, who were rendered homeless by the disastrous earthquake in that section. During the emergency, approximately 2,000 persons were fed each day, and shelter was provided by tents, cots and mattresses from March Field. Airplanes carried the needed supplies and personnel to the stricken area.

The TC-13, the Army's largest non-rigid airship, arrived at her permanent station, Langley Field, Va., on May 17 and was assigned to the 19th Airship Company.

Training of Air Corps personnel in instrument flying at the end of 1933 was conducted at several flying fields. The policy was to train all personnel, not only because of the added safety, but also because such piloting technique would make it possible to conduct flying operations under all sorts of weather conditions.

At Scott Field, Ill., satisfactory tests were conducted on a motorized observation balloon to determine the practicability of converting an observation balloon into an airship to transport it from one observation point to another. The craft can be flown as an ordinary observation balloon and then hauled to the ground, the cable disconnected, and a small power car attached; after which it can be operated as an airship.

During the year high altitude flights were made by Air Corps pilots in connection with research work on the cosmic ray. These flights were made in cooperation with Dr. Robert Millikan, of the California Institute of Technology, Pasadena, Calif., who has devoted considerable study to that particular phase of scientific endeavor.

CHAPTER VII

NAVAL AVIATION

Equipment—Need for More Planes—Admiral King's Report—Aircraft Carrier Tonnage—Proposed Procurement Program—Flight Tests on 25 Types—Reserve Training—The "Macon" Enters Service—The Navy's Safety Record—Public Works Funds.

DRASTIC reductions in appropriations forced upon the Bureau of Aeronautics of the United States Navy, economies in both procurement and operation which caused much concern throughout all branches of the defensive establishment. Many projects involving procurement of equipment and improvements at air stations were either postponed or abandoned altogether.

On January 1, 1934, the Navy had on hand about 1,000 planes, exclusive of those in the Naval Reserve. The number of combat planes, including observation, was about 750; and there was an imperative need for more machines possessing the speed and other service characteristics required to place naval aviation equipment on a parity with that being developed by other powers.

Admiral King's Report

The regular Navy had 826 commissioned and 337 enlisted pilots. The Marine Corps had 103 commissioned and 30 enlisted pilots. Rear Admiral Ernest J. King, Chief of the Bureau of Aeronautics, reported that the Navy lacked 138 officer pilots necessary for present operations, and that the shortage would not be overcome until 1945 unless remedial action is taken with regard to the commissioning of Naval Academy graduates.

The practice of commissioning graduates only when needed to maintain the total strength of the whole Navy, it was said, prevented the Bureau of Aeronautics from acquiring sufficient officer pilot personnel. The problem was receiving considerable attention at the end of the year.

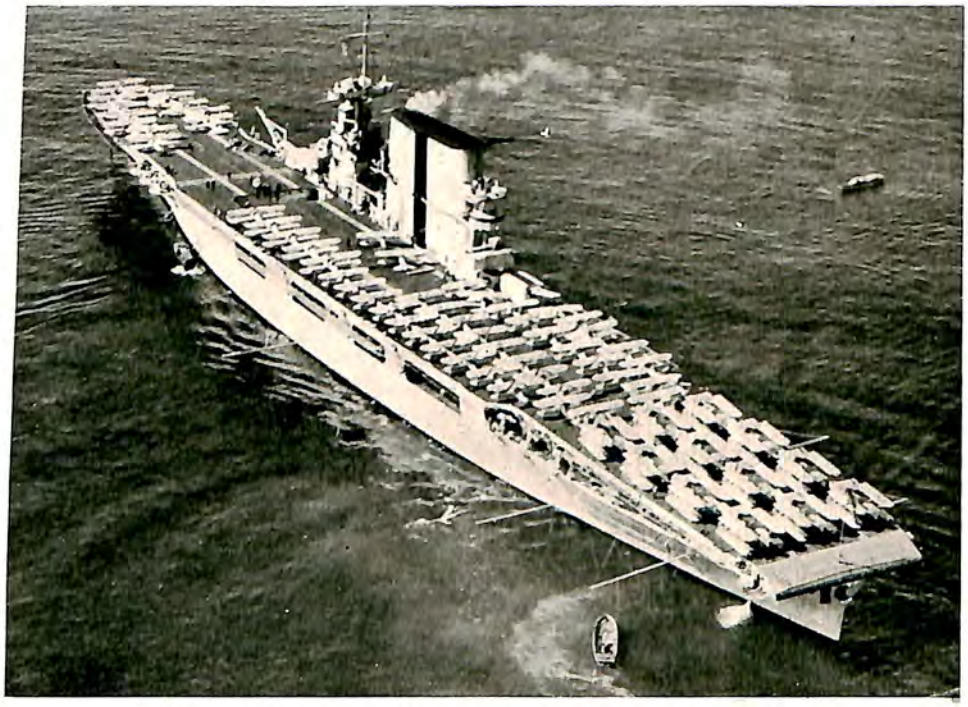
During the year all tactical units of Naval Aviation, except the majority of such units with the Marine Corps, were assigned to duty with the active Fleet. The shore establishment included only planes for training purposes, both regular and reserve, and a small

number for administrative and experimental or development use.

Scouting, torpedo and bombing, observation and fighter planes were maintained on the aircraft carriers "Lexington," "Saratoga" and "Langley," while catapults on battleships and cruisers permitted the operation of scouting and observation planes anywhere at sea.

Aircraft Carrier Tonnage

"There was no change in our country's operating aircraft car-



THE AIRCRAFT CARRIER "U. S. S. SARATOGA"

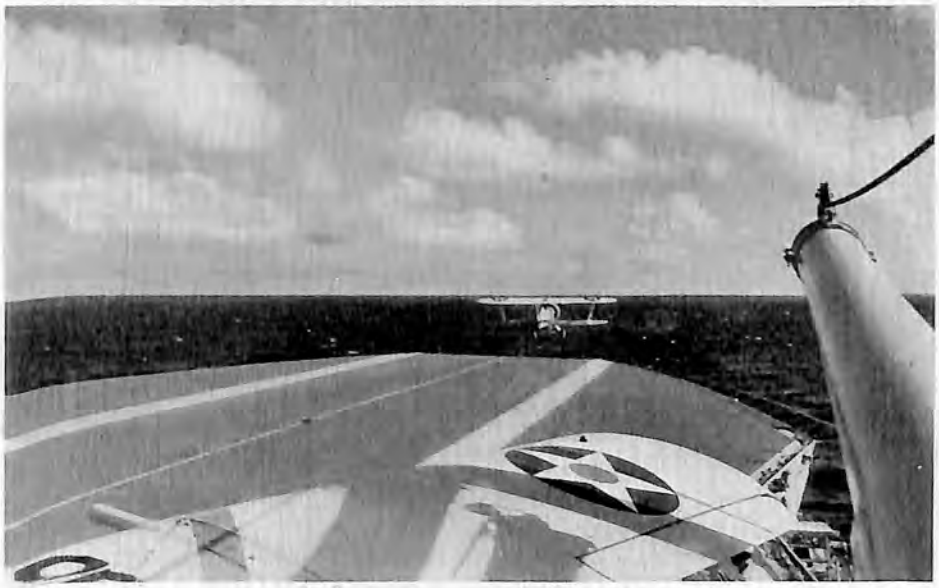
With the "U. S. S. Lexington" this vessel formed the Navy's only modern aircraft carrier equipment in service in 1933. The new "U. S. S. Ranger" was to be commissioned early in 1934.

rier tonnage during the year, and there will be no change until the 'Ranger' is commissioned in 1934," Rear Admiral King reported. Under the arms limitations treaties the United States and Great Britain may build 135,000 tons of carriers. Of the three carriers in service the "Langley" alone is experimental, and may be replaced. The two other carriers form 66,000 tons of the American quota, yet provide only two landing decks, or actual operating

units. Great Britain has five carriers, three of them classed as experimental, meaning that they can be scrapped and replaced within tonnage limits at will.

The new "Ranger" will add 13,800 tons to the American service, leaving 55,200 tons unfilled in the carrier category. Scrapping the "Langley," it was stated, would permit construction of three more carriers, making a total of six. On the other hand Great Britain need build only two more to have seven modern carriers, or seven landing units at sea, against the American possible six. Japan has built nearly to her treaty limit, and has four landing decks.

The shortage of carriers, while serious, was a problem of second-



OFF FROM ITS FLOATING AIRPORT

A Boeing single-seater, Wasp-powered fighter taking to the air from the deck of the aircraft carrier, "Saratoga."

ary nature compared to that presented by the lack of an adequate number of planes for fleet aviation. Since initiation of the 1,000-plane program in 1926, 15 cruisers, the "Ranger" and the airship "Macon" have been authorized for the Navy. Those vessels and the airship should carry at least 212 planes, yet no provisions had been made for procurement at the end of the year. Certain members of Congress, however, were alive to the danger of delay, and they were planning to sponsor legislation early in 1934 designed to equip naval aviation within the limits, at least, of minimum peacetime requirements.

Proposed Procurement Program

Having in mind the far-flung operations of peace-time naval aviation, with equipment not only needed for the Fleet and shore stations in the United States but also in Panama and Hawaii, it was believed that a new five-year program should be established, to provide in that period, 650 new planes required for surface ships now under construction and 534 new planes for replacement of obsolete aircraft.

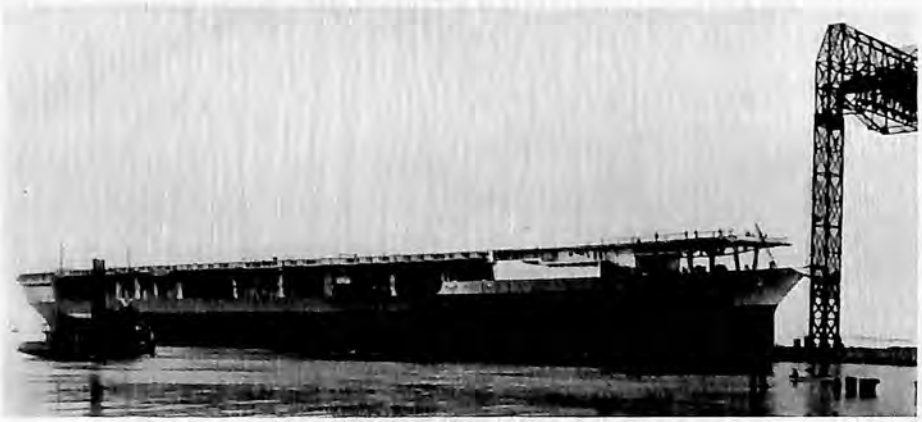
To provide the United States with an adequate naval air arm

THE AIRCRAFT CARRIER "U. S. S. LEXINGTON"
One of the U. S. Navy's two modern carriers in service, convoyed by the cruiser "Salt Lake City."

flight deck cruisers and additional aircraft carriers would be necessary, it was said. Naval experts asserted that a balanced Navy required from 14 to 18 aircraft carriers. Under the treaty the United States is permitted 14 vessels that can be fitted with landing decks, including flight deck cruisers. With only three such vessels, or 21 per cent of the allowance, to be available in 1934, naval aviation was seriously handicapped, particularly as the Navy building program called for 28 modern cruisers, built, building or authorized; and the need for aircraft vessels was more urgent if the flying branch was to serve the Fleet with efficiency.

Flight Tests on 25 Types

Consistent with the American military policy of utilizing limited appropriations to build a nucleus for defense, concentrating on the development of a few units of the most modern equipment for operation by a small peace-time force, and depending upon the nation's resources to meet a national emergency, the Navy experienced a most active period of aeronautical experimentation during the year. The flight-test section at the Naval Air Station, Anacostia, D. C., conducted extensive performance and acceptance trials on 25 different types of planes built under contract for the Navy, to determine the types best suited for naval aviation. In addition to



NEW AIRCRAFT CARRIER "U. S. S. RANGER"

When commissioned early in 1934 the "Ranger" will be the third modern carrier in the American Navy.

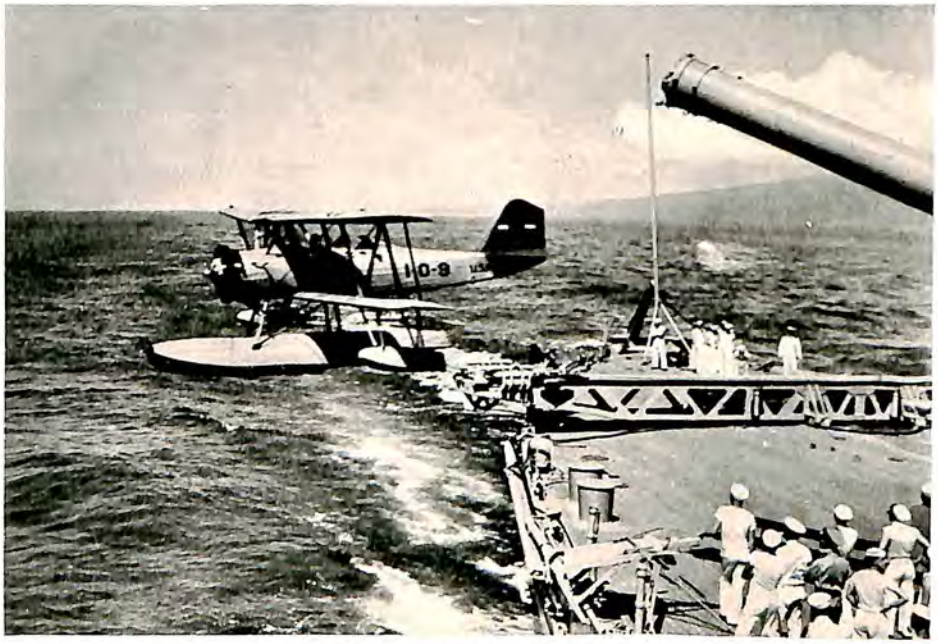
the tests made at Anacostia others were conducted at the Naval Air Station, Norfolk, the Naval Aircraft Factory, Philadelphia, the Naval Proving Grounds, Dahlgren, Va., and the Washington Navy Yard. In general, these trials required the determination of performance characteristics, catapult tests, water tests, night flying tests, diving tests, and arresting gear tests, these latter for use in connection with aircraft carriers. Additional tests were made on radio installations, propellers, power plants, armament and miscellaneous equipment.

Progress was made in high-speed development, but, owing to curtailed expenditures, the United States is far from being abreast of foreign powers in this important phase of aviation. Fast two-seater fighters with retractable landing gear have been developed

and assigned to the Fleet, and the development of tactics for this new type of combat plane has been vigorously carried out.

Reserve Training

Despite the shortage in funds the training of reserve personnel was carried out in a more satisfactory manner than during former years. For the first time all reserve bases carried on major overhaul of aircraft and engines, which was not only adopted as an economy measure, but also provided excellent ground training. Sev-



A CATAPULT TAKE-OFF

A Wasp-powered Vought Corsair leaving the "U. S. S. Oklahoma."

eral reserve fields were improved during the year to permit night flying, which now makes all reserve bases available for undertaking this important phase of training.

As one example of the efficiency of the Aviation Reserve, a unit from Philadelphia and another from Brooklyn were mobilized on the night of the "Akron" crash and were ready at daylight to begin search operations, continuing thereafter from daylight to dark for several days. Some 438 Naval Reserve aviators and 60 Marine Corps Reserve aviators received 15-day periods of active duty and aviation training, many of these reserve officers performing this

duty without pay. Forty-one Naval Reserve aviators did one year's active training duty with the aircraft squadrons of the Fleet, while 12 Marine Corps Reserve aviators performed a similar period of duty with the regular aircraft squadrons of the Marine Corps.

Loss of the airship "Akron," April 4, 1933, with 73 officers and men, including Rear Admiral William A. Moffett, then Chief of the Bureau of Aeronautics, was one of the greatest peace-time disasters in the history of the Navy. Subsequent investigations by a Navy Court of Inquiry and a joint Congressional Committee showed that the disaster was due to no fault in the design or construction of the airship. Many valuable lessons were learned in the loss of the "Akron," and, as soon as funds become available, it is the intention of the Bureau of Aeronautics, under Rear Admiral Ernest J. King, Admiral Moffett's successor, to continue the investigation of large airships.

The "Macon" Enters Service

During the same month that the "Akron" was lost, its sister ship, the "U. S. S. Macon," was completed and began trial flights. The "Macon" is described in detail in the chapter on lighter-than-air.

The "Macon" acquired the squadron of Curtiss-Wright Sparrow Hawk fighting planes from the "Akron." They are specially designed, high-performance, combat planes, so adapted that they can operate from the dirigible, facilities being provided for their hooking-on, dropping-off, and housing in the airship while it is in flight. While basing at Sunnyvale, the "Macon" will be assigned to the Fleet, and it is felt that definite proof of the naval value of this type of aircraft operated in conjunction with the Fleet will be further demonstrated. The Navy's first West Coast airship base at Sunnyvale was placed in commission April 12, 1933.

In September, 1933, a squadron of six Consolidated patrol boats, commanded by Lt. Comdr. D. M. Carpenter, made a non-stop flight from Norfolk, Va., to Coco Solo, Canal Zone, 2,059 statute miles, a record distance for formation flights. The purpose of the flight, however, was not to make a record, but rather to transfer the planes to San Diego, Calif., where early in 1934 they were to make another and even more thrilling massed flight, non-stop to Hawaii.

The Navy's Safety Record

There was a considerable increase over 1932 in the number of

flying hours per forced landing due to power plant failure, which clearly demonstrates the increased reliability of American aircraft engines. The Navy's safety record also continued on a high plane of efficiency, not a single life ever having been lost on battleships or cruisers due to malfunctioning of the catapults, and only two fatalities in aircraft occurring in more than 40,000 landings and take-offs made on the restricted platforms of the aircraft carriers since their first operation in 1922. Fourteen Navy and Marine Corps pilots were saved by emergency parachute jumps during the year, continuing the record of naval "Caterpillars," none having ever been killed through malfunctioning of the parachute.

The Navy, Marine Corps and Reserves flew a total of 228,238 hours in heavier-than-air craft during the year, with 23 fatalities, making 9,923 hours of flying per fatality. When it is considered that the figure 9,923 is derived by including one death caused by a propeller accident, and another caused by a man falling while cranking a plane, the Navy's actual flying record for safety is exceedingly high. The Navy flew a total of 1,655 hours during the year in lighter-than-air craft, with 75 fatalities, 73 of them, one a reserve colonel of the Army, occasioned by the loss of the "Akron."

Public Works Funds

Late in 1933 the Public Works Administration, at the direction of the President, allocated to the Navy $7,500,000 for aircraft and accessories. At the end of the year about $5,200,000 of that sum had been obligated, including actual contracts totalling $2,600,000. The balance was to be spent early in 1934. Purchases under the public works allotment included planes complete with engines, instruments and accessories, new and improved instruments for planes already in service, new and improved radio sets for planes in service, variable pitch propellers, and numerous miscellaneous airplane accessories. The greater share of planes and material was for replacement, the remainder to make up shortages which had existed through lack of funds.

CHAPTER VIII

ARMY AND NAVY PROCUREMENT

History of Procurement Practice—Negotiated Contracts Initiated—Disadvantages of Competitive Bidding—Findings of the Lassiter Board—Negotiated Contracts Recommended—Investigations of 1925—The Act of 1926—Design Competitions—Purchase Methods Under the Act—Service Test Procurement—Production Procurement.

PURCHASES of aircraft, engines and accessories for the Army and Navy air forces became a subject of considerable debate in 1933 when there arose two questions concerning future contract relations between the manufacturers and procurement divisions of the services. One question involved design rights and an equitable method of compensating the originator of an unpatented design when competitors are given service contracts for production orders. The second question dealt with official interpretation of existing laws as to how far procurement officers might go in negotiating contracts instead of subjecting them to competitive bidding. At the end of the year there was every indication that Congress would solve both problems by writing into new legislation clear and exact provisions for all kinds of procurement contracts.

That such important matters as those involving Government purchases of aircraft materiel were not translated into standardized practice years ago may be attributed to the fact that aircraft manufacturing is a science still very much in the early stages of development and as yet wholly incapable of being standardized.

The designers and manufacturers, the able and experienced procurement officers in the air services and the members of the Congressional committees concerned with procurement legislation have been in agreement on several facts which tend to complicate the problem. They agree, for example, that the art of design cannot be standardized, that it must change constantly in order to make progress. They agree that the requirements of the air services must change continuously, at least for some years to come, that every new order for equipment involves much new invention, that specifications must possess flexibility in order to realize the fullest possible development in a design from its inception, into the experimental stage, on through the service tests and even through production orders.

The procurement policy of the Government has always lagged behind the technical developments and new service requirements, the reason being that policy is formulated by processes necessarily slow while aviation development is rapid. The last definite policy was written into the Act of July 2, 1926, when Congress made what was thought at the time to be comprehensive stipulations governing both Army and Navy aircraft procurement orders. The Act was based on nine years of experience beginning when the United States entered the World War in 1917.

History of Procurement Practice

At the outbreak of the World War in 1914 some half dozen small shops in the United States were producing experimental planes. The Army and Navy had bought a few experimental machines under the law permitting them to negotiate a contract direct with the manufacturer of anything exclusive or so individual that it could not be provided by others, if invited to participate in open bidding.

In 1915 the Allied governments, unable to build enough planes, placed orders with the American manufacturers. That was the beginning of the industry, but it accomplished little toward original design here because only foreign designs were used. The Allied missions arriving in the United States in 1917 to advise the Government as to how it might best contribute to the war effort urged that only machines of foreign design be produced. That idea was frowned upon because the American Government felt that it would discourage the infant industry and place this country at the mercy of other powers in any future emergency.

The American industry at that time was handicapped by the fact that it had never produced a fighting plane of its own design. To save time our builders had to start producing foreign models. The Liberty engine, developed here for fighting craft, was largely the work of designers recruited from the automobile industry. Training planes and engines to power them, however, were developed here in the United States. Starting with nothing the Government had to bear the tremendous cost of war expansion. Delay was inevitable. There was much confusion. There was need for haste in production. The Allies had pointed out that England was losing as many planes as she built, month by month. France, Belgium and Italy had nowhere near enough. There was no time to set up any new procurement policy. Under the wartime powers conferred by Congress aircraft equipment was bought on contracts negotiated on a cost-plus basis, admittedly an unsatisfactory method because it did not

encourage any attempt at saving on the part of the manufacturer.

Cost-Plus War Contracts

The stimulus of war, however, inspired the American manufacturers to undertake original design, at the same time expanding the production of their plants. Contrary to recurrent assertions from irresponsible persons the Government's wartime production program was not a failure. The repeated charge that the Government spent one billion, six hundred million dollars on aviation and got nothing in return is not substantiated by fact. Congress, it is true, appropriated more than sixteen hundred million dollars for the Army air service, but nearly half that amount remained in the U. S. Treasury.

EXPERIMENTAL ATTACK PLANE

The new Northrop attack plane, with Wright Cyclone R-1820 engine, for the Army Air Corps.

It was never encumbered. The balance covered all expenditures for military aviation here and abroad. About $350,000,000 was spent in the United States for aircraft equipment—planes, engines and parts.

During the 21 months of the war effort American manufacturers built for the Army alone 13,894 airplanes and 41,953 engines, with spare parts, also more than 2,000 planes for the Navy, and further, huge orders of manufactured parts which were shipped to Europe for assembly there. Of the total, those builders which could properly be classified as aviation companies produced 9,742 planes and 14,765 engines.

At the time of the armistice 2,091 American-built fighting planes

had been shipped to France, and 1,040 more were on the docks here awaiting transportation overseas. That total almost equalled the 3,309 planes which the Central Powers had in front line service at that time. Twelve of our 45 Army squadrons on the Western Front were equipped with these American machines.

When the armistice was signed our factories were geared up to an output of 21,000 planes a year, and they were actually producing more than all the Allies combined. The next few months would have found American machines virtually swarming over the enemy lines by the thousands. It was this rapidly growing air

NEW OBSERVATION SESQUIPLANE

This Curtiss two-place Army observation plane, with Wright Cyclone engine, has a retractable landing gear.

power of the United States, and Germany's knowledge of it, which helped to force the war to an early conclusion.

At the close of the war there were in the United States 24 aircraft and engine companies, some large, others small and experimental, representing a total capitalization of twenty-three million dollars. They employed 175,000 men and women. Their designing staffs were the equal of any in the world. Those designers, with their accumulated experience, have been responsible for the remarkably efficient machines supplied our Army and Navy air forces since the World War.

Within three months after the armistice the American aircraft

industry had been liquidated to 10 per cent of its war strength, and it was struggling for existence without any Government procurement policy or immediate hope that one would be forthcoming.

Negotiated Contracts Initiated

The American Aviation Mission, appointed by President Wilson in 1919 to go abroad and study post-war developments, recommended in its report that the national policy should be "to maintain and encourage a considerable number of well-manned and well-equipped private design plants . . . and to place orders with these plants, at fair prices, for design and for experimental construction of planes, motors and appliances. . . . Competition with the industry should be avoided . . . that a definite method of payment for independent

AIR CORPS TRANSPORT

One of the Bellanca C-27A transports, powered with Pratt & Whitney geared Hornet engine, used by the Army Air Corps.

design, experimental production, changes in design, alterations and adjustments be worked out by the Government as quickly as possible, to the end that the design and improvement of motors, planes, balloons and appliances may be stimulated and not stifled."

During the next two years the aircraft industry remained on the verge of extinction through lack of Government support. A minimum of money was appropriated for new machines, and still less for new designs. A half dozen manufacturers were able to procure small orders which were let on a basis of competitive bidding. Nearly all the new design which seemed imperative was undertaken in the Government aircraft plants maintained by the services. Those plants were essentially experimental and intended originally for research and repair depots. They had not shown results which would warrant maintaining them at the expense of the industry.

The manufacturers proposed that the Government spend its money with the industry and the industry in return would devote it to designing and producing the best equipment in the world. The services agreed, and experimental contracts were let through negotiations with individual companies. By 1923 American machines had won every essential world's record.

Disadvantages of Competitive Bidding

That was important, but it was not the entire picture. A few record-breaking machines would not keep the industry alive. Sporadic orders from the services were helpful; but the manner of letting

HIGH-WING OBSERVATION PLANE

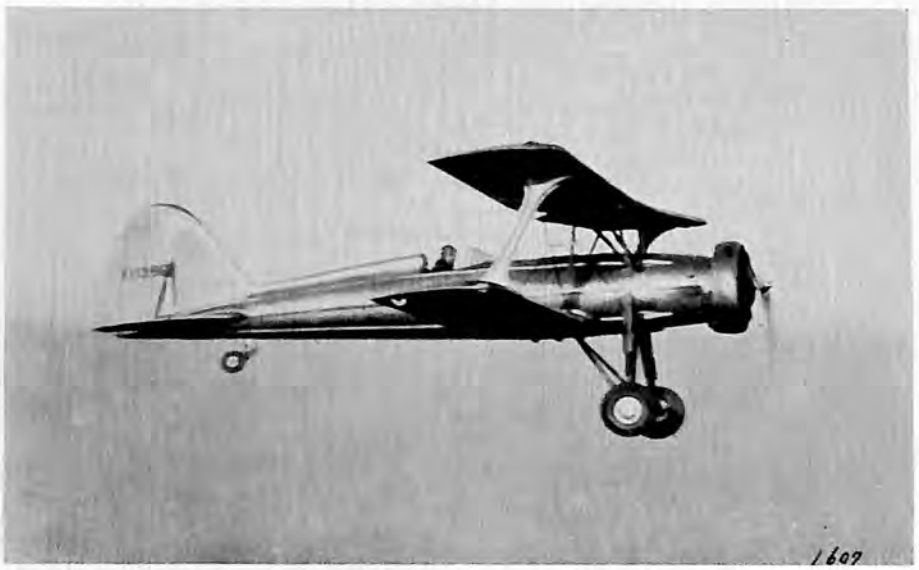
This new Curtiss two-seat monoplane for the Air Corps, with Wright Cyclone engine and a retractable landing gear, has slots and flaps for a lower landing speed.

service test or production contracts was not calculated to keep the industry in a healthy condition or the services properly equipped. The practice at that time was to let contracts to the lowest bidder. Manufacturers created their own designs to a certain stage, built one or two experimental planes on order and then trusted to luck that they would get production contracts. Unless their bid was lower than others they lost out; their design would be produced by a lower bidder. That practice not only discouraged the manufacturers; it served to stifle inventive genius. The industry could not afford to maintain large design staffs and experimental laboratories. Individual designer-constructors would not devote their time to

development work because, under the prevailing system, it invariably involved a direct financial loss. In 1923 the tangible assets of the entire aircraft industry in the United States were conservatively appraised at about $8,000,000. Fewer than six manufacturing companies could be depended upon for new designs had an emergency required such development within a year.

Findings of the Lassiter Board

The Lassiter Board of the Army in its confidential report dated October 11, 1923, made the following observations:



ALL-METAL TRAINING BIPLANE
The Great Lakes Aircraft Corporation's PT-930 trainer.

"A graphic representation of the state of the aircraft industry shows how far the industry falls short of being able to meet war requirements and that planes in sufficient quantities would not be produced under present conditions until nearly two years after the war had begun. . . .

"The Committee finds our Air Service to be in a very unfortunate and critical situation. Since the World War aviation has come to play an increasingly important part in military operations, but measures have not been taken in our country to keep step with this evolution. Due to the reduction of the Army the personnel of

the Air Force has been diminished; moreover, aircraft have not been manufactured to replace the types produced during the World War. For lack of business our aircraft industry is languishing and may disappear. It requires time to begin production of airplanes and it takes time to train personnel. We cannot improvise an Air Service and yet it is indispensable to be strong in the air at the very outset of war. Therefore, it is the opinion of the Committee that our peace-time Air Service have a strength and an organization permitting rapid expansion to meet the first requirements of a war and then be capable of steady expansion to meet the ultimate requirements of the war. It is impossible under present conditions to pass

THE GREAT LAKES NAVY BOMBER

One of the new mystery planes developed for naval aviation, powered by a Pratt & Whitney Wasp Junior.

at once from our present peace status to the peace status desired, and hence we should have a development program extending over a period of years, providing for yearly increments in both personnel and materiel, and adopted by Congress as a continuing project."

The Lassiter Board recommended a continuing procurement program "extending through a period of approximately ten years."

Negotiated Contracts Recommended

In its report for 1924 the National Advisory Committee for Aeronautics recommended consideration of the practice of negotiated contracts. The report stated in part:

"These aircraft manufacturers have had to rely for orders upon Government agencies, and the limited amount of governmental purchases has forced a number of manufacturers to go out of the aircraft business. It is a matter of grave Government concern lest the productive capacity of the industry may become so far diminished that there may not remain a satisfactory nucleus. By a 'satisfactory nucleus' is meant a number of aircraft manufacturers, distributed over the country, operating on a sound financial basis, and capable of rapid expansion to meet the Government's needs in an emergency.

"To maintain a nucleus of an industry it has been proposed either

NON-STOP TO PANAMA

The flagship of the squadron of Consolidated P2Y1 Navy flying boats, with Wright Cyclone engines, which in 1933 made a record non-stop flight of 2,058 miles from Norfolk, Va., to the Canal Zone.

that the Government substantially increase the volume of its orders for aircraft or devise a policy for the apportionment of orders at fair negotiated prices without regard to competition."

Investigations of 1925

On February 27, 1925, the Assistant Secretaries of War and Navy endorsed a number of stated principles, among which the following are of interest here:

"1. The Government shall encourage and promote the design and manufacture, by other than Government agencies, of aircraft, air-

craft engines and equipment. The Government shall not engage in such work in competition with the aeronautical industry.

"2. The Government shall recognize and sustain the principle of proprietary design rights applied to all aeronautical material.

"3. The Government will not purchase or acquire the design rights for aircraft, aircraft engines or accessories when these are the products of established manufacturers.

"4. The Government will not purchase aircraft, aircraft engines or accessories of new design until after the actual articles have been presented for test, nor until said articles have demonstrated their superiority over existing and accepted standard types, unless the design project is of such magnitude as to demand Government assistance in its development."

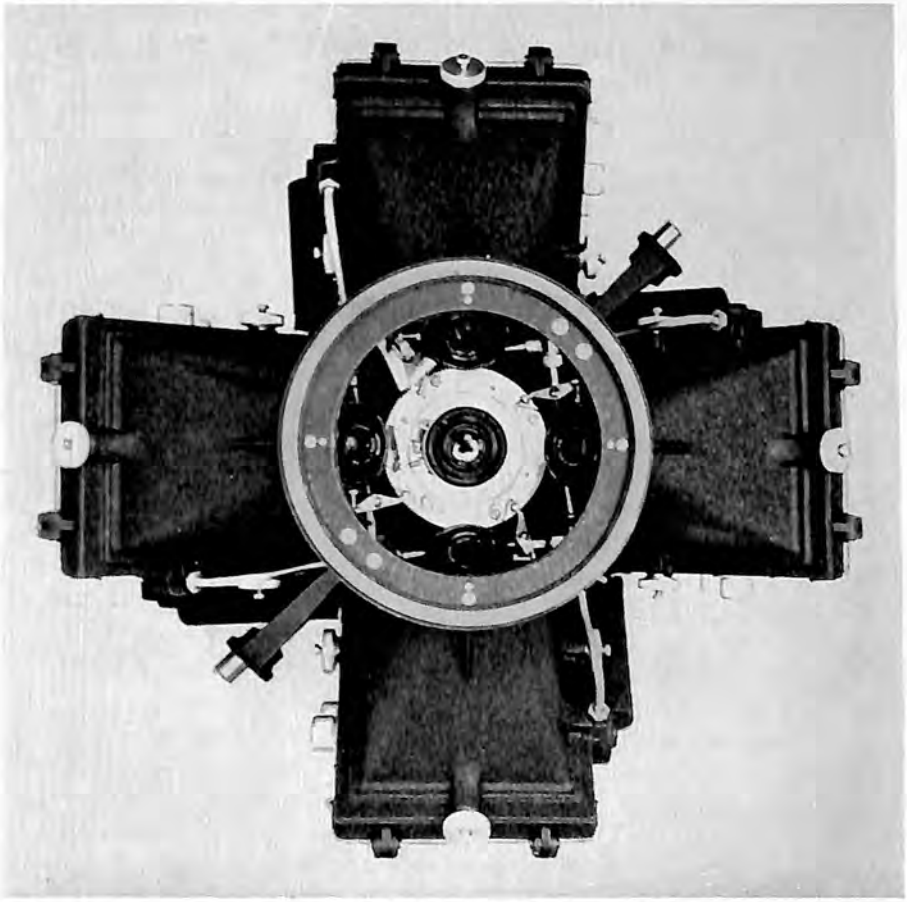
Although there had been more than twenty aircraft investiga-

A TWO-PLACE FIGHTER

The Curtiss-Wright Osprey with 420 horsepower Whirlwind engine.

tions in eight years Congress late in 1924 started another investigation through the Select Committee of Inquiry into Operations of the United States Air Services, to be known as the Lampert Committee. Its investigation extending over a period of many months was exhaustive and thorough. Its report dated December 14, 1925, contained these findings:

"That the aviation industry in the United States has dwindled and is dwindling; and that the principal causes of the weakness of the industry are:—



THE FIVE-LENS AERIAL CAMERA

With this Fairchild TA-3 camera, its five lenses and shutters operating simultaneously, the field work of civil and military map-making is reduced from years to hours.

"(a) Lack of continuity in Government orders.

"(b) Losses on governmental contracts, both experimental and production.

"(c) Direct competition by Government plants.

"(d) Failure to recognize and protect design rights.

"(e) A destructive system of competitive bidding."

Among the recommendations of the Committee were:

"1. That the Federal Government cease competing with the civilian aircraft industry in the construction of aircraft, engines and accessories.

"4. That one single governmental civil agency be given sole charge of procurement of aircraft, engines, and equipment, to the end that duplication in expense be avoided, uniformity of equipment promoted, and a continuous and definite policy established looking to the strengthening of the sources of supply, the maintenance of the industry, the promotion of the aircraft production capacity of the Nation, and the establishment of a sound policy of Government procurement.

"5. Congress should at once pass a law permitting the procurement of aircraft, engines and aeronautical instruments and accessories without requiring competitive bidding under restrictions that will promote the best interests of the Government.

"6. That Congress authorize the procurement agency to recognize rights in design of aircraft, engines and accessories."

The President's Aircraft Board, known as the Morrow Committee, was appointed by President Coolidge in September, 1925, to hold hearings and report on the needs of the services and other branches of aviation. Its report dated November 30, 1925, contains the following comments:

"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.

"We find a specific criticism of the continued operation of the Naval aircraft factory. We believe that this factory should not be used on a production basis in competition with private industry, but that its maintenance for certain repair and experimental purposes is justified."

The Morrow Board recommended:

"1. The adoption of a policy of continuity in orders and of a standard rate of replacement.

"2. Production orders be given only to companies which maintain design staffs of reasonable size and keep them active.

"3. Proprietary rights in design be fully recognized.

"4. Governmental competition with the civil industry in production activity be eliminated except in those projects impracticable of realization by the civil industry.

"5. During a period of production of a type accepted as standard there be placed a succession of small orders for experimental designs to be given limited service tests, the best of these designs produced during a two or three year period being adopted as the next standard. Such orders, distributed among firms having design and production staffs of proven competence, should be awarded at

a liberal price, high enough to cover all the over head expense involved in the upkeep of the design and experimental departments.

"6. Existing statutes covering the procurement of supplies and requiring competitive bidding be modified where necessary to allow putting the recommendations previously made into effect.

"7. Governmental research in aeronautic science be actively continued and the testing facilities of the various department agencies should be made readily available to the civil industry. The functions of the National Advisory Committee for Aeronautics should be extended to cover the field of advice to inventors regarding aeronautic inventions."

THE SEVERSKY AMPHIBION

Major Alexander de Seversky over New York in his fast low wing all metal amphibion powered by a Wright Whirlwind 420 horsepower engine. This plane established a world's high speed amphibion record on October 8, 1933, flying 180 miles an hour. COPYRIGHTED, NEW YORK AIRVIEW SERVICE, FLUSHING.

The Act of 1926

In hearings on proposed legislation following the reports of the Lampert Committee and the Morrow Board officers of the services testified that they were in hearty accord with recommendations seeking to provide authority for the services to negotiate contracts on a design rights basis without competitive bidding.

In his testimony before the Senate Military Affairs Committee on February 6, 1926, General Mason M. Patrick, Chief of the Army air service, said:

"At the present time it is impossible for an aircraft designer to patent the design of his aircraft. He has no protection. It can be pirated by anybody. The result is that a concern may bring me a design of an airplane and apparently it will satisfy my needs and is something we want, and yet as the law and regulations now stand I am practically compelled to advertise and ask everybody to bid on the construction of that plane. This is unfair to the designer and unfortunate to the air service. There have been a number of concrete examples where that has been done, aircraft designed by certain firms, and then the air service has simply taken the designs and asked everybody to bid on them.

"In nearly every single instance the designer has named a price higher than some of his competitors, because he knew more about the actual work than the others, and in practically every case where his competitors have taken the business away from him, they have lost money. This provision was to right these wrongs and the interest of the United States would be served thereby. It means I can do like any other business man. I can go out and give these men an order at a fair price. I maintain in my section a small audit section, so that I can audit very carefully every aircraft contract we let in order to ascertain that there is no unfairness nor undue profit made by the manufacturer. I am endeavoring to have more than one firm furnish aircraft of the same type, so that I may play them off one against the other and get them in competition in that way. This doesn't do away entirely with competitive bidding. It still leaves it possible to use that if we wish. But it does give the Secretary authority to place orders in a business-like fashion. To my mind it is essential that this should be enacted in order to keep alive the airplane industry."

The Air Corps Act of July 2, 1926, was the result of the hearings. Since that date its Section 10 has been the law governing the contractural relations between the Army and Navy air services and the industry.

Design Competitions

Paragraphs (a) to (i) of Section 10 relate to experimental procurement. The Secretaries of War and Navy are authorized to conduct design competitions through formal advertisement, competitive bids and contract awards.

Paragraph (j) limits procurement orders to American manufacturers, except for experimental purposes.

Paragraph (k) reads as follows:

"The Secretary of War or the Secretary of the Navy may at his discretion purchase 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 aircraft parts or aeronautical accessories of the best kind for the

FALCON SEAPLANE

This two-place Curtiss Falcon observation seaplane is powered by a Wright Cyclone engine.

Army or the Navy, as the case may be, and if as a result of such procurement, new and suitable designs considered to be the best kind for the Army or the Navy are developed, he may enter into contract, subject to the requirements of paragraph (j) of this section, 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."

Under the terms of that paragraph it was generally believed that the Secretaries had authority to negotiate contracts without resorting to bidding.

Paragraphs (l) to (p) inclusive, provide for audits and payments.

Paragraph (q) reads:

"In the procurement of aircraft constructed according to designs presented by any individual, firm, or corporation prior to the passage of this Act, which designs have been reduced to practice and found to be suitable for the purpose intended or according to 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 such quantities of said aircraft, aircraft parts, or aeronautical accessories as he may deem necessary: *Provided*, That the action of the Secretary

A NAVY PATROL OVER HAWAII

One of the Keystone Pk-1, Wright Cyclone-powered flying boats on duty in the islands.

of War or the Secretary of the Navy, in each such case shall be final and conclusive."

That provision permitted the services to negotiate contracts for production orders on equipment designed prior to passage of the Act.

Paragraphs (r) and (s) provide for the purchase of new designs following a survey and report by the special Patents and Design Board, with full authority to negotiate contracts up to $75,000 for any single improvement.

Paragraph (t) provides that the Secretaries may award contracts to the "lowest responsible bidder" and that their decisions

shall not be reviewable except by the President and the Federal Courts.

Purchase Methods Under the Act

The Army and Navy air services have interpreted the terms of the Act variously. The Army Air Corps has had two methods of securing experimental equipment, particularly with planes. One has been formal design competitions. The other has been to accept from the manufacturer an experimental plane, for one dollar, and let the manufacturer take his chances on procurement orders after complete development and flight tests at his risk. The Navy also has had two methods of securing experimental planes, the first by negotiated contracts, in which the manufacturer offers a design and the Navy is willing to pay a substantial amount for the privilege of guiding development of that design to meet certain special requirements. The second method provides for formal proposals, or design competitions, based on specifications supplied by the Navy.

Service Test Procurement

Interpreting the Act of 1926 as authorizing negotiated contracts in procurement orders for service tests following development of a design, both the Army and Navy adopted the practice of dealing directly with the designers for a certain number of machines, the idea being to recognize the proprietary rights in a particular design. The practice was held justified on the grounds that no design is fully developed until after it has passed the service tests, thus the service test orders amounted, in effect, to a number of experimental machines. Impossibility of producing such planes through bidding was apparent, due to the constant changes, unavoidable delays and other details in service test operations which make the cost item an unknown quantity until after final completion of the contract.

Production Procurement

In their production orders the Army and Navy adopted different policies. The Army generally interpreted the Act of 1926 to provide that the designer should have first claim to a production order for his design; and until November, 1933, the practice was to negotiate such contracts. The Navy, on the other hand, let all production contracts on the basis of formal bidding, with the excep-

tion of orders involving designs created prior to passage of the Act. The designer was held to have received adequate compensation for his creation through the design and service tests orders.

In November, 1933, the Assistant Secretary of War, with delegated responsibility for final allocation of procurement orders, adopted the policy of letting production contracts only on the basis of competitive bidding. Thus both the Army and Navy at the end of the year were following the policy of competitive bidding instead of contract negotiations with the manufacturers.

In the services and throughout the industry it was felt that the Act of 1926 had lent itself to misinterpretation; and that 1934 would find Congress clarifying its original intent through further legislation.

OVER THE HIGH SIERRAS

One of the Curtiss Condor Bombers, Conqueror-powered, on an Air Corps mission over the California peaks.

CHAPTER IX

NOTABLE FLIGHTS

Achievement of the Lindberghs—Post's Record World Flight—Balbo's Massed Flight—British Conquer Mount Everest—French Beat British Distance Record—Italy Takes Speed Record—French Break Altitude Record—Turner's Record Flight—New York-Haiti Non-Stop—Ulm's Australian Flight—Other Adventures.

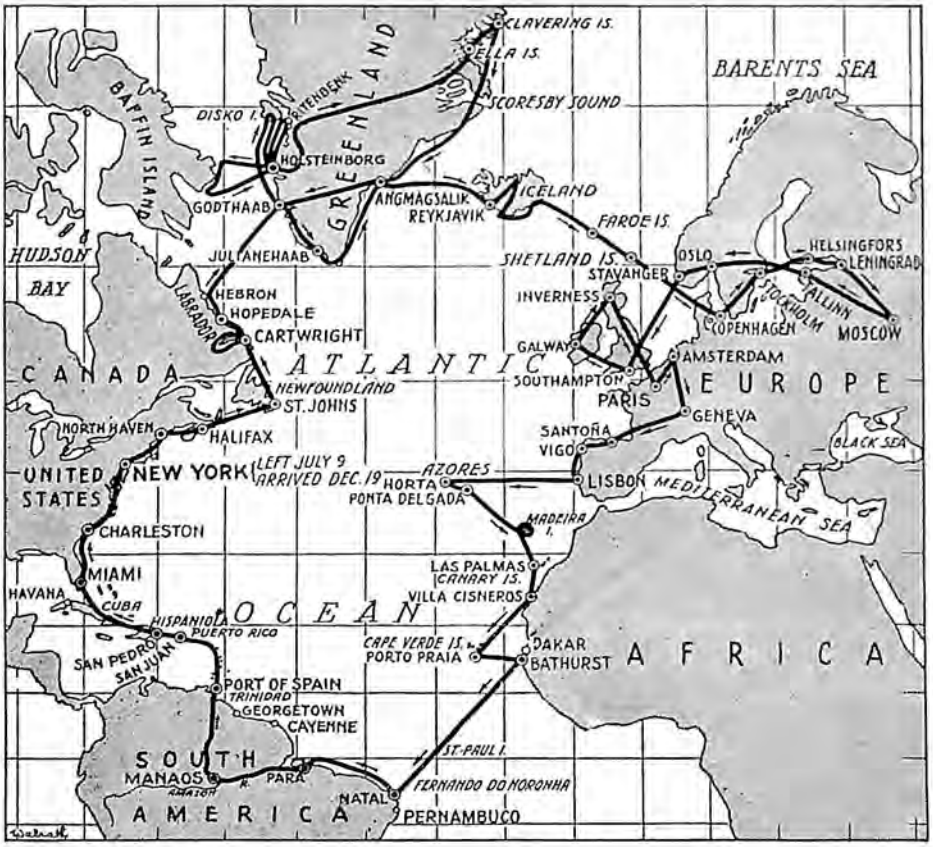
DURING 1933 men, and women too, flew faster, farther and higher than ever before. They conquered new and unexplored fields. They invaded out-of-the-way places which had always baffled the efforts of brave and skillful aviators. They overcame the traditional enemy of their race, bad weather, and hurtled through Arctic cold and tropic heat, rain and snow and fog, in one demonstration after another that better planes, engines and navigational instruments are still being made to bring success to the most unusual ventures of those who take to the air in ships.

Opinions differ as to the outstanding flying achievement of the year, although it is generally agreed that four stand apart from the rest—the 30,000-mile flight of the Lindberghs, Wiley Post's flight around the world in a week, Balbo's massed flight to the United States and the British aerial conquest of Mount Everest.

Achievement of the Lindberghs

As technical adviser to the Pan American Airways System, Col. Charles A. Lindbergh projected a survey of the proposed North Atlantic air line routes early in 1933. He was accompanied by Mrs. Lindbergh, who served as radio operator and co-pilot, also taking ground speed and drift readings.

Their machine was the same Lockheed Sirius low-wing monoplane in which they made their great flight to Japan and China two years previously; and it was equipped with the same metal Edo pontoons. New equipment included a Wright Model F Cyclone engine rated at 700 horsepower and supercharged to give 750 horsepower, a Hamilton controllable pitch propeller, Sperry artificial horizon and directional gyro on the special instrument board installed in the machine.



Courtesy of the New York Times.

Atlantic survey by the Lindberghs in 1933.

The Lindberghs left New York on July 9 and returned on December 19. Their purpose was not to single out an air line route but rather to secure specific data about flying conditions, exploratory work toward definite conclusions as to the practicability of commercial routes across the Atlantic, a phase of the research work which Pan American Airways had been doing for three years.

Flying up the east coast of the continent to the Arctic Circle the Lindberghs, as the map of their flight shows, hopped 650 miles over water from Hopedale, Labrador, to Godthaab, Greenland, thence to Halsteinborg where they made repeated flights over regions never before penetrated. One took them to Baffin Land, on the continent again, and back without landing, another 600-mile journey over a frozen wilderness. There were other flights toward the north, fol-

lowed by an 800-mile flight over the Greenland ice cap to Ella Island, thence to Claverling Island, back down the east coast of Greenland to Angmagsalik where they turned westward and again hurdled the ice cap back to Godthaab, which they circled and left for Julianehaab. They flew nearly 4,000 miles over and around Greenland. Iceland was their next stop. After that their journey read like a map of Europe, first as explorers, then unofficial good will ambassadors trying their mightiest to be plain tourists, even in Russia.

HOME FOR CHRISTMAS

Colonel and Mrs. Lindbergh arrive in Miami after their 30,000 mile survey flight for Pan American Airways during the last five months of 1933.

From Lisbon, Portugal, they hopped to the Azores, sped southeast to Madeira, the Canary Islands, the African coast, Cape Verde Islands, and back to Africa whence on December 6 they took off for Natal, Brazil, 1,800 miles across the South Atlantic. Their journey northward was over the route of the Pan American Airways System, including a jaunt up the Amazon River to Manaos. On their return to the United States they had visited 21 countries in 198 flying hours during which they traversed nearly 30,000 miles with the same plane, motor and other equipment. For the part she played as co-pilot and navigator the National Geographic So-

ciety awarded Mrs. Lindbergh the Hubbard Gold Medal, which her husband had received after his flight to Paris.

Post's Record World Flight

In the same "Winnie Mae," the Lockheed monoplane in which he and Harold Gatty made their record world flight in 1931, Wiley Post, this time flying solo, broke their former record when on July 22, 1933, he landed in New York, having flown around the world in seven days, 18 hours and 49 minutes. The record made by Post and Gatty was eight days, 15 hours and 51 minutes.

AROUND THE WORLD IN A WEEK

Wiley Post and the "Winnie Mae" visit Oklahoma City after their second record flight around the world.

Post not only used the same plane, but the same engine on both world flights. The engine was a supercharged Pratt & Whitney Wasp. It had logged 846 hours before the take-off from Floyd Bennett Field on the morning of July 15. New cylinder heads, with the modern thin fins for cooling, and new sodium-cooled valves were the only alterations to the veteran Wasp, that and a Smith controllable pitch propeller which at 15,000 feet pulled the "Winnie Mae" at 200 miles an hour, and let him fly at any height. In Russia he dropped down from 21,000 to 200 feet before he could see the ground. New instruments helped him through bad weather.

Writing in the *Sperryscope* for October, 1933, Post asserted: "There were hours when I was forced to fly absolutely blind or above the clouds. It was called a solo flight, but I never could have made the record without the efficient little co-pilot—the Sperry Pilot for automatic flying. Without it the strain of flying through the worst weather I ever saw would have been too great.

"Most of the first hop from New York to Berlin was flown in clouds and rain. Between Khabarovsk, Siberia, and the Alaskan coast the automatic pilot did all the work and took me through a continuous blind stretch for seven hours."

At a luncheon tendered Post by the Aeronautical Chamber of Commerce of America, Thomas A. Morgan, president of the Chamber, presented him with an illuminated parchment scroll which read in part:

"Your flights have reflected great credit upon American airplanes, engines, instruments and fuels. By your technical knowledge, flying skill, dauntless perseverance and supreme endurance you have wrought mightily in displaying before the world the excellence of American engineering and construction in aeronautics."

The log of the flight follows:

	(Miles) Distance	Total Flying Time Hr.	Min.	Length of Stop Hr.	Min.	Total Elapsed Time Hr.	Min.	Aver. Speed per Hour	Point to Point Flying Time Hr.	Min.
New York-Berlin	3,942	25	45	2	15	28		153.1	25	45
Berlin-Koenigsberg	340	30	15	13	5	44	35	75.6	4	30
Koenigsberg-Moscow	651	35	50	1	52	53	12	116.6	5	35
Moscow-Novosibirsk	1,579	49	5	2	5	69	2	119.2	13	15
Novosibirsk-Irkutsk	1,055	55	38	15	25	91		161.1	6	33
Irkutsk-Rukhlovo	750	63	10	9	3	107	25	99.6	7	32
Rukhlovo-Khabarovsk	650	67	30	2	13	113	58	150.1	4	20
Khabarovsk-Flat	2,800	90	02	15	58	152	28	124.3	22	32
Flat-Fairbanks	375	93	16	7	3	162	45	116.1	3	14
Fairbanks-Edmonton	1,450	102	38	1	33	173	41	154.7	9	22
Edmonton-New York	2,004	115	54			186	57	151.0	13	16
Total distance	15,596	115	54	71	3	186	57	134.6	115	54

Another daring attempt to make the first solo flight around the world was that of James Mattern, who left New York on June 3, and on June 15 was forced down with a wrecked plane in Siberia to remain 14 days on the banks of the Anadyr River before he was rescued by Eskimos. He broke his ankle in the crash, and had only a small supply of chocolate and biscuits which was exhausted in five days. The Eskimos took him to their village and on July 5 they brought him into the town of Anadyr where the radio reported him alive.

Balbo's Massed Flight

General Italo Balbo and his seaplane armada of 25 seaplanes

manned by nearly 100 officers and men took off from the water at Orbetello, Italy, on July 1, 1933, on what was to be the greatest mass flight in aviation history. Their objective was Chicago, and after that a return flight to Rome by way of New York, Newfoundland and the Azores. They lost one seaplane and a member of its crew in landing at Amsterdam on the westbound flight which took them by way of Ireland, Iceland, Labrador and Montreal to Chicago, where they landed on July 15, having made the 6,100-mile trip with 24 seaplanes in less than 15 days elapsed time and 47

GENERAL BALBO'S FLAGSHIP

One of the Italian armada which made the round trip flight to the United States in 1933.

hours, 50 minutes flying time. The longest and most hazardous leg of their journey was the 1,500-mile over-water hop from Iceland to Labrador when they had to fly blind through mist, yet maintain formation.

General Balbo flew his armada from Chicago to New York in perfect formation, and several days later flew to Shoal Harbor, Newfoundland, for the take-off back over the Atlantic. The 24 seaplanes rose out of Shoal Harbor on August 8, and headed for the Azores. During the departure from Ponta Delgada another

seaplane was wrecked on the take-off and an officer was killed. The 23 remaining seaplanes landed in Lisbon on August 9. They flew on to Rome on August 12, the 23 seaplanes having made the round trip across the Atlantic and covered about 12,000 miles.

Plans for the massed flight were in progress for nearly a year before the departure. The seaplanes were Savoia S-55, twin-hull models, powered with two Isotta Fraschini 18-cylinder Asso 500 horsepower engines set tandem above the monoplane wing 79 feet from tip to tip. The hulls were 52 feet long. Among the navigational instruments were the Sperry artificial horizon and directional gyro, and a new short wave radio developed by the Italian Government for military purposes.

British Conquer Mount Everest

Midst a veritable wilderness of peaks that stand sentinel about its crest Mount Everest at last lay at the mercy of the aerial camera when on the morning of April 3, 1933, two British Westland biplanes zoomed out of the haze and careened back and forth over the summit of the world's loftiest mountain 29,141 feet high. It was a triumph for aviation, particularly for the skill and organization ability displayed by the British expedition, which had been preparing for months to conquer Everest and map the approaches in this most inaccessible region of the Himalayas.

The Houston-Mount Everest Expedition numbered 25 members who worked for months on their equipment. Their base was set up at Purnea, 145 miles from Everest, which lay concealed behind the ever-present clouds over the foothills. Even when high in the air over the route taken to Everest the dust clouds served to obliterate landmarks and render imperative a second flight to procure the over-lapping vertical aerial photographs which was one of the scientific purposes of the expedition.

The flight from Purnea over Everest and return was made in about three hours. The Marquess of Clydesdale and Lieut. D. F. McIntyre piloted the two planes, and their observers were Col. L. V. S. Blacker and S. R. Bonnett, respectively. The commander of the expedition was Air Commodore P. F. M. Fellowes.

To reach Everest the pilots climbed their planes to an altitude of about 30,000 feet. At one point they were caught in a down draft from the west wind beating against the steep side of Everest, and the planes were hurled downward half a mile in a few seconds. They crossed the topmost ridge of the great peak with only 100 feet to spare. They made two complete circuits of the summit, and fifteen minutes later turned back toward their base.

On April 19 the expedition successfully completed its vertical aerial photographic survey.

French Beat British Distance Record

On February 8, 1933, Squadron Leader O. R. Gayford and Flight Lieutenant G. E. Nicholetts, of the British Royal Air Force, set a new distance mark of 5,308 miles when they landed their giant Fairey monoplane, Napier-powered, at Walvis Bay, South Africa, 57 hours and 25 minutes out of Cranwell Airdrome in Lincolnshire, England.

A sandstorm over Nigeria carried them 300 miles off their course, and from there on headwinds cut down their speed, so that their average was only 93 miles an hour.

The British did not enjoy the world distance record more than a few months. Two French pilots, Paul Codos and Maurice Rossi, in one of the outstanding flying achievements of the year captured the record when they flew their Hispano-powered Blériot-110 monoplane "Joseph Lebrix," from Floyd Bennett Field, New York, to Rayak, Syria, 5,657 miles, beating the British record by 349 miles.

Codos and Rossi loaded their plane with 1,770 gallons of gasoline making its total weight nine tons, and used nearly all the 4,200 foot runway at Floyd Bennett Field to get into the air at 5:41 o'clock on the morning of August 5. They ran into bad weather at Halifax, N. S., and for five hours could not see the wing tips, while bumpy currents buffeted them first one side then the other. They could not see the ocean because dense black clouds clung to the surface and they were further handicapped by rain and hail. At a great height that night they sighted the star Arcturus and found they were on a true course to Cherbourg which they sighted next day.

Paris gave them clear weather, and that second night in the air they had the moon for company to Budapest. On the third day, after sighting Saloniki Peninsula they ran into headwinds which prevented either pilot gaining an instant's rest; and the strain was beginning to tell on them. The Aegean Islands popped up before them, then the island of Rhodes slipped beneath the faithful plane and the pilots lost all sense of time. Then suddenly, to them, they saw Latikia on the Syrian coast. Realizing that they could not reach their original destination, the Persian Gulf, because headwinds had reduced the supply of fuel, Codos and Rossi decided on Rayak. They spent 40 minutes trying to find Rayak, which was the most trying period of their flight, because they wanted to reach

WORLD RECORD FOR DISTANCE

The Bleriot-110 in which Lt. Maurice Rossi and Paul Codos made the new record for a non-stop flight, New York to Rayak, Syria, 5,657.3 miles, August 5-7, 1933.

a good landing field and the poor visibility threatened to prevent it. Their engine had consumed 30.38 gallons of gasoline an hour during the 56 hour flight.

Italy Takes Speed Record

After two years of unremitting effort in which a considerable sum of money was spent by the Italian Government in development work and two pilots lost their lives, Italy on April 10, 1933, captured the coveted world record for speed. Warrant Officer Francesco Agello flew three times in both directions over an official three-kilometer course at Lake Garda, for an average speed of 423 miles an hour.

The machine was not a special racer but a training plane developed from the Schneider Cup racers of 1931 and known as a Macchi 72, with two Fiat engines developing a total of 2,500 horsepower. The plane weighed three tons and had a wing area of only 161 square feet. It landed at 130 miles an hour.

Another pilot of the military high speed school at Lake Garda flew the same seaplane at the rate of 381 miles an hour over a 62.137 mile course on October 8, 1933. On this flight the plane was kept at 15 to 62 feet above the water; the takeoff was in 47 seconds and the landing at a speed of 186.4 miles an hour.

The American land plane speed record was broken on September 4, 1933, when James R. Wedell, at Glenview, Ill., made 304.98 miles an hour in his special racer, powered by a Pratt & Whitney Wasp engine.

WORLD RECORD FOR SPEED

The Italian Macchi-72 seaplane which broke all speed records in 1933, making 423 miles an hour.

French Break Altitude Record

On September 28, 1933, Gustave Lemoine took his Potez-50 biplane off the field at Villacoublay, France, and broke the world altitude record, reaching a height of 44,819.418 feet. His plane was powered with a Gnôme-Rhone K-14 engine. He broke the record of 43,976.245 feet made by Capt. Cyril Frank Uwins in England on September 16, 1932.

Turner's Record Flight

At 10:38 o'clock (1:38 a. m. eastern standard time) on the night of September 24, 1933, Col. Roscoe Turner lifted his special Wasp-powered Wedell-Williams racer off the United Airport at Burbank, Calif., and headed East for a new transcontinental record. The field was shrouded in mist; obviously it was not a night to race through the turns of Cajon Pass, so Turner climbed 11,000 feet and headed straight for Cadiz in the Mojave Desert. He made 270 miles an hour over the Sierra Madre range; and over the desert picked up a tail wind which helped him jump to five miles a minute.

He was able to check his course on the jagged Needles, and again at Holbrook, Ariz., while the airway beacons guided him across the Hopi Desert. At Albuquerque, 5,000 feet above sea level, he landed at 100 miles an hour and refueled, having made 600 miles in two hours and ten minutes.

WORLD RECORD FOR ALTITUDE

The Potez-50 in which Gustave Lemoine reached a new record altitude for airplanes 48,819.4 feet, over Villacoublay, France, September 28, 1933.

He flew at 12,000 feet until black clouds rose up about him, then he dropped two miles and hedge-hopped across the wheat fields of Kansas, landing in Wichita for more fuel. From Wichita on he encountered clouds and rain, dodged one storm, ran into another and landed at Indianapolis, his last stop.

Hot waves of air bounced him two or three hundred feet as he sped over Ohio. Pennsylvania greeted him with a ground haze which thickened as he neared New York. He set his golden monoplane down on Floyd Bennett Field, New York, at 11:43½ o'clock on the night of September 25, having spanned the continent, 2,520 miles from Los Angeles to New York in 10 hours, four minutes and 55 seconds, an average speed of 250 miles an hour, and beating the record made by James H. Haizlip in August, 1932.

Another remarkable flight across the country was the non-stop record made by Lt. Comdr. Frank Hawks in his Cyclone-powered Northrop Gamma on June 2, 1933. Hawks left Los Angeles at 5:51 a. m. Pacific standard time, and encountered fog in the San Bernardino mountains, but from there on across Colorado, north of Kansas City and Indianapolis, and over Pittsburgh, thence into New York, he had fair weather, landing at 11:19 p. m. New York daylight time, a non-stop record of 13 hours and 26 minutes, which

broke his former record of 17 hours and 36 minutes made on June 28, 1929. His average speed was 181 miles an hour.

New York-Haiti Non-Stop

On June 11-12, 1933, Captain J. Errol Boyd and two companions, Robert G. Lyon and Harold Palmer Davis, made a non-stop flight from Floyd Bennett Field, New York, to St. Marc, Haiti, about 2,470 miles, in about 24 hours. Their plane was the famous eight-year-old "Columbia" veteran of two transatlantic and many long non-stop flights.

COL. TURNER AND HIS RACER

In this Wedell-Williams special racer, powered with a Pratt & Whitney Wasp motor, Col. Roscoe Turner won the Bendix Transcontinental Race in July, 1933, making a new east to west record. Later in the year in the same plane he established a new record west to east in 10 hours and five minutes.

Ulm's Australian Flight

Sir Charles Kingsford-Smith repeated his achievements in long distance flying when on October 11, 1933, he landed at Wyndham, Western Australia, having flown his single-engined Percival Gull monoplane from Lympne Airdrome, England, in seven days, four hours and 43 minutes. Nine days later, on October 20, Charles T. P. Ulm, with three companions, brought their Wright Whirlwind-powered Avrfok-10 plane to earth at Derby, Western Australia,

only six days, 17 hours and 56 minutes out of Harmondsworth, England, beating Kingsford-Smith's time and setting a new record for travel between the mother country and Australia.

Other Aerial Adventures

Rear Admiral Richard E. Byrd ushered in his second Antarctic adventure on December 22, 1933, when he put his Curtiss-Wright Condor seaplane over the side of his flagship and with Harold I. June, chief pilot of the expedition, soared out over the ice pack on the Ross Sea into unexplored wastes. The flight lasted four hours and took

WINNER OF LAND SPEED RECORD

James R. Wedell and his special racer, Wasp-powered, in which he made the land speed record of 304.98 miles an hour at Glenview, Ill., September 4, 1933.

them to Latitude 70 degrees south, 350 miles beyond the record penetration which was made by Cook in 1773. The flight established the fact that contrary to former theories there is no land in that particular area.

Among the Atlantic flights of 1933 were those of Capt. James A. Mollison from Africa to Brazil, ending February 9, followed in July by the adventure of Capt. Mollison and his wife, the former Amy Johnson, when they flew from Pendine Sands, Wales, across the Atlantic and crashed while attempting to make a night landing at Stratford, Conn., on July 23.

Two Spanish aviators, Capt. Mariano Barberan and Lieut.

Joaquin Collar landed at Camaguey, Cuba, on June 11, 1933, 39 hours and 55 minutes after leaving Seville, Spain. They flew about 4,900 miles, the longest flight over waters of the North Atlantic.

One of the most daring and tragic flights of the year was that of the Lithuanian-American pilots Capt. Stephen Darius and Stanley Girenas who after two years of preparation, left Floyd Bennett Field, New York, on July 15, 1933, and flew non-stop toward their native land, to lose their way in a storm and crash in a forest outside Soldin, Pomerania, within a few miles of their goal, Kaunas, Lithuania. Both were killed.

Salient details of other flights of the year will be found in the chronology.

NEWS PLANE COVERS FLOOD

From a Detroit News plane over Keyport, Ky., on a 750 mile round trip flight covering the Ohio River flood in March, 1933. The pilot-reporter Piersol and photographer Kuenzel left Detroit early one morning and returned in time to get story and pictures into the early afternoon editions.

CHAPTER X

AERIAL SERVICE

Statistics—Aerial Photography and Mapping—Charter Flights—Sightseeing—Forest Patrol—Flood Control—Crop Surveys—Outlook for 1934.

REFLECTING prevailing slack business conditions the aerial service industry in the United States in 1933 suffered another set-back even more severe than that experienced during the previous year. Many aerial service organizations were forced to suspend operations, at least temporarily. On January 1, 1934, only 215 operators were known to be in business, as compared to 280 the year before and 352 at the end of 1931. Their numbers had dwindled from 800 during the peak year of 1929.

The gross income from all activities aggregated between five and six million dollars in 1933 as compared to 10 to 12 millions in 1932. Part of this shrinkage was due to lower charter rates, which

OVER SOUTHERN CALIFORNIA

A Douglas amphibion, powered by two Wright Whirlwind engines, operated by the Wilmington-Catalina Air Lines.

for single-engined land planes averaged five cents a mile less than the 20 to 25 cents charged in 1932, while the heavier land planes and over-water equipment brought about 20 per cent lower rates than the 82 cents to $1.40 mileage charge during 1932.

A very large part of the rental service during the last year is attributed to pilot students qualifying for licenses. The yearly number of student permits having reached 10,109 on January 1, 1934, as compared to 10,000 twelve months earlier.

The 215 operators reporting in the annual survey of the Aeronautical Chamber of Commerce of America indicated that about

THE BELLANCA SPECIAL

With a gasoline capacity of 1,000 gallons this Wasp-powered Bellanca monoplane is designed for long-distance flying.

95 per cent of their 1,810 planes in service are single-engined machines seating two or three persons, 52 per cent being open cockpit types, 43 per cent monoplanes and the balance a miscellany of multi-engined planes, seaplanes, amphibions, flying boats and cabin jobs of four to eight place capacity.

The number of employees reported to the Aeronautical Chamber was as follows:

	1932	1933
Pilots	732	728
Mechanics	1,946	1,748
Others	1,352	1,276
	4,030	3,752

The difference in number of hours flown on various missions is shown here:

Hours Flown in Aerial Service

	1932	1933
Short hops	76,640	47,258
Charter flights	51,421	34,464
Photographing	11,243	2,877
Mapping	5,550	3,910
Crop Dusting	12,426	1,119
Student Instruction	183,436	176,042
Student Solo	176,689	168,943
Miscellaneous	74,323	22,814
Total Hours Flown	591,728	457,427

Sightseeing hops and aerial taxi sustained the greatest losses, the 962,212 passengers carried in 1933 as compared to 1,118,587

THE STEARMAN MODEL 80

Variations in this basic design, with its Wasp motor and Hamilton controllable pitch propeller, are the Stearman 81 and 82.

in 1932 and 1,875,992 in 1931 also reflecting the general depression from the peak of 2,995,530 passengers flown in aerial service operations in 1929.

Aerial Survey

Fairchild Aerial Surveys is mapping a proposed dam site and watershed covering 25,000 square miles in New Mexico, Arizona and Utah. Use of the multiple lens camera and the development

of oxygen apparatus for personnel and superchargers for motors combined to facilitate the speed of map-making, thus making such surveys more economical for geological exploration, city planning, assessment and evaluation work, irrigation projects, reforestation and soil erosion studies and utility extension surveys. Several other companies were engaged in aerial photography during the year, among them Hobi Air Service at Eugene, Ore.; Welch Flying Service at Rochester, N. Y.; Mountain Airways at Laramie, Wyo.; Dallin Aerial Surveys at Philadelphia; Richmond Air Transport at Richmond, Va.; Ames Skyways at Boston; Inter-Island Airways at Honolulu, and Pacific Aeromotive Corporation at United Airport, Burbank, Calif.

All the above companies had long records of other aerial service activity, including emergency flying to snowbound districts, rescue work in flooded areas, forest fire patrol and transportation in the national forests, and innumerable charter flights by business executives, salesmen, sportsmen, advertising agencies and others. Whenever time-saving was an essential to success in business or sport, or in the saving of human life or property, there the aerial service operator proved to be a public institution of incalculable value, one that will become more generally patronized with improved conditions.

NEW KELLETT AUTOGIRO

The K-4 side-by-side model developed in 1933.

CHAPTER XI

PRIVATE FLYING

Pilots and Airplanes—Light Planes Popular—New Landing Facilities—Air Cruises—Contests—Exploration—Aircraft in Business—Aviation Editors Organize—Glider Activities.

ON JANUARY 1, 1934, the Aeronautics Branch of the Department of Commerce reported in the United States and possessions 13,960 licensed pilots and 9,284 airplanes, of which 6,896 were licensed and 2,388 bore identification numbers only.

With 615 planes on the air lines and 1,810 known to be employed in aerial service and flying school operations, the balance, or approximately 6,859 machines, are assumed to be in use among business houses, industrial concerns, the aircraft and allied industries and individuals who fly for business or pleasure.

Among the 13,960 persons holding pilot licenses there were 7,103 of the transport grade, 1,070 limited commercial, 16 industrial, 4,505 private and 1,266 solo pilots. They included 362 women, 71 with transport, 34 limited commercial, one industrial, 178 private, 77 solo and one autogiro license. The exact number of pilots actually engaged in private flying is problematical, because there is no way of keeping an accurate check on those who own their planes one month and sell them the next, those who pilot machines for private owners or those who occasionally hire planes for special trips. The depression discouraged private ownership to such an extent that only those with independent incomes or persons requiring fast transportation in their business could afford to operate airplanes.

Taking into account the air line and aerial service operations, which are included in the totals, the following statistics are of interest as indicating the status of private flying. California led all States with 2,622 licensed pilots. New York was second with 1,353 and Illinois third with 880. California led with 1,030 aircraft. New York was second with 915 and Illinois third with 623.

The 6,896 licensed aircraft represented a drop from the previous year when there were 7,330. Of the 16,598 incorporated cities and towns in the United States, 2,848, or 17.6 per cent, could boast of one or more airplanes, the Aeronautics Branch reported. The

four leaders were Chicago with 287, New York with 246, Los Angeles with 159 and Detroit with 122.

The 13,960 licensed pilots represented a drastic reduction from 18,594 on January 1, 1933; due in part to the reversion of many private and solo licenses to the student grade when the private pilot requirements were raised and the solo license discontinued on July 1. That is evidenced by the year's increase of student licenses from 8,038 to 11,469 on January 1, 1934.

In a special bulletin the Aeronautics Branch urged upon the private pilot need for more extended study in the requirements for

PITCAIRN CABIN AUTOGIRO

One of the models in favor among private owners.

safe cross-country flying, stressing greater familiarity with the mechanics of plane and engine, possession of adequate maps and a knowledge of how to use the airways with the Government facilities always available for weather information and direction finding. The use of radio in private planes, particularly on machines which transport numbers of guests or business executives on long cross-country trips, was recommended.

The light plane, with either cabin or a storm-shelter for the open cockpit types, attracted the majority of private buyers in 1933. Sales of large multi-engined equipment, because of prices, were

limited to business and industrial houses and wealthy sportsmen using their planes as air yachts. The side-by-side two-place open or closed models, four-place cabin and three-place open types were best sellers during the year.

New Landing Facilities

The 2,000 new airports which the Aeronautics Branch is establishing with public works funds in towns where municipal property

AERONCA WITH EDO FLOATS

One of the world's smallest seaplanes for private flying. This Aeronca C-3 weighs only 541 pounds.

is available should encourage private flying through the increase in the number of places where planes may be flown, landed safely and properly serviced.

A plan for using public works funds to establish water terminals at all the larger centers was under consideration by the Aeronautics Branch at the end of the year. That, its proponents believed, more than any other single activity in 1934 would encourage commuting

by air. George B. Post, vice president of the Edo Aircraft Corporation, who drafted the plan for Director of Aeronautics Eugene L. Vidal, proposed steel or wooden barges with an inclined runway leading down into the water, and a turn-table for re-launching planes with a minimum of effort after they have been beached and taken on or discharged passengers. Such a floating base was used in 1933 by the Marine Air Transport Company, being moored to a pier on the Jersey City side of the Hudson River opposite New York. It brought aerial commuters to within ten minutes of their offices in downtown Manhattan.

By placing such facilities at those centers located on waterways, nearly all large cities and towns would be available to the private owner in a hurry, because he would not lose time coming into the

NEWS BY LAND, SEA AND AIR

The New York Daily News Amphibion Privateer, Wright Whirlwind powered, a regular adjunct of that newspaper's transport equipment.

business districts from outlying airports.

Commuting among business men gained in popularity during the year, when scores of newcomers joined such veterans as Charles A. Hinsch, Jr., and John Pattison of Cincinnati; Richard F. Hoyt, Roland Palmedo, William Fahnestack, Willis D. George, Lawrence Turnure, Barron Lambert, Alan Eustis, Samuel L. Rigister, William B. Harding, Edward B. Cahn, and Bertram S. Rosenbaum, of New York; G. T. Baker, of Chicago; Heyward E. Boice, Jr., of Baltimore; A. Hammon Amick, Jr., of Cumberland, Md.; John H. Candler, of Atlanta, and many other owners of private planes who commute to business in their own craft and fly for sport and pleasure.

Air Cruises

Eleven amphibions and seaplanes, piloted by their sportsmen-owners and with guests aboard, participated in the third annual invitation cruise of the Aviation Country Club of Long Island in July. They included George B. Post in an Aeronca seaplane, Thomas Eastman in a Waco seaplane, Earl D. Osborn in a Fleet seaplane, Mr. and Mrs. John Lapham in a Commuter amphibion, Mr. and Mrs. Richard F. Hoyt in a Keystone Commuter, Powel Crosley, Jr., with guests in a Douglas Dolphin amphibion, Mr. and Mrs. Charles W. Deeds in a Sikorsky amphibion, Mr. and Mrs. Grover Loening

LOWELL THOMAS TAKES THE AIR

The famous radio reporter gives his regular evening broadcast from one of Eastern Air Transport's Curtiss-Wright Condors a half mile over New York City.

in a Loening amphibion, Dr. Harry V. Spaulding in a Keystone Commuter, John T. du Bois Wack and Reginald V. Williams. Their itinerary was across Long Island Sound to the Hudson, to Glens Falls, Lake George, Lake Champlain and return.

During the summer of 1933 more than 2,000 landings were made on the waters of New York City. The Cord Airport at Auburn, Ind., a private company landing field maintained at a cost of about $200 a month, reported 700 landings during the year by company executive planes and visitors.

Among the 160 planes visiting Miami during the races and air

meet in January, 1933, 87 were privately owned. Roy Liggett, of Wichita, in a Cessna monoplane, won the Col. E. H. R. Green $6,500 trophy prize for speed over a 30-mile course. James Wedell won $300 in a free-for-all speed race at 205 miles an hour. Jack Morris, of Pittsburgh, won $150 in a 15-mile cabin plane race. E. H. Wood of New York, in a Beechcraft, won the Texaco trophy over a 5-mile course. Ben Stegall, of Atlanta, in a Travelair, won the Sportsman Pilot event. The Cleveland Pneumatic Tool Company trophy was won by Henry Little of Philadelphia. Alton B. Sherman, of Hyannis, Mass., won the Curtiss Trophy and $200. Douglas Davis, of Atlanta, won another free-for-all race. The handicap race prizes were awarded by Col. Henry L. Doherty. W. H. Rausch, of White Plains, N. Y., and Elkin Floyd, of Jacksonville,

NEW KINNER FOR PRIVATE FLYING

The Kinner Airplane and Motor Corporation's two-place, side-by-side cabin low-wing monoplane, with a 160 horsepower Kinner R-5 engine.

were among other prize winners. J. Heron Crossman, of Wilmington, N. C., won first prize of $1,000 in the derby from Daytona Beech to Miami. Others who received money prizes in that event were Willis George, of Great Neck, N. Y., Larry P. Sharples, of Philadelphia, J. W. Starke, of New York, Frank Ball of Muncie, Ind., Joe L. Willoughby, Jr., of Newport, R. I., Raoul Cote, of Kankakee, Ill., who finished second, and Edgar Woodhams, of Manhasset, N. Y., who placed third.

The air cruise program sponsored by the Aeronautical Chamber of Commerce of America promoted wider use of planes by private pilots and their friends. In April the first cruise took ten planes to Atlantic City. St. Louis staged the second cruise in May, with 22 planes on a 280-mile flight. In June the St. Louis fliers

staged another cruise with ten planes. An aerial treasure hunt was held from Roosevelt Field, Long Island.

Hundreds of private pilots and owners of planes flew to Roosevelt Field for the Charity Air Pageant in October.

The Contest Committee of the National Aeronautic Association announced that free-for-all races at sanctioned air meets in 1934 and 1935 will be limited to five cubic inch displacement groups —200, 375, 550, 1000 and unlimited.

Exploration

Possibly one of the most attractive fields for private flying is that of exploration. The Byrd and Ellsworth expeditions to the

NEW LOENING AMPHIBION

This cabin monoplane was brought out by Grover Loening during 1933.

Antarctic were expensive and required months of preparation and organization. Others, however, were actually simplified by using aircraft, such as the African hunting trip made by Mr. and Mrs. F. Trubee Davison in 1933. A score or more groups spent their summer vacations on flying trips to out of the way places in the West, Canada and Mexico.

Aircraft in Business

Among the principal users of aircraft for business purposes in 1933 were the motion picture companies, newspapers, and radio broadcasting companies covering news events. Riots, hurricanes,

floods, fires, man hunts, engineering projects, parades, the inauguration of President Roosevelt and countless other events were covered by flying reporters, camera men and radio announcers. Twenty-nine newspapers used airplanes for delivery and distribution.

Among the larger business organizations using aircraft in promotional work was the Coca-Cola Company through its flying lecturer, William T. Campbell. Mr. Campbell, piloting his own autogiro, in 1932 and 1933 lectured on aviation in 39 states before 500,000 students in schools and colleges, besides addressing many luncheon clubs and giving radio talks. At the end of 1933 he was on a tour in the West at the end of which he would have covered

READY FOR POLAR ADVENTURES

The Byrd Antarctic Expedition's Curtiss-Wright Condor on Edo floats.

every state. The enterprise of the Coca-Cola Company in sponsoring such an educational program, with its great value in explaining the importance of aircraft in national defense, received widespread commendation.

Aviation Editors Organize

One of the most important developments of the year was a movement on the part of aviation editors of newspapers to organize for the purpose of exchanging general information. They were to form the National Association of Aviation Editors early in 1934,

with Reginald M. Cleveland, New York Times, president, and George Mason, Boston Transcript, secretary and treasurer. The governors of various zones, to be elected at the organization meeting, included Sherman B. Altick, New York Sun; William Westlake, Chicago Herald-Examiner; Deverne Barber, Miami Herald; Joseph Edgerton, Washington Star; James V. Piersol, Detroit News; and Burton E. Moore, Jr., Hartford Times, with others to be elected later from additional zones.

SHELL'S AVIATION SALES MANAGERS

Major R. G. Ervin, Major James H. Doolittle and Major J. A. Macready, representing the three Shell Oil companies, meet for a conference. The plane is a Waco, with Continental engine.

Glider Activities

Gliding and soaring proved of absorbing interest to an increasing number of enthusiasts in 1933. At the end of the year the Aeronautics Branch reported 149 licensed glider pilots, including two women. California led with 25. New York was second with 20 and Ohio third with 15.

Licensed gliders numbered 56, with 585 unlicensed gliders bringing the total to 641. Here too California led with 99. New York and Ohio each had 55. Michigan and Pennsylvania each had 47.

The two weeks of adventure at the annual meet in Elmira, N. Y., in July, under the auspices of The Soaring Society of America, was replete with thrills. There was plenty of bad weather. Thunder heads appeared over the Chemung Valley without warning, and on occasion they were ridden over into the Finger Lakes region.

Among the winners of the various events were Emerson Mehlhose with 178 minutes aloft in a sailplane, R. F. Carey with 196 minutes aloft in a utility glider and Richard C. DuPont rising to 4,334 feet in a sailplane and again riding 18.4 miles. Jack O'Meara, N. H. McDowell and Warren Eaton made notable records in stunting.

One of the most interesting glider events of the year was Richard DuPont's expedition to the Blue Ridge Mountains in September. The Washington Glider Club had pioneered in that section. Mr. DuPont won the American distance record when on September 21, 1933, he traveled 121.6 miles in his Bowlus sailplane from Rock Fish Gap, Va., to Frederick, Md., that distance approaching the world record of 136.8 miles.

The world record for duration with gliders was made August 3-4, 1933, by Kurt Schmidt in Germany. He remained up 36 hours and 35 minutes.

AT ROOSEVELT FIELD

Private fliers from all points attend an air show on Long Island.

CHAPTER XII

AIRWAYS AND AIRPORTS

The Federal Airways System—Communications—New Routes Under Public Works Program—Increase in Airports—Leading Airports—Federal Aid.

AMONG the principal factors promoting the steady growth of American aviation in 1933 were the continued development of the Federal Airways System on the part of the Government and the maintenance of airports by municipalities and commercial organizations.

The Federal Airways System

Proving that the air routes are public traffic lanes in one way or another of inestimable value to all the people, the Federal Airways System at the beginning of 1934 was being used by the domestic air transport lines operating on schedule, the Army Air Corps, the Navy Bureau of Aeronautics, National Guard flying units, reserve units, commercial flying schools, Federal and State departmental units, aerial and charter plane services and private owners.

Under the Aeronautics Branch of the Department of Commerce the Federal Airways System in the United States was further developed in 1933, so that at the end of that year there were 19,992 miles of routes, of which 18,655 miles were thoroughly equipped for night flying and 1,337 miles were in operation as daylight routes. The Air Navigation Division of the Aeronautics Branch reported 1,510 rotating and 286 flashing beacons on those routes. Pilots in the air could receive weather data from 68 radio communication stations, and they had 94 radio range beacons to help them maintain a true course. At the same time supplementary radio service, both communication and directional over short distances, was available from 77 marker beacons.

For emergency landings on the Federal Airways between regular airports there were 242 lighted intermediate fields and 19 unlighted fields on the daylight routes. At the same time throughout the country there were available 550 marked auxiliary fields for emergency landings.

Communications

On January 1, 1934, weather information was flowing over 13,000 miles of teletypewriter circuits, the reports collected at airports and weather broadcasting stations to be passed on to all pilots. Radio was also used to broadcast this data from point to point, eight stations operating solely for that purpose. There were 205 teletypewriter stations at airports and other weather-reporting posts. In addition there were 317 Weather Bureau airway stations without teletypewriter service, their reports forwarded by telephone or telegraph.

Transmission of weather maps by teletypewriter carried out experimentally in 1932 became a routine operation throughout the Federal Airways System in 1933. Maps are transmitted to key points on the airways network every four hours.

At 70 locations the remote control method of operation was adopted for radio communication stations and radio range beacons. Operating personnel are stationed at an airport where there is a weather reporting station and teletypewriter equipment. The transmitters of the radio facilities are at sites one to 15 miles away, where antennas will not obstruct air navigation. They are linked with the airport station by telephone circuits. All operations are carried out over the telephone, dial switches being used to turn apparatus on or off and for some 15 other functions such as to switch on the current at the transmitter to warm the tubes or to turn on rotating equipment at the radio range beacon preparatory to putting its signals on the air. In radiotelephone work the voice signals traverse the telephone circuits and are then broadcast at the radio communication transmitter.

Some radio range beacons being in remote locations with telephone circuits lacking, the experiments were undertaken with remote control by radio. In these a radio impulse originating at an intermediate landing field or a weather reporting station, and picked up automatically by an unattended receiving set ten miles away, was used to turn on the radio range beacon, and to silence it.

Automobile radio sets capable of receiving weather broadcasts from the Federal Airways System radio stations were suggested in a letter sent to manufacturers of radio receivers. Sets capable of receiving the frequencies between 200 and 400 kilocycles would make these broadcasts available to motorists. Automobile clubs have informed the Department that they already use weather information obtained from the airways stations in planning itineraries for members. They support the view that weather information

obtained en route would be of utmost service to persons making cross-country automobile trips, particularly at night and in mountainous regions.

No new lighted airway construction was undertaken in 1932, and none was provided for in the regular budget during 1933 because of the Federal economy program.

New Routes Under Public Works

The Government's special recovery program, however, provided a method for obtaining urgently needed additional routes. Public works funds were allotted for 2,638 miles of new routes, many of

READY FOR THE NIGHT ARRIVALS

The administration building and passenger station on the Indianapolis municipal airport.

which were under survey at the close of 1933. Those routes included: Northern transcontinental route, Minneapolis-St. Paul, Minn., to Seattle, Wash.; Fargo, N. D. to Pembina, N. D.; St. Louis, Mo. to New Orleans, La.; Tulsa, Okla. to St. Louis, Mo.; Galveston, Tex., via Houston, to Waco, Tex.

The Commerce Department's experimental radio system for blind landing of aircraft, first publicly demonstrated at Newark Airport in March, 1933, gives lateral guidance by means of a runway localizing beacon and a check on forward progress by means of marker beacons; and it then directs the plane to the ground by means of a landing beam. Later in the year further experiments

were made with a multi-motored transport plane, the earlier flights having been made with smaller machines.

A radio approach system developed during the year is somewhat similar, but less comprehensive. With the latter, the pilot follows signals of a radio range beacon and two marker beacons to find his way to the airport and descend to about 50 feet above the ground, thus making landings possible when there are ceilings of 50 feet or more. The blind landing system is designed for landings under zero ceiling and zero visibility conditions. Both systems are experimental projects. The Department is studying other means of combating poor visibility conditions at landing fields.

The lighted and radio-equipped airways are maintained by a highly trained corps of engineers, supervisors, radio operators, mechanicians, airways keepers and intermediate field caretakers. The facilities are under surveillance day and night to assure that they will function according to standard whenever their assistance is required by pilots. Air lines, which operate on rigid schedules, could not achieve the dependability that has become characteristic of their service without these air navigation aids. At the same time all other pilots use these facilities.

Not infrequently the airways personnel serve the public in unusual ways. During the "Graf Zeppelin's" flight from Florida to Chicago special weather reports were radioed to the airship. An Army bomber, lost in a smoke haze over Greensboro, N. C., was given radio directions which enabled the pilot to reach the airport. The radio station at Murfreesboro, Tenn., broadcast at frequent intervals that an airport's lights were out, due to power failure, and this message was received by two incoming planes which made safe landings with the aid of firepots and automobile headlights hastily set up as temporary substitutes for the boundary and landing lights. James R. Wedell, flying from Texas to rush a sick child to an operating table in a Baltimore hospital, fought his way through severe storms with the assistance of the Federal aids to air navigation.

Increase in Airports

On January 1, 1934, there were in the United States 558 municipal, 650 commercial, 55 Army, 18 Navy and 85 miscellaneous Federal, State and private airports.

California led all other States with a total of 211 airports and landing fields. Texas was second with 144 and Ohio third with 117. Texas led in her 52 airports, while Pennsylvania was first

with 70 commercial airports. In addition Alaska had 5 municipal, 2 commercial airports and 71 auxiliary fields. Two Alaskan airports were lighted for night flying. A third of the airports and fields in the United States were lighted at the end of 1933.

In its annual survey of airports made at the end of 1933 the Aeronautical Chamber of Commerce of America learned that despite the general effects of the depression which caused a few airports to be closed for want of patronage, and possibly because of ill-advised location, airports during the year had increased by 14 municipal and 31 commercial. The survey disclosed further that the total airports reporting to the Chamber planned a fourfold increase in expenditures for expansion during 1934. Airport managers believed that maintenance costs would increase because of the NRA codes and business recovery.

Leading Airports

Nine of the leading airports reported their business activities for the year as follows:

Airport	*Landings*	*Air Line Passengers*	*Other Passengers*	*Pounds of Mail*	*Pounds of Express*
Cheyenne	6,724	18,859	300	761,324	82,264
Cleveland	26,944	104,948	10,000	938,000	260,000
Pittsburgh	7,055	9,168	10,826	246,140	19,607
Kansas City	17,170	39,447	10,956	327,489	
Newark	19,232	120,000		1,500,000	425,000
Floyd Bennett	51,828	52	27,193	98 bags	100
Chicago	32,441	120,313	15,330	1,528,104	161,050
Detroit	10,860	25,000	5,268	70,000	50,000
San Diego	18,000	4,035	2,000	27,638	3,850
San Francisco	22,562	8,423	35,954		
Oakland	66,000	21,000	18,000	200,000	10,000

Ranking with the leaders among commercial terminals United Airport at Burbank, Calif., reported significant facts concerning operations during 1933. As one of the terminals for Los Angeles traffic United Airport was reputed to rank fourth in the United States. During the year 29,181 air line passengers and a total of 126,672 persons were flown in or out, an increase of 19 per cent. Private flying operations gained 26 per cent. While the number of charter flights declined the number of charter and sightseeing passengers increased 25 per cent.

Los Angeles was fortunate in having available another fine airport, Grand Central Air Terminal, at Glendale, with an average of 18 daily landings and 56 air line passengers daily during the year.

The advantage of having more than one first class airport in a city was demonstrated by Floyd Bennett Field, New York, which received several air line planes barred by fog at their own terminals. In all 51,828 landings, all classes, were made at this airport in 1933. Roosevelt Field, Long Island, reported growing popularity among private pilots and aerial service operators coming to New York. The Civil Works Administration was building new roads into the Birmingham, Ala., Municipal Airport; and other facilities

KANSAS CITY'S MUNICIPAL AIRPORT

Within ten minutes of the business center this great development forms a union station for some of the nation's leading air lines.

were to be provided for the 106th Observation Squadron, National Guard.

San Francisco Bay Airdrome reported a substantial development in private flying, particularly in the use of small planes. Tulsa, Okla., Municipal Airport planned new runways in 1934; and reported an operating profit continuously since it was opened in 1928. The Holman Municipal Airport at St. Paul, Minn., reported increasing activities, with expansion projects to cost $130,000 in 1934. The Allegheny County Municipal Airport at Pittsburgh,

Pa., reported a 50 per cent increase in flying activity, including air line traffic.

Lunken Airport, Cincinnati's municipal field, planned extensive expansion in 1934. Oakland, Calif., Airport completed its major construction operations during the year. A total of 492 persons took flying instruction at the Cleveland, O., Municipal airport during the year, and 212 made solo flights. Air line passengers numbered 104,948. Central Airport at Camden, N. J., the Philadelphia Terminal, handled 16,000 air line passengers and received an A-1-A rating from the Department of Commerce.

Newark Airport, the air line terminal for New York, increased

MILWAUKEE'S AIR MARINE TERMINAL

One of Kohler Aviation Corporation's transports leaving the municipal overwater flying base in the heart of the Wisconsin metropolis.

its area by 40 acres and extended one of its runways by 1,000 feet. The Kansas City, Mo., Municipal Airport was to spend $50,000 on expansion projects in 1934. A total of 39,447 air line passengers were handled at this airport in 1933. Fairfax Airport at Kansas City opened a night club in its administration building. Indianapolis, Ind., Municipal Airport handled 14,000 passengers and at the end of the year reported a 10 per cent increase in operations, with a further growth indicated upon completion of the new lighted airway to Louisville, Ky.

The Chicago Municipal Airport reported a 20 per cent increase in business and the contemplated construction of a lake front air-

port. Parks Air College port at East St. Louis installed new equipment to accommodate increased business at its repair depot. The Shushan Airport at New Orleans was completed during the latter part of 1933 in time for dedication during the 1934 Mardi Gras season. An elaborate dedication ceremony was planned for February 9, 1934, with the National Airport Conference of the Aeronautical Chamber of Commerce and several days before the Pan American Air Races, which were to be held at the airport. It is situated on an artificial peninsula in Lake Pontchartrain, within 20 minutes of the business district of New Orleans. A modern administration building and two hangars had been completed at the end of the year.

Federal Aid for Airports

The Civil Works Administration, organized as a Federal agency to relieve unemployment during the winter of 1933-34 by providing jobs on public projects, authorized and encouraged the use of Federally-paid labor on municipal airport development. No limit was set upon the amount of airport work that might be started, except that each State was given a definite sum for all its C. W. A. projects, and it might devote any part to airports. It was further required that the land selected for the fields be owned or leased by the municipalities. Any work could be undertaken provided that at least 80 per cent of the civil works funds was spent on labor. If the cities supplied material civil works labor was available for installation of hard surface runways, erection of buildings and similar construction operations. Where the material was not supplied civil works employees might be assigned to clearing land and grading runways.

Approximately 650 airport projects had been approved at the end of 1933, among them 360 new airports and 290 improvements of existing fields, though the reports on activities in the 48 States were not complete at that time. Officials believed that the total would reach 2,000. The Federal policy of aiding in the development of the nation's airport facilities was considered one of the outstanding developments of the year, and of incalculable value to commercial aviation, private flying and the national defense. The State programs were in active charge of the State Civil Works administrators, acting on recommendations of State airport advisors appointed by the Aeronautics Branch.

CHAPTER XIII

EDUCATION AND TRAINING

Flight Training—Pilot Licenses—Lower Cost of Training—Blind Flying Courses—Aeronautical Courses in Seventy Colleges and Technical Schools—Elementary and Secondary Education.

THOUSANDS of young men and women in the United States were taking some kind of aeronautical instruction on January 1, 1934. Some were learning to fly. Others were becoming expert designers and constructors of aircraft and engines. Still others were specializing in one or more of the various branches of commercial aviation.

Pilot Licenses

The list maintained by the Aeronautical Chamber of Commerce of America and checked with the Department of Commerce reports

ABOVE THE CLOUDS

A Curtiss-Wright Speedwing, with Whirlwind engine, over the Rocky Mountains.

indicates that 1,778 persons in the United States received their first pilot licenses during 1933. They are classified as follows:

Transport Pilot Licenses	269
Limited Commercial Licenses	63
Private Pilot Licenses	851
Solo	595
Total	1,778

The "solo" classification was created in 1933. The 595 solo licenses were granted between March 11 and August 5 when that classification was abolished. The Aeronautics Branch planned in 1934 to replace it with another classification to be known as "amateur."

The Department of Commerce list of student permits and pilot licenses issued annually is as follows:

Year	*Student Permits*	*Aircraft Pilots*
1927	.....	1,027
1928	.....	4,435
1929	20,400	7,863
1930	18,398	9,932
1931	16,061	7,221
1932	11,325	5,535
1933	12,752	5,648

Lower Cost of Training

The cost of instruction in flying schools showed a downward trend in 1933, an example being the Boeing School of Aeronautics at Oakland, Calif., the only training institution of United Aircraft & Transport Corporation. The Boeing School reduced the cost of both its ground school and flying instruction, at the same time holding to its established requirements for admission.

During the year this school, which draws on the resources of United Aircraft & Transport Corporation to qualify students for positions in air transport and aircraft manufacture, added a number of subjects to the curriculum, including instruction in instrument flying, communications, metal working and closer contact between the students and actual operations of United Air Lines, which has its western base adjoining the school at the Oakland airport. Relations with the various universities and high schools were extended. At the beginning of 1934 the student body represented every State and a number of other countries.

Employees of United Air Lines were being given a correspondence

school course without charge, and the wide interest displayed justified the undertaking.

Blind Flying Courses

During 1933 Penn School of Aviation at Pittsburgh, Pa., underwent considerable re-organization which brought about a marked increase in enrollment. The Harrisburg Division was discontinued in April and the Bettis Field Division was transferred in May to

A PACIFIC COAST TERMINAL

One of the United Air Lines Wasp-powered Boeing transports at the Los Angeles terminal, United Airport, Burbank, Calif.

the Allegheny County Municipal Airport. That permitted expansion of the facilities available to students, and the addition of a ground school. The response was immediate. The number of active students increased 50 per cent in three weeks.

A course of instrument flying was established and proved popular, all the regular pilots of Pennsylvania Air Lines enrolling in addition to several other transport pilots from various sections of the country. Two of the school's planes are now equipped for this type of instruction which has been incorporated in the master pilot's

course. The school's main base at the Pittsburgh-Butler Airport was well attended, an average of 25 active students a month having been maintained for the year. Curricula and plans have been drawn up for the establishment in 1934 of three new special courses: instrument and radio repair and maintenance, electrical repair and maintenance, and propeller repair and maintenance.

The Parks Air College of East St. Louis, Ill., continued to operate one of the best-equipped flying schools in the country. The Ryan School of Aeronautics at San Diego, Calif., operated both flight and ground school departments. The above schools hold Approved Type Certificates from the Department of Commerce, as do a number of others listed in the Appendix.

Aeronautical Courses

Seventy universities, colleges and technical schools reported to the Aeronautical Chamber of Commerce of America in a survey made at the end of 1933. Those institutions, which did not include Annapolis or West Point, reported 73 full time instructors in aeronautics and 171 part time instructors, with a total of 4,814 students taking aviation courses leading to degrees in either aeronautical or mechanical engineering.

According to their reports the institutions offering degrees in aeronautical engineering were the University of Alabama with 319 students, University of Cincinnati with 116 students, University of Detroit with 126 students, Guggenheim School of Aeronautics at Georgia School of Technology with 39 students, Louisiana State University, Massachusetts Institute of Technology with 166 students, University of Michigan with 163 students, University of Minnesota with 184 students, Mississippi State College, University of Pittsburgh with 55 students, Rensselaer Polytechnic Institute with 31 students, Stanford University, University of Washington and the Daniel Guggenheim School of Aeronautics at New York University with 331 students.

The last-named institution in 1933 adopted a policy of admitting women for graduate work only. The Master of Science degree is now recognized by the Graduate School, making it possible for graduates of engineering colleges who major in aeronautics to present themselves as candidates for the Master of Science degree in the Graduate School with part of their work in aeronautics.

The Curtiss-Wright Technical Institute of Aeronautics at Grand Central Air Terminal, Glendale, Calif., gave both engineering and mechanical courses. The Guggenheim Aeronautics Laboratory of

the California Institute of Technology specialized in meteorological education with special reference to air transport operations. The Cornell Flying Club of that University gave ground school work preparatory to flight training. The University of Southern California specialized in commercial aviation courses.

Other institutions giving some kind of aviation instruction, usually elective courses toward a degree in mechanical engineering, were the Armour Institute of Technology, Bradley Polytechnic Institute, University of California in cooperation with the Boeing School, Carnegie Institute of Technology, Case School of Applied Science, The City College, New York; Clemson College, Colorado Agricultural College, University of Colorado, Cornell University, University of Florida, University of Idaho, University of Illinois, Iowa State College giving credit courses in aerodynamics, structures, design and graduate courses; the State University of Iowa, Johns Hopkins University, Kansas State College, Lehigh University, University of Louisville, Ky.; Montana State College, Morningside College at Sioux City, Ia.

Also the University of Nebraska, University of Nevada, University of New Hampshire, North Dakota Agricultural College, Northwestern University, Oklahoma Agricultural and Mechanical College, Oklahoma City University, The University of Oklahoma, Oregon State College, Pennsylvania State College, University of Pennsylvania, The Polytechnic Institute of Brooklyn, Princeton University, Purdue University, Rose Polytechnic Institute, Southern Methodist University, Swarthmore College, Agricultural and Mechanical College of Texas, University of Toledo, Tulane University, University of Utah, Valparaiso University, Virginia Polytechnic Institute, University of Virginia, State College of Washington, College of William and Mary, also giving flight instruction; Yale University and the University of Akron.

Elementary and Secondary Education

The Daniel Guggenheim Fund Committee on Elementary and Secondary Aeronautical Education, which had been pioneering in the training of teachers and in research work in this branch of education for several years, exhausted the grant which had been given it by the Daniel Guggenheim Fund for the Promotion of Aeronautics, and transferred its activities to the Division of Aeronautical Education in the School of Education at New York University.

Policies which had been laid down by the Committee were car-

ried on by the University group under the direction of Prof. Roland H. Spaulding. Enrollment for the courses in the training of teachers increased considerably. A course begun the preceding year, setting forth Contemporary Trends in Commercial Aviation, was continued. The curriculum for the training of teachers was enriched by a practice school for training airplane and airplane engine mechanics. Despite the difficulties in which the majority of the nation's public schools found themselves during the year they continued to introduce into the curriculum the study of aviation in one form or another.

As the number of public school systems giving ground school courses and training for mechanics continued to increase, the number of private commercial schools engaged in this type of education decreased. It became increasingly evident that the history of education with respect to automobiles was being repeated in aviation. In a very few years, relatively speaking, all aeronautical education on the elementary and secondary level may be given in the public schools with the possible exception of a few cases throughout the United States wherein old and established private schools have been able to meet the competition of endowed or publicly supported institutions.

While most of the work at the School of Education was in the direction of improving teacher-training and teaching methods, several researches were undertaken in an effort to gain more competent knowledge with respect to the best practices in this field of education.

The Division of Aeronautical Education of New York University will continue to serve as a clearing house for information pertaining to aeronautical education, and will continue to render assistance to schools desiring to start courses in aviation.

CHAPTER XIV

LAWS AND REGULATIONS

State Legislation—State Licensing Systems—State Regulations—Airport Enabling Acts—Taxation—New Federal Regulations—Amateur Pilot Licenses—Student Permits—Air Race Rules—Airworthiness Requirements.

AS WAS expected, 1933 proved to be a year of considerable legislative activity. All except two States, Louisiana and Mississippi, met in legislative session, and Kentucky was the only State of the remaining 46 in which aeronautical legislation was not considered. In all except seven of these other 45 States, laws affecting aviation in one way or another were passed. Of a total of 349 bills on aeronautical subjects introduced, 105 were passed and became law.

The most important of these new laws will be referred to briefly and in connection with their subject matter, classified for purposes of convenient reference as follows: Licensing of Aircraft and Airmen and Regulation of Aeronautics; Airport Enabling Acts; Taxation; and Laws of Miscellaneous Character. The changes in laws affecting licensing and gasoline taxes may be observed by referring to the tables in the Appendix in former volumes.

Licensing and Regulation

In Arkansas the Department of Aeronautics was abolished. In California the definitions of terms in the uniform licensing law passed in 1929 were restated, and pilots exonerated from liability for death or injury to guests carried gratuitously, unless intoxication or wilful misconduct of the pilot proximately causes the injury or death; also Federal air transport certificates were required for the transportation of passengers for hire by aircraft between fixed termini within the State.

Colorado passed a law permitting the sale of beer on aircraft engaged in the transportation of passengers, and abolished the Aeronautics Commission.

Connecticut prohibited carrying passengers commercially in aircraft from any but a recognized airport without a permit from the Commissioner of Aeronautics; required licenses for glider pilots and instructors and established four classes of licenses; prohibited flying at less than 2,000 feet over communities and public gather-

ings and elsewhere at less than 500 feet; redefined certain aeronautical terms; revised the set-up of the State Airport Commission; provided rights and duties of non-resident pilots and aircraft unregistered in Connecticut; provided for the storage and public sale of abandoned aircraft; provided for fees to be charged by the Commissioner of Aeronautics; repealed 3,077 of the general statutes (relating to the responsibility of pilots); defined the factors to be considered in determining the airworthiness of aircraft; provided for new classes of yearly licenses for pilots; provided for the use, packing and maintenance of parachutes; and imposed penalties for reckless flying and for acrobatic flying with passengers.

Georgia enacted a law requiring Federal licenses for aircraft and airmen and also containing the so-called uniform provisions as to height of flight, damage to persons and property on the ground, collision of aircraft, and liability to passengers. All States now have licensing laws.

Idaho now requires State registration and licensing of all aircraft and airmen operating within the State except Federal, State, and foreign government aircraft and airmen.

Illinois amended portions of its "Act to Regulate Aeronautics" by restating the definitions of terms, redefining the duties of the State Aeronautics Commission, and fixing license fees for airports and air schools.

In Maine a new law legalizes the operation of aircraft on Sunday, heretofore forbidden, and another provides for the registration with the Secretary of State of resident aircraft and pilots and non-resident aircraft and pilots going into Maine for commercial purposes.

Michigan enacted a law providing for registration and registration fees of "all aircraft operating over the lands and waters of this State" except Federal, State, and foreign government aircraft operating noncommercially in Michigan.

Minnesota enacted a law providing extensively for the regulation of aeronautics, requiring Federal licenses for all civil aircraft and all airmen operating civil aircraft except those licensed by a foreign government, creating and defining duties for a State aeronautics commission, and fixing fees for airport and air school licenses.

The New Hampshire law requires the registration with the public service commission of resident airmen and civil aircraft owned by residents, civil aircraft owned by non-residents but flown commercially in the State and non-resident airmen operating

commercially in the State, and airports and areas from which flights are to be made.

In New York the temporary State Aviation Commission was extended to April 15, 1934.

Pennsylvania repealed its 1929 aeronautical statutes and enacted a very comprehensive law providing, among other things, for Federal licenses for aircraft and airmen (with certain exceptions), ownership of air space, lawfulness of flight, damage to ground property, liability to passengers, and collision of aircraft.

The Rhode Island law creates a commission to investigate the

OHIO'S FLYING CHIEF

Capt. Fred Smith, Ohio State Director of Aeronautics, and his Continental-powered cabin Waco for personal transportation.

desirability of maintaining an aviation unit in the State.

Airport Enabling Acts

New laws of this type, under which political sub-divisions of the State are authorized to acquire and establish airports and landing fields, were enacted in California, Florida, Georgia, Iowa, Michigan, Minnesota, Pennsylvania, and South Carolina. The recognition of the importance and necessity of such facilities, as evidenced by the increase in such laws, is gratifying.

Taxation

This subject continued to be one commanding the greater part of the attention of the various legislatures. For the most part, the new tax laws, 42 in number in 1933, concerned the tax on gasoline, and it is significant to note also that of 244 bills affecting aviation, introduced but failing of passage, more than 65 per cent related to the gasoline tax.

Detailed discussion of these laws will be unnecessary here as the summary of the gasoline tax laws in all the States has been brought up to date as of January 1, 1934, and appears in the Appendix. A comparison of the 1932 and 1933 gasoline taxes shows that in 1933 no State lowered the tax, but eight States increased it.

Laws of Miscellaneous Character

No new insurance laws were passed during 1933 but some of the new laws not previously mentioned will bear comment.

In Connecticut railroad companies organized under Connecticut laws may acquire, own, maintain and operate aircraft for the transportation of passengers and property. Idaho repealed the law prohibiting the transporting by air of game and fur-bearing animals. Iowa declared by law that any object, over fifty feet high hereafter erected within 1,000 feet of the limits of any municipal airport and which may endanger or obstruct aerial navigation, is a nuisance.

In Kansas railway corporations are now authorized to transport persons, property and mail by air. Minnesota now prohibits hunting or killing birds or animals by aircraft. New Mexico granted railroad corporations the same powers of air transport as Kansas.

Pennsylvania set aside $50,000 to assist in the development of aeronautics in the State. Rhode Island authorized railroads incorporated and operating in the State to operate aircraft.

Tennessee now prohibits by law the institution of any action against a municipality arising out of the management of a municipal airport; and Wyoming prohibits the shooting or hunting of game or birds by aircraft.

At the annual meeting of the American Bar Association in August, 1933, the Chairman of its Committee on Aeronautical Law, which has for several years been engaged in studying a proposed uniform State code for aeronautics, reported that the Committee had not yet completed a code and desired time for further study and future submission:

"Your Committee has felt that this code should not be submitted until it is entirely satisfied that, if and when adopted by the several States, it will at least be sufficiently definitive to remain good for a few years. Aviation is changing so rapidly that I don't know how any human agency can create any code which will be valid for any long number of years, but we do ask that the matter be resubmitted to the Committee with authority to confer with the Commissioners for the further consideration of this code."

The Committee was continued for another year.

Federal Regulations

The U. S. Department of Commerce, administering the Air Commerce Act of 1926, through the Aeronautics Branch from time to time changes the regulations concerning civil interstate flying. During 1933 revised Air Commerce Regulations were designed to encourage private ownership by reducing the obligations of non-commercial operators.

A new amateur grade of pilot license may be obtained after 25 hours of solo flying, provided the applicant passes the written examination and flight test. Prior to the creation of the amateur grade, students had to fly 50 hours to qualify for license, and could then take the tests for either the private or limited commercial grade. The holder of an amateur pilot license is privileged to fly licensed aircraft on his own responsibility, and may carry licensed transport, limited commercial or private pilots, but no other passengers.

Student licenses are now valid for two years instead of one. Amateur and private pilots are required to undergo renewal physical examinations every two years—private pilots previously were examined annually. Applications for license renewals in the noncommercial grades (amateur and private) may be submitted by mail, relieving pilots of personally seeing inspectors, although in the commercial grades (transport, and limited commercial) personal appearance before an inspector is still required. Persons under 21 years of age are required to obtain consent of parents or guardians before they can be issued any type of pilot licenses.

Private pilots now may operate aircraft carrying guests, executives or employees of companies by which they are employed, provided no payment is made for the transportation, and they also may demonstrate to prospective buyers aircraft in flight. Limited commercial pilots have been given a similar privilege with respect to operations outside their base areas; such flights previously were

permissible for limited commercial pilots only within ten miles of their home airports.

The Air Regulation Division, besides effecting the foregoing changes respecting operations of private owners and noncommercial airmen, kept abreast of changes in other phases of aeronautics by making the necessary changes in regulations. Authority has been given for passengers to sit at controls of dual controlled aircraft, if operated by a pilot licensed in the higher grades and no passengers are carried for hire.

Special rules for conduct of air races and air meets require race officials to keep spectators at sufficient distance from the area used by aircraft, that there may be no interference with pilots or hazard for spectators, and to take other measures for assuring the public safety. Also in connection with air races, an amendment to the Air Commerce Regulations prescribes a special marker to be displayed at an airport where such an exhibition is in progress, this marker to indicate to non-participating airmen whether or not it is permissible for them to land.

Keeping abreast with developments in another line, the Department studied its airworthiness requirements for aircraft, outlined the changes which appeared advisable to assist designers in making use of new aerodynamic data and information, and discussed these proposed amendments in a conference with the aircraft manufacturing industry. The chief aim of the revision is rationalization of the requirements, made possible by the results of research and experiments conducted by various agencies in the past few years. The requirements, which comprise Aeronautics Bulletin No. 7-A, were to be published in their revised form during 1934.

AN EXECUTIVE'S PLANE

A Bellanca, Wasp-powered Senior Skyrocket, owned by Socony-Vacuum Corporation, New York, and used by Col. H. W. Lake, manager of its aviation department, for executive work.

CHAPTER XV

LIGHTER-THAN-AIR

The "Macon" Enters Service—The "Graf Zeppelin's" Record—The Army TC-13—Goodyear Blimps—The 1933 Stratosphere Flight—Plans for Another High Flight—Other Balloon Adventures.

IN the lighter-than-air history of 1933 there were written many brilliant triumphs and one grim tragedy. The crash of the U. S. Navy rigid airship "Akron" off the New Jersey coast on the storm-swept night of April 4, 1933, shocked the world. Seventy-three officers, men and guests lost their lives, among them Rear Admiral William A. Moffett, Chief of the Bureau of Aeronautics of the Navy, and possibly the most sincere and energetic proponent of rigid airship development in the United States. In and out of the services he was affectionately known as "the father of lighter-than-air."

The Joint Congressional Committee, selected to make a thorough investigation, worked eight hours every day for 14 days, and found that the "Akron" disaster was the result of flying the ship into a severe storm, and not due to any structural fault in the ship itself, or to anything inherently wrong with the principles governing dirigible construction.

The "Macon" Takes the Air

The loss of the "Akron" was followed that same month by the launching of the new "Macon" at the great plant of the Goodyear-Zeppelin Corporation, in Akron, O.

On its trial flights the "Macon" proved to be the fastest airship ever built, attaining a speed in excess of 74 knots or about 85 miles an hour. This proved the aerodynamic efficiency of the design and demonstrated the practical value of the inside power plant arrangement with the attendant saving in parasite drag.

In the compromise design adopted for the "Akron" the presence of two sets of radiators on each outrigger made the cowling problem rather difficult and the drag of the installation was rather high. In the "Macon" design the radiators have been removed from the outriggers and placed in streamlined blisters on the sides

of the hull. The remaining outrigger elements have been very efficiently cowled and this "cleaning up" has had a marked influence on the ship's top speed.

Another factor contributing to the higher propulsive efficiency is the use of metallic propellers running at a slower RPM than the wooden ones used for the "Akron."

While the "Macon" is only nine feet longer than the "Graf Zeppelin," it has nearly twice the gas capacity of the German ship. It is nearly 33 feet greater in diameter, giving it an aspect ratio of 5.9 as against 7.7 of the "Graf."

The hull of the "Macon" is mainly of duralumin transverse frames connected by longitudinal girders, the latter extending from bow to stern. The frames over most of the length of the ship are 36-sided polygons, with their corners connected by longitudinal girders. Near the stern the number of sides reduces to 24. The fins, two horizontal and two vertical, are near the stern of the ship. The fixed surfaces are approximately 105 feet in length, 40 feet wide and 12 feet thick at the base adjacent to the hull.

The "Macon" has three gangways, commonly known as "catwalks." One of these extends along the top center line of the ship from a point approximately 85 feet from the bow to a point about 135 feet from the stern. On each side of the ship, at a point about 45 degrees from the vertical, is a similar gangway, providing access to the engine rooms, quarters, airplane hangar, fuel, oil, ballast tanks and lines, as well as the control lines. Access to the top catwalk is provided through any of the main frames, and there are ladders and steps in two of the main frames. The gas valves are near the top catwalk. The gun platforms and crow's nest are also reached through this gangway.

In the forward and after sections of the ship, along the bottom center line, additional catwalks are located, one leading from the officers' quarters above the control room to the mooring winch platform. The stern walkway leads to the observation and gun platform in the extreme stern of the ship, and also to a ladder extending down to the auxiliary control room in the lower vertical fin.

The "Macon" has eight 550-horsepower engines, each provided with a separate compartment inside the hull, each room having a deck space of about eight feet square. Gasoline storage tanks in the nearby gangway feed by gravity to the engine carburetors. All these compartments are fireproofed. The engines are the Maybach model VL-2 gasoline motors. They are 12-cylinder, 60-degree, V-design, water cooled, with aluminum pistons and crankcase.

The water ballast recovery system, condensers of which are visible outside the hull of the "Macon" above each propeller, is used to condense into water the vapor in the exhaust gases of the engines, and it serves as ballast in preserving the equilibrium of the ship.

The "Macon's" normal gasoline supply of 124,000 pounds, or 62 tons, is stored in 110 aluminum tanks of three sizes, the majority being of 120-gallon capacity. These tanks, along the gangways on the sides of the ship and convenient to the engine rooms, are so arranged as to distribute the fuel weight properly to keep the ship on an even keel. Oil is stored in 1,500-pound capacity tanks, one near each engine room.

THE "MACON'S" PORTABLE DOCK

The new airship takes off from the portable mooring mast developed by the U. S. Navy for its giant lighter-than-air craft.

The ballast system consists of 44 rubberized fabric storage bags, varying in size, connected by a system of piping, and each bag is equipped with a quick discharge valve which can be operated through a wire pull leading to the control car.

Living accommodations for the crew are concentrated amidships, abreast of the airplane compartment. The captain and the executive officer are the only officers who have rooms to themselves. To save weight more than one member of the crew use the same bunk, as part of the crew is at leisure while the others are on watch. The bunks are built in as part of the ship. The furniture consists of aluminum chairs, tables, desks and lockers.

The galley (kitchen) has an especially equipped light-weight stove which weighs (including water heater and coffee urn) only 140 pounds. The water heater holds eight and one-half gallons, and the coffee urn seven gallons.

The generator room, eight feet square, is just forward of the forward engine room on the starboard side of the ship, and power produced in this room is used to operate lights, radio, telephone, water and oil heaters, fuel pumps, small motors, ventilating fans and other equipment.

In the "Macon's" lower vertical fin is installed the emergency control room, having elevator and rudder wheels, similar to those in the forward control room. This auxiliary station provides facilities for directing the ship's movements should the control cables from the forward control room become disabled.

The "Macon" has 12 gas cells ranging in capacity from 100,000 cubic feet to 980,000 cubic feet. Each cell is a fabric cylinder dimensioned to fit its particular location in the ship's framework, the largest cell occupying a position about amidships; and this cell is 74 feet long and 130 feet in diameter. Light cotton cloth was used as a base from which the cells were made. The cell fabric is of gelatin-latex construction. About 12 acres of fabric, 56,000 square yards, were used in making the cells.

The outer cover of the "Macon," about 36,000 square yards of fabric—slightly more than seven acres—was made of cotton cloth having a weight of only 2.8 ounces per square yard. The cover after being placed was given a coat of clear acetate dope by brush, which was to shrink the fabric and make it taut. The second coat was sprayed on, and the last two coats, sprayed on, contained aluminum powder, giving the ship its silvery appearance. In addition to providing a thoroughly weatherproof covering, aluminum dope reflects rather than absorbs heat of the sun, which would cause the lifting gas to expand.

The radio outfit aboard the "Macon" was built to specifications and developed by the Bureau of Engineering of the U. S. Navy. Trailing wire types of antenna are arranged to be reeled in by especially built electrical winches. In addition there is a short fixed-wire receiving antenna attached to the hull of the ship.

While in outward appearance, the "Macon" is a copy of the "Akron," within and around the ship are 100 or more minor alterations.

The "Macon," captained by Commander Alger H. Dresel, participated in the maneuvers of the Pacific surface fleet off the western coast and was a very important factor in that great demon-

stration. The new ship carries the five Curtiss Sparrow Hawks formerly on the "Akron."

The "Graf Zeppelin's" Record

While the "Macon" was aloft on the flight from Lakehurst to her new base at Sunnyvale, Calif., the globe-girdling "Graf Zeppelin" was shoving through the fog and storm on the way to Akron and the world's fair at Chicago, the great ship coming to the United States from South America.

The "Graf's" grey ghostlike hull loomed over the Goodyear-Zeppelin dock at Akron in the teeth of a 40-mile gale, but, ably handled by its experienced crew, it rode out the high winds of the night and was brought in shortly before dawn on October 25.

BIRTHPLACE OF AIRSHIPS

The Navy's new airship "Macon" landing at the Goodyear-Zeppelin dock at Akron, Ohio. PHOTO COPYRIGHT BY THE DETROIT NEWS

The flight to Chicago was safely made and the ship, after stopping at Akron for refueling on the return trip, kept to a schedule established weeks before and faced a bright morning sun to start on its long hop back to Friedrichshafen, Germany, on Saturday, October 28.

Battling strong headwinds the "Graf" arrived over its home port on November 2, just 112 hours and 20 minutes out of Akron. Although the flight failed to establish a record for Zeppelin speed over such a distance, it does afford the basis for some interesting comparisons with steamship speeds.

The fastest ocean crossing between New York and Cherbourg, France, four days and 17 hours, took 40 minutes longer than the "Graf" trip required, making no allowance for the stop at Seville.

The "Graf" trip was approximately 2,000 miles longer than the steamship trip, 400 miles on this side of the Atlantic and about 1,500 miles on the other side. On this Atlantic crossing the "Graf" spent approximately 60 hours getting from land on this side to land on the other.

The "Graf Zeppelin" completed its fifth year in September, 1933, having made 300 flights including one around the earth, one to the Arctic and 48 ocean crossings. The ship had flown 428,700 miles and carried 17,500 passengers, 44,092 pounds of mail and 81,570 pounds of freight; its time in the air being 7,000 hours. It is scheduled to make monthly trips to Rio de Janeiro, Brazil, beginning in April, 1934, and fortnightly trips beginning as early in the summer as possible.

The Army TC-13

The completion of the Army airship TC-13 by the Goodyear-Zeppelin Corporation and its subsequent service, marked another important development of the year.

The ship was completed in April and its first test flight, commanded by Major W. E. Kepner, was made April 27. The TC-13 is a non-rigid ship, the largest of that type ever constructed in the United States. It is more than 200 feet long and has a displacement of approximately 11 tons, of which four and one-half tons are available for useful load in the form of crew, equipment, fuel and armament.

Facilities for meals in flight, with sleeping quarters and all necessary accommodations for the crew of six men during extended flights of four or five days, are new features of this type.

The car, more than 40 feet long, is suspended directly under the envelope, and all the wires which support the car are contained within the envelope. The car's bottom is constructed in the form of a boat for water landing. For that purpose a sea anchor, which in reality is a large inverted canvas umbrella, was developed as part of the ship's equipment.

An interesting item of equipment is the small sub-cloud car to be lowered from the ship 1,000 feet by a flexible cable that contains a telephone line, making it possible for the observer in the sub-cloud car to communicate with the crew in the airship and even direct maneuvers during certain weather conditions when this procedure is advisable.

For raising and lowering the sub-cloud car a small power-driven windlass is used and is capable of raising the car with the

observer at the rate of 200 feet a minute. In case of engine trouble the car can be raised by hand. The TC-13 is equipped with two 375-horsepower geared air-cooled engines, mounted on outriggers. It has a gas capacity of 360,000 cubic feet. It is helium-inflated. The ballonets will hold 108,000 cubic feet of air, allowing the ship to rise to an altitude of 10,800 feet without losing helium.

Goodyear Fleet of Airships

The fleet of Goodyear blimps is, as has been stated in previous issues of the Aircraft Year Book, the only privately owned fleet of airships in America, and continues to make important contributions to the art of airship construction.

In 1933 Goodyear operated two ships at the Century of Progress Exposition at Chicago, carrying thousands of passengers on sight-seeing trips. One of the ships, based at New York, continues to operate in the area adjacent to the nation's metropolis. Another is based at Los Angeles.

Through the winter three of the ships operate in Florida, one based at St. Petersburg and two at Miami.

The Stratosphere Flight

On the morning of November 20, 1933, Lieut. Comdr. T. G. W. Settle and Major Chester L. Fordney went up from Akron in their 600,000 cubic foot balloon, built by Goodyear, for their flight into the stratosphere. When the great flight was finished and the balloon landed near Bridgeton, N. J., late on the night of November 20, Commander Settle said he believed the balloon had reached an altitude of 59,000 feet.

However, when the instruments were calibrated, it was found that the balloon had attained an altitude of 61,237 feet, a new official world's altitude record. Russian balloonists had made a flight two months earlier and claimed they reached a height of 62,000 feet, but this was not official and no attempt has been made to substantiate the claim. Therefore the American stratosphere balloonists hold the world's official record.

The balloon used by Settle and Fordney is the largest ever built. It has a capacity of 600,000 cubic feet, but for the flight on November 20th was inflated with only 125,000 cubic feet of gas, because the gas expands five times its sea level volume to fill the entire bag at peak altitude.

The gondola is only seven feet in diameter, providing quarters

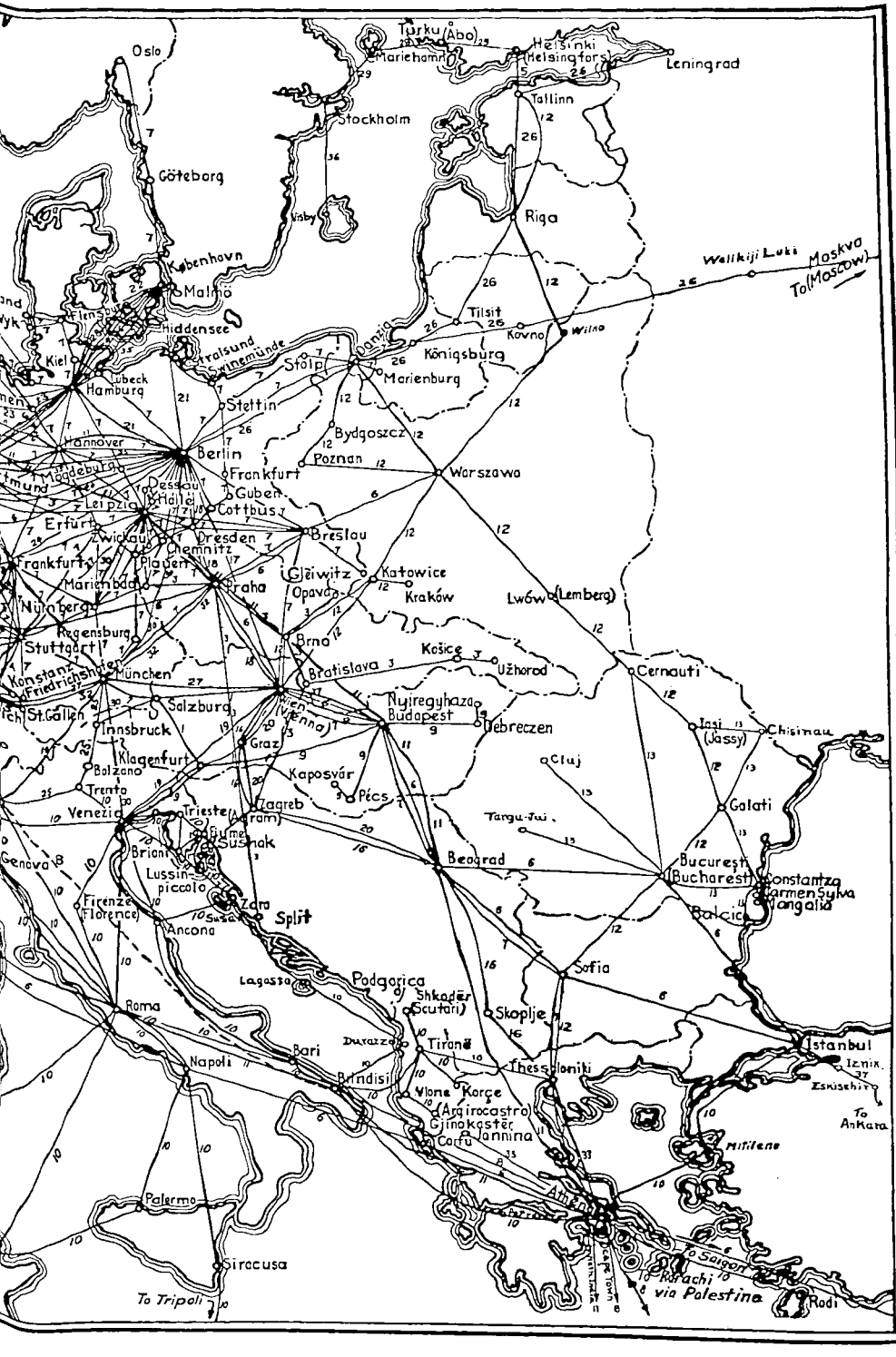
very close and cramped for the pilot and his aide. The shell wall of the gondola is only one-eighth of an inch thick and is made of eight segments of Dowmetal tightly welded together. The shell weighs only 196 pounds. It was built by the Dow Metal Company of Midland, Mich.

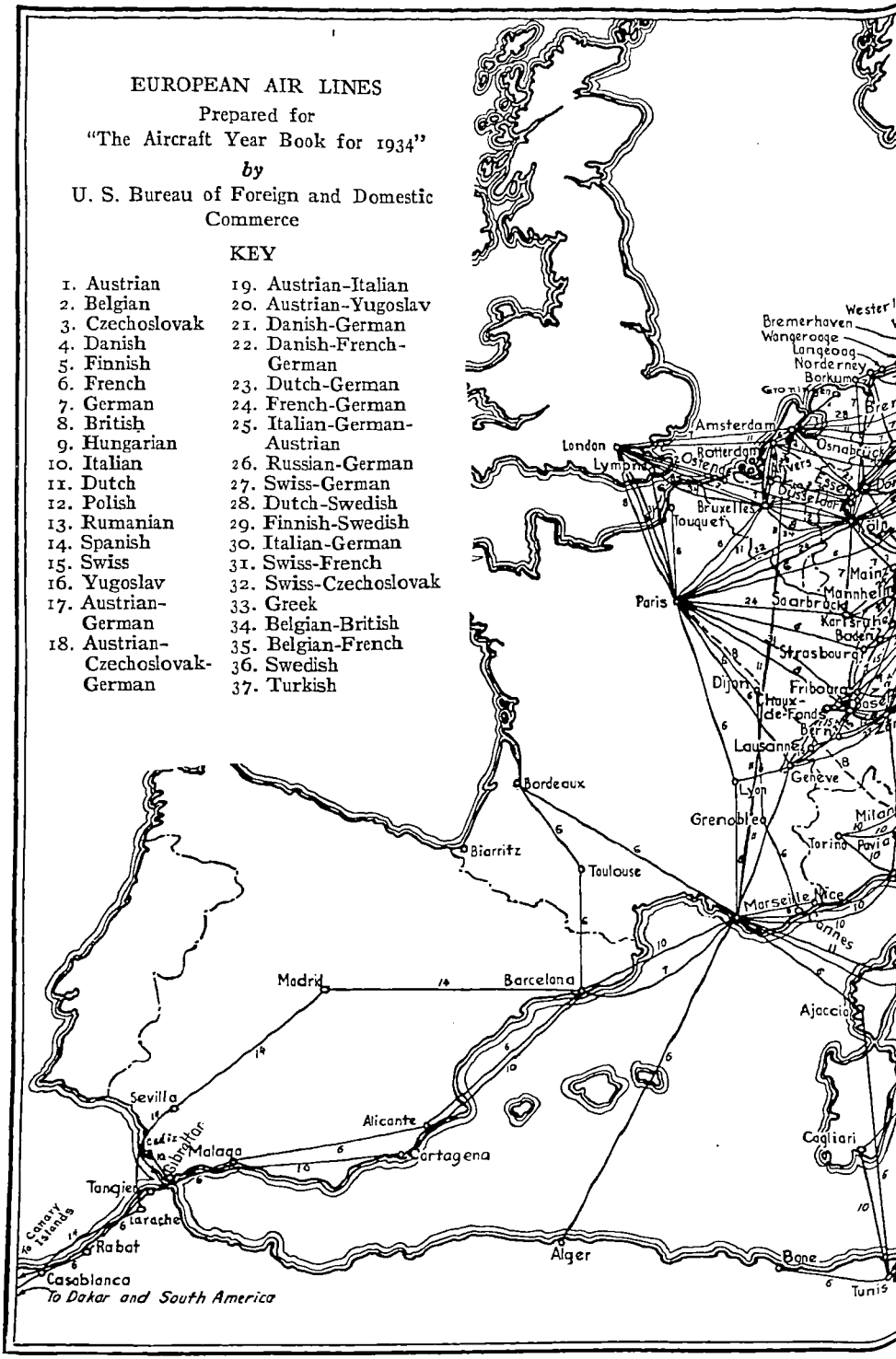
Other Balloon Adventures

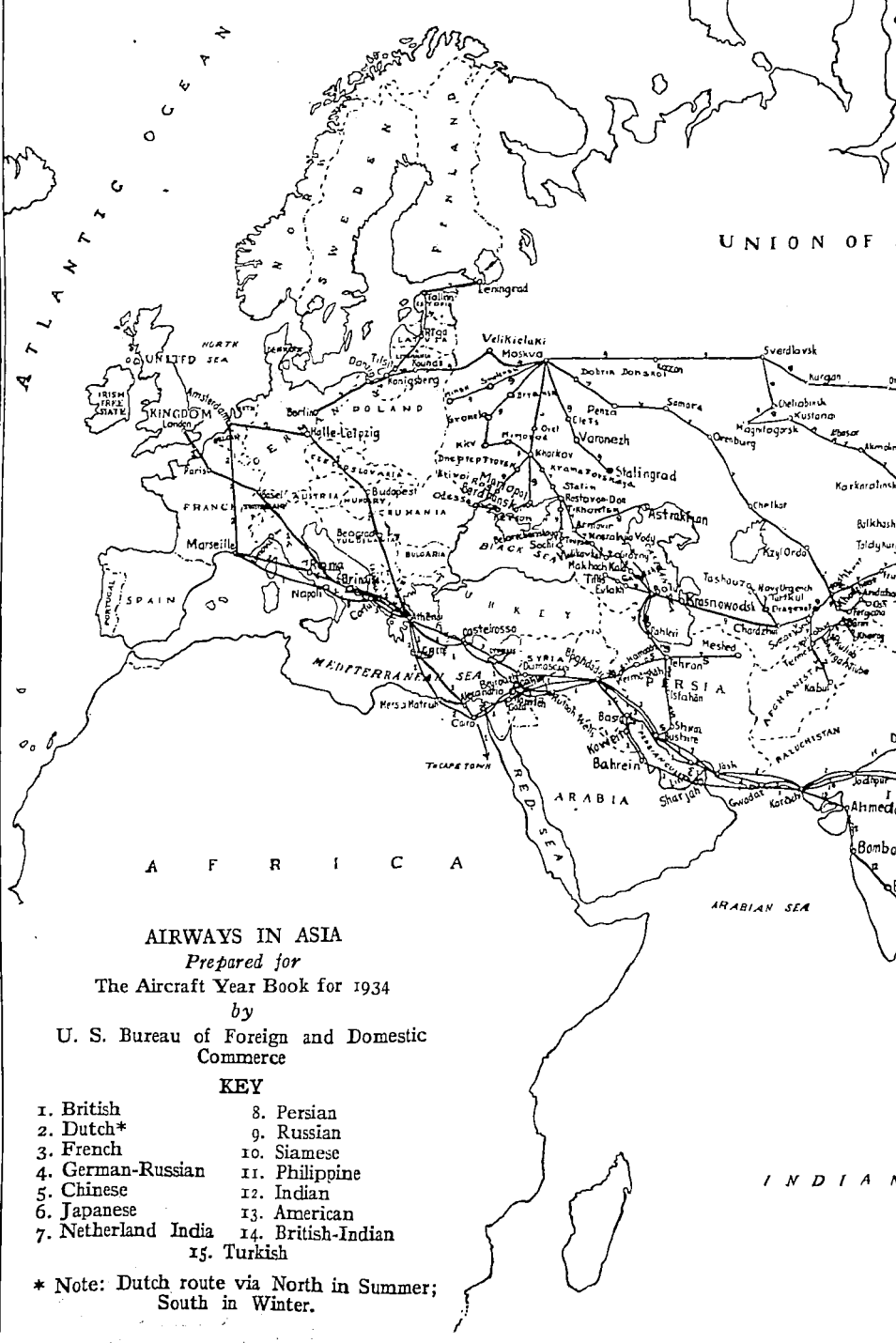
Lieut. Comdr. Settle's second major accomplishment of the year was his balloon endurance record of 52 hours on his flight in the 1933 Gordon Bennett International Balloon Race from Chicago on September 2nd. Captain Franciszek Hynek and Lieut. Zbigniew Burzynski, the Polish fliers, outdistanced Settle in the ill-starred race, however, and, together with Ward T. Van Orman and Frank A. Trotter of the Goodyear team, were lost for days in the Canadian wilds. Forced down in a terrific thunderstorm about 40 miles northeast of Sudbury, Ontario, Van Orman and Trotter were missing nine days before they were found in an electric power lineman's hut, suffering from ptomaine poisoning and their clothes torn to shreds by their struggle through the brush. They placed third in the race.

Plans for Another Stratosphere Flight

Preliminary work on a 3,000,000 cubic foot balloon was started by the Goodyear Tire & Rubber Company in Akron in January, 1934, in preparation for a flight to the stratosphere in June, sponsored by the U. S. Army and the National Geographic Society. Captain A. W. Stevens, noted aerial photographer, and Major William E. Kepner, the Army's famous balloonist, were scheduled to make the flight from some point in the Middle West, possibly from Akron, as was the Settle-Fordney flight. The preliminary work involved rubberizing acres of fabric, to be assembled into a mammoth bag, about 300 feet high with diameter of 170 feet. It is expected to lift its crew about 15 miles or more into the stratosphere.


Oslo
Turku (Abo)
Mariehamn
Helsinki (Helsingfors)
Leningrad
Tallinn
Stockholm
Göteborg
Visby
Riga
Wielkiji Luki
Moskva (Moscow)
To (Moscow)
København
Malmö
Tilsit
Kovno
Wilno
Hiddensee
Stralsund
Swinemünde
Danzig
Königsburg
Stolp
Marienburg
Kiel
Lübeck
Hamburg
Stettin
Bydgoszcz
Hannover
Berlin
Poznan
Frankfurt
Warszawa
Magdeburg
Dessau
Halle
Guben
Cottbus
Leipzig
Erfurt
Breslau
Zwickau
Dresden
Chemnitz
Plauen
Frankfurt
Gleiwitz
Katowice
Marienbad
Praha
Opava
Kraków
Lwów (Lemberg)
Nürnberg
Regensburg
Brno
Stuttgart
Bratislava
Košice
Užhorod
Cernauti
Konstanz
Friedrichshafen
München
Wien (Vienna)
Nyiregyhaza
Budapest
Debreczen
Iasi (Jassy)
Chisinau
St. Gallen
Innsbruck
Salzburg
Graz
Cluj
Klagenfurt
Kaposvár
Pécs
Balzano
Trento
Zagreb
Galati
Venezia
Trieste (Agram)
Fiume
Susak
Targu-Jiu
Genova
Brioni
Lussinpiccolo
Beograd
Bucuresti (Bucharest)
Constantza
Carmen Sylva
Mangalia
Balcic
Firenze (Florence)
Zara
Susa
Ancona
Split
Sofia
Lagosta
Podgorica
Shkodër (Scutari)
Skoplje
Roma
Durazzo
Tiranë
Istanbul
Izmik
Eskisehir
To Ankara
Bari
Napoli
Brindisi
Thessaloniki
Vlone
Korçe
Argirocastro
Gjinokaster
Janniná
Corfu
Mitilene
Palermo
Siracusa
To Tripoli
To Saigon
Karachi via Palestina
Rodi


EUROPEAN AIR LINES
Prepared for
"The Aircraft Year Book for 1934"
by
U. S. Bureau of Foreign and Domestic Commerce
KEY
1. Austrian
2. Belgian
3. Czechoslovak
4. Danish
5. Finnish
6. French
7. German
8. British
9. Hungarian
10. Italian
11. Dutch
12. Polish
13. Rumanian
14. Spanish
15. Swiss
16. Yugoslav
17. Austrian-German
18. Austrian-Czechoslovak-German
19. Austrian-Italian
20. Austrian-Yugoslav
21. Danish-German
22. Danish-French-German
23. Dutch-German
24. French-German
25. Italian-German-Austrian
26. Russian-German
27. Swiss-German
28. Dutch-Swedish
29. Finnish-Swedish
30. Italian-German
31. Swiss-French
32. Swiss-Czechoslovak
33. Greek
34. Belgian-British
35. Belgian-French
36. Swedish
37. Turkish
Bremerhaven
Wangeroage
Langeoog
Norderney
Borkum
Amsterdam
London
Rotterdam
Ostend
Bruxelles
Touquet
Paris
Saarbrücken
Karlsruhe
Baden
Strasbourg
Dijon
Fribourg
Bâle
Berne
Lausanne
Genève
Lyon
Grenoble
Bordeaux
Biarritz
Toulouse
Marseille
Nice
Cannes
Milan
Torino
Pavia
Madrid
Barcelona
Ajaccio
Cagliari
Sevilla
Cadiz
Gibraltar
Malaga
Alicante
Cartagena
Tangier
Larache
Canary Islands
Rabat
Casablanca
To Dakar and South America
Alger
Bone
Tunis



AIRWAYS IN ASIA

Prepared for

The Aircraft Year Book for 1934

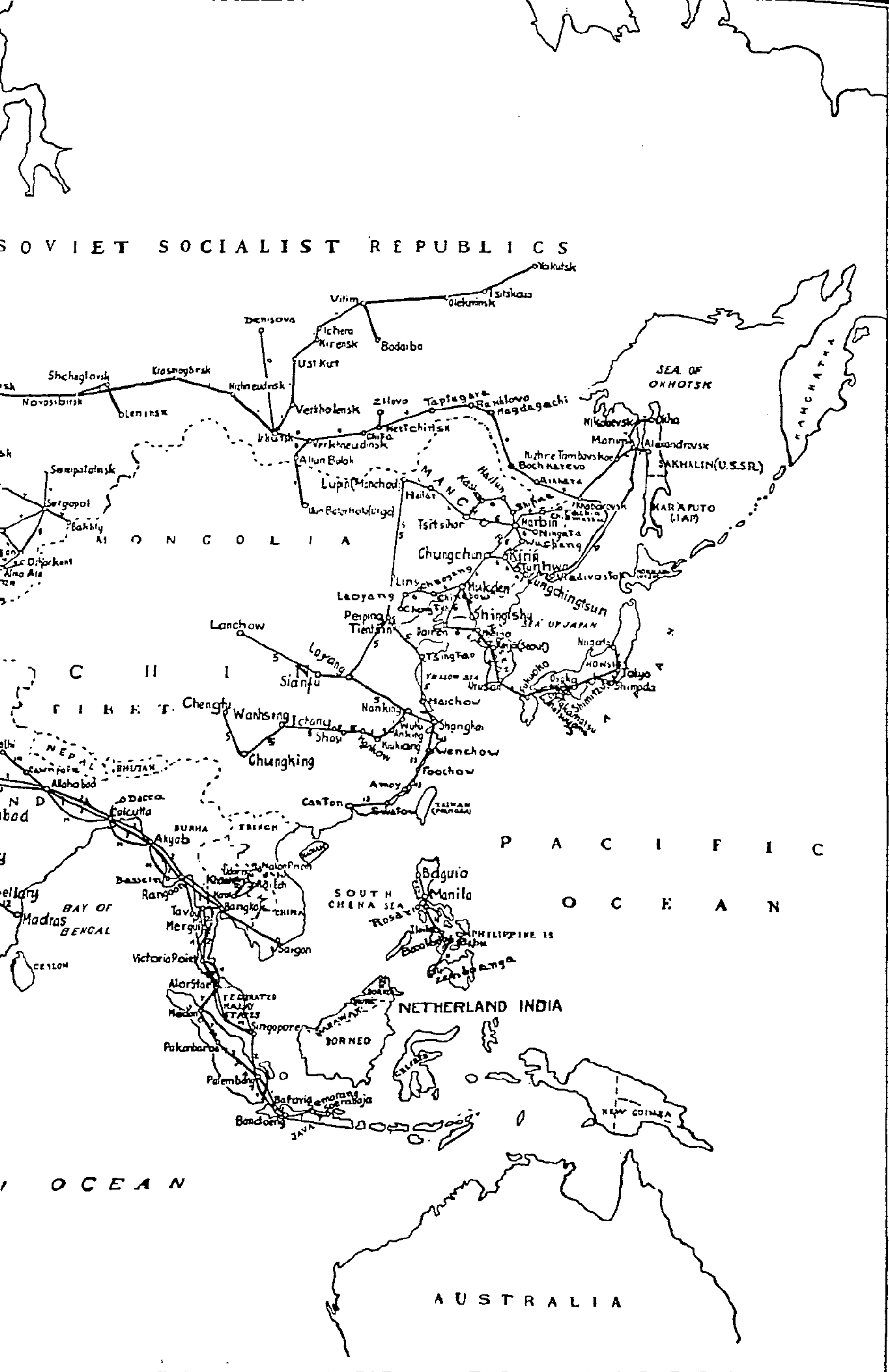
by

U. S. Bureau of Foreign and Domestic Commerce

KEY

1. British
2. Dutch*
3. French
4. German-Russian
5. Chinese
6. Japanese
7. Netherland India
8. Persian
9. Russian
10. Siamese
11. Philippine
12. Indian
13. American
14. British-Indian
15. Turkish

* Note: Dutch route via North in Summer; South in Winter.



SOVIET SOCIALIST REPUBLICS
Yakutsk
Vitim
Olekminsk
Bodaibo
Kirensk
Ust Kut
Denisova
Shcheglovsk
Novosibirsk
Verkholensk
Irkutsk
Verkhneudinsk
Altun Bulak
Nertchinsk
Chita
SEA OF OKHOTSK
Nikolaevsk
Okha
Alexandrovsk
SAKHALIN (U.S.S.R.)
KARAFUTO (JAP)
Semipalatinsk
Sergiopol
Bakhty
MONGOLIA
Harbin
Tsitsihar
Hailar
Chungchun
Kirin
Mukden
Vladivostok
Laoyang
Peiping
Tientsin
Dairen
Lanchow
Loyang
Sianfu
Chengtu
Wanhsing
Ichang
Chungking
Hankow
Kiukiang
Anking
Nanking
Shanghai
Wenchow
Foochow
Amoy
Canton
Swatow
TAIWAN (FORMOSA)
Haichow
Tsingtao
YELLOW SEA
SEA OF JAPAN
Keijo (Seoul)
Fusan
Niigata
HONSHU
Tokyo
Shimoda
Osaka
Fukuoka
Shingishu
Tungchingtsun
CHINA
TIBET
NEPAL
BHUTAN
Allahabad
Calcutta
Dacca
Akyab
BURMA
FRENCH
Rangoon
Bassein
Bangkok
Tavoy
Mergui
Victoria Point
Saigon
BAY OF BENGAL
Madras
Bellary
CEYLON
Alor Star
FEDERATED MALAY STATES
Medan
Singapore
Pakanbaroe
Palembang
Batavia
Bandoeng
Soerabaja
JAVA
BORNEO
SARAWAK
CELEBES
NETHERLAND INDIA
NEW GUINEA
SOUTH CHINA SEA
Baguio
Manila
Iloilo
Cebu
Zamboanga
PHILIPPINE IS
PACIFIC OCEAN
OCEAN
AUSTRALIA

CHAPTER XVI

WORLD AVIATION

International Competition—Commercial and Military Development—Airways—Popularity of American Planes and Engines.

ALTHOUGH prevailing economic conditions reduced the normal number of sensational achievements in aviation among the nations of the world, the year 1933 wrought important developments in governmental policies and international rivalries. Expenditures for air force equipment and training of flying personnel were maintained at a high level, not only by the larger air powers, but by several smaller nations.

Great Britain, France, Italy, Japan and Russia embarked upon new programs designed to develop their air forces far beyond the numerical and technical strength contemplated two years ago. Germany, under the peace treaty barred from setting up an air force, in 1933 adopted a policy of aerial armament which soon became one of the first objectives of the Hitler Government. Commercial aviation in the Reich had grown tremendously during the year, and the German air transport system, together with improved planes and increased flying personnel, actually gave Germany the status of an air power; so that, including the United States, there were seven air powers on January 1, 1934. Poland and Czechoslovakia, with their well-trained air forces and small but efficient aircraft industries, ranked high among the secondary powers in the air.

Air transportation became a recognized arm of an air force when during the year all the nations installed on their lines planes and auxiliary equipment which in speed and other performance qualities equaled, and in some instances exceeded, the military equipment of two years ago. At the same time national enterprise in expansion of routes to Asia, Africa and Latin America intensified international competition and developed rivalries which might create almost any kind of a situation in the near future.

The Governments not only were subsidizing their air line operations by paying a mileage rate. They were training personnel, providing auxiliary equipment and in many cases actually buying aircraft for the transport companies. Thus the competitive nature of international air line operations became similar to that existing

in ocean shipping, with the added feature of being active military auxiliaries in case of war or any other emergency requiring fast transport of troops over vast distances.

As in the United States, surface transportation interests abroad in 1933 devoted more intensive study to air line operations than at any time in the history of aviation, the reason being that faster planes, better schedules, enhanced reliability and increased popularity brought forth air transport not as a potential competitor as formerly, but as a real carrier, its superlatively greater speed providing a service which surface transportation can never equal. Streamline trains and motor cars were under development abroad as in the United States, the idea being to follow the trend in streamline design in order to lend surface vehicles an appearance of high speed, thus offsetting the favorable impression created by modern aircraft.

Flying clubs, aerial service and private flying activities abroad suffered from economic conditions but at the end of the year there was apparent an awakened public interest which promised considerable activity in 1934.

Argentina

In Argentina more governmental attention was given to aeronautics during 1933 than ever before. More aid was given to air transportation. The Government factory at Cordoba started production on a first lot of 50 Wright Cyclone engines under license with Curtiss-Wright Export Corporation which supplied the materials and accessories. The factory was also licensed to build Curtiss-Wright military planes. The Government also has in operation Bellanca, Fleet, Stearman, Waco, Curtiss-Wright and Vought planes and Kellett autogiros.

The Civil Aeronautics Administration owned 25 light planes used by flying clubs. There were also 53 privately owned planes under the Administration's control.

While modernizing the military and naval flying equipment in 1933 the Government appropriated 275,000 paper pesos ($110,000) for direct aid to clubs and schools. To assist the private plane movement all customs duties on aeronautic material were abolished.

A contract was made with the French air line, Air France, to operate two round trip schedules a week between Bahia Blanca and Comodoro Rivadavia, one of them to Rio Gallegos, receiving from the Government 15,000 paper pesos ($6,000) a month. The Government operated it for some time and placed it upon a com-

mercial basis upon the insistent demand of the communities served. The aircraft factory management at Cordoba planned later to start a Buenos Aires-Cordoba scheduled service in which there would be three flights each way a week. The scheduled services of the Pan American-Grace and Pan American Airways and the Air France were continued, and faster planes were to be put in service by the American system.

Some 15,000 passengers were carried by the air lines during the year. On January 1, 1934, there were 86 privately owned planes

"FLYING DOWN TO RIO"

Interior of a Sikorsky "clipper ship" in the Pan American Airways service.

and 246 holders of limited commercial pilot's licenses. Private pilots covered 30,000 miles during the year. Three companies using four small planes were actively engaged in air taxi, survey, photographic and other work.

Australia

Aviation in Australia has made steady progress. Bids have been asked for the extension of the "Empire Service" from Singapore, its present terminus, to Darwin and thence, an eastern section,

to Brisbane and Charleville to Cootamundra, and a western section to Katherine and Perth. From Singapore eastward and within Australia the service will be Australian. It is largely Imperial Airways to Singapore though there is Indian interest in the section stretching across that country. The London to Australian capitals service will carry passengers, mail and goods over the long distance in 17 days. The subsidy from the Australian Government will not exceed $463,000 the first year.

The Australian Empire Airways, Ltd. was organized at Sydney by the Imperial Airways (of Great Britain) and Queensland and Northern Territory Aerial Service of Brisbane, and this company will bid for the overseas section (Singapore-Darwin) while the Australian National Airways, Ltd. and Wyndham Airways, Ltd. plan to operate the internal sections.

Scheduled air services are maintained over routes measuring a total of 7,133 miles; 5,453 miles are subsidized; five lines with 1,210 miles are operated under mail contracts, and two unsubsidized services, 470 miles long do not carry mail. The maximum subsidy a year payable to the first group of operators is £93,381 ($454,439 at par). During the first six months of 1933 the planes on subsidized services flew 270,415 miles and carried 15,205 pounds of mail and 1,383 passengers. During that period the contract operators carried 2,992 pounds of mail. There were no bad accidents.

There are six subsidized flying clubs, each with a flying school, and a number of associated clubs and commercial flying schools. During the first six months of 1933 the six clubs flew 4,360 hours, and 52 pilots completed training.

The Government maintains 11 airways, 8,747 miles in all, and owns or leases 183 landing fields, 60 of which are airports. The 120 licensed public airports are inspected regularly.

Four companies use 21 planes for transportation work between the gold fields and coastal points in New Guinea, a territory under Australian mandate. In 1932 the planes flew 5,954 hours and carried 8,802,706 pounds of freight to and from those inaccessible mining areas.

Austria

Austrian aeronautics center largely in the operations of the Austrian Air Transportation Company which either alone or with German, Italian, Czechoslovak or Yugoslav companies maintained 1932 schedules. French, Hungarian, Italian, Polish and Swiss

lines serve Vienna, an important air center during summer months. The Austrian company used nine German Junkers planes and received a cash subsidy of 1,470,000 schillings ($260,000) in 1933. The company's planes flew 306,848 miles and carried 7,192 passengers, 38,153 pounds of mail and 147,406 pounds of excess baggage and goods during the first 11 months of 1933. There are no night services in Austria although the airports at Vienna, Graz, Klagenfurt, Innsbruck and Salzburg are equipped for night flying. Several unlighted emergency fields are available.

There is no extensive manufacture of aircraft. One shop is equipped for repair work, and it builds a few light planes. The Government Flying School produces its own training planes. Total production of aircraft was 10 in 1932 and eight in 1933. There are about 100 licensed pilots, 60 civil planes, including 40 privately owned, and a number of gliders. There are no military air forces. The police use three planes as required. Popular interest is growing, spurred on by six flying and four glider clubs.

Belgian Congo

Aeronautical activities of a civil nature are limited to the scheduled air services of the Belgian Air Transportation Company which operates from Boma to Leopoldville via Matadi, Thysville; Leopoldville to Port Francqui via Eolo and Leopoldville to Stanleyville via Banningville, Inongo, Coquilhatville, Basankusu, Lisala, Bumba and Basoko, a total distance of 1,715 miles.

Belgium

Special funds for new military planes were appropriated by the Belgian Government in 1933. Much of the existing equipment is old and in need of replacement. The trend is away from French equipment. British equipment has been purchased. There is now much interest in American planes, engines, instruments and parts.

There remain 12 Belgian manufacturers of aircraft, but most of them are not important as airplane manufacturers. The Belgian Aeronautic Construction Company ("Sabca") was intended to be the principal manufacturer and to make Belgium independent of foreign sources for aeronautic material. Most of the production is by that company, but strong foreign competition and a limited market have made its problems difficult. That company builds engines as does the Renard Aircraft and Engine Company, largely from Belgian and French designs.

There are civil airports at Brussels, Ostend, Antwerp, St. Hubert, Bosselies, Liége and Le Zoute; the first three being customs airports. Military airports at Courtrai, Liége, Tirelmont, Diest, Vivelles and Bourg-Leopold are open to civil planes, as are the emergency fields at Brasschaet and Elsenborn. The Brussels, Ostend and Antwerp airports are lighted. The airways from Brussels to the borders, toward London, Paris, Cologne and Amsterdam are lighted by 21 revolving beacons.

There are more than 300 private pilots and 60 private planes licensed in Belgium. Seven firms operate 27 planes for flying schools and miscellaneous activities. The schools trained 36 pilots in 1933.

Thirty-two planes are used by the Belgian Air Transportation Company ("Sabena") for regular schedules and taxi work. Most of these planes are British and Dutch tri-engined types. The company operates the services London-Ostend-Le Zoute and Brussels-Antwerp-Rotterdam-Amsterdam alone. It cooperates with Imperial Airways in the London-Brussels-Cologne-Dusseldorf service and with Air France in the Brussels-Essen, Mulheim-Hamburg-Copenhagen and Essen, Mulheim-Dortmund-Berlin services which aggregate 1,439 miles. In addition a Brussels-Cologne night mail and express line is operated by the company during summer months. The company has not yet been able to open its projected service to the Belgian Congo where it has operated local services for several years.

"Sabena", during the first 11 months of 1933, did 620,534 miles of scheduled flying with 12,850 passengers; 62,293 pounds of mail and 595,718 pounds of express and baggage. There were no fatalities. The air line receives a cash subsidy of about half a million dollars a year.

Bolivia

The Bolivian air force in 1933 bought a number of Curtiss-Wright military planes and engines which were used in operations in the Chaco. The Government has made considerable use of aircraft for transportation purposes between the capital and other cities and the military forces at distant points at much lower altitudes, conditions which make transportation of vital importance. There are 32 landing fields and about 20 emergency landing fields but there are no first-class airports.

The Lloyd Aero Boliviano, which has operated a commercial air line in Bolivia since 1925, has been almost entirely in the service of

the Government, and it operated a military transport service between Cochabamba, Santa Cruz, Villa Montes and Fortin Munoz. Scheduled commercial services were discontinued, except the Cochabamba-Santa Cruz-Puerto Suarez and Cochabamba-Todos Santos-Trinidad lines. The company receives a subsidy of $35,300 a year.

Brazil

In Brazil additional air lines were started and planned during 1933. More airports were provided. Public interest in aeronautics increased; and improvements were made in the military and naval air services. Considerable military equipment was purchased. Training was intensified. A plan to manufacture aircraft in Brazil was

AMERICAN PLANES IN SOUTH AMERICA

Two-seater Vought Corsairs on duty in the Brazilian air service.

advanced but no settlement of that matter had been reached at the end of the year.

The air force is using Wright Whirlwind engines in training planes, in recently purchased light fighting and reconnaissance machines and in new transport planes. The Navy twin-engined patrol boats are powered with Wright Cyclones and a squadron of Vought Corsairs has Pratt & Whitney engines. The Army air force has 23 single-seat Wasp-powered Boeing pursuit planes, a number of Waco machines, Fleet training planes, Kellett autogiros, Stearman planes and a Martin. Aeroncas and Bellancas are used extensively by private fliers in Brazil.

By a decree dated early in the year funds are collected for the development of ground facilities by means of the obligatory use of a special stamp for mail originating at Brazilian post offices. A

credit of $240,000 from this source has been set aside for early work on the Ponta do Calabouco (Rio de Janeiro) airport which will be large and fully equipped. An airship base is being set up about 26 miles from Rio de Janeiro. The municipality of Sao Paulo is building an airport which will have four long runways, a number of hangars and good lighting facilities.

The Pan American Airways' weekly service along the entire coast is maintained regularly. The Condor Syndicate maintains its weekly service between Natal and Rio de Janeiro, its twice-a-week service between Rio de Janeiro and Rio Grande, and has operated the new Sao Paulo-Campo Grande and Campo Grande-Cuyaba services since early in 1933. A subsidiary company, the Empreza de Viacao Aerea Rio Grandense, extended its Pelotas-Porto Alegre-Santa Cruz-Santa Maria service northward to Cruz Alta and westward from Pelotas to Bage and Santa Anna to Livramente. A new company, the Aeroloyd Iguassu, for several months has operated a four-times-a-week service between Sao Paulo and Curityba, 292 miles. For a thousand miles along the Amazon River from Para to Manaos, via Breves, Gurupa, Prainha, Santarem, Obidos, Parintins and Itacoatiara, the Pan American Airways System operates weekly schedules under contract with the National Government.

The total length of the air lines in Brazil increased from 11,406 miles in 1932 to 13,000 miles in 1933.

There is much local interest in plans to speed communication between Brazil and Uruguay and Argentina on the south and the West Indies, Cuba and North America and Africa and Europe to the north, west and east. The French line along the coast to Buenos Aires and across the continent to Santiago, Chile, intends to speed the ocean crossing by the use of land planes over the 1,900 miles from Natal to Dakar. The airship service to Spain and Germany may be improved by adding the new Zeppelin, which was nearing completion in Germany. A fortnightly flying boat service across the Atlantic, using an anchored vessel as a fuelling base, and a base at Bathurst, Africa, which would be connected with German cities by planes of the Deutsche Luft Hansa, was to start early in 1934.

Bulgaria

Bulgaria has two airplane factories, at Kazanlik and at Bojourishte airport, near Sofia. In addition to the first class airport at Sofia there are six second class airports and 20 emergency fields, Government owned. Under the terms of the Treaty of Neuilly, Bulgaria may not maintain military aircraft. French, Polish and

German lines serve Sofia without subsidy, in any case, from the Bulgarian Government.

Canada

The development and control of all aeronautics is under the jurisdiction of the Canadian Department of National Defense. Governmental activities were again curtailed in 1933. Estimates of expenditures for civil aeronautics, including control of commercial and private flying, construction and maintenance of airways and aids to air navigation, airship bases and flying clubs totaled $1,600,000 for the year ending March 31, 1934, a reduction of $150,000 under the appropriation for the preceding year. The air mail budget was increased by $136,500, to $361,500.

The Northern Aerial Mineral Exploration, formed early in 1928, said to have been the first user of aircraft for mining and exploration work, disposed of its remaining equipment to rely upon air transport companies. The Canadian Airways, Ltd., the largest aviation company in Canada, secured a contract with the Central Patricia Gold Mines, Ltd., for the movement of 300 tons of materials before the ice melted in the spring of 1933, and for the regular transport of passengers, equipment, and supplies. The Spence-McDonough Air Transport, Ltd., of Toronto, withdrew from charter flying after operating several planes in the mining region of Northern Ontario and the Great Bear Lake section of the Northwest Territories. The company's planes were sold to Canadian Airways, Ltd., of Montreal.

The provincial service of Saskatchewan bought five flying boats from the National Government for forest patrol duty. That province thus augmented the patrol work done for it by Brooks Airways, of Prince Albert.

The seven manufacturers of aircraft are now engaged largely in repair work. The recent output is unknown but is believed to have been small. There is no local production of airplane engines. Imports of aircraft and parts, not including engines, were valued at $274,314 in 1932, and a further reduction is reported for 1933. The public policy is to purchase from Canadian or British sources of supply as far as practicable as provided by an Order in Council dated March 14, 1933. Second hand or used aeronautic material is prohibited from importation.

Aeronautical imports from the United Kingdom in 1931 were valued at $177,564, and in 1932 they amounted to $32,429. Comparative figures covering imports from the United States were $264,-

918 and $197,744, respectively. American aeronautics exports to Canada during the first 10 months of 1933 amounted to $50,211, with $7,795 worth of engines. They included Aeronca, Stearman, Waco, Bellanca, Consolidated Fleets, and Sikorsky planes, with Curtiss-Wright, Lycoming, Kinner and Pratt & Whitney engines.

The number of licensed civil aircraft fell from 445 in 1932 to 334 on September 30, 1933. Forty-six are privately owned.

The number of airports licensed for the use of civil aircraft remains almost unchanged at 83. Forty-eight intermediate landing fields are under development on the Canadian transcontinental airway, and 12 more are planned. The customs airports in September, 1933, were: Fernie, British Columbia (Municipal airport); Fredericton, New Brunswick (seaplanes only); Hamilton, Ontario; Lethbridge, Alberta; Montreal, Quebec (St. Hubert); Montreal, Quebec (Fairchild—seaplanes only); Moose Jaw, Saskatchewan; Regina, Saskatchewan; Toronto, Ontario (Barker Field); Vancouver, British Columbia (Municipal airport); Vernon, British Columbia; Walkerville, Ontario; Winnipeg, Manitoba and Prince Rupert, British Columbia (Seaplanes only). The 1,200 miles of prepared airways remained dark because of economy.

The number of licensed pilots increased to 795—366 private and 429 commercial—on September 30, 1933. The number of mechanics then stood at 387. All holders do not keep their licenses constantly in effect.

All except 700 of the 3,800 miles of scheduled air lines in Canada are operated by Canadian Airways, Ltd. The Canadian Air Force again operated the Montreal-Rimouski mail service during the summer of 1933. Flights were arranged according to the arrivals and departures of transatlantic vessels, effecting a saving of from one to three days in mail time.

Chile

Operations of the Chilean National Air Lines have been confined to those north of Santiago since 1931. Flights are made twice a week in each direction and all important points as far north as Arica are served. The company has nine planes, including two tri-engined transports. The Pan American-Grace Airways provides international service with stops at Arica, Antofagasta, Ovalle and Santiago with flights twice a week in each direction. The French company—Air France—continues its weekly mail service between Santiago, Buenos Aires and Europe.

Most of the private flying is done by the members of the Aero

Club of Chile at Santiago. This club has 333 members, of whom 210 are pilots, with eight light planes, mostly Waco machines.

There are nine commercial and seven military airports and 11 landing fields.

China

Greater progress has been made in Chinese aeronautics during the last two years than ever before. Most of the several hundred military surplus planes acquired from European nations after the World War were never flown. Activities were sporadic and there

CURTISS HAWKS IN CHINA

Fifty of these pursuit biplanes, with Wright Cyclone engines, were delivered to the Chinese Government in 1933. They are reputed to be the fastest fighting planes in Asia.

was no coordination or definite plan of development. The National Government and several provincial governments undertook development of the military air forces. Schools were started and emphasis placed on modern equipment.

Operations of the Japanese air forces convinced the Government of their value in defense. There was widespread dissatisfaction because sufficient Chinese air forces could not be marshalled for the defense of Shanghai and other areas. The Chinese make first class fighting pilots when properly trained.

A hundred competent pilots and as many mechanics were trained

in 1933. Modern equipment is being supplied the units on active service.

All aeronautical activities are under strict military or other governmental control. Most of the military school and other flying is done by direct national authority but five or six provincial governments support and direct important military schools and units, and provide landing fields. In addition to public funds devoted to air force development a national lottery is held quarterly. The first of these in the summer of 1933 netted about $750,000 for the air forces. Other funds are collected in increasing amounts by societies and individuals.

Fifty modern Curtiss-Hawk single seat pursuit biplanes, with 700 horsepower Wright Cyclone engines and having a top speed of more than 200 miles an hour, were delivered to the Chinese air forces in 1933. A number of Curtiss-Wright, Fleet and Waco training planes are in service at the aviation schools. The Chinese also have a number of Wasp-powered Stearmans and Vought Corsairs.

The governments of Great Britain, France, Italy and Germany have assigned air attaches to their embassies in China, in efforts to divert from the American market Chinese purchases of aeronautical equipment.

Landing fields number 125 to 200 or more. A recent count gave 135 fields suitable for use. Japanese forces lately provided several others, and new fields are being prepared throughout the country. Most of these landing places are small and poorly equipped. Permanent improvements are limited. Many old fields have been abandoned and later cultivated. Few airports have radio stations. There are no lighting facilities. The meteorological service is provided by commercial operators.

The China National Aviation Corporation, 55 per cent owned by the Chinese Ministry of Communications and 45 per cent by the Pan American Airways System, now operates American equipment from Shanghai to Hankow via Nanking, Anking and Kiukiang; Hankow to Chengtu via Chungking; Shanghai to Peiping, via Haichow, Tsingtao and Tientsin, a total of 2,240 miles. Equipment included Wright Cyclone-powered Keystone amphibions and Whirlwind-powered Stinson monoplanes. An associated company, with American capital and management, the Pacific American Airways, started a Shanghai-Canton service in October, 1933. Stops are made at Wenchow, Foochow, Amoy and Swatow, all coastal points. The distance is about 890 miles.

The Eurasia Aviation Corporation, two-thirds owned by the

Ministry of Communications and one-third by the Deutsche Luft Hansa of Germany, was organized in 1930 to provide air services from Chinese centers along the Pacific coast and Europe by way of Russia. The company operates from Shanghai to Lanchow via Nanking, Loyang and Sian and Peiping to Loyang, 1,420 miles. Irregular flights are made from Lanchow to Urumtchi via Suchow and Hami.

Colombia

Modern planes were added to the Colombian military air forces in 1933, mostly Curtiss-Wright planes and engines. A new company entered the commercial air transportation field. Existing airports were improved and construction started on others.

The Uraba, Medellin and Central Airways which started the Medellin-Turbo-Cristobal service in 1932 continued in operation, and the "Scadta" company, beginning in September 1933, cooperated by providing a connecting service to Bogota. A traveler may now fly from Bogota to Cristobal on Wednesdays or Sundays or in the reverse direction on Tuesdays and Fridays, in less than eight hours. The Colombian Air Service Company, which has operated a civil flying school at Bogota, entered the transportation field with a daily service from Bogota to Medellin, employing three planes and three pilots.

A new contract has been signed by the Government and the "Scadta" company by which the latter may carry mail until 1942. The company sold some of its planes to the Government for military transportation purposes. It still has 14 planes, some with American engines. The company improved its Barranquilla airport and prepared an airport for land and seaplanes at Palenquero near Dorado.

A new airport has been completed at Cartago in the Department of Valle; another at Socorro, near Bucaramanga has been completed and work started on another at Cienaga. Landing fields have been prepared for military operations.

Costa Rica

The National Air Transportation Company started several air services between the important centers in Costa Rica under authority granted in 1932 and renewed in July, 1933, for a period of five years. Shortly after that renewal the company started a weekly service between San Jose and Port Limon to connect with mail

steamers. Another local service is operated weekly over that route. The company's three planes, including one nine-passenger Fokker, are said to have been used to capacity much of the time. The Pan American Airways System's three-times-a-week service by way of San Jose is an outstanding feature of the transportation facilities.

Cuba

Practically all civil aeronautic activities during 1933 were confined to the scheduled operations of the Cuban National Aviation Company and its affiliate, the Pan American Airways System, which provides several services connecting Cuba with all parts of both American continents and the West Indies. The local company provides a daily service between Havana and Guantanamo via Cienfuegos, Santa Clara, Moron, Camaguey, Manzanillo and Santiago de Cuba, almost the length of the island, and a daily service between Santiago de Cuba and Baracoa, via Antilla and Cayo Mambi. The company planned eventually to introduce 10-passenger planes cruising at 190 miles an hour and permitting travel between Havana and Santiago de Cuba in less than three hours, counting the five stops en route. New and faster equipment is being employed by the Pan American Airways which has steadily improved its schedules. The Cuban air force has a number of Curtiss-Hawk pursuit planes, and Waco, Fleet and Aeroncas for training.

Czechoslovakia

Czechoslovakia's aircraft manufacturing industry entered several foreign markets in 1933. The wide public interest in aeronautics, indicated by membership in aeronautic organizations of over 70,000 in a population of about fifteen million, was heightened by such events as the flying day at Prague when 150,000 persons paid to visit displays of new models of civil and military planes, and to see expert flying.

There are three manufacturers of planes and three engine companies. Normal production capacity is estimated at 300 planes and 800 engines, but that can be trebled. The Government factory near Prague is producing modern military planes. The Avia Company, owned by the Skoda Works, produced civil and military types of planes and engines. The Aero Tovarna Letadeo produces a plane with a two-cylinder, two-cycle engine. The Ceskomoravska Company is developing improved types of planes. The Walter Company is an important engine manufacturer.

There are 30 airports in Czechoslovakia; those at Prague, Brno and Bratislava are lighted and seven others are exclusively for military use. Eight airports are owned by manufacturers, clubs or individuals. The Prague-Brno-Bratislava route, 188 miles, is lighted by 17 beacons, each throwing two fingers of light and turning six times a minute, and visible 31 miles. The Czechoslovak section of the route used by the French service to Prague, 90 miles, has eight beacons.

The Masaryk Aviation League with over 60,000 members is important among the several associations and clubs. It possesses 30 airplanes and during the year the Zlin branch of the league was given a plant where it plans to build 100 planes. Work was started on the first ten in June, 1933. It is intended to increase training work and to train 5,000 pilots during the next five years. Late in the year 12 two-place training planes were ordered by the league from the Government airplane factory for delivery early in 1934. The plant at Zlin was also given five Walter Junior 120 horsepower engines for use in planes to be built there. The Ministry of Public Works planned to purchase eight training planes with available funds, to be distributed to clubs for training purposes.

There were 100 licensed glider pilots and 72 gliders in May, 1933. Civil planes numbered 141 on January 1, 1933. Of the planes 106 were of domestic design and manufacture; 20 were of foreign design and manufacture and 33 were employed in scheduled air transportation. The estimated number of active military pilots is 2,200 while an equal or greater number are said to be in training. Counting active, reserve and civil pilots estimates of the total run up to 10,000. Estimates of the total number of military planes are from 500 to 1,200, some of which are reported to be in reserve storage.

The Czechoslovak State Air Line continued operating the Prague-Brno-Bratislava-Uzhorod, Bratislava-Zagreb and Prague-Marienbad-Carlsbad services, and added one to Susak, Yugoslavia, a summer resort on the Adriatic sea which was quite successful financially. Wright Whirlwind engines were used to power the tri-motored transports. Experimental flights over the Prague-Uzhorod-Bucharest route were made beginning in September, preliminary to the inauguration of a regular service. This followed an agreement between Czechoslovakia and Rumania earlier in the year.

The Czechoslovak Air Transportation Company continued its Prague-Leipzig-Essen-Rotterdam-Amsterdam, Marienbad-Carlsbad-Chemnitz-Leipzig and Vienna-Prague-Dresden-Berlin (in cooperation with Austrian and German companies) services. A shoe manu-

facturer at Zlin operated a scheduled service between Zlin and Prague. In addition to these lines extending 2,250 miles, there were Austrian, French, German and Polish services over Czechoslovakia. Both passenger and express traffic increased in 1933.

The 1934 budget allocates to the Ministry of Public Works for civil aeronautics the equivalent of $1,138,074 (at the average exchange rate for 1933) compared with $1,427,774 for 1933. More than one-sixth of the appropriation will be for the State Air Lines. The Aviation Fund, the voluntary collection of which has been successful throughout the country, will partly make up the reduction in the budget allowance.

Denmark

Denmark has about 90 military and naval planes, about the same number of military and naval air pilots, eight commercial and six private planes. The mail traffic was nearly twice as great as in the year before due to the night mail service from Helsingfors to London and Paris, a part of which was operated by the Danish Air Transport Company. The accelerated increase in traffic resulted in plans to continue the Copenhagen to Berlin and Hamburg services throughout the winter of 1933-34. That progress is made in a strongly competitive territory. There are three flights each way a day between Copenhagen and Paris and London. A total of 26 planes land and depart from the Copenhagen airport every day. The Danish line increased passenger fares to equal second-class rail fares, a circumstance brought about by the railroads.

The former policy of maintaining small armies has been revised to provide for more than double the military and naval air forces.

Dominican Republic

A passenger and mail service between Santo Domingo and Santiago de los Caballeros was started February 20, 1933, by the National Aviation Company, using two American planes. The daily flights of one hour are by way of La Vega and Moca. In June a daily route was started to the south—Santo Domingo, Bani, Azua, San Juan and Barahona. At the same time a third route was started, between Santo Domingo and El Seybo via San Pedro de Macoris and La Romana. The Pan American Airways System served Santo Domingo and San Pedro de Macoris on its intercontinental, three-times-a-week, service.

Ecuador

The army in Ecuador has two military planes. The principal airports are at Guayaquil, Latacunga and Quito. The only commercial activity is that of the Pan American-Grace Airways, Inc., which provides a twice-a-week service in each direction, north and south, via Salinas and Guayaquil.

Egypt

The Egyptian air forces received ten new planes in 1933. Scheduled air lines were started. Commercial activities are confined largely to a Egyptian-British company, Misr Airwork, Ltd., which operates a flying school, aerial service and a twice-a-day transport service between Cairo and Alexandria. Light British planes are used. In summer months the company also operates a weekly schedule from Alexandria to the coast resort at Mersa Matruh. Imperial Airways of Great Britain between London and Johannesburg and India and other eastern points makes connections through Egypt. The Dutch line also serves Cairo, and an arrangement has been made for the extension of an Italian air service from Tobruk on the Mediterranean coast to Alexandria.

El Salvador

Aeronautics is limited largely to the activities of the Government air force which uses seven planes, three of which are Curtiss-Wright Ospreys, Wright Whirlwind powered, acquired in 1933. San Salvador is served by the Pan American Airways System and the Central American Air Transportation Company.

Estonia

The principal aviation developments in Estonia during 1933 were of a promotional character. Commercial flying was carried on by three foreign companies. The Finnish Air Transportation Company continued its Helsingfors-Tallinn daily service. The German-Russian Air Transportation Company served Tallinn on its Berlin-Leningrad service. The Polish Air Transportation Company operated between Tallinn, Riga and Warsaw. Estonia gave no direct financial aid to any of these companies. The Estonian air defense force has 30 British planes.

The Air and Gas Defense League is active, with headquarters at the Ministry of Communications at Tallinn and 3,000 members in

14 clubs. The league plans to build five planes and three gliders for training members. Lectures have been given to several thousand boys on model airplane building. School teachers are to be given courses that they may assist boys in building models.

Finland

Considerable attention is being given to modernizing Finland's air forces. There are over 100 military land and seaplanes of several classes and types. Efforts are being made to manufacture more of this equipment in Finland. Recent imports have included Curtiss-Wright engines from the United States, some British planes and motors, and planes from Czechoslovakia.

The Air Defense League and the Finnish Aviation Club, with branches in most centers, are building up public interest in all forms of aeronautics. The Air Defense League arranged two courses of flying instruction during 1933, graduating thirteen pilots. The Government granted 56,000 marks for the purpose.

The subsidy voted for the Finnish Air Transportation Company in 1933 was $40,920. That company continued its daily service to Tallinn, Estonia and its Helsingfors-Abo-Stockholm service, the latter in cooperation with the Swedish Air Transportation Company. The company cooperated in the night mail service from Helsingfors to western European points by way of Stockholm and Copenhagen from May 1 to September 30. Northern mail was delivered at London and Paris early on the first morning after posting. American engines were introduced on one of the routes.

The company completed 10 years of operations on November 1, 1933. In that time its planes have flown 1,162,018 miles and carried 42,000 passengers, 283,644 pounds of mail and 744,802 pounds of express and baggage. In the first 10 months of 1933 the Finnish planes flew 128,008 miles and carried 3,750 passengers, 27,558 pounds of mail and 59,321 pounds of express.

France

A general "stock-taking" in French aeronautics during 1933 included controversies about the Air Ministry, air transport and international rivalries. The commercial air transportation companies were amalgamated into one, the Air France Company. The Air Ministry, organized in 1928, was not given a full legal status and it has not had uniform support. It was abolished in 1932 and its functions consolidated with those of the Ministries of War and

Navy in a Ministry of Defense. By a broad reorganization of the Air Ministry, effected by a series of decrees in 1933, there was a move toward the consolidation of public aeronautic functions. Technical services and the National Meteorological Office, formerly independent, were brought into the Ministry which is divided into five directorates: general technical; civil aviation; military air material; military personnel; and fifth, budget, civilian personnel and accounts. At the same time the Central Committee for Flight Tests was created as an independent body. The technical directorate or bureau will deal with research work; it will control the weather bureau which must cooperate with others, including the civil aviation bureau. The air material bureau will handle the production of equipment in series. A policy of the Ministry is to reduce the number of prototype planes to be developed by the technical bureau.

A law regulating the status of commercial air transportation became effective on June 15, 1933. It provides strict and full control of subsidized companies. Scheduled air services may be operated by the Government or by subsidized or non-subsidized companies. Air mail contracts may be made between the Ministry of posts, telegraphs and telephones and subsidized or non-subsidized companies. Cash subsidies may not exceed 200,000,000 francs ($7,840,000) a year and contracts providing for subsidies may not be made for longer than 15-year periods. They are subject to change at five-year intervals and to renewal for not more than 15 years, and they will be awarded on a competitive basis. Shares of operating companies must be registered and may not be transferred without permission of the Air Ministry. The by-laws of such companies must have Air Ministry approval and the Government must be in possession of at least 25 per cent of the capital stock and have representation among the directors.

The operating companies finally concluded an arrangement for their amalgamation into one, the Air France. An agreement between the air minister and the companies made on May 30, 1933, provided that the new company would be formed and all the old ones liquidated on or before September 1, 1933. The Government would subsidize the new company for a period of 15 years from June 1, 1933. The changes would be made in compliance with the new law governing commercial air transportation. Details of the services to be operated (practically no changes from those already in operation being made) were included and it was stipulated that the total subsidy for the period June-December 1933 should not exceed 94,500,000 francs, that it should not exceed 150,000,000 francs for the year 1934 and that the maximum shall be reduced by

5,000,000 francs for each of the next three years. Beginning with the year 1936 the company will reimburse the Government one-half of the increase of commercial receipts of the preceding year as compared with the year 1934.

Details of the services to be operated by Air France, as prescribed by the agreement between the Air Ministry and the company are as follows: (Note that exact conversions have been made from kilometers to miles and from francs to dollars—the latter being at the rate of 1 franc to 3.92 cents which is the par rate and which was the average rate of exchange in November, 1933, as measured by the gold dollar. The November average, using the paper dollar, was 1 franc to 6.27 cents; thus the total amount of subsidy for the year 1934 is $6,068,160, or, if measured by paper dollars, $9,705,960.)

	Service	*Subsidy*	
		Per mile flown (cents)	*Per year (dollars)*
A	Toulouse-Barcelona-Alicante-Malaga-Tangier-Rabat-Casablanca. 1,146 miles.		
	Round trip a day; 836,580 miles a year	69.39	584,080
A(a)	Marseille-Barcelona. (Subsidy allowed only for Marseille-Perpignan section-171 miles.)		
	Round trip a day; 124,830 miles a year.	69.39	86,240
B	Casablanca-Agadir-Cap Juby-Villa Cisneros-Port Etienne-St. Louis-Dakar-Natal-Recife-Maceio-Bahia-Caravelles-Victoria-Rio de Janeiro-Santos-Florianopolis-Porto Alegre-Pelotas-Montevideo-Buenos Aires-Mendosa-Santiago. 5,406 miles, excluding 2,071 miles between Dakar and Natal—covered by steamer.		
	Round trip a week; 562,224 miles a year. (Plus 104 voyages—215,384 miles by steamers.)		
	Casablanca-Dakar (184,184 miles; $162,671)	88.32	
	Natal-Santiago (378,040 miles; $691,813)	183.00	
	Dakar-Natal (by steamer) $5,880 per voyage.		
	Total subsidy for entire service (discrepancy is unaccountable)		1,485,680
C	Marseille-Algiers. 499 miles	75.70	274,400
	Round trip a day; 364,270 miles a year.		
D	Paris-Strasbourg-Prague-Vienna-Budapest-Belgrade-Bucharest. 1,395 miles.		

	Round trip a day (except Sunday) Paris-Vienna Round trip a day (except Sunday) March to to September incl.: three round trips a week Oct.-Feb. Vienna-Bucharest; 755,450 miles a year.	88.32	638,960
E	Prague-Warsaw. 329 miles. Three round trips a week: 98,700 miles a year.	66.24	70,560
F	Bucharest-Istanbul. 321 miles Three round trips a week from May to August, inclusive: 32,100 miles a year.	66.24	23,520
G	Belgrade-Sofia. 205 miles. Three round trips a week from April to September, inclusive; 30,750 miles a year.	94.63	31,360
G(a)	Sofia-Saloniki. 155 miles Three round trips a week from May to August, inclusive: 15,500 miles a year.	94.63	15,680
H	Paris-Basel. 256 miles. Three round trips a week from May to October, inclusive; 38,400 miles a year.	66.24	27,440
I	Paris-Brussels-Antwerp-Rotterdam-Amsterdam. 286 miles Round trip a day: 208,780 miles a year.	63.08	141,120
J	Paris-Cologne-Berlin. 552 miles. Three round trips a week: 165,600 miles a year.	63.08	113,680
K	Paris-Sarbruck-Frankfort-Leipzig-Berlin. 628 miles. Three round trips a week from May to September, inclusive; 78,500 miles a year.	63.08	54,880
L	Brussels-Essen-Hamburg-Copenhagen-Malmo. 506 miles. Three round trips a week from May to September, inclusive; 63,250 miles a year.	63.08	43,120
M	Marseille-Bastia-Naples-Corfu-Athens-Castelrosso-Beirout-(automobile service to Damascus—60 miles) Damascus-Bagdad-Basra-Bushire-Lingeh-Jask-Gwadar Karachi-Jodhpur-Allahabad-Calcutta-Akyab-Rangoon-Bangkok-Saigon. 7,636 miles. Round trip a week; 794,144 miles a year.	176.63	1,528,800
N	Paris-London. 233 miles.		

	Two round trips a day (one on Sunday) October to April, inclusive; three round trips a day (one on Sunday) May to September, inclusive; 375,504 miles a year.	47.31	239,120
O	Paris-Lyons-Marseille. 454 miles.		
	Round trip a day; 331,420 miles a year.	50.47	180,320
O(a)	Lyons-Cannes. 217 miles.		
	Round trip a day; 158,410 miles a year.	50.47	78.400
O(b)	Lyons-Geneva. 70 miles.		
	Round trip a day; 51,100 miles a year.	50.47	23,520
P	Marseille-Ajaccio-Tunis. 621 miles.		
	Round trip a day; 453,330 miles a year.	94.63	427,280

The total length of these routes is 21,086 miles. The schedules call for 5,538,842 miles to be flown in a year and for steamers to operate over 215,384 miles and automobiles 6,240 miles. The average subsidy payment is 98.52 cents a mile flown (this excludes the subsidy for ocean vessel service but includes the automobile service) with the franc converted at par or 1 franc equal to 3.92 cents. It is $1.5758 with the franc converted at 6.27 cents—the average exchange rate for paper dollars in November, 1933.

The amalgamation was effected between June and August. Thus, in accordance with the agreement between the companies, Air Union, Air Orient, International Air Navigation Company and General Air Transport Company and the Air Ministry, Air France is the present operator of French commercial air services. The company has a capital of 120,000,000 francs, $4,704,000, divided into 240,000 shares of 500 francs, $19.60 each, representing the contributions of the four companies. The Government receives 80,000 shares. The Aeropostale company could not take part in the change because it is in process of liquidation. Its facilities are used by Air France under lease.

The theory of the Government is that commercial air transport will be more efficiently operated; that manufacturing companies will have much less influence in commercial transportation and that the subsidy payments required will be considerably less, while the lines will be more directly under Government control. The capitalization is less than before and equitable adjustments offer difficult problems. The Aeropostale company had outstanding capital, including bonds, greater than that of the Air France. Its current assets, including claims against the Government, have been represented as worth 120,000,000 francs. The cash subsidy is reduced nearly one-fourth—from an average of some 196,000,000 francs a year during recent years (about one-third of the appropriations

for civil aviation) to 150,000,000 francs for 1934. It has been reported that of this saving 10,000,000 francs will be devoted, in 1934, to the development of a new line from France through French colonies in Africa to Madagascar. This will remain a Governmental undertaking.

In military and naval air forces there have been important developments. The creation of an independent air army was reported in April. Early in 1933 there were 112 army, 18 navy and 34 colonial squadrons, as compared to a total of 144 two years ago. In 1933 the number of active planes was 1,850 compared with 1,500 in 1931: the total number of military aircraft was about 4,500 which was 183 smaller than the number reported in 1931. Military air personnel is given at some 33,000 of which more than 10 per cent are pilots. The Air Ministry is now modernizing air units and equipment. In addition to large orders announced in recent months others are under consideration for the purpose of keeping the plants steadily in production.

France has 27 active aircraft and 11 active aircraft engine manufacturers. The latest estimate of normal maximum capacity is 3,000 planes and 6,000 engines a year. Most of the production is after French designs and it is largely military in character. Public funds aid in the development of new designs, and numerous improvements in both commercial and military aircraft were made in 1933. An order, late in 1933, calls for an air mail plane with a 690 horsepower engine and a high speed of 248 miles an hour, and a minimum cruising radius of 621 miles with a useful load of 1,100 pounds. Every effort is made to produce aircraft which can be purchased and operated by private flyers. There has been some change in regulations designed to increase this market without relaxing the safety requirements.

France imports very little aeronautic equipment. Exports have decreased from $8,348,000 in value in 1930 to $6,520,000 in 1931, about $3,000,000 in 1932 and to a smaller amount in 1933. The Air Minister and other high officials went on a tour of several European countries in a number of the newer commercial planes in the summer, partly in the interest of export business. Efforts toward consolidating manufacturers have been continued with some effect.

Some years ago a plan for the administration of airports by local chambers of commerce was presented but the change was made in only two instances, at Lyons and Bordeaux, the Air Ministry being in charge of the others. Recent legislation encourages the creation of private airports.

France has 19 first class airports and 131 other airports and

landing fields. Lighted airways number six and measure 1,680 miles. They extend from Paris to the English Channel; Paris to the Belgian frontier on the route to Brussels; Paris-Strasbourg on the route to Prague; Paris-Marseille; Paris-Bordeaux; and Bordeaux-Marseille. The lights are unevenly spaced at considerable distances with powerful lights placed where they can be mounted on high points. The lights are turned on only when required.

The number of civil aircraft registered in France has reached some 1,600 but the current register, started in 1928, is a "running" one and some aircraft have been withdrawn from use, leaving a smaller actual number. About 750 planes were reported privately owned in October, 1933, and 220 planes were in scheduled air services at one time during the year. The many flying clubs and schools remain active and the number of civilian pilots is growing steadily. The number of pilots' licenses issued during the last four years is 1,475 and the number of students, not including members of clubs, was 157 on June 30, 1933.

By a decree dated in September there are two kinds of private pilot licenses. A license of the first category does not allow the holder to carry passengers. To qualify for a license of the second category, which permits passengers, one must have a record of 1,864 miles of flying with at least eight landings on as many different airports, no two of which are less than 12 miles apart. One-third of this flying may be replaced by 20 hours of solo flight. Two flights of at least 310 miles with only one stop must be made, and on separate days.

Germany

During 1933 there was considerable reorganization and concentration of control of aviation in the German Government. An Air Ministry was formed. The manufacturing industry prospered. Commercial air transportation made progress. Private, club and other activities increased.

Aeronautics, once a branch of the Ministry of Communications, is now under the Air Ministry headed by Captain Hermann Goering with Erhard Milch as Undersecretary of State for Aviation. The Ministry is divided into five groups: air transport and air law, technical, administrative, air sport and training and air protection. In addition there is an independent establishment styled Office for Flight Security, responsible to the Air Minister. It does the testing work formerly done by the German Experimental Institute for Aviation.

The air transport and air law bureau is divided into eight divisions: international law and international air agreements; German air law, customs, passport, international trade, airports, air traffic and general air transportation; airship traffic and operations; the League of Nations and air disarmament; scheduled air transportation; air traffic statistics; publicity; and flight safety matters. The technical bureau is divided into three divisions. The first handles

GERMANY'S FOUR-ENGINED TRANSPORT
The Junkers G-38 introduced in air line service during 1933.

research and inventions, technical and scientific matters and exhibitions. The second is concerned with improvements of land planes and of engines and the third with improvement of seaplanes, propellers and instruments. Air defense matters, handled by the fifth bureau, include the training of the people in means of defense against possible danger from hostile aircraft.

The air police, radio and weather services and some others

formerly under control of the several States have been brought under the Air Ministry by a recent decree.

The several aeronautic associations and clubs are more centralized, notably by the formation of the German Air Sport Association in March at the instance of the Air Ministry. The new association includes the National Socialistic Flying Corps, the Rhoen-Rossitten organization (gliding and soaring) and the German Aviation League; and an affiliate is the Aero Club of Germany. The new order follows others during the last few years and brings many thousands of members into close association.

The total National Government appropriations for civil aeronautics have averaged more than $10,000,000 for the last several years; indications are the amount is larger by about 75 per cent. Half of the appropriations have been devoted to direct cash subsidies in recent years. The amount for subsidies is larger by about one-fifth for 1933-34.

There are three principal air transportation companies: the Deutsche Luft Hansa, which accounts for most of the services and most of the traffic; the German Air Transportation Company and the German-Russian Air Transportation Company. The latter is owned by the Deutsche Luft Hansa and Russian interests.

It operates the Berlin-Koenigsberg-Moscow and Leningrad services. Departure from Berlin is at 6:30 A. M. instead of 2 A. M. as before. The German Air Transportation Company has its ten services using 19 planes. There were few changes in the Deutsche Luft Hansa services. The summer schedules for 1933 included 53 lines, 15 of which extended beyond the borders and were operated largely in cooperation with other companies. In addition to these mixed (passenger, mail and express) schedules the company operated seven special mail and express services. The company served 52 German and 31 foreign cities. Of special importance is the Berlin-Rotterdam-Amsterdam express service in which the large Junkers Ju-52 planes are used, and by which the second Berlin-London connection is made daily. The elapsed time between the two cities is five hours and 20 minutes. The total length of all German air services was about 23,000 miles in 1933.

There were two outstanding developments in German air transport. For the first time the principal international and longer local services are being operated throughout the winter. Flying time was reduced on practically all services during the summer of 1933 and it will soon be reduced considerably further by the introduction of new, larger and faster planes and by the more powerful engines in certain existing planes to increase speed 20 per cent.

Traffic figures from May 1 to August 31, 1933, as compared with the same season in 1932 show healthy growth. The mileage flown in mixed services increased 6.2 per cent to 2,849,990 miles; the number of passengers increased from 45,055 to 56,583, 25.6 per cent, caused partly by fare reductions. Measured by passenger-miles the traffic increased 34.1 per cent to 10,153,017. Baggage increased from 90.7 to 94.3 metric tons, and freight traffic increased 12.4 per cent to 459.7 metric tons. The letter air mail volume increased but that of newspapers decreased. The November traffic was 190 per cent greater than that of November 1932, because services were continued instead of being suspended as heretofore. The seven mail and freight services operated in part or wholly at night during the summer of 1933 were discontinued for the winter. These services are: Berlin-Hannover-Cologne-London; Cologne-Brussels-Paris; Cologne-Frankfurt/Main; Cologne-Hannover-Malmo-Copenhagen; Munich-Huernberg/Fuerth; Berlin-Vienna-Budapest-Belgrade-Sofia-Saloniki-Athens and Frankfurt/Main-Stuttgart.

The Deutsche Luft Hansa owned and operated 152 planes during 1933.

It placed equipment orders worth two and one-half million dollars during the summer of 1933, with supplemental orders later. An order for 12 tri-engined Junkers Ju 52/3m planes was reported to have been filled and a similar order was to be filled in 1934. This plane is expected to cruise at 153 miles an hour (or at 165 with an American engine) and have a high speed of 177 miles an hour. This type of equipment will assist the company to operate its planes an average of 136 miles an hour in 1934 as compared with 99.5 miles an hour in June, 1933.

Germany's air transport efforts in Asia, in connection with Atlantic steamers and across the south Atlantic were continued during the year. Experimental flights via Spain, the Azores, Bathurst, West Africa and the S. S. Westphalen in mid-Atlantic were carried out late in the year with a view to a fortnightly transatlantic service to work in conjunction with the airship service between Germany and Brazil.

There is increased interest and activity in sport and training operations. Gliders with low-powered, light engines sufficiently strong to take off and light enough not to hinder gliding maneuvers are popular. A number of improvements to airports and a few new airports have been added partly because of this activity.

Practically all kinds of aeronautical equipment are manufactured in Germany. At the beginning of 1933 there were two airship, fifteen airplane, six sailplane and glider, seven airplane engine,

three parachute, and many other manufacturers of parts, instruments and supplies. The reorganization of the Junkers company and the settlement of its accounts with creditors was completed so that the organization is again on a going basis. The Henschel Flugzeugwerke Akt. Ges., manufacturer of aircraft was formed at Berlin with a capital of 500,000 marks (about $124,000) in March. There is an effort to develop Diesel engines of which four types have been produced. A further step toward the production of an inexpensive light plane was made with the introduction of a single-place plane to sell at about $925. It has a 20 horsepower geared engine operated at 3,500 revolutions per minute. Curtiss-Wright, Pratt & Whitney, Waco and other American aircraft products are used in Germany.

Great Britain

The general progress in British aviation during 1933 was great in the growth of scheduled air traffic and the extension of air services. Noteworthy advance was made in military activities and the improvement of flying equipment.

The development of the British air forces as planned will result in increasing the number of squadrons. The plan contemplates additional squadrons at home and in other parts of the empire. The Royal Air Force has more than 2,000 planes. About ten per cent of the 30,000 air force personnel are pilots.

The program for modernizing the equipment in use was practically completed in 1933. In its study of American aircraft, the Air Ministry bought a Vought Corsair with Pratt and Whitney Wasp engines. Faster planes were introduced and training was continued with a view to being able to defend important centers, including London which is said to be the most vulnerable city on earth. Long range seaplanes and light and heavy bombers receive much attention. England probably has the fastest fighting planes of all air powers; and her objective is for a 300 mile an hour fighter with full military equipment. Further control of civil aviation was under official consideration during the year. A distinction between private aircraft and those used for aerial service may be made in a change of the regulations. Authorities believe that a private plane, known to be well maintained, should not necessarily be subject to annual major overhauls to maintain the certificate of airworthiness. Irregular and surprise inspections are planned to inspire the proper maintenance of private machines. Commercial aircraft inspections each quarter have been recommended.

Net estimates for aeronautics for the public budget for the year ending March 31, 1934, amount to £17,426,000 ($73,501,125) including £663,000 ($2,796,468) for civil aeronautics. Of the latter amount £146,000 ($615,813) is recoverable from British Governments in Africa on account of the Imperial Airways service from London to Johannesburg. The net total is thus $2,180,655 which is an increase of £17,000 ($71,703) over the preceding year. Additional sums are used for the benefit of civil aeronautics in common

THE GOOD SHIP "HERACLES"

Passengers boarding one of the Imperial Airways cross-channel planes at Croydon, London's airport.

with other branches. The amount allotted to subsidies for air services is £548,000 ($2,311,409) and to flying clubs £20,000 ($84,358).

Appropriations for new aircraft for the current fiscal year amount to £2,084,000 ($8,790,104) and since this is a larger sum than was devoted to this item last year when 13 squadrons were reequipped, it is believed that at least that number were to be reequipped during the current year. Other amounts have been voted to cover engines,

spare parts and replacements. The 27 manufacturers of aircraft, nine engine companies and accessory firms thus have a large domestic market, and they have received substantial orders. Export business is reported to have been good.

In 1932 the British aircraft exports were valued at $6,140,243. The manufacturing industry is said to be in good condition and paying profits.

The principal British air lines are those of Imperial Airways which operate the London-Paris; London-Paris-Basel-Zurich; London-Brussels-Cologne; London to India and London to South Africa services. The South African line may be extended by a coastal service from Durban to Mombasa. The Indian service was extended from Karachi to Calcutta in July, to Rangoon on October 1 and to Singapore late in December. The scheduled time between London and Singapore is 10 days. Beyond Karachi the service is by Indian and British interests combined; beyond Singapore the line will soon be extended to Australia under joint Australian and British control. In 1932 the company's planes flew 1,765,770 miles and carried 45,148 passengers, 311,525 pounds of mail and 1,312,740 pounds of express and baggage. The 1933 traffic was much greater but final figures are not available. The company has 40 planes and employs 50 pilots and 1,300 other personnel.

The number of "A" pilots at the beginning of 1933 was 2,397; "B" pilots, 369. There were 981 registered civil airplanes, including 402 privately owned. There are 397 airports of which 35 are for public use. Four of these are Government owned, ten by municipalities, four by clubs and 17 privately owned. The remaining 362 are for private use and of these, 329 are privately owned and used for pleasure flights. Plans have been made for additional airports to meet present and future needs.

Greece

The Greek Air Transportation Company using four Junkers planes, in 1933 operated its Athens-Saloniki and Athens-Jannina lines, 460 miles. The country is served by Italian, British, Dutch, French, Yugoslav, German and Polish air lines.

There are few domestic civil aeronautic activities other than the development of airports. There are four airports for land planes, at Athens, Larissa, Jannina and Agrinion, seven for seaplanes, at Athens, Nea Pergamos, Phaeakion, Crete, Porto Rafti, and Saloniki, and one at Saloniki for both land and seaplanes. In addition there are nine emergency fields for land planes and 34 designated emer-

gency landing places for seaplanes. There are no lighted airways and the limited lighting facilities at the airports are only for emergency use. The single airplane factory, at Phaleron, is employed in repair work for military planes of which there are about 180 mostly of British and French manufacture.

Guatemala

The Government possesses seven planes, four of which are old French types. Guatemala City has a good unlighted airport with a natural-surfaced runway 4,000 feet in length. During 1933 an airport was built at Puerto Barrios. There are 26 other airports and landing fields. The National Aviation Company using one single and four multi-engined planes, expanded operations so that its services now are: Guatemala-Quezaltenango-Guatemala, daily; Guatemala-Mazatenango-Retalhuleu-Coatepeque-Guatemala, daily; Guatemala-Rabinal-Cobán-Salama-Guatemala, three times a week; Guatemala-Flores, weekly and Guatemala-Puerto Barrios, weekly. A contract was signed between the National Government and the Empresa Servicios de Guatemala, Inc. and it was expected this line would be started late in the year. Guatemala City is served by the Pan American Airways System between Brownsville and Panama. Puerto Barrios is on that company's route between Miami and Panama, the junction point being at San Salvador. The company in 1933 introduced a local service between Guatemala City and Tela, Honduras, via Flores and Puerto Barrios.

Haiti

Port au Prince, Haiti, is served by the Pan American Airways System with schedules three times a week each way. There are no local aeronautic activities of importance. The airport at Port au Prince which measures 1,200 by 2,100 feet has been improved particularly in the matter of surfacing. Other airports, suitable for small planes, are at Cape Haitien, Gonaives and Port de Paix and, on the island of La Gonaive, Jeremie and Hinche.

Honduras

The ratification of the Pan American Convention on Commercial Aviation was approved by the National Congress in January, 1933. Considerable work was done toward the improvement of airports. There are first-class airports at San Lorenzo and Tela; 51 others are in regular use and 12 more are under construction. Three

military planes have been purchased for the station at Tegucigalpa. One plane is used by a business organization. One plane is operated exclusively for taxi service, based at San Pedro Sula; the local commercial operators also offer taxi services.

Fourteen planes, including four tri-engined, are operated in local services employing 12 pilots. The Government has an air mail contract with the Transportes Aeros Centro Americanos which maintains a twice-a-week service between San Salvador and Guatemala and another between San Salvador and Managua, Nicaragua. Ordinary mail is carried within Honduras and between that country and El Salvador and Nicaragua without a surcharge. The "Taca", The Empresa Dean and Morgan Airlines run daily services between Tegucigalpa and San Pedro Sula, Tela and La Ceiba on the north coast. There are regular twice-a-week services to most of the airports in the western part of Honduras, to most of the airports in eastern towns and three-times-a-week between Tegucigalpa and San Lorenzo. San Lorenzo is a stopping point of the Pan American Airways System between San Salvador, El Salvador and Managua, Nicaragua. That company in 1933 started a weekly service from Tela to Guatemala City.

Hungary

The principal aeronautic activity is that of the Hungarian Air Transportation Company which uses 15 planes, ten pilots, five pilot mechanics and five radio operators. Its routes are between Budapest and Vienna, Budapest and Belgrade, Budapest and Pecs and Kaposvar and Budapest to Venice via Klagenfurt. The planes flew 378,279 miles in 1932 and carried 6,439 passengers, 86,528 pounds of letter mail, 86,795 pounds of newspapers, 16,729 pounds of parcel post and 224,503 pounds of baggage and goods. The 1933 traffic is reported to be larger. The company's subsidy is said to be equivalent to $44,500 a year. Hungary is also served by Dutch, French and German companies.

Taxi services are offered by the Hungarian Air Transportation Company. There are 15 privately owned airplanes, 11 by the Sport Flying Association of the Joseph Technical College at Budapest where some 70 new pilots are trained annually. The only customs airport is that at Budapest known as Matyasfold. There are eight landing fields. The Active Hungarian Aerial Association is interesting the people in aeronautics. The country is not permitted to maintain military air forces.

Iraq

Bagdad's new airport was opened by the late King Feisal on April 5, 1933.

The Government has shown much interest in aeronautics. Eight new British planes in 1933 brought the military air strength to 22 planes. A local company was organized to operate taxi and eventually regular services in Iraq and to nearby countries. The Deutsche Luft Hansa was granted permission to operate scheduled services but the company failed to obtain favorable action in Persia and no definite plans have been announced. Bagdad is served by the planes of the Royal Dutch Air Lines, Air France and Imperial Airways, all of which have weekly services connecting the city and points East with Europe.

India

The outstanding aviation event in India during 1933 was the successful flight over Mount Everest, the highest known point on earth, nearly seven miles above sea level. The principal civil air activities are those of the ten flying clubs under the guiding influence of the Aero Club of India and Burma, Ltd. The moving force toward the development of aeronautics flows from these clubs with some 2,000 members, about 40 planes and valuable landing ground facilities. Public funds are devoted to these clubs and the improvement of ground facilities. There are about 400 civil pilots and 100 civil planes, one-third of them privately-owned.

The weekly Karachi-Ahmedabad-Bombay-Bellary-Madras air mail service, operated by Tata Sons, is to be extended to Colombo, Ceylon, in 1934. The Karachi-Delhi weekly service, first operated by the Indian State Airways in cooperation with Imperial Airways and later by the Delhi Flying Club, was suspended when a new service was extended from Karachi across India. The Indian National Airways started a daily service from Calcutta to Dacca and a twice-a-week service from Calcutta to Rangoon. This company is affiliated with the Indian Transcontinental Airways, Ltd. which was formed to operate the section of imperial air services between Karachi and Singapore. The capital was subscribed 51 per cent by Imperial Airways, 25 per cent by the Indian National Airways (which is to develop feeder services in India), and 24 per cent by the Government of India. A majority of the board of directors will be Indians and part of the operating personnel will be Indians, some of whom are in training. The Indian Government will not grant

a subsidy for the Indian section: it will come from the British Government and amount to £40,000 ($186,588) for each of the first two years, £30,000 ($139,941) for each of the next two years and £20,000 ($93,294) each for the fifth and sixth years. It will be divided equally between the two companies which are expected to pool their income and operating expenses and divide profits according to stock ownership. The weekly service, using British planes, was extended from Karachi to Calcutta via Jodhpur, Delhi, Cawnpore, Allahabad in July, 1933, to Rangoon via Akyab, Sandoway and Bassein in October and to Singapore in December.

The Dutch Airlines and the Air France (formerly Air Orient) line continue their weekly flights across India to the Far East.

Irish Free State

A Cork-Dublin-Belfast-Glasgow-Manchester scheduled service was planned and flights were made late in the summer to test the landing facilities and the conditions to be met in regular operation. Interest in developing good airports and in connecting the country with others by air was maintained, particularly in those centers which would benefit most directly. The idea of transferring ocean mails between aircraft and vessels at Irish ports with a view to saving much time for mails between continental points and the United States is given much consideration.

Italy

Italian bombing squadrons could make a non-stop round trip flight to Paris with full loads. The long coast lines of Italy favor the use of seaplanes, and the Royal Air Force of Italy dominates the Mediterranean. It has more than 2,000 combat planes. Most civil aeronautic activities are involved in the development and production of equipment and in scheduled air transportation. There are 60 planes owned privately. Additional private and sport flying is done in planes of the 86 flying clubs, and flight training is carried on by six schools. The clubs belong to the Royal Aero Club of Italy.

Premier Mussolini recently made himself Air Minister and General Pellegrini was appointed Director of Civil Aviation. General Valle is Under Secretary for Air. An unusual regulation became effective during the year. The Air Ministry fixed the maximum life of civil flying equipment. For all engines the maximum use before retirement was set at 2,000 hours. The limit for land planes was

fixed at 3,500 hours; and for seaplanes 3,500 hours if of metal construction, and 1,500 hours if other than all-metal construction. In exceptional cases and after rigid inspection these maxima may be increased by ten per cent.

Another Government rule is that where possible, all equipment for military units, commercial air services and subsidized clubs and schools must be of domestic design and manufacture. The Avio Linee is using Wright Whirlwind 330 horsepower engines in trimotored transport planes on their route over the Alps.

There are 14 manufacturers of aircraft. Four others build engines alone. Importation of aeronautical equipment has been reduced to a small quantity while exports have reached considerable proportions.

Seven air lines maintain schedules between points in Italy, her colonies and nearby countries. Italian lines extend northward to Vienna and Berlin; eastward to Istanbul, Rhodes and Alexandria, Egypt; southward to Tripoli, Sirte, Bengasi and Tobruk; and westward to Algiers, Cartagena, Barcelona, and Marseille. The total length of Italian lines was nearly 11,000 miles in 1933. The flying personnel number 102 pilots, 49 mechanics and 42 radio operators. There are no night schedules or lighted airways.

Some military airports are equipped for night operations. There are 14 customs airports in Italy and five in the colonies, for land planes; and 14 and four respectively, for seaplanes. There are 11 other civil airports in Italy and one in a colony for land planes and six in Italy for seaplanes. There are also seven designated points, without facilities, for seaplanes to land. Landings at other than these airports and places, except in emergency are prohibited. A new airport at Milan soon will replace the present small field. This will be 7,800 by 5,800 feet, the largest airport in Europe.

Japan

Japan is small in area, the centers of population are near each other, the surface is largely mountainous and paddy field rice is grown on much of the level areas. The Government is trying to overcome these handicaps to flying. The growing popularity of aeronautics has been stimulated by military air activities. More than 100 planes, in addition to other equipment, have been presented to the Government by societies and individuals. There is much interest in adequate air defense for all cities. Most air activities are of a military or naval character. Practically all civil aviation is in connection with air transportation and flying schools

and is controlled by the Aeronautics Bureau, Department of Communications. Ground facilities are largely military. The military and naval air forces have gained rapidly in numerical strength in recent years. The Japanese are trying to build all their own equipment.

There are about 400 civilian airplane pilots and about 17,000 officers and men were in the naval and military air forces in 1933. In 1933, Japan had in her military and naval service about 1,500 combat planes, 750 on active status, the others in reserve.

Airway beacons are installed on the Tokyo-Fukuoka route, 311 miles. Ten aviation radio stations and five aviation meteorological stations are listed.

There are nine commercial manufacturers of airplanes, engines, parts and accessories. Two other companies build airships and balloons. Normal annual capacity is estimated at 1,700 planes, with maximum capacity twice that number. Most of the planes and engines are of foreign design, a few are of local design. Some are altered foreign types. On January 1, 1934, the Japanese aircraft factories were operating with two labor shifts, the production being largely military equipment.

The Japan Air Transport Company carries passengers, mail and express between Tokyo and Dairen via Osaka, Fukuoka, Urusan and Heijo, 1,289 miles. Between Tokyo and Osaka, 264 miles, flights are made twice a day, and the rest of the route is covered once daily. The company started a nightly Tokyo-Osaka mail and express service in November, 1933. There is also a three-times-a-week Tokyo-Shimazu schedule via Shimoda, 161 miles. The Japan Air Transport Research Studio maintains a daily Osaka-Matsuyama schedule, 180 miles. The Asahi Periodical Navigation Company maintains a three-times-a-week service between Tokyo and Niigata, 263 miles. During the fiscal year ending March, 1933, planes in scheduled air transport flew 1,219,591 miles and carried 11,415 passengers, 215,707 pounds of mail and 143,006 pounds of express. The Japanese are using a large number of Wright Whirlwind engines in their transport planes. Their latest high speed transport is also an American product, a General Aviation low wing monoplane with the latest Series F Wright 700 horsepower Cyclone engine. They also have a number of Pratt and Whitney Wasp-powered Vought Corsairs, several Waco planes and Kellett autogiros.

The Ministry of Communications is reported to have a ten-year plan for extending air transport. Cash subsidies to air transporta-

HAWAIIAN AIR TRANSPORT

The Inter-Island Airways Wasp-powered Sikorsky over Windward, Molokai.

tion for the year ending March, 1934, amount to 2,110,000 yen, $648,614.

From Dairen northward in Manchuria there are 2,800 miles of Japanese military air routes in operation, nine routes in all, using 40 planes.

Latvia

Latvian aeronautics is limited largely to the military air force which has about 60 planes of several European types, most of which are old. Riga is served by the German-Russian Air Transportation Company and the Polish Air Transportation Company. Swedish and Russian interests are planning to establish a line from Stockholm to Moscow via Riga.

Lithuania

Practically all aeronautics is military and some new equipment has been added in the last several months. There are about 75 military planes. The only commercial flying is done by the German-Russian Air Transportation Company which serves Kaunas. When the company's concession was extended another year from May 1, 1933, the Government agreed to erect a meteorological station at the Kaunas airport.

The Lithuanian Aero Club has 14,000 members and is doing a great deal to promote aeronautics. The club, which owns a few training planes, plans to purchase a new two-passenger plane abroad. The club flying school turned out its third class in 1933; of the six new pilots two were women.

Mexico

The Mexican Government in 1933 bought modern military equipment. Training planes were added to the military air forces. The organization of the second air regiment was completed. It was equipped with 31 planes built from American plans in the military factory at Mexico City and powered with engines from the United States. Aid to transport operators is granted by the remission of taxes on fuel for aircraft used in commercial service. Payments are made for the carriage of mail and increasing attention is given to ground facilities. There are about 150 civil aircraft, nearly one-third of which are in scheduled services.

There are 212 registered airports and landing fields. The most important is the large, lighted airport at Mexico City. A system has been worked out for marking each airport. On some prominent building in each city and town having an airport in its vicinity there will be large markers including letters and figures indicating the class, ownership, the State in which located, the size, altitude, services available and direction from the marker of the airport or landing field. Thus a flyer can determine from a brief marker the details he may need without difficulty. Improvements in airports are rapid and new landing facilities are being added.

The lines of the Mexican Aviation Company (associated with the Pan American Airways System) operate from Brownsville to Mexico City via Tampico, from Tampico to Vera Cruz and Merida, and from Mexico City to Vera Cruz and to Guatemala City and San Salvador. Another associated company, the Compañia Aerovias Centrales operates from Ciudad Juarez (El Paso) to Mexico City via Chihuahua, Parral, Torreon, Durango and Leon, and from Nogales to Mexico City via Hermosillo, C. Obregon, Navajoa, Los

Mochis, Culiacan, Mazatlan, Durango and Leon. Three new American nine-passenger planes with a high cruising speed were acquired late in 1933. Rutas Aereas Occidentales Guadelajara, another company, operates a three-times-a-week service between Guadelajara and Puerto Vallarta via Ayutla and Masciate, 155 miles. Other short line services are maintained in regions not well served by surface transportation. About 4,600 miles of new routes in Mexico will be opened as conditions warrant.

Foreign flyers have been invited to visit Mexico and the formalities have been so simplified that one may go to a Mexican consulate and arrange a trip without difficulty. The customs airports in Mexico are: Matamoros, Tamaulipas; Nuevo Laredo, Tamaulipas; Piedras Negras, Clahuila; Ciudad Juarez, Chihuahua; Nogales, Sonora; Mexicali, Baja California; Tijuana, Baja California; San Miguel de Cozumel, Campeche; Progreso, Yucatan and Mariscal on the Guatemalan border.

Netherland India

The Royal Dutch Airlines continues to link the colony with Amsterdam by its nine-day weekly service, and the traffic has gradually increased. The local routes operated by the Royal Dutch Indian Airlines have been curtailed to some extent because of light traffic. The Batavia-Bandoeng service makes two flights each way a day. The Batavia-Soerabaja line is daily. Weekly flights are made between Batavia and Alor Star, via Medan. The length of all routes is 1,800 miles.

The contract between the company and the Colonial Government was renewed for a period of three years with the annual subsidy reduced to 700,000 florins, $419,160. The proposed extensions of the Royal Dutch Airlines and the British Imperial Airways by way of Netherland India to Australia have excited much local interest.

The Colonial air forces have a number of Curtiss-Hawk pursuit planes, with Curtiss Conqueror 650 horsepower engines.

Netherlands

Holland proves that a nation small in area can be great in the air. Most of the non-military activities are carried on by one company, the Royal Dutch Air Navigation Company for Netherlands and Colonies, in brief the K. L. M., a leader among European air lines. It operates the longest air service in the world. That is between the Netherlands and Netherland India, some 9,000 miles.

This long intercontinental service is said to need but little subsidy and it is reported that most of the mail guaranteed and paid for by the post office is actually carried, so popular has the service become among the many thousands of correspondents in the mother country and her colonies. Recent discussion has involved the carriage of mails alone over the long route by faster planes in three and one-half days. Another project contemplates Zeppelin service over the same route.

On January 1, 1934, the K. L. M. had in service 34 transports, many powered with American engines. Wright Cyclones and Pratt and Whitney Hornets powered several of the Fokker VIII twin-motored transports, Pratt and Whitney Wasps powered eight Fokker XII tri-engined ships, and six XVIII tri-engined planes carried Wright Whirlwinds, as will the new super-speed transport plane of Pander and Zonen built for fast mail service between Holland and the Dutch East Indies. One type of transport brought out late in 1933 is the F XXII with four American engines in the wings, to seat 21 passengers in European service or ten in reclining chairs on the East Indian route. K. L. M. employs 34 pilots, 20 radio operators and 527 other personnel.

Four manufacturers build airplanes. They turned out about 55 in 1933. Imports of instruments and parts from the United States are increasing.

The K.L.M. in 1933 started two new lines, one from Amsterdam to Berlin via Hannover and the other from Amsterdam to Groningen. The company's traffic for the first eight months of 1933 showed large increases over that of 1932. The planes during the eight months flew 1,615,000 miles, including the service to East India, and carried 28,880 passengers (538 in East Indian service), 230,850 pounds of mail (20,850 in Indian service), and 2,012,800 pounds of express (62,800 in Indian service).

New Zealand

New Zealand's ten flying clubs, all receiving aid from the Government, flew their planes privately 253,160 miles during the twelve months ending October 1933. About 142,000 miles were flown in aerial service operations. There are 30 licensed airports for use by club and private planes. During the last year 113 private pilots' licenses were issued, making a present total of 274. There are 68 civil aircraft of which six are used by the four commercial operators. Sixteen are privately owned. All aviation is controlled by the Defense Department which has 12 military planes.

New Zealand will grant £5,000, $24,333, a year subsidy for the London-Australia air line to be in operation in 1934. Although mail must be carried between New Zealand and Australia by water the saving in time between New Zealand and Europe warrants the subsidy. A project for a New Zealand line, sponsored by Sir Charles Kingsford-Smith, contemplates a four-times-a-week service between Auckland and Dunedin, via New Plymouth, Wellington, and Christchurch, 900 miles, in an elapsed time of eight hours. Another schedule twice a week would be from Auckland to Nelson on the east coast, via Hamilton, Rotorua, Gisborne, Napier and Wellington. Four planes would be used.

Norway

Norway's military and naval air forces carry on practically all aeronautic activities with 40 naval, 75 military aircraft and about 40 training and other planes. The Norwegian Air Transportation Company, with the Deutsche Luft Hansa and with the support of the National Government and the City of Oslo, has maintained summer services from Oslo to Copenhagen and German centers for several years. Plans have been made by a large shipping company to take over the air transportation, put in more capital and increase operations.

A large airport for land and seaplanes at Oslo to cost $800,000 has been projected. The city in 1934 plans to provide some of the required funds for immediate work. Funds for that and two other airports were to be appropriated by the National Government.

Nicaragua

The Central American Air Transportation Company, known locally as Transportes Aereos Centroamericanos or, shortly, "Taca," obtained authority to operate scheduled services and special flights between any airport in Nicaragua and between points in Nicaragua and other Central American countries. There is a regular service between points in Nicaragua and Honduras, Salvador and Guatemala. In July, 1933, authority was granted by contract to the air lines of Nicaragua to operate scheduled services between Managua and other cities having airports, particularly those on the Atlantic Coast and in the northern departments. A tri-engined plane has been used extensively between Managua and Bluefields. The Lineas Aereas Nacionales Empresa Venditti ("Lanev") operates between Managua, Corinto, Bluefields, Jinotega, Esteli, Ocotal and other points. Man-

agua is efficiently served by the Pan American Airways System.

There is a scarcity of surface facilities in Nicaragua and the Government favors any responsible project for air transport. Operators are favored with a number of landing fields developed by the United States Marine Corps although there is difficulty in keeping them free from plant life.

Panama

Panama is an important "cross-roads" for aircraft as well as ocean vessels. The schedules on three routes to the United States, across the northern part of South America, and down the west coast of South America on the Pan American Airways System and the Pan American-Grace Airways, and the Uraba, Medellin and Central Airways service between Cristobal and Medellin, Colombia, are maintained regularly and traffic is growing rapidly. A local service, the length of the Panama Canal, is provided, by the Isthmian Airways, Inc., with three flights each way a day, using eight-passenger seaplanes. The Aerovias Nacionales was organized in 1933 and a twice-a-week schedule started between Panama City and David for passengers, mail and express. There are 12 civil planes in Panama, including a light training plane owned by the Panama Aero Club. A number of the club's members are pilots.

The Isthmian Airways uses the harbors at Balboa and the Folks River at Cristobal. Paitilla Point, in the suburbs of Panama City, is used by Pan American Airways planes. Military facilities are used by civil planes at several points. The hilly terrain and rapid growth of tropical vegetation provide problems in maintaining adequate landing fields.

Paraguay

In 1933 the Government of Paraguay recognized the great need for an air line connecting Asuncion, the capital, with Buenos Aires. Military planes have been purchased, and the air force is undergoing active training.

Persia

The several local lines between important centers in Persia which were maintained by the German Junkers Company for five years were suspended on March 25, 1932. Negotiations failed to restore the services at the end of 1933. The British Imperial Airways changed its Indian route to the southern side of the Persian Gulf

but the French and Dutch lines to the Far East continue flying over Persian territory, making stops at Bushire, Lingeh and Jask.

Ten British training planes and 30 fighting planes were purchased in Great Britain for the Persian air forces. Forty American engines and metal propellers were bought for military planes.

Peru

During 1933 the Peruvian Government bought a number of Curtiss-Wright military airplanes powered with the Wright Cyclone engine. Commercial planes were taken over for military duty and the service of the Faucett Aviation Company was disrupted. It resumed on July 1, 1933. The company's planes carried 81 tons of cargo for the Government during a short period. The Naval Air Line was of great importance to the military forces because it provided the only means of transportation except pack trains over a considerable section of the country. The Faucett Aviation Company was authorized by law to continue its scheduled services for ten years from June 4, 1933. The Pan American-Grace Airways was awarded a concession to operate its schedules for ten years, beginning March 28, 1933.

Philippine Islands

Aviation received impetus in 1933 by the Government's tentative plan for development of an air section in the Constabulary, more airports and other ground facilities, additional air lines, and a survey flight of Pan American Airways' representatives projecting a twice-a-week schedule between Manila and Shanghai.

The public program, as planned, provides 1,262,568 pesetas, $631,284, during the next three years for the development of the Constabulary unit, 12 intermediate landing fields on established air routes, improvement of the Manila airport and six new provincial airports.

The Philippine Aerial Taxi Company, using six American planes, operates regularly between Manila and Baguio and Manila and Rosario, 239 miles. The Iloilo-Negros Air Express Company operates twice a day between Iloilo and Bacolod and between Iloilo and La Carlota, three times a week between Iloilo and Manila, twice a week between Manila and Bacolod, via Iloilo, and weekly between Manila and Cebu, via Iloilo, between Iloilo and Zamboango, via Cebu, and between Iloilo and Fabrica, a total of about 775 miles. Manila has an aerial taxi service. During the first seven months

of 1933 the Philippine lines flew 180,687 miles and carried 10,948 passengers.

There are nine licensed pilots and 29 licensed airplane and engine mechanics and welders. The operating companies have their own flying schools. Ground school instruction is offered by the Philippine School of Aviation and the Philippine Military Academy at Manila. There is no manufacturing. A dozen planes are registered, two privately owned.

The two airports owned by the Government at Baguio and Cebu, nine privately owned airports, and ten military and naval fields which are open to civil planes, encourage all forms of flying.

Poland

Geographical and political factors add to the importance of Poland in aviation. Between Germany on the west, Russia on the east, the Baltic countries to the north and several eastern European countries to the south, and with level terrain, Poland is a natural and strategically important flying center. A military air force, said to be made up of 9,200 officers and men with 1,300 pilots and 1,000 modern planes, makes the nation a power to be considered in any future war.

Interest centers in military aviation and all aeronautical activities are centered in the air force. There are one Government and three commercial manufacturers of aircraft and three aircraft engine plants. Many planes are built to foreign design under license but prize-winning planes of Polish design have been produced. The 1932 European Air Challenge competition for light planes was won by a Polish plane built at the shops of the Warsaw Polytechnic School of Engineering. Ninety engines of the British Bristol Jupiter type were to be built during the year by the Skoda Works at Warsaw. Two hundred engines of an American type were produced by that plant recently and negotiations started for building another American type of engine there. Instruments and other accessories are imported, but the national policy favors domestic production. Poland sold planes to Rumania in 1933.

The Glider Construction Works at Warsaw and the Aero-Association of students of the Lwow Polytechnic Institute build gliders of which there were 77 in Poland in 1933. There were more than 300 glider pilots.

There are more than 200 licensed civil pilots in Poland. Of the 129 civil planes, early in the year, 50 belonged to the flying clubs. The academic clubs at Krakow, Lwow, Poznan, Warsaw

and Wilno are associated with the Flying Club of the Republic of Poland. The National Air Defense League with several hundred thousand members maintains a civil pilots' school at Radom. The Association of Polish Flyers in Poznan and the Lublin Aviation Club are active. There are three technical research institutes. The "Veritas" Bureau has technical control of civil aircraft; and the Association of Polish Aeronautical Industries operates from Warsaw.

There are 25 public and four private airports. Six military airports are closed to civil planes. All airports are lighted and fully equipped. Radio stations of the Ministry of Communications operate at the principal airports. Direction finding equipment is planned for the Warsaw, Katowice, Krakow, Lwow, Poznan, Torum and Wilno airports. The meteorological service is provided by the Government Institute of Meteorology and Hydrography, controlled by the Ministry of Communications in cooperation with the chief military meteorological station. There are 38 first-class synoptic stations, 42 second-class meteorological and 72 observation stations. The Warsaw-Danzig, Warsaw-Poznan, and Warsaw-Lwow routes, over 500 miles, are lighted at intervals of 35 miles.

Schedules are maintained by the Polish Air Transportation Company which is publicly owned and managed. The routes connecting Warsaw with other Polish cities and with Vienna, Danzig, Riga and Tallinn and Bucharest, Sofia and Saloniki measure more than 3,000 miles in length compared with 2,300 miles last year. Thirty planes are used, including several tri-engined, ten-passenger transports powered with Wright Whirlwind engines.

Portugal

The Aero Club has trained 12 civil pilots.

The Portuguese army air service has 90 planes and the navy air service 24. Imports for the military services numbered 18 planes in 1932 and 19 in 1933, including five Fleet Model 10 seaplanes for the Navy. Twelve planes were built in 1932 and 17 in 1933 at the military airplane factory near Lisbon. These planes were of French and British design. Engine production after British designs numbered 25 in 1932 and 17 in 1933.

Rumania

Practically all aeronautics in Rumania is military in character, and control of civil activities has reverted to the military authorities.

There are about 150 military planes in active service. The people feel the need of sufficient air power to defend the country on short notice. The military planes actually available total about 500. There are approximately 500 pilots, about one-third of them civilians.

The Royal Rumanian Air Club has most of the outstanding personalities in its membership of 650. That club and the Rumanian Association for Air Propaganda assist flying schools which turn out pilots capable of using light planes. These pilots can go to the Government school for further training.

Aircraft are produced largely in the three local factories. Foreign designs are followed in most instances and some equipment is purchased abroad, principally in France, Great Britain and Germany.

A governmental organization operates commercial air lines over two routes, 700 miles, during the summer months. Four Junkers six-passenger planes, one Junkers tri-engined ten-passenger and three Avia six-passenger planes are used. The Air France and the Polish Air Transportation Company also maintain schedules linking Rumania with other countries.

Siam

The Siamese Aerial Transport Company operates a twice-a-week service in northeastern Siam over a distance of about 385 miles using four light British planes. This company was formed in 1931 to take over the commercial services maintained by the army air force since 1922. The Government controls a majority of the stock. The mail contract with the Government is on the kilogram-kilometer basis, and is equivalent to 20 cents per pound per 100 miles. Plans for extension of the company's service to Hanoi, French Indo China, and possibly up into China were to be carried out in 1934. For the fiscal year ended March 1933 the company carried 50 passengers, 26,251 pounds of mail and 5,499 pounds of express. The planes flew 71,612 miles. There were no accidents, with few interruptions in service.

Manufacture of aircraft is relatively extensive and under military control. A number of engines and a few military airplanes are imported.

Siam is served by the Royal Dutch Airlines, British Imperial Airways and the Air France, each of which maintains weekly service to the East and to Europe. Air mail time between Siam and the United States over a recent seven months period averaged less

than 20 days compared with an average of 36 days for ocean mail.

Spain

Control of all aeronautics is centered in the National Government of Spain, but partial autonomy was arranged for Cataluña late in 1933. The Direction-General of Aeronautics under control of the Council of Ministers was created early in the year to assume the functions formerly exercised by the Direction-General of Civil Aeronautics, the Bureau of Military Aviation, the Bureau of Naval Aeronautics and the National Meteorological Service. The Superior Council of Aeronautics including the President of the Council of Ministers, the Chief of the Major Central Staff of the army, the Chief of the Major Staff of the navy, the Undersecretary of Communications, the Director-General of Aeronautics and a secretary was organized during 1933. Air force plans contemplate a Spanish Air Armada, the Air Corps of Aerial Defense and the Air Corps for Cooperation with the army and navy. There will be an air tactical school. A general aeronautics school to train military, naval and civil personnel has been opened.

The Spanish Air Mail Line continued the daily, except Sunday, schedules between Barcelona, Madrid, and Seville, 571 miles. During the first nine months of 1933, in these services, the ten planes flew 254,600 miles and carried 3,600 passengers, 126,544 pounds of mail and printed matter, 90,022 pounds of baggage and 33,550 pounds of express. Traffic was slightly less than for the similar period in 1932 when the services were operated on Sundays.

The L.A.P.E. operating from Central Europe down the west coast of Africa is using Ford planes powered with Wright Whirlwind engines.

A weekly schedule between Seville, Larache, Agadir, Cape Juby, and Gando, Canary Islands, was started in November by the Spanish Air Mail Line, using three three-engined planes. Subsidy payments for this line equal $1.40 a mile. French, German and Italian lines link Spain with other countries.

An airship base at Seville has been authorized by the Ministry of Public Works. A mooring mast, 185 feet high, a hydrogen gas plant and tanks, pipes and other equipment necessary to the handling of airships, with an adequate hangar, are being established. German engineers are employed on construction. These facilities are for use at present by German airships operating between Europe and South America.

The Government has provided about 70 airports most of which are open to civil planes.

The Spanish Aeronautical Federation is composed of regional federations which are made up of the widely scattered flying, glider and other clubs. There are six glider clubs at Madrid alone. The Federation receives and distributes to the member associations a subsidy from the National Government.

Construction of aeronautical equipment in Spain, using foreign designs where necessary, with Spanish capital and labor, is a fixed policy. The army shops at Madrid and the naval aircraft plant at Barcelona repair all types of flying equipment and build some planes. In addition there are three commercial airplane and two engine manufacturers. These are relatively large companies and their several plants are scattered widely. Private purchasers of small Spanish-made planes and gliders receive cash subsidy payments from the Government.

Straits Settlements and Malaya

Aeronautic activities in this section are confined mostly to two flying clubs, the Royal Air Force which has an important base at Singapore, and the weekly services of the British Imperial Airways and the Royal Dutch Airlines which serve Alor Star and Singapore. There are about 60 licensed pilots two of whom own light airplanes. The Kuala Lampur and the Singapore flying clubs each have three training planes. The Kuala Lampur club receives Government aid to the extent of $14,000 annually; the Singapore club, distinguished because it uses seaplanes exclusively, received $34,200 on its formation in 1928 and since then an annual sum of $11,400. Its planes may be used in the campaign against smuggling following recent highly successful flights for that purpose.

A large airport is under construction at Singapore, 70 acres have been reclaimed from a nearby swampy area. The British Imperial Airways was to extend its service to Australia in 1934. The Royal Dutch Airlines uses the military base at Seletar on the northeast coast of the island, 20 miles from Singapore. Radio and other facilities are in use. The meteorological service of Malaya provides weather data.

Sweden

In Sweden during 1933 the Royal Air Force, which is both mili-

tary and naval, had 200 planes, three-fourths in active service. Its training planes are powered with Wright Whirlwind engines.

The Swedish Air Transportation Company operated its Stockholm-Abo-Helsingfors schedules in cooperation with the Finnish Air Transportation Company and during more months of the year than ever before. The Swedish company, in cooperation with the Royal Dutch Airlines, continued the "Scandinavian Air Express" between Malmo and Paris and London, the Swedish planes going as far as Amsterdam. The company operated a section of the night air mail service between Helsingfors, Stockholm, Malmo, Copenhagen, Hamburg, Amsterdam, Rotterdam and London and Paris from May to September. A new line between Stockholm and the summer resort at Visby, Gotland, was operated by the company in July and August, and it was planned to extend it to Riga, there to connect with a Russian line from Moscow. A 21-passenger plane for delivery to the Swedish company early in 1934 was to be powered with four American engines. A high speed American mail plane was to be delivered to the company early in 1934. Sweden has five airplane and engine factories. One is working on a new "turbine plane." The others build largely after Swedish and German designs, while the engine factory uses British designs. There are two promotional societies—the Swedish Air League with 1,200 members and the Royal Aero Club of Sweden with 600 members and branches at Gothenburg and Malmo. The Stockholm Flying Club has 60 members.

One of several airports under way is that at Molndal, four miles from Gothenburg. The program of providing emergency landing fields between Stockholm and Malmo and between Malmo, Gothenburg and Oslo, Norway, was advanced and tests with lighting equipment for these routes were made in 1933.

Switzerland

Scheduled air traffic in Switzerland showed further development in 1933. There were 85 civil planes and 220 pilots. There are six customs airports of entry. The first-class airports are those at Basel, Geneva and Zurich. Second-class airports are at Berne, Lausanne and St. Gall. Those at Biel and La Chaux-de-Fonds are considered third-class. There is considerable sight-seeing and aerial service at all airports.

Air passenger traffic increased 14.4 per cent over 1932 during the summer season of 1933, May 1 to October 31. Mail traffic increased 23.7 per cent and baggage and freight traffic 5.2 per cent.

The "Swissair" company operated a new service between Zurich, Basel and Frankfurt. That company employs the fastest aircraft in commercial use in Europe, and additional fast planes were purchased in the United States with a view to maintaining a leading place. It is now using 330 horsepower Wright Whirlwind engines in its fleet of tri-motored transports and Wright Cyclones in its American high speed Lockheeds. A General Aviation GA-43 and a Curtiss-Wright Condor, both Wright Cyclone-powered, will be delivered in 1934.

Switzerland, because of her central location and small area, is in a strongly competitive position requiring resourcefulness and good management, in air transport, a fact which is apparent in the success of "Swissair."

Turkey

Much new equipment was acquired by the Turkish air forces in 1933. The monthly lotteries of the Aviation League continue to assist in providing planes and training. A flying club has been organized at Istanbul.

The Office of the Undersecretary for Sea and Air Affairs in the Ministry of Economy was created by law on May 31, 1933, and this office will regulate civil aviation. Approximately $120,000 was voted for the expenses of the office during the year ending May 31, 1934. About $100,000 will be spent to promote civil aviation under other budget items.

The Turkish commercial air service between Istanbul and Ankara, via Eskisehir, 300 miles, with flights on Mondays, Wednesdays and Saturdays, was started on May 27, 1933. By a law effective on May 27, a special organization, civil in character and a legal entity, was set up in the Ministry of National Defense and called the Administration for the State Exploitation of Air Routes. Operations are on a commercial basis. The Curtiss-Wright six-passenger, twin-engined Whirlwind-powered Kingbirds are in service. The passenger fare is equal to rail and Pullman fares. The Administration insures each passenger for 10,000 Turkish pounds.

Istanbul is served by French and Italian companies.

In addition to the airports at Istanbul open to civil planes, Bayukdere for seaplanes and Yesilkoy for land planes, there are others at Ankara and Eskisehir, with 14 emergency fields on the airways.

The Turkish Government airplane factory at Kayseri, operating under the supervision of Curtiss-Wright personnel, completed six Curtiss Fledgling training planes equipped with Wright Whirl-

wind engines. The same factory at the end of 1933 was constructing six Curtiss Hawk pursuit planes with Wright Cyclone 700 horsepower engines and having a top speed in excess of 200 miles an hour. The motors are American-built and the planes are constructed with materials from America. These planes will augment the 24 Curtiss Hawks powered by Wright Cyclones and six Curtiss Fledglings powered by Wright Whirlwind engines shipped to Turkey during the last 18 months.

U. S. S. R.—Russia

Operation and control of all Russian civil aviation center in

AMERICAN PLANE FOR SWITZERLAND

General Aviation's GA-43 low wing, all-metal transport, with Wright Cyclone engine, over New York before delivery to the Swiss Air Lines.

the Chief Administration of Civil Aeronautics, which is attached to the Soviet of Peoples Commissars. The Administration has organized manufacturing and operating trusts to handle phases of aeronautic activities. The trusts operate as far as possible like commercial undertakings.

Civil aviation is regarded as a military reserve. All organizations are closely linked with the military air forces, and their activities are in support of air force development. It is reported that about one-third of the public funds are spent for land, sea and air

forces, and that the air forces are considered of the greatest importance to the defense of the vast areas in Russia. The civil aeronautics budget for 1932 amounted to 89,745,000 rubles (nominally $46,500,000) of which nearly one-half was for the purchase and development of equipment, one-fifth for schools and research and about one-eighth for airports and ground organization. That was exclusive of special sums for associated activities and the aid of the Osoaviakhim or Society for Air and Chemical Defense. This society is a powerful aid for the Chief Administration for Civil Aeronautics as well as the military air forces. The Osoaviakhim, with over 6,000,000 members, publicizes aeronautics and collects funds for research work, the construction of large numbers of all kinds of aircraft and kindred purposes. Periodicals contain voluminous material on the importance of air defense and the development of civil aeronautics. That activity, together with educational and training work, is said to have made Russia the most air-minded of all nations. Late in 1933 a committee was organized to cooperate in the development and construction of airships, and several million rubles were collected for the purpose.

The number of active pilots in 1933 was 5,400. Total military air personnel was reported at 33,000. These figures compare with 2,000 active and 350 reserve pilots and total aviation personnel of 26,600 in 1931. The Administration is assisted in its training of aviation personnel by the Osoaviakhim and by the Society of Friends of the Radio which trains radio operators for civil aviation. There are 35 flight training centers. The Osoaviakhim has a number of schools and clubs where it provides instruction. A number of institutions give engineering and other technical courses.

The Aviation Engineering Academy, the Central Hydroaerodynamic Institute and the Engine Research Institute are important among the several research institutions. They are well equipped, and a number of improved processes and materials have been reported.

The number of planes in scheduled air transportation service is about 500. The latest dependable information places the number of military planes at 2,700, exclusive of training, compared with 1,500 in 1931.

In two years to January 1, 1934, the number of important airplane factories had increased from 16 to 20, and annual production from 700 to between two and three thousand planes. Planes of all types from small trainers to five-engined 38-passenger transports are produced. One plant reports a production of 2,000 engines a year. An important factory near Moscow, employing 14,000 per-

sons in three 8-hour shifts, seven days a week, turns out about 600 planes a year. These are three-engined, 300 horsepower, seven cylinder radial, nine-passenger planes, twin-engined bombers and twin-engined observation planes. There are facilities for the production of a thousand gliders annually. The first semi-rigid airship of Russian design and construction was tested early in 1933.

Every effort is made to design and produce all aeronautical equipment in Russia. A few foreign planes, principally German and Italian, are used in air transport. Several German Diesel engines have been imported. But importations are relatively small. Every factory carries on research and experimental work. There is much pride expressed in progress in working out new and improved designs, in the development of improved metals, in the successful use of electric welding, in the accomplishments in building air and

ENGLAND BUYS A VOUGHT

This Wasp-powered Vought Corsair with Hamilton controllable pitch propeller was constructed on order from the British Air Ministry.

water-cooled engines of all needed capacities and in the successful prompt introduction of changes and improvements during manufacture.

There were 170 airports and 700 landing fields on January 1, 1934. Many of the airports have radio stations. About 3,700 miles of airways are reported to have lighting facilities. There is much local criticism of airport and other ground facilities.

Scheduled air transport operations extend across Russia, east to west, to the south and to the southeast. Omitting duplications, they number about 35 and measure 20,148 miles, including the services between Moscow and Leningrad and Berlin, 1,695 miles, operated by the German-Russian Air Transportation Company. Russian ANT-9's, tri-motored transports, powered with Wright Whirlwind

engines, were used on that route. Schedules vary according to season, flights being more frequent in summer months but progress is being made in increasing winter operations. Occasional flights are made on additional routes and efforts are being made to extend service into the northern regions. The Moscow-Irkutsk line, 2,924 miles, and the Irkutsk-Vladivostok line, 2,156 miles, represent magnificent pioneering achievements.

Union of South Africa

The Union of South Africa is linked with Great Britain and other parts of the British Empire by Imperial Airways which in 1932 extended its weekly service into the Union. The Union Airways has built up a lucrative daily passenger and freight business between Durban and Johannesburg, and it has an air mail contract covering this service as well as between Durban and Cape Town, via East London and Port Elizabeth. The South-West Africa Airways operates a weekly mail and passenger service between Windhoek, S. W. Africa, and Kimberley where connections are made with Imperial Airways.

Official statements that air services would be operated by the railroads or in close operation with them were made in 1933. Some late changes have tended toward control by public railroad officials and it is expected that all forms of transportation will ultimately be centrally controlled. The flying clubs which have been of great importance will continue to offer taxi and miscellaneous flying services.

Steps have been taken to improve the air force and it is reported that a factory soon will be provided for the manufacture of aircraft using British engines and designs, with the latter modified to meet local conditions. Airports have been improved in many instances and this work is under way throughout the Union. Several new airports and landing fields were built during 1933.

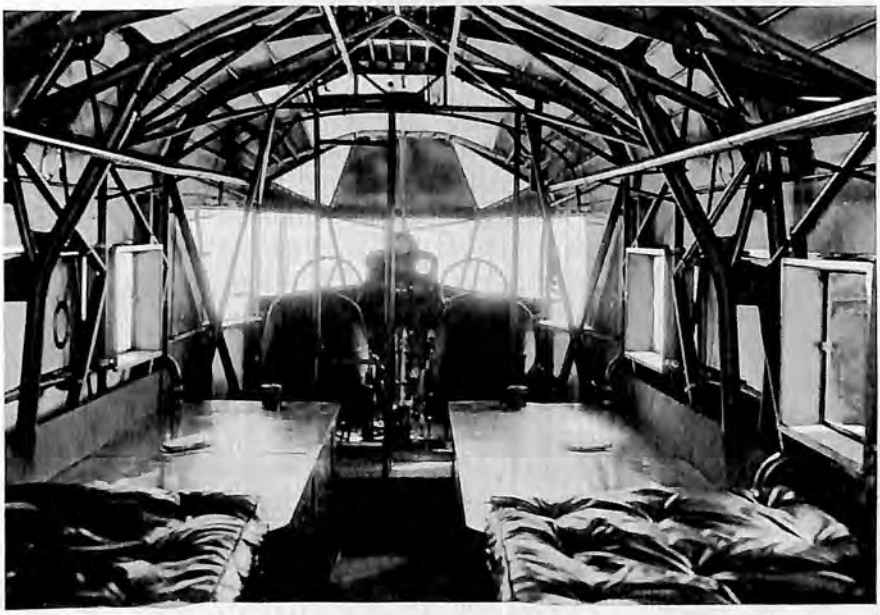
Uruguay

The Government of Uruguay in 1933 planned to continue the construction of a naval and commercial airport on the Isla Libertad in the Montevideo harbor and purchase additional planes for the military flying school, but funds were not available. French equipment for the school was secured during the year. A more simplified procedure for the clearance of commercial planes was decreed on April 27, 1933. The Pan American-Grace Airways, the Pan Amer-

ican Airways System and the Air France continued their scheduled services respectively, providing three flights a week to the United States and one a week to France.

Venezuela

A French air line company recently sold its Venezuela concession to a local company, Linea Aeropostal Venezolana, which continues the use of personnel and equipment and has purchased three



INTERIOR OF THE BYRD CONDOR

Working quarters of the explorers as they fly over the Antarctic wastes.

new planes of the same type. The Pan American Airways service, with flights twice a week, maintains schedules along the coast with stops at Maracaibo, Cumarebo, where a new airport has been completed; La Guaira, Maturin and Caripito. The Government is reported to have purchased three additional French planes, increasing its air fleet to 14 machines. One other plane is used by an oil company. There are no private or commercial taxi or miscellaneous flying activities. Most of the military flying is centered about the military aviation school at Maracay.

Yugoslavia

Yugoslavia's aeronautic activities are centered in military forces with about 700 pilots and a like number of planes. The Yugoslav Royal Aero Club has 17 branches, each of which may have subsidiary organizations. Most of the flight training is in military schools. The national policy is for domestic production of all equipment. The four factories (one of them state-owned) are considered capable of producing 250 planes a year from one Yugoslav and several French designs. The plants which manufacture British, French and Czechoslovak types of engines can produce some 225 units annually. There are about 25 civil planes, a third used in scheduled air transport operations.

The Yugoslav Air Transportation Company, because of reduced subsidies, has cut schedules since 1930 and of late has cooperated closely with the Air France organization. The company purchased supplies and planes, and established a good repair shop. It has a concession for the sale of fuel and oil and for repair work to civil planes at Yugoslav airports. In 1933 the company operated services over the Belgrade-Skoplje-Saloniki, Belgrade-Zagreb-Gratz-Vienna, Zagreb-Ljubljana and Zagreb-Susak routes, a total of 945 miles. In 1932 the company's planes flew 150,026 miles and carried 1,507 passengers, 4.489 pounds of mail and 86,065 pounds of express and baggage.

WING STRUCTURE OF BOEING TRANSPORT

The duralumin ribs of the all-metal planes in service on United Air Lines.

CHAPTER XVII

MANUFACTURING AND ENGINEERING

Technical Development—Trends in 1934—Airplane Manufacturers Engine Manufacturers—Accessory Manufacturers.

FASTER and more comfortable airplanes, more powerful engines and more efficient propellers, with vastly improved navigational instruments and other accessories, characterized the technical branches of aviation in 1933, and pointed the way to still greater development during the next 12 months.

Speeds of 200 miles an hour, formerly limited to military machines or special racers, became a feature of regular transport planes in the United States, represented by several models produced by as many manufacturers. The German single-engined Heinkel-70 was the fastest and probably the year's only commercial product doing more than 180 miles an hour in all Europe.

In the United States the low-wing, all-metal monoplane cruising at upward of 190 miles an hour with from 12 to 14 passengers and cargo became an actuality; while in other countries the technicians had not been able to combine speed with passenger accomodations, as evidenced by the presence in the United States at the end of the year of foreign aeronautical agents either buying the American machines or negotiating for the rights to manufacture.

Meanwhile the engineering staffs in American aircraft plants derived additional satisfaction from the fact that their new military planes under the most rigid test conditions were making the world's highest speeds, type for type.

On January 1, 1934, the trend in Europe was toward commercial planes cruising at 250 miles an hour and fighting machines doing 300 miles an hour at normally high altitudes under practical service conditions. That was their objective. In the United States leading engineers agreed that such performances are possible with the present technical knowledge, provided there is a continuous program of development over a period of from three to five years. It was admitted that the liberal funds devoted to long-term military directives by the Governments of Great Britain, France, Italy, Japan and Russia, and even Germany, might conceivably place the United States at a serious disadvantage within two or three years, if

similar programs were not undertaken by the American Government.

In the United States the development of commercial aircraft still remained wholly a matter of individual initiative and private enterprise; and the fact that transport planes were in the ascendancy as compared to private-owner and light plane types, may be attributed solely to the orders, aggregating about eight million dollars in value, which the air lines placed with the manufacturers in 1933.

Internally braced cantilever monoplane design featured all the new transports, with the exception of the Curtiss-Wright Condor in the United States and the Boulton & Paul in Europe, both biplanes.

Conversely, the private airplanes brought out in the United States were largely biplanes or externally braced high wing monoplanes, while in Europe they followed the trend in transport development, being predominantly low-wing cantilever monoplanes.

Refinement in design, with streamlining of a high degree, was responsible for much of the increased speed. Stressed skin wings, retractable landing gears, controllable propellers and high lift devices either enhanced the speed or otherwise contributed to efficiency of operations. Wing flaps—air brakes—slots and wing to fuselage fillets showed promising development at the end of the year. Control surface tabs became almost standard equipment on all fast planes. They were used to help balance the control surfaces or as trimming surfaces, which being controllable from the cockpit, could be employed in deflecting the ordinary surface to change the trim of the plane or, in combination, for both balance and trimming. As trimming surfaces the tabs eliminated the stabilizer adjustment. The use of fillets to eliminate flutter at high speeds showed considerable promise at the end of the year. Flaps to reduce landing speeds and serve virtually as air brakes were employed effectively, although admittedly in the initial stages of development. They were receiving more attention than ever because of the problems attending their use experimentally. Various types of flaps reduced landing speed and steepened the angle of glide, but at the same time presented a problem of maintaining lateral control in the new landing speeds.

Notable increase in the rated power of radial air-cooled engines was brought about by improved cooling, better cylinder fin heads and intercylinder air deflectors, improved cowling design and baffling of cylinders. The power increase in water-cooled engines, as represented by the Curtiss Conqueror, was developed by ground boosting through ramming scopes or intakes on the installations, the use of stellited face valves and similar refinements. Increased

power for approximately the same engine weight was an important contribution of the year.

In his successful efforts to improve his product the engine manufacturer was able to specify and obtain a definite minimum anti-knock or octane value for fuel to be used in each case; and that permitted higher compression ratios and supercharging pressures. Yet there was evidence that the limit in power as compared to weight had not been reached. At the air races, for example, some engines were boosted to develop nearly 50 per cent more than their rated horsepower. During the year 14-cylinder radial engines were installed in military planes and at the same time they appeared on commercial planes for experimental service.

OUT ON TOP

Lt. Commander Frank Hawks over Southern California in his new Texaco "Sky-Chief"—a Northrop Gamma, with a 14-cylinder Wright Whirlwind, supercharged for high altitudes.

The trend was toward still larger and more powerful engines; and a definite need existed in the United States for motors of 1,000, 1,500 and 2,000 horsepower to meet the competition developing in Europe and to satisfy the demands for larger power units on over-water craft, particularly flying boats capable of transocean flying with pay loads.

Possibly a thousand or more different improvements entered into the development of aircraft, engines and parts during the year, and chief among them were the new departures in metal fabrication. Metal definitely became the favorite among airplane de-

signers because of its greater inherent strength, rigidity and durability, coupled with the new corrosion-resisting processes.

At the same time, combinations of metal, wood and fabric were still favored by some designers because they tended to dampen vibration, though aluminum alloys still dominated the field at the beginning of 1934. Physical properties were improved by using dural and magnesium requiring lower heat treatment temperatures. Chrome nickel promised corrosion-resisting properties superior to aluminum alloys. Copper-beryllium alloys were being used to some extent, as was phosphor bronze. Heat-treated chrome-molybdenum or chrome-nickel-molybdenum forgings were being used to replace welded steel fittings. Stainless steel was not overlooked, being in favor for specific purposes.

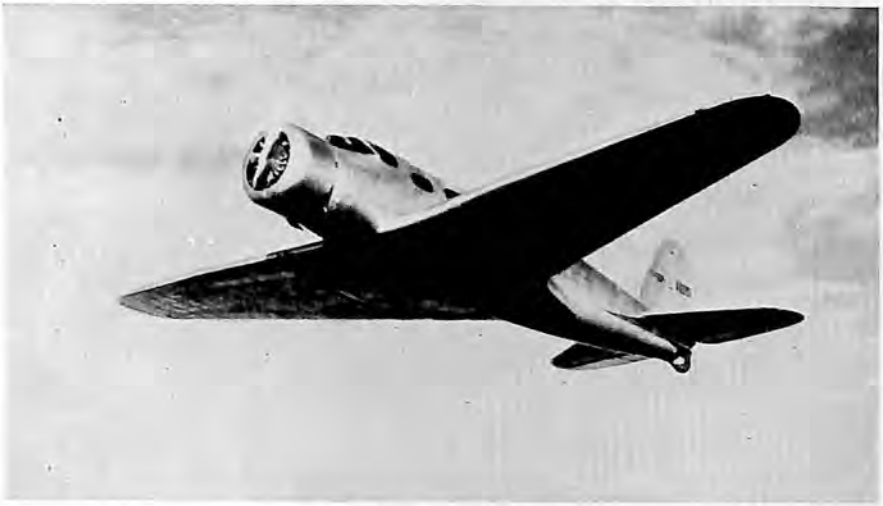
Each of the several types of controllable pitch propeller was further developed during the year and in service on both military and air line machines. In combination with the more powerful engines they contributed materially to the efficiency of operations. The controllable pitch propeller proved that it could hold the engine to its rated horsepower on take-off and climb, and at the same time materially increase cruising speeds. Equally important, it increases the propulsion efficiency of multi-engined planes with one engine dead; and further, contributes to performance in high altitude flying.

Outstanding was the American development in sound-proofing, brought about by improved motor exhausts, geared engines and three-bladed propellers which reduce the propeller noise, and the scientific insulation of the airplane cabin. Noise reduction in the cabins and elimination of excessive vibration in the instrument boards were twin problems for years; and they were under way to solution at the end of 1933, with a record of remarkable accomplishment. Anti-vibration mountings for instruments, flexible engine mountings, insulated walls and bulkheads and a technically correct choice of materials and location of windows, ventilators and other "noise-leaks" have eliminated the most objectionable, disturbing noises, with promise of still further improvement.

The automatic pilot was further developed during the year, when engineers of the Sperry Company added a hydraulic control system. The relative movement between the gyros and their casing is converted by means of a pneumatic pick-off and relay system into movements controlling a hydraulic servo unit which in turn provides the power for moving the controls of the plane. The automatic pilot was adopted as standard equipment on the new Douglas transport to enter TWA service early in 1934.

The development of a radio approach system to permit landing

on a fog-shrouded airport with ceilings as low as 50 feet, was under way at the end of the year. Regular aircraft radio receiving sets in the plane and a radio range beacon with two marker beacons on the ground form the experimental equipment. The pilot flying blind picks up the signal of the first marker which he identifies by its audio frequency note. When it fades out he knows he is directly over its antenna, the location of which he knows. Gaging his glide toward the airport he soon picks up the second marker; and when it fades, he again knows his exact position near the field. The Department of Commerce tests were promising, though officials warned that the new system, as well as the major system of blind radio landing, was still in the experimental stage.



THE VULTEE TRANSPORT

A new low wing, all-metal transport monoplane with retractable landing gear. The engine is a Wright Cyclone.

The compression ignition type engine was still in an experimental state at the end of the year, limited principally to one project in the United States and two in Europe. The steam engine as a power plant for aircraft was receiving attention on both continents. The Besler brothers' steam engine plane was flown experimentally at Oakland, Calif.

While American builders, subject to the specifications of air line operators, limited their overland transport planes to 12 or 15 passengers, the British, Dutch and Russians continued to produce 18 to 32 passenger planes, confident that they can be developed to operate economically and efficiently. In the United States the

larger machines were limited to over-water craft, two models of which, the Sikorsky and Glenn Martin designs, were to take the air in 1934.

Airplane Manufacturers

Aeronautical Corporation of America, Cincinnati, O., continued refinement of its basic model the Aeronca C-3, a light two-place monoplane powered with an Aeronca E-113A engine. Several of these models equipped with Edo floats were delivered to purchasers during the year.

American Eagle-Lincoln Aircraft Corporation, Kansas City, Kan., produced six units in 1933. Four were of the trainer type and two were cabin models.

Amphibions, Inc., Garden City, N. Y., concentrated development on its three-place cabin amphibion known as the Privateer P-3B. This model powered with a Continental R-670 offered many refinements in efficiency and passenger comfort over the original designs which appeared in 1932.

B/J Aircraft Corporation, Baltimore, Md., a division of North American Aviation, Inc., consolidated its management with that of General Aviation Manufacturing Corporation in May. This consolidation was effected through the merger of General Aviation with North American. The activities of B/J remained concentrated on military design and production. During the year 26 02-J's were delivered to the Navy. The 02-J is a two-place observation powered with a Pratt & Whitney Wasp Junior and is available either as a land plane or a seaplane. Negotiations were completed for an additional number of these planes for the Naval Reserve. Two experimental planes were also delivered to the Navy. These were a two-seater fighter designated as the B/J XF2J and a single-seater fighter designated as the B/J XFJ3J.

Barling Aircraft, Inc., St. Joseph, Mo., produced a six-place cabin monoplane in 1933 using a conventional, tubular, fabric covered fuselage, with stamped dural for the wings.

Beech Aircraft Company, Wichita, Kan., completed its experimental work and made available to the market a series of four-place cabin biplanes powered with Wright engines. The three basic models had advertised speeds of 170, 200 and 240 m.p.h., depending on the choice of engine.

Bellanca Aircraft Corporation, New Castle, Del., announced its now Senior series of Skyrocket and Pacemaker models. These models were equipped with full N.A.C.A. type engine cowls, new

low drag landing gear, wheel type controls and many refinements in passenger comfort. These new models are six-place cabin monoplanes and are equipped with Pratt & Whitney S1D1 Wasp and Wright Whirlwind 420 engines respectively. Ten C-27A transports were delivered to the Army Air Corps. This model, commercially available as the Airbus, is a 12-place monoplane. The Aircruiser series was available either as a passenger transport of 15 places or as a cargo plane. Both the Airbus and Aircruiser models are powered with either Pratt & Whitney Hornets or Wright Cyclone engines.

THE BESLER STEAM ENGINE PLANE

National Aeronautic Association observers fueling the plane before its demonstration flights at Oakland, Calif.

Boeing Airplane Company, Seattle, Wash., a division of United Aircraft & Transport Corporation, completed an order for 60 all-metal, low wing twin Wasp-powered monoplane transports for United Air Lines. Fifteen additional planes of this design were constructed for the general transport market. Known as the Boeing 247 the transport was flown 10,000,000 miles during 1933 from sea level to 15,000 feet in temperatures ranging from 110 degrees to 30 below zero. It was the first high-speed multi-engined transport to use supercharged engines of the type formerly confined to

military planes; and it was said to be the first production transport to have complete interchangeability of all main parts one plane with another. The Boeing transport, going from design into full production, and thence in service on United Air Lines, made possible the first "same day service" between the Atlantic and the Pacific. Passengers could leave New York shortly after midnight and arrive in San Francisco the evening of the same day. The Boeing 247 is 51 feet 4 inches in overall length, has a wing spread of 74 feet and represents one of the latest developments in transport streamlining, with retractable wheels and internally braced surfaces. The Boeing company in 1933 also began production on a fleet of all-metal, low-wing single-seater pursuits powered with Pratt & Whitney Wasps for the Army Air Corps. The first of the production series was flown late in the year. Early in 1933 Boeing delivered to the Air Corps the last of an order of seven all-metal, low-wing twin-engine (Hornets) bombers, and completed a Navy contract which called for 113 aircraft carrier fighters of the F4B-3 and F4B-4 single-seater, Wasp-powered types.

Consolidated Aircraft Corporation, Buffalo, N. Y., during 1933 designed and constructed the Model-11 Fleet powered with the Kinner R-5, 160 horsepower engine. This model which is basically the same as the Model 5 and 10 Fleets, was redesigned and power added to permit installation of guns and bombs. Consolidated delivered to the Air Corps the YIP-25, a two-seater pursuit powered with a Wright Conqueror supercharged engine, and began production on four P-30 models, a plane of the same general design as the YIP-25. An order was also received for four A-11 attack planes. That model is basically the same as the P-30, incorporating necessary changes to adopt it for attack work. To the Navy, Consolidated delivered the XB2Y-1 dive bomber powered with a twin-row Wasp Junior. Twenty-one P2Y-1 long range patrol flying boats were delivered to the Navy. These boats were powered with two Wright Cyclone E-1 engines. An additional boat of the same type designated as the XP2Y-2 was also delivered. This boat was changed to incorporate Wright Cyclone F engines, which were located in the leading edge of the upper center section instead of between the wings as in the P2Y-1.

Curtiss Aeroplane & Motor Company, Inc., Buffalo, N. Y., a division of Curtiss-Wright Corporation, concentrated on military production, with 1,200 employees. A new two-place, all-metal observation monoplane, the YO-40B (700 horsepower Wright Cyclone) was developed for the Army Air Corps, and production started on five. Forty-six A-12 Shrike (700 horsepower Wright Cyclone)

low-wing, all-metal attack monoplanes equipped with slots and flaps were also being produced for the Air Corps. That order was the result of service testing on the A-8 monoplanes which this company delivered in 1932.

The Curtiss Hawk was further developed into the F11C-2 and F11C-3 for the Navy. They are single-seat fighters with a Wright Cyclone 700 horsepower engine. Twenty-eight were delivered to the Navy. During the year, a two-place Curtiss Falcon seaplane, with a 700 horsepower Cyclone was developed for the export field. A number were sold in South American markets. The F9C-2's, single-seater airship fighters with the Wright Whirlwind 420 horsepower engine, are now operating from the airship "Macon." Extensive service tests were completed on the Curtiss electrical controllable pitch propeller which was granted an Approved Type Certificate by the Department of Commerce in August, 1933.

Curtiss-Wright Airplane Company, St. Louis, Mo., a division of Curtiss-Wright Corporation, devoted activities to both the commercial and military markets. The outstanding development of this company was the T-32 Condor, powered by two 700 horsepower Wright Cyclone engines. This new biplane transport carried 15 passengers, two pilots, complete radio and 650 pounds of mail, baggage and express at a cruising speed of 150 m.p.h. Thirty-one of these Condors were sold during the year, 19 of which went to American Airways, nine to Eastern Air Transport, two to the Army Air Corps and one to Admiral Byrd. The Condor first called public attention to the strides made in cabin noise reduction by tests which proved that the noise level by decibel count is approximately the same as that of a Pullman car. The Curtiss-Wright Trainer, a two-place biplane, equipped with a Wright Whirlwind 175 horsepower engine, was developed for the export market. Production was continued on the Curtiss-Wright Sport, a three-place biplane powered with a Wright Whirlwind 175 horsepower engine, and on the Speedwing, a one- to three-place biplane powered with the Wright Whirlwind 250, 330 or 420 horsepower engines for the commercial market. The Osprey two-place, biplane fighter, with 420 horsepower Whirlwind, was produced and a number exported chiefly to South America.

Douglas Aircraft Company, Inc., Santa Monica, Calif., continued design and production of planes for the air services and delivered the first of a fleet of Douglas 14-passenger transports for Transcontinental & Western Air. It is a low-wing, all-metal cantilever monoplane with fillets and retractable wheels. The passenger cabin is 26 feet four inches long, five feet six inches wide and six

feet three inches high. It is ventilated and steam-heated. Split trailing edge flaps, for air brakes, are built into the lower side of the wing to increase lift and slow down landing speed. The overall length of the fuselage is 62 feet. The wing span is 85 feet.

General Aviation Manufacturing Corporation, Dundalk, Md., a division of North American Aviation, Inc., early in 1933 continued experimental production of the GA-43, an all-metal, low-wing 11-place transport monoplane powered with the Pratt & Whitney T1C Hornet or Wright Cyclone F3 engine. Orders for these ships have been received from the Japan Air Transport, Swiss Air Traffic Company, Ltd., Scadta, Ltd., of South America, and Western Air Express. Particular attention has been paid in this design to passenger comfort and ease of maintenance. With one pilot it has a payload of 2,200 pounds and a cruising speed of 188 m.p.h.

Great Lakes Aircraft Corporation, Cleveland, O., continued production of its models 2T-1A and 2T-1E, two-place, open biplanes for the commercial market, and completed several experimental planes for the Navy. One, a dive bomber, passed its acceptance tests late in the year.

Grumman Aircraft Engineering Corporation, using the plant of the former American Airplane & Engine Company at Farmingdale, Long Island, N. Y., produced 29 planes for the Navy in 1933. The planes are fast two-seater fighters with retractable landing gear, a single-seater fighter and a utility type amphibion.

The Hammond Aircraft Corporation, Ypsilanti, Mich., produced a three-place open land biplane, with the 100 horsepower Kinner K-5 engine, for private flying and training.

The International Aircraft Corporation, Niles, Mich., reported production during 1933 of 41 of its Heath light planes, a majority being the 40 horsepower single-place, high-wing monoplane models. Engineering was completed on a low-wing monoplane to use the 95 horsepower engine produced by the company.

Kellett Autogiro Corporation, Philadelphia, Pa., continued work in connection with autogiro technical development to appear in its 1934 models. A new model, the K-4, was introduced, possessing improvements over previous models. The K-4 is a side-by-side, two-seater, open cockpit or demountable cabin autogiro, and is powered with either a Continental or Jacobs engine.

Kreider-Reisner Aircraft Company, Inc., Hagerstown, Md., a division of Fairchild Aviation Corporation, continued production of the Fairchild 22, a two-place open cockpit monoplane powered with a Cirrus Hi-drive engine. During the year improvements were made in this model and it was introduced with Wright Gipsy,

Warner 125 and 145 horsepower engines. Production of the Fairchild 24, available with a Cirrus Hi-drive or a Warner engine, was also continued. A new development during the year was the design of a high-speed, single-engine amphibion transport for Pan American Airways, deliveries to be made early in 1934. The Fairchild 71 was available on special order and several were supplied to the export market. The factory was enlarged during the year and it is now equipped with an anodic and heat-treating plant.

Lockheed Aircraft Corporation, Burbank, Calif., continued production of its Vega and Orion models. The Vega is a five-seven-place high-wing cabin monoplane, both models powered with Pratt & Whitney Wasp SC1 engines. The Orion, a five-six place, single-

PROGRESS IN CONSTRUCTION

Clean streamlining and sturdy construction of the modern plane is emphasized in this view of the United Air Lines Wasp-powered Boeing transport.

engine, low-wing cabin monoplane, was available either as a passenger or combination mail and passenger transport, and was supplied with Pratt & Whitney Wasp SC1 and S1D1 or Wright Cyclone engine. A new model designated as the Electra was developed during the year. It is a 12-place, low-wing, twin-engine monoplane, designed especially for the transport market.

Grover Loening Aircraft Company, Inc., Garden City, N. Y., confined its activities to experimental work. The company introduced an experimental monoplane amphibion powered with a Wright Whirlwind 300 horsepower engine. This model is a development of the Loening Commuter.

Luscombe Company, Kansas City, Mo., a new company, began

production of a two-place side-by-side, all-metal cabin monoplane to be powered with a Warner Super-Scarab engine for the private market.

Glenn L. Martin Company, Baltimore, Md., devoted its facilities during 1933 to the construction of three transatlantic flying boats for Pan American Airways System, and to a production order of 48 bombing planes for the Army similar to the experimental XB-907, described in the Aircraft Year Book for 1933. The first of these bombing planes was delivered in November. Further developments of this type were in definite form and were to be brought out in 1934. The three 50,000-pound ocean type flying boats for Pan American will have four engines developing 3,200 horsepower. The hull is stabilized in the water by a newly invented type of outboard displacement known as Seawings. The boats will have accommodations for 40 to 50 passengers and a crew of five. During the year from 1,800 to 2,000 men were employed by the Martin company.

Monocoupe Corporation, Robertson, Mo., continued to supply the private market with its two-place, side-by-side cabin monoplanes powered with Warner engines. Late in 1933 the company received from the U. S. Department of Commerce an order for 10 planes.

The National Airplane & Motor Company, Muskogee, Okla., made one two-place, high-wing monoplane to sell for $900 with a Salmson engine. The single unit manufactured in 1933 had a 40 horsepower engine of the firm's own make.

Northrop Corporation, Inglewood, Calif., during 1933 brought out the following new models for the transport market: the Delta 1-A, a nine-place, all-metal, low-wing cabin monoplane powered with a Wright Cyclone engine, and the Delta 1-B, a slight revision of the 1-A, equipped with a Pratt & Whitney Hornet engine. For the Army this company produced the Model 2-C, a two-place, all-metal, low-wing monoplane. For the Navy, the Northrop XFT-1 Shipboard Fighter was produced experimentally.

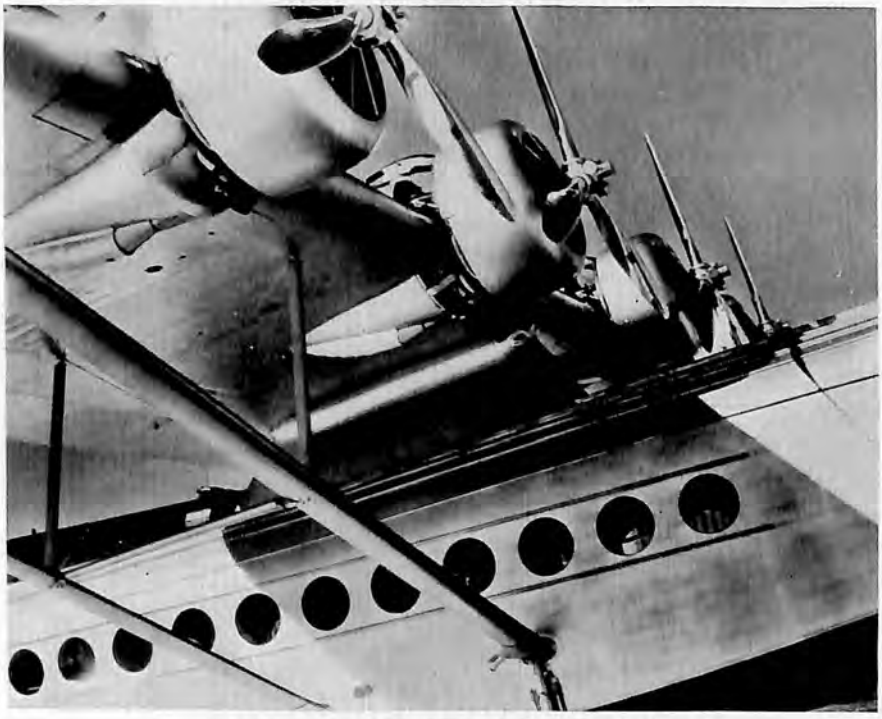
Pitcairn Autogiro Company, Willow Grove, Pa., early in 1933, made available for the private market the PA-18 and the PA-19 models. The PA-18 is a two-place, tandem, open cockpit autogiro with a Kinner R-5 160 horsepower engine. The PA-19 is a four-place cabin autogiro with either a Pratt & Whitney Wasp Junior T3A or a Wright Whirlwind 420 horsepower engine. During the latter part of the year, this company concentrated its activities on technical development of the three-bladed rotor and to the problem of placing all flight control in the rotor system.

The Security National Aircraft Corporation, occupying the old Emsco plant at Downey, Calif., built three planes of the two-place

low-wing trainer type. The Kinner folding wing patents are incorporated in the model. The planes are powered with Kinner engines.

Sikorsky Aviation Corporation, Bridgeport, Conn., a division of United Aircraft & Transport Corporation, at the end of 1933 was completing for Pan American Airways the first of three long distance ocean flying boats, the model S-42.

The S-42 is a high wing monoplane, externally braced. The main



POWER PLANTS OF NEW SIKORSKY

Close-up of the four Hornet motors developing 3,000 horsepower on the new Pan American Airways Sikorsky S-42, for ocean service.

wing and horizontal stabilizer have front and rear spars, but other surfaces are monospar. The wing spars are continuous throughout the span forming a one-piece wing without center section. The tail surfaces deviate from conventional Sikorsky design in that they are attached directly to the hull rather than being supported by outriggers and struts. The power plant consists of four Pratt & Whitney geared Hornet engines of 700 horsepower each and three-bladed Hamilton Standard controllable propellers, located in and

forward of the leading edge. Good water clearance for the propeller tips is obtained by supporting the wing above the hull on streamlined triangular members that form portions of the main bulkheads. This method of suspension provides cleanliness beyond that ordinarily encountered in flying boat design. Metal construction is used throughout except that tail surfaces, ailerons and flaps are fabric covered. All rivets in the skin of both wing and hull are countersunk for the reduction of air and water resistance. It is an interesting fact that there are approximately 300,000 rivets used in the construction of each ship.

The function of the S-42 is two-fold, to transport a mail load and a crew of six over 2,500 miles non-stop and against a 30-mile head wind, or to carry 32 passengers with 1,000 pounds of mail and express for 1,250 miles without refueling. The ranges set forth above will be accomplished at cruising speed of 154 m.p.h. at 8,000 feet using 70 per cent of the total horsepower. Flight with full load can be maintained at 10,000 feet on any three engines. The gross weight of the S-42 is approximately 37,000 pounds and its weight empty for passenger service 20,000 pounds. The S-42 has a wing span of 114 feet 2 inches. The overall length is 68 feet 8 inches.

Sikorsky also offers for the commercial market the S-30, S-40 and S-41 amphibions which are five-place, 12-place and 16-place respectively.

The Speed Bird Corporation, Keyport, N. J., was organized during the year to serve owners of Bird planes with replacement parts. At the end of the year a small biplane for training or sport, with an engine power range of from 50 to 110 horsepower, was nearing completion.

The Star Aircraft Corporation, Bartlesville, Okla., in 1933 produced one two-place, side-by-side high-wing externally braced cabin monoplane.

The States Aircraft Corporation, Center, Texas, in 1933 made one "States" high-wing monoplane, using a 100-125 horsepower engine.

Stearman Aircraft Company, Wichita, Kan., a division of United Aircraft & Transport Corporation, designed and produced the Model 80 series during 1933. The Model 80 is a high speed utility plane for the sportsman pilot. The Model 81, a conversion of the Model 80, is a long distance mail plane and the Model 82 is a military conversion of the Model 80. All models are powered with the Pratt & Whitney Wasp Junior or T3A.

Stinson Aircraft Corporation, Wayne, Mich., a division of the

Cord Corporation, continued production of its Reliant Models and made available to the private market the Reliant SR, a four-place high-wing cabin monoplane powered with a Lycoming R-680 engine. This company introduced two new designs during 1933, the Model A, an "eight-passenger and hostess" short haul tri-motor transport. They utilize the Smith controllable pitch propellers, automatic flaps, hydraulic vacuum-boosted brakes, a patented double-taper wing and sequi-spar construction. The other new model was the Senior Trainer Model O. Particular attention was given the installation of light armament in the basic design. Two forward fixed synchronized machine guns, one flexible machine gun and one A-3 bomb rack, may be quickly installed. All necessary permanent fittings are installed at the factory for the armament changes.

Chance Vought Corporation, East Hartford, Conn., a division of United Aircraft & Transport Corporation, continued production of the Corsair type of convertible land and seaplane for the United States Navy and foreign governments. For the Navy, the production types were the SU-2 and SU-3, Hornet-powered, two-place scouting planes and the O3U-3, Wasp-powered, two-place observation planes. The latter type is readily convertible from land plane to seaplane and may be operated from land, water, catapult or carrier deck. Other deliveries to the Navy included the first of a new series of scouting airplanes known as Model SU-4, in production at the end of 1933, and two experimental models. One, the XF3U-1, was a high-speed Scout and Bomber, powered with a two-row Pratt & Whitney Wasp Junior engine. The other experimental model was a single-float observation amphibion. For the export market the company produced the V-80 single-seater and the V-90 two-seater Corsair.

Waco Aircraft Company, Troy, O., continued production of its Waco models and introduced several new models to supplement its standard line. The Model U1C, a four-place cabin biplane powered with a Continental R-670 engine, was refined for the 1933 market. Models PLA and ULA, two-place, side-by-side open cockpit or convertible cabin biplanes were available, powered with Jacobs LA-1 and Continental R-670 engines respectively. Three-place open cockpit planes powered with Jacobs LA-1, Continental R-670 and Warner engines were produced for the market under Models PBF, UBF and RNF. A new model was designated the WHD, a two-place high performance biplane with a Wright Whirlwind 420 horsepower engine. Models 240A and 240TA, three-place, open cockpit biplanes, were available on special order. This company supplied its various models to the export field during the year.

Aircraft Engine Manufacturers

Aeronautical Corporation of America, Cincinnati, O., continued production of the Aeronca E-113A, a two cylinder opposed air-cooled engine developing 40 horsepower at 2,500 r.p.m. This engine supersedes the Aeronca E-113 which developed 36 horsepower. The E-113A is equipped with a new type of head construction and each engine has automatic spark control. The mounting studs are so designed that the engine can be mounted in a full rubber unit.

The Aviation Diesel Engine Company, Ltd., has developed a diesel engine on which the firm hopes to get into production in 1934. It is a variable controlled high speed diesel of 400 horsepower. The test model, a radial on the four cycle principle, had 1,000 hours running time at the end of the year.

Allison Engineering Company, Indianapolis, Ind., a division of General Motors, produced the first of a new series of liquid-cooled 12 cylinder V type engines, but no detailed information has been released concerning them. This company continued its campaign toward the adaption of its steel back, bronze lined bearings among an increasing number of engine builders here and abroad.

Continental Aircraft Engine Company, Detroit, Mich., a subsidiary of Continental Motors Corporation, in 1933 introduced the Model R-670. This model was a seven-cylinder, radial air-cooled engine developing 210 horsepower. Its specifications were in general similar to the Model A-70-2 with the exception that the R-670 has rear part exhausts. Production was continued on the Model A-40, a four-cylinder horizontally opposed air-cooled engine developing 37 horsepower, as well as the Model A-70-2.

General Airmotors Company, Scranton, Pa., developed certain principles covering a three-valve engine and secured A.T.C. No. 36 for 1,900 r.p.m. with a displacement of 487.3

Jacobs Aircraft Engine Company, Pottstown, Pa., completed development of a new seven cylinder air-cooled radial engine, Model L-4. This engine develops 225 horsepower at 2,000 r.p.m. Late in the year several experimental engines of this types were block tested and flown. Production plans were to make the engines available early in 1934. Battery ignition will be standard equipment. Magneto ignition will be optional. Model LA-1, a seven cylinder radial air-cooled engine rated at 170 horsepower, was continued. The Model L-3 55 horsepower engine was discontinued.

Kinner Airplane & Motor Corporation, Ltd., Glendale, Calif., continued production of the Kinner K-5, B-5, R-5 and C-5 models, all five cylinder radial air-cooled engines rated at 100, 125, 160 and

KINNER AND CONTINENTAL ENGINES

Kinner K-5, 100 horsepower (upper left); Continental A-70-2, 215 horsepower (upper right); Kinner C-5, 210 horsepower (center); Kinner R-5, 160 horsepower (lower left); and Continental A-40, 37 horsepower (lower right).

210 horsepower respectively. Plant facilities were expanded to provide space and equipment for the production of a two-place, side-by-side monoplane which this company also manufactures.

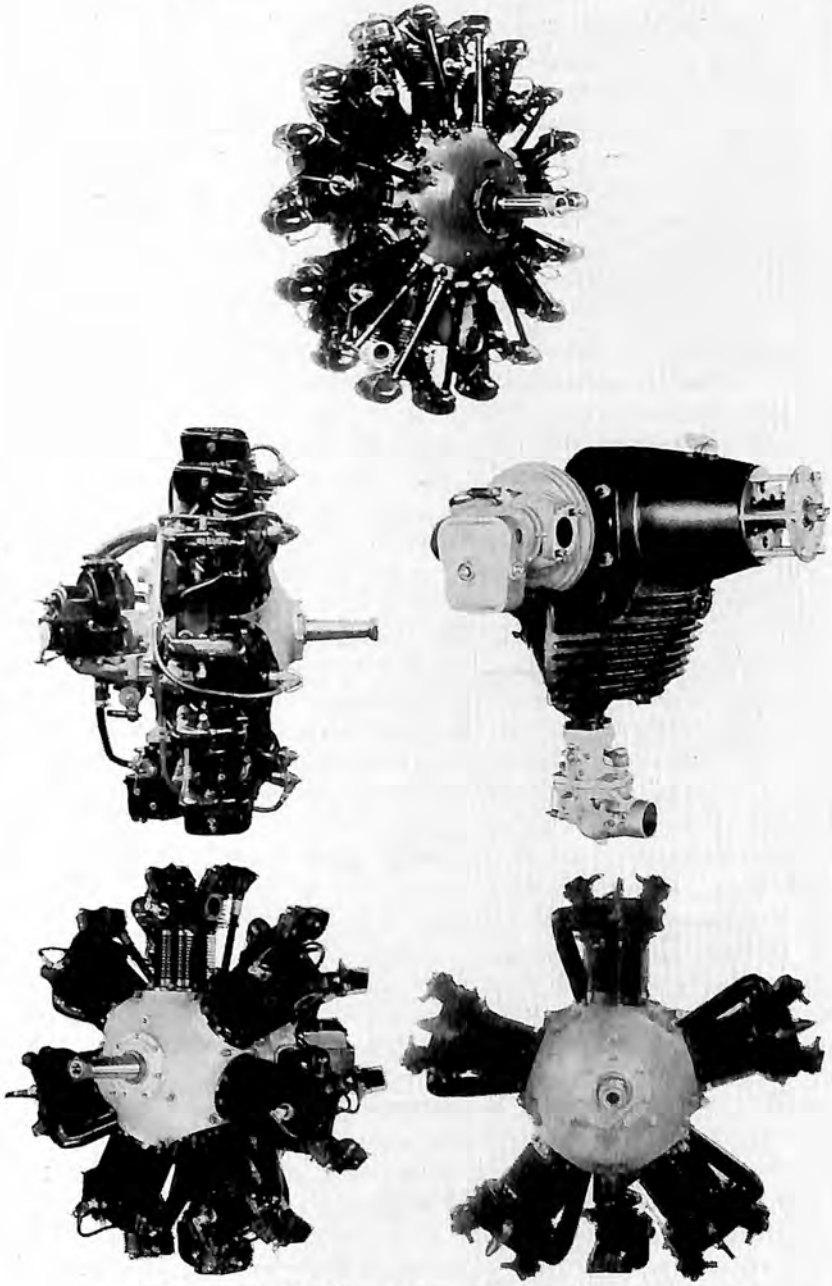
Lycoming Manufacturing Company, Williamsport, Pa., a division of the Cord Corporation, continued production on the 215 and 240 horsepower models of the R-680 series, nine-cylinder, radial, air-cooled engines. A change was made in the method of model designation to conform to Army and Navy standards. The Model number of the R-680-BA, 240 horsepower engine in 1932 was changed to Model R-680-2 under the new designation. This company obtained approval from the Department of Commerce on a rating of 220 horsepower at 2,050 r.p.m. on the Model R-680 engine with 5.5 compression ratio, using 58 octane fuel. This engine will be known as the Model R-680-4. The cylinder head design used last year on the Model R-680-BA engine has been adopted as standard on all models. This company has also received Department of Commerce approval to operate all engines at 2,300 r.p.m. for use with controllable pitch propellers, and adaptations have been made for gun synchronizers. The Lycoming line of engines now covers a complete range from 200 to 260 horsepower, from 2,000 r.p.m. to 2,300 r.p.m. with or without synchronizer drives. Fuel pump drive, vacuum pump drive, generator drive, dual tachometer drive adapter and radio shielding are optional equipment and may be applied to any engine model.

The Menasco Manufacturing Company, Los Angeles, Calif., produced 11 of its four and six cylinder in-line inverted air-cooled engines in 1933. These are used mainly in special racing planes which were in evidence at the air meets held during the year. The company manufactures most of its own parts for the engines.

The Milwaukee Parts Corporation, Milwaukee, Wis., produced four of its eight cylinder 90 degree "V" type engines. They are 470 cubic inch air-cooled engines developing 115 horsepower at 1,650 r.p.m.

Monocoupe Corporation, Robertson, Mo., continued to make available its Model R-266, a five cylinder radial air-cooled engine rated at 90 horsepower at 2,375 r.p.m.

The Pratt & Whitney Aircraft Company, East Hartford, Conn., a subsidiary of the United Aircraft & Transport Corporation, during 1933, in addition to perfecting and increasing the horsepower of its standard production models of the Wasp Junior, Wasp and Hornet, made available for domestic commercial use two higher horsepower engines of the 14 cylinder, two row, radial, air-cooled type—the Twin Wasp Junior and the Twin Wasp. Both engines



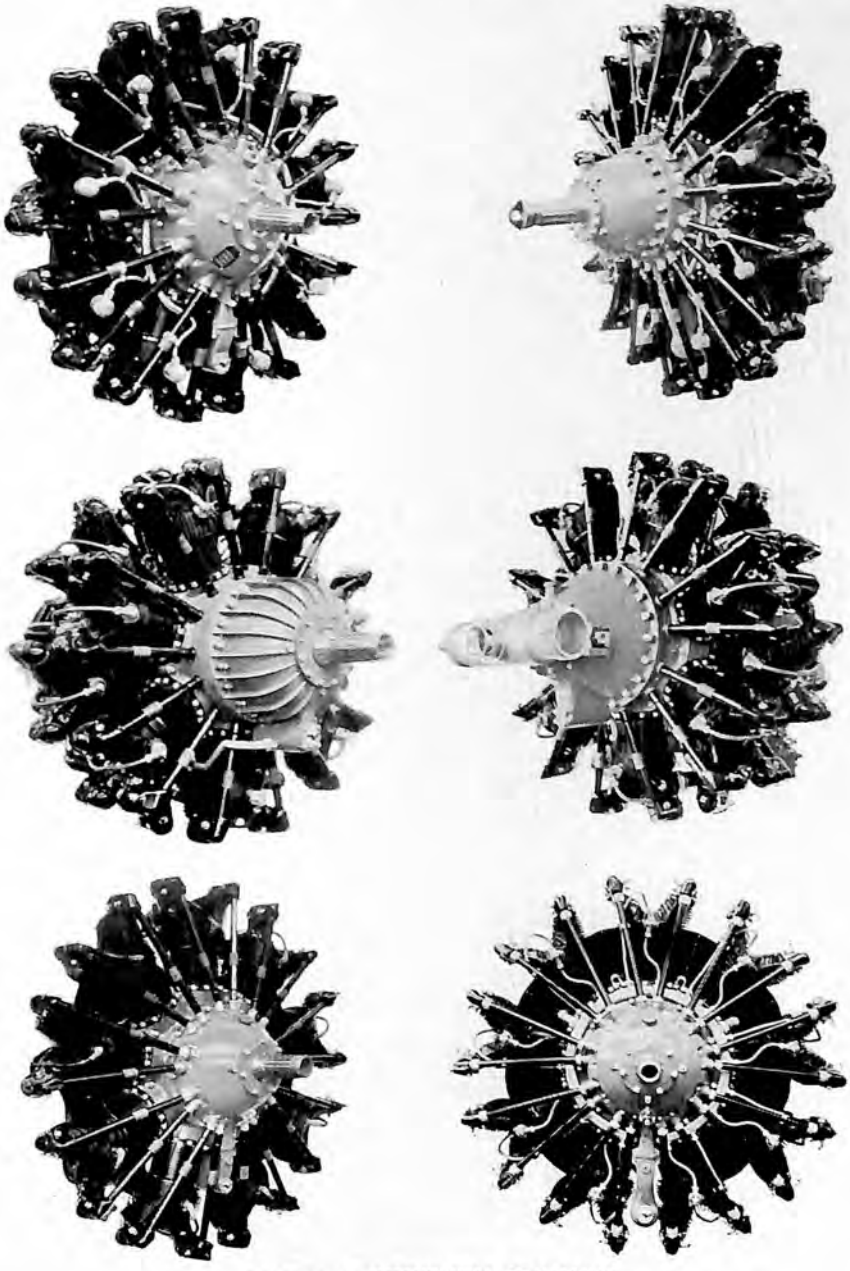
LYCOMING, WARNER AND AERONCA ENGINES

Lycoming R-680-BA, 240 horsepower (top); Warner Super-Scarab, 145 horsepower (left center); Aeronca E-113A, 36 horsepower (right center); Warner Scarab, 125 horsepower (lower left); and Warner Scarab, Junior, 90 horsepower (lower right).

are equipped with propeller reduction gearing in the 3:2 ratio. The Twin Wasp Junior is also equipped with 4:3 gearing. It is now available, ranging from 650 to 700 horsepower, with the Twin Wasp at 750 to 800 horsepower.

Development of the B series Wasp Junior and the D series Hornet, the latter being of smaller diameter than previous Hornet models, were also effected during the same period. Probably the most outstanding features of the airplane engine market during 1933 were the demands on the part of commercial air line operators for the maximum in engine performance and the ascendency of American aircraft engines in the markets of the world. The military services have always required the utmost in performance and were willing to make sacrifices in certain engine characteristics in favor of it. Commercial airplane manufacturers and air line operators heeding the public demand for high performance have required of the engine manufacturer military engine performance without sacrificing any of the other characteristics. That brought about engineering programs independent of military development primarily to meet the increased commercial demand in 1933. The results of these efforts have been outstanding as evidenced by the availability for commercial use of engines of 550, 700 and 800 horsepower with satisfactory characteristics of dependability and economy. The Wasp engine is in daily service at 550 horsepower compared with 420 in 1932, the Hornet at 650 to 700 horsepower compared with 525 in 1932. The Twin Wasp at 750 to 800 horsepower opens up a new field for transport operation.

Plans for several 1934 commercial aircraft are built around this Twin Wasp. Recognition of these forward strides in engine development has been well received throughout the world. Wasp and Hornet engines are now standard equipment on many of the major European, South American and Oriental air lines; and are now used in the military services of 17 countries throughout the world. Pratt & Whitney engines are available to the commercial market in the various models and various ratings of each model, ranging from 320 to 800 horsepower. The grade of fuel to be used and operator's requirements are the factors determining ratings within the maximum and minimum range indicated as follows: the Wasp Junior, an engine of 985 cubic inch displacement, is manufactured to deliver from 320 to 420 horsepower. The Wasp ranges from 420 horsepower to 550 horsepower. Various Hornet series carry ratings from 525 horsepower to 700 horsepower. The Twin Wasp Junior is now available for domestic commercial service at from 650 to 700 horsepower. The Twin Wasp with an 1,830 cubic



PRATT & WHITNEY ENGINES

Wasp Junior, 300-420 horsepower (upper left); Hornet 1690 geared, 575-700 horsepower (upper right); Twin Wasp Junior, 650-700 horsepower (center left); Hornet 1690, 575-700 horsepower (lower left); Twin Wasp, 750-800 horsepower (center right); and Wasp, 420-550 horsepower (lower right).

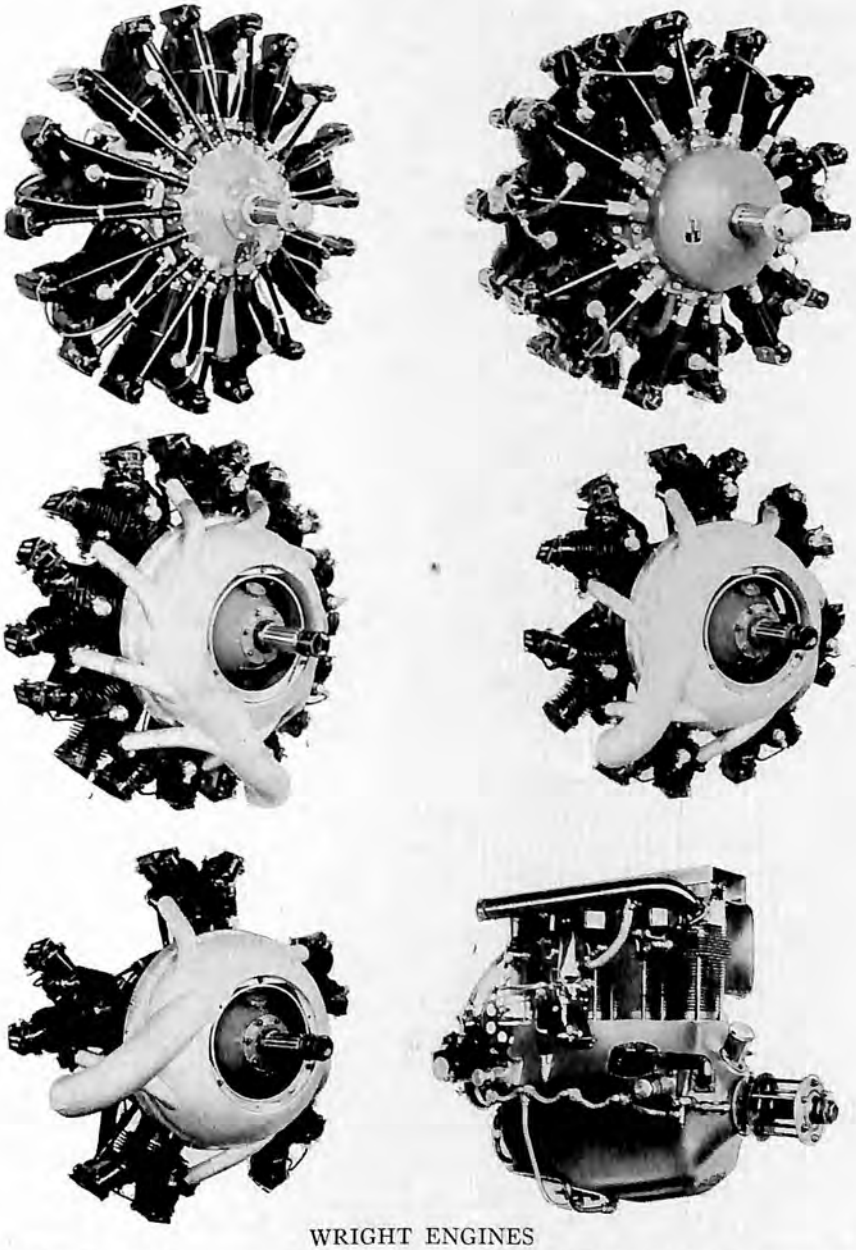
inch displacement may be procured for domestic use rated at 750 to 800 horsepower.

The Pratt & Whitney Aircraft Company during 1933 incorporated a number of significant engineering changes, though basic Pratt & Whitney design features remain unchanged. In all engines the forged type aluminum piston has become standard while the design of a new type oil-tight push rod cover has proved so satisfactory that soon it will be incorporated as standard equipment on every model. All engines are equipped with an integral control mechanism to actuate the new type Hamilton Standard hydro-controllable pitch propeller. One of the outstanding accomplishments of the year was the improvement in cooling of both nine and 14 cylinder models by means of better cylinder head fins and inter-cylinder air deflectors of distinctive Pratt & Whitney design. A distinct trend toward the increase of the use of engines equipped with propeller reduction gearing has been noted through the year and Pratt & Whitney with its own patented and thoroughly proved designs has provided reliable equipment of this order because of extensive research carried on in the reduction gear field.

Prospects for 1934, in the light of curtailed military appropriations, would not be particularly bright except for the possible increase in commercial and export sales through the re-equipment of air lines and the availability of foreign markets through superior design. Standardization and decreased unit cost of production was to be an objective of this manufacturer in 1934, with the cooperation of operators and airplane manufacturers in simplifying and standardizing their requirements and scheduling production sufficiently in advance to allow for quantity production of engines.

Warner Aircraft Corporation of Detroit, Mich., continued production of the Scarab Junior, a five cylinder, radial air-cooled engine rated at 90 horsepower at 2,025 r.p.m.; and increased the power rating of the Scarab, a seven cylinder radial air-cooled engine from 110 horsepower at 1,850 r.p.m. to 125 horsepower at 2,050 r.p.m. Early in the year, this company placed in production the Super-Scarab, a seven cylinder, radial, air-cooled model which developed 145 horsepower at 2,050 r.p.m. Warner continued to supply wheels, brakes and shock struts for the commercial market.

Wright Aeronautical Corporation, Paterson, N. J., a division of Curtiss-Wright Corporation, during 1933 further developed the Series F Cyclone introduced commercially in 1932, the Wright double-row Whirlwind, a 14 cylinder, two-row, air-cooled engine rated at 700 horsepower built for the U. S. Navy, and the Curtiss Super Conqueror, a 12 cylinder, liquid-cooled Vee type engine



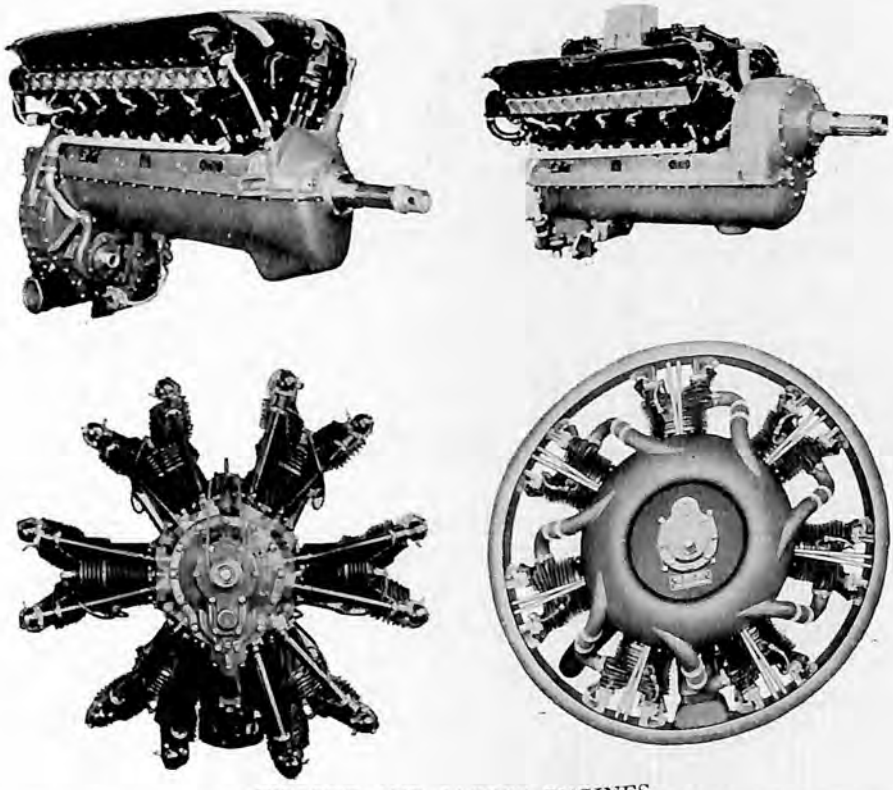
WRIGHT ENGINES

Cyclone F, 700 horsepower (upper left); 14 Cylinder Whirlwind, 700 horsepower (upper right); Whirlwind, 330, 365 and 420 horsepower (center left); Whirlwind 250 and 280 horsepower (center right); Whirlwind, 175 horsepower (lower left); and Gipsy, 90 horsepower (lower right).

equipped with a built in, gear driven, centrifugal supercharger. The Series F Cyclone was originally placed in production in 1932 with a U. S. Department of Commerce sea level rating of 700 horsepower at 1,900 r.p.m. with 87 octane fuel. Unique features of this engine included a new design of cylinder head with integral spark plug coolers, an 11 inch diameter supercharger impeller turning at a relatively low speed, a greatly simplified accessory section, and a down-draft carburetor—the first of its type provided as standard equipment with a production radial air-cooled engine. During 1933 six additional ratings were approved for the Series F Cyclone by the Department of Commerce, with various grades of fuel. The rating of the original engine was increased from 700 horsepower at 1,900 r.p.m. at sea level to 715 horsepower at 1,950 r.p.m. using 87 octane fuel. In addition, two models rated at 675 horsepower and 645 horsepower were approved using fuel of 80 and 73 octane number respectively.

Four Series F Cyclone models, supercharged for performance at high altitudes, were also approved by the Department of Commerce and introduced to the commercial market. These engines were rated as follows: 710 horsepower at 7,000 feet altitude with 87 octane number fuel, 735 horsepower at 4,000 feet altitude with 87 octane number fuel, 670 horsepower at 2,500 feet with 80 octane number fuel and 620 horsepower at 4,500 feet with fuel of 73 octane number.

A feature of the Series F Cyclone is that all models are identical with the exception of the pistons in engines built for full throttle operation at sea level and the amount of supercharging applied in altitude performance engines. In the engines built for full throttle operation at sea level, different compression ratios are used to obtain the best performance with the fuel used in service. The 715 horsepower Cyclone using 87 octane number fuel employs a compression ratio of 6.4 to 1, the 675 horsepower engine using 80 octane fuel a compression ratio of 5.7 to 1 and the 645 horsepower model using 73 octane fuel a compression ratio of 5.3 to 1. These three compression ratios are obtained by using pistons of three different designs. All three types of pistons are identical in weight and are directly interchangeable without affecting any other part of the engine or rebalancing the crankshaft. That feature is said to be of particular advantage to operators to whom the higher octane number fuels are not now available. If fuel of only 73 octane number is obtainable, the operator may use the Cyclone with pistons designed for a compression ratio of 5.3 to 1. Later when 80 or 87 octane number fuel can be procured, the operator may increase the power



WRIGHT AND JACOBS ENGINES

Curtiss Super-Conqueror V-1570, 650 horsepower (upper left); Curtiss Geared Conqueror V-1570, 625 horsepower (upper right); Curtiss Challenger, 185 horsepower (lower left); and Jacobs LA-1, 170 horsepower (lower right).

of his engine at relatively low expense by substituting the higher ratio pistons for the original pistons. All Series F Cyclones supercharged for altitude performance have a compression ratio of 6.4 to 1 regardless of the fuel used. These engines differ from the engines rated at full throttle at sea level only in the speed of their supercharger drive gears which is higher to produce a higher degree of supercharging. As all supercharger drive gears, regardless of their ratio, are interchangeable, engines supercharged for altitude performance may be converted into engines for full throttle operation at sea level by substituting supercharger drive gears of lower ratio for the original gears. Conversely, engines designed for full throttle operation at sea level may be converted into altitude performance engines by replacing the original pistons and supercharger drive gears for those of higher ratio.

All Series F Cyclones may be supplied with propeller reduction gears of 8:5 or 16:11 ratio. The 8:5 ratio gear unit is of the modified Farman type which has been used with Wright radial engines for a number of years. The 16:11 gear unit is of a distinctively new compact design. The exclusive use of spur gears in the 16:11 unit is an indication of its simplicity of design. The Series F Cyclone may also be equipped with mechanism for the operation of hydraulic controllable pitch propellers.

A number of Wright double-row Whirlwind, 14 cylinder, two-row, radial air-cooled engines rated at 700 horsepower were supplied to the U. S. Navy during 1933 for installation in high performance experimental aircraft. An engine of that type was also installed in the Texaco "Sky Chief," low-wing Northrop monoplane, flown by Lieut. Commander Hawks to a new non-stop transcontinental record of 13 hours, 27 minutes in June. This engine was the first 14 cylinder, two-row, radial air-cooled engine to power an American built commercial airplane. It was also the first engine of its type to establish a long distance speed record. The Wright double-row Whirlwind may be supplied either as a direct drive engine or a geared engine with a propeller speed reduction of 8:5 or 4:3 ratio.

The single row Whirlwind Series of engines was built during 1933 in three sizes and six models. These were the nine cylinder Whirlwind 420, rated at 420 horsepower at 2,150 r.p.m., the nine cylinder Whirlwind 365 rated at 365 horsepower at 2,100 r.p.m., the nine cylinder Whirlwind 330 rated at 330 horsepower at 2,000 r.p.m., the seven cylinder Whirlwind 285 rated at 285 horsepower at 2,000 r.p.m., the seven cylinder Whirlwind 250 rated at 250 horsepower at 2,000 r.p.m. and the five cylinder Whirlwind 175 rated at 175 horsepower at 2,000 r.p.m. To further test the service endurance of the seven cylinder Whirlwind 285 engine, a 400-hour endurance test was completed in August 1933. At the end of the test the engine was found to be in excellent condition proving that 400 hours between overhauls is both possible and practical. All Whirlwind models were available in either direct drive or geared form. Geared engines are supplied with propeller speed reduction units of 2:1 or 1.58:1 ratio.

The Curtiss Conqueror was supplied to the U. S. Army and foreign air line operators in four models. Models offered included the direct drive Conqueror rated at 650 horsepower at 2,400 r.p.m., the two-to-one geared Conqueror rated at 625 horsepower at 2,450 r.p.m., the seven-to-five geared Conqueror rated at 625 horsepower at 2,450 r.p.m. and the Super Conqueror rated at 600 horsepower at

12,000 feet altitude. The Conqueror is the only liquid-cooled aircraft engine manufactured in the United States on a production basis. It may be operated with either water or Prestone as the coolant. The Super-Conqueror is similar in general design to the standard Conqueror models but has a supercharger of the built-in-centrifugal type housed at the rear of the engine and driven through a shaft which provides the required flexibility to protect the supercharger gears and bearings from acceleration loads. Endurance tests conducted during the year indicate that the Super-Conqueror rated at 600 horsepower at 12,000 feet, is satisfactory for operation at an output of 750 horsepower at sea level. This engine may also be supplied with propeller reduction gears. The Wright Gipsy, a four cylinder, in-line, air-cooled engine rated at 90 horsepower at 1,950 r.p.m. and the Curtiss Challenger, a six cylinder, radial, air-cooled engine rated at 185 horsepower at 2,000 r.p.m. were also offered to the commercial market during 1933.

Accessory Manufacturers

The Aircraft Radio Corporation, of Boonton, N. J., devoted its laboratory and production facilities to serving the various departments of the Government.

The Air Reduction Sales Company, of New York, continued to supply the industry with gas welding apparatus, its Airco Outfit No. 91 being especially developed for aircraft welding.

The Air Transport Equipment Corporation of Garden City, N. Y., developed new magnesium landing gear wheels for semi-low tires, new tail wheels for amphibions, new free-range position lights on the rear end of the rudder, improved radio shielding equipment and freeze-proof airspeed tubes.

The Aluminum Company of America continued development of dural metals and marketed a special chair for passenger planes. Its varied list of heat-treated aluminum alloys one-third the weight of steel includes sheet metal for structural parts, round and streamline tubing, extruded sections for special requirements, forgings and miscellaneous fabricated parts. Much progress was made on corrosion resistance as represented in the composite Alclad sheet, a strong alloy core protected by a thin skin of pure metallic aluminum.

The American Gas Accumulator Company, of Elizabeth, N. J., in its capacity as selling agent for Sperry, BBT and AGA products, continued to market airport lighting equipment, including landing area floodlights, double-end revolving beacons, boundary lights and floodlights for interior illumination.

The American Telephone & Telegraph Company, of New York, continued to supply the air transport industry with teletypewriter circuits and other equipment. Approximately 25,000 miles of the Bell System wires were in constant use by the Airways Division of the Department of Commerce for dissemination of weather information.

Aqua Systems, of New York, added improvements to its established systems for storing and handling gasoline and oil, with special attention to underground storage tanks and airport refueling services.

The Bendix Products Corporation, of South Bend, Ind., a subsidiary of Bendix Aviation, developed a standard pilot seat of minimum weight to meet Air Corps requirements, and placed in production a series of streamline tail wheel steering knuckles. Low pressure wheels and brakes, streamline wheels and brakes, and the Bendix Pneudraulic Strut were major developments during the year.

The B. G. Corporation, of New York, further developed its line of radio-shielded spark plugs, employing special materials and the most exacting standards of design and workmanship. A special plug was developed for liquid-cooled engines.

Berry Brothers, of Detroit, devoted considerable research and experimentation on weather racks and in salt water which resulted in improvements in their line of airplane finishes. New quick-drying and synthetic enamels were perfected and heavy bodied dopes were developed for the Navy. A pigmented dope of metallic lustre, was also put on the market.

The Breeze Corporation, of Newark, continued to supply its ten-year old market with its flexible metal air hose, and at the same time made available complete shielded ignition systems, from magneto housings to spark plug cans, conduit fittings for all kinds of wiring, Aeroflex fuel and oil lines with fittings, and other accessories, including a new line of aircraft navigation and running lights.

The Champion Spark Plug Company of Toledo, O., expanded plant and payroll to produce its new mica aircraft spark plug, a radically improved design in the method by which the mica-wrapped spindle is secured in the bushing to form a positive gas-tight joint. A metal sleeve is forced between bushing and spindle under pressure and electric heat so that the metal actually flows to form the joint.

The Cleveland Pneumatic Tool Company, in addition to its "Aerol Strut," developed a pneumatic starter adaptable to both the

electric inertia accelerator and to winding the inertia starter without electric power. One of the unique developments is the use of the spline shock absorber practically doing away with the landing gear.

The Curtiss Aeroplane & Motor Company, of Buffalo, N. Y., completed tests on its electric controllable pitch propeller, and a number were installed on air line and military planes. The pitch of the Curtiss propeller is changed by means of a small electric motor which is geared to the propeller blades with a reduction gear ratio of 36,000:1.

The Eclipse Aviation Corporation, of East Orange, N. J., a division of Bendix Aviation, continued serving the market with starters and injection equipment, and added to its products the Eclipse Air Injection Starter. The company planned important new developments for 1934.

The Edo Aircraft Corporation, of College Point, N. Y., exclusive specialists in the design and manufacture of all-metal seaplane floats and hulls, developed six new models of floats for Department of Commerce license, constructed a complete float type amphibion for the Seversky Aircraft Corporation, produced a new type of float equipped with retractable landing beaching gear, and continued to supply standard floats for private and transport flying. Edo float models were designed especially for the Byrd Expedition's Curtiss-Wright Condor and Col. Lindbergh's Lockheed plane.

The Egyptian Lacquer Manufacturing Company, of Kearny, N. J., continued its production of a complete line of clear and pigmented dopes, solvents, thinners, lacquer enamels, undercoats and finishes for fabric, metal and wood parts of aircraft.

The Electric Storage Battery Company, of Philadelphia, continued development and production of its line of Exide batteries for aviation service, one of the most important being the TX-19, designed to handle all lighting loads—radio, starting and ignition.

The Fairchild Aerial Camera Corporation, of New York, completed development work on the T-3A five-lens camera taking overlapping photographs in series for line drawn maps and military intelligence. Actually five cameras combined in one, the T-3A takes simultaneously one vertical photograph and four oblique photographs, and the latter are rectified into vertical photos during the printing process, the same scale as the one made with the vertical lens chamber. From an altitude of 20,000 feet a strip 20 miles wide is covered at a scale of 1 to 40,000, and a single assembly of five photographs covers 226 square miles. From 25,000 feet a strip 26 miles wide is covered and the scale is 1 to 50,000, approximately.

At this same altitude, and allowing an overlap of 55 per cent for one photograph upon the preceding photograph, a strip 357 miles in length can be covered; since this strip is about 26 miles wide a total area of approximately 9,000 square miles can be covered with a single loading of the camera.

The Fay-Egan Manufacturing Company, of Cincinnati, O., continued specializing in the mass production of aluminum alloy propeller blades by means of automatic and semi-automatic machines developed in its own shops.

Fleetwings, Inc., of Roosevelt Field, L. I., N. Y., continued to supply the aircraft industry with its shot-welding process for stainless steel; and at the same time produced structural units, including wing ribs, tail surfaces and ailerons.

General Electric continued to work with aircraft engine builders in designing more efficient superchargers. The results of this work were apparent in the increased power ratings both at sea level and at altitude of a number of different engines. The development program on superchargers included the design and construction of a test set-up whereby it is possible, for the first time, to accurately measure the power required and the exact amount of pressure rise obtained from a gear driven supercharger at various engine speeds. Since suprecharger impeller speeds are constantly increasing, now ranging from 15,000 to over 30,000 r.p.m., considerable research has been carried out on designs which will permit economical manufacture of impellers for safe operation at these speeds. Development has been continued on different types of two-stage superchargers for altitude operation.

General Electric also developed a new sonic altimeter, which has a working range from approximately 200 feet down to 2 feet above the ground. An electrical pick-up is utilized so that echoes can be heard thru the standard radio ear phones. This instrument will be most valuable in the blind landing development, since it is a true height above ground indicator and its range of operation is particularly effective. The manufacture and sale of airport and airway lighting equipment was continued.

For more than three years the B. F. Goodrich Company, of Akron, has carried on continuous development of aircraft de-icers. During the last winter they were being used successfully on the Transcontinental & Western Air planes. The Goodrich Company established a special department for that work, while its aviation division continued production of several improved types of aircraft tires for all purposes.

The Goodyear Tire & Rubber Company developed a new hy-

draulic brake on the multiple metal disc principle, and continued to export to nearly all countries its line of Airwheel tires and tubes and wheels and brakes of the full-balloon or extra-low-pressure type.

The Gulf Refining Company, of Pittsburgh,, supplied aircraft operators with a complete line of fuels and lubricants.

The Hamilton Standard Propeller Company, of Hartford, Conn., increased the number of employees, and continued development of two types of propeller, one being adjustable on the ground, and the other controllable in the air. Because of increased speed of the new military and commercial planes a controllable propeller is important; and the product of this company makes possible the use of geared, supercharged engines on high speed ships.

A NEW SHIP FOR THE AIR CORPS

The Army airship TC-13—built by Goodyear—stationed at Langley Field, Va.

The Haskelite Manufacturing Corporation, of Chicago, developed new lining panels for transport planes, one "Aluminum Plymetl," a light balsa wood core faced with dural sheets, perforated on one side to further lighten the panel and add sound deadening. Another panel was the light, fire resistant Robertson bonded metal veneered by Haskelite and available with light gauge steel or aluminum sheets on which a fabric is fused, and in turn veneered with fancy woods for cabin decoration.

The Hurley-Townsend Corporation, of New York, during the year arranged with the Scintilla Company for world manufacturing rights outside the United States, to the copper-cooled HT spark

plug, which will be marketed by 200 Scintilla sales agents abroad.

The International Flare-Signal Company, of Tippecanoe City, O., continued its production of a complete line of parachute flares, all awarded Approved Type Certificates as meeting the requirements of the U. S. Department of Commerce.

The Irving Air Chute Company, of Buffalo, continued its development of parachutes, most important innovations being a quick-release harness and the Irvin Chair Chute which is believed to meet all requirements for passengers in cabin planes. A new parachute flare was also placed on the market during the year. The company announced that 36 countries use 12 different models of Irvin parachutes which have saved a total of 800 lives.

Walter Kidde & Company, of New York, installed on hundreds of military and transport planes their new Lux airplane engine fire detector and their Lux extinguisher, with which more than forty engine fires were snuffed out while motors were being warmed up. Improvements in the control system of the extinguisher reduced to an eighth the effort required to operate it in an emergency. The fire detector was developed to give both audible and visible alarms instantaneously.

The Kollsman Instrument Company, of Brooklyn, New York, introduced new instruments and increased its personnel 100 per cent. The sensitive altimeter was redesigned, increasing its accuracy and reliability still further. An air speed indicator and a tachometer were developed. A new and revolutionary type of compass was added to the Kollsman line. This instrument was made in two sizes for board mounting with a shock absorbing device built as an integral unit inside the case. Supplied with these compasses is a compensator eliminating error even when the plane is inclined at any angle up to 15 degrees. Four types of manifold pressure gages in varying ranges and calibrations were developed besides vapor pressure thermometers and an engine gage unit consisting of a calibrated thermometer, oil pressure and fuel pressure gage. Standard air speed indicators and fuel quantity gages were also redesigned, making them simpler and increasing their life.

The Leece-Neville Company, of Cleveland, continued to supply the industry with three sizes of 12-volt, voltage-regulated engine-driven generators and also three sizes of two-voltage generators to supply a high voltage for aircraft radio while making available the normal voltage.

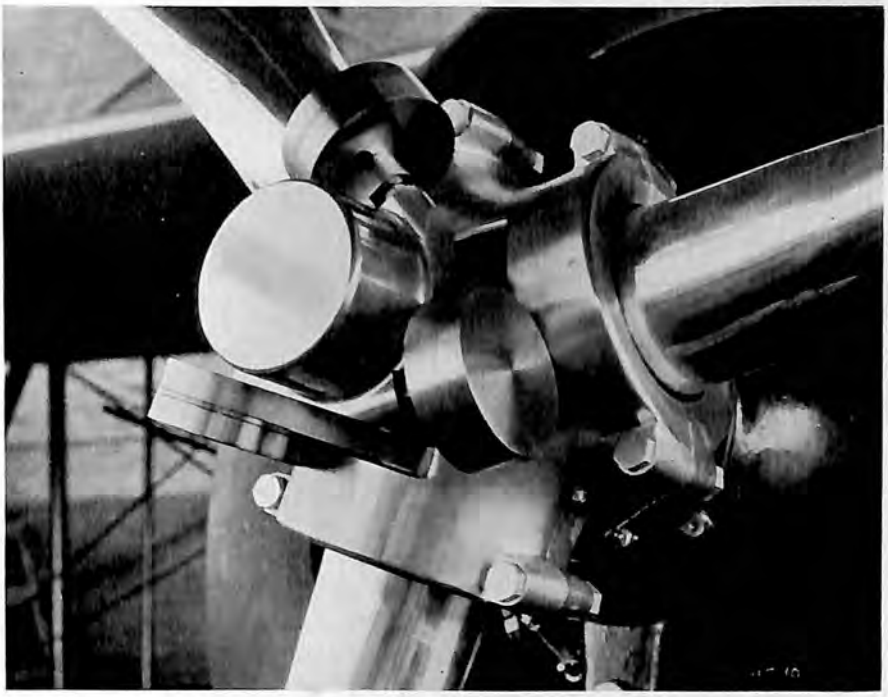
The MacWhyte Company, of Kenosha, Wis., introduced a streamline tie rod with a true streamline section, showing under flight and wind tunnel tests certain advantages over the standard oval or

lenticular section. Improved stainless steel rods with better corrosion resisting properties were also developed during the year.

The Mercury Aircraft Corporation, of Hammondsport, N. Y., continued to produce parts for lighter-than-air craft.

The Nicholas-Beazley Airplane Co., Inc., Marshall, Mo., supplied parts including speed rings, safety belts, screw machine parts, steel stamp parts and wooden propellers.

The Norma-Hoffman Bearings Corporation, of Stamford, Conn.,



HYDRAULICALLY CONTROLLED AIR SCREW

A close-up view of the 1933 development in Hamilton Standard controllable pitch propellers.

developed a number of new types of small ball bearings for use on control applications, including both rigid and self-aligning sealed bearings and newly designed sensitive bearings for gyroscope gimbals and other aircraft instruments.

The Ohio Seamless Tube Company, of Shelby, O., continued to supply airplane manufacturers with both carbon and alloy seamless tubing conforming to Government specifications.

The Parker Appliance Company, of Cleveland, continued to sup-

ply the industry with aircraft piping equipment in brass and aluminum alloys. The Parker tube or pipe connection is based on a flange on each of the tube ends to be joined. The flanges are wedged between two parts of the pipe fitting which are screwed together.

The Pioneer Instrument Company continued to produce and supply a world-wide market with air distance recorders, air speed indicators, pitot and venturi tubes, altimeters, bank indicators, climb indicators, clocks, magnetic compasses, drift indicators, fuel gauges, supercharger gauges, tachometers and thermometers.

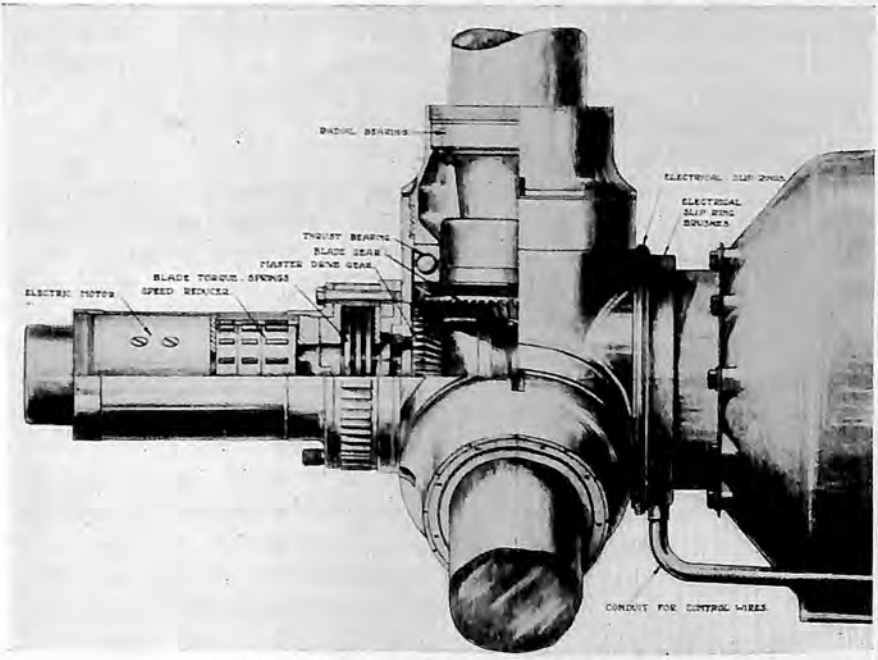
The Pittsburgh Screw and Bolt Corporation continued production of the Dicks hollow steel blades for propellers; and they were standard equipment in the air services and on scheduled transport lines.

The Pyle-National Company, of Chicago, redesigned its 36-inch floodlight believed to be the largest on the market for a 5,000 watt-115 volt lamp; also developed a new built in leading edge landing light, a new type of prismatic lens navigation light, using silvered glass precision mirrors and lenses of heat-resisting glass. That new equipment was installed on the Boeing transports.

A most important step was taken by Radio Corporation of America, when all its aviation radio activity was transferred from Radiomarine Corporation of America, one subsidiary company, to RCA Victor Company, another subsidiary. This move brought RCA's aviation activity completely under one roof, figuratively speaking, for at its large Camden plant RCA has concentrated all research activity, commercial development and production of apparatus. This move will throw the full advantages of RCA's resources squarely into aviation. Following this transfer, development was immediately begun on a complete new line of aviation radio apparatus. Complete systems for any aviation communication or navigational use are in production and will be marketed. Component items of systems now available include a new aircraft beacon weather receiver for itinerant aircraft and small air lines, a new aircraft transmitter, a new airport receiver equally adaptable to pilot or aviation executive home use, and a new airport traffic control transmitter.

John A. Roebling's Sons Company, of Trenton, N. J., continued production of special control cables, welding wire and other wire rope accessories. Special care was given the control cables, said to represent the highest development in the art of wire rope manufacture. Each individual wire is submitted to exacting tests, after which the finished cable is subjected to proof-loading and fatigue-testing far beyond the most rigid specifications.

The Scintilla Magneto Company, of Sidney, N. Y., a subsidiary of the Bendix Aviation Corporation, developed a new line of aircraft magnetos embodying new features designed to meet the requirements of latest engines and anticipate future improvements as well. Among the outstanding features of the new series is increased electrical output to take care of high compression and supercharged engines. Distributor gears are fully enclosed in a separate compartment and run in a bath of lubricant. A new pivotless breaker is used which greatly simplifies the checking and adjustment of



CURTISS CONTROLLABLE PITCH PROPELLER

The pitch of the Curtiss propeller is changed by means of a small electric motor which is geared to the propeller blades with a reduction gear ratio of 36,000:1.

the breaker contacts. Great attention has been given to accessibility of parts and ease of disassembly to facilitate inspection and adjustment.

The Shell Petroleum Corporation continued to work with the engine manufacturers in a united effort to increase the operating efficiency and power output of engines through a more perfect adaptation of especially designed aircraft fuels and lubricants. Considerable research dealt with the anti-knock or octane rating of aviation fuels.

The Sinclair Refining Company, of New York, continued to supply the operators of flying craft with its special line of fuels and lubricants.

SKF Industries expanded its aviation activities in the development of ball and roller bearings for aircraft engines and other equipment. A special department produced engine bearings having particular precision tolerances. A control pulley incorporating a ball bearing was developed during the year. The airship "Macon" contains more than 3,000 SKF bearings.

The Smith Engineering Company, of Cleveland, O., manufacturers of the Smith Controllable Propeller, was taken over by the Cord Corporation. The Lycoming Manufacturing Company at Williamsport, Pa., another unit of the Cord Corporation, was licensed to manufacture the Smith controllable propeller, and sales are also handled by this company.

The Smith controllable propeller is mechanically operated and has an infinite number of blade settings. The control is operated from the cockpit and the blade angle can be changed at any time in flight at the will of the pilot. Provision was also being made for electrical control for use on multi-motored planes. The line of propellers formerly manufactured by the Smith Engineering Company was being retooled for production, with plans for the design and manufacture of a complete line of controllable propellers for engines ranging from 200 to 800 horsepower.

The Socony-Vacuum Corporation, formed in 1931 by the merger of the Standard Oil Company of New York and the Vacuum Oil Company, was marketing its products developed for aviation service including lubricants and a fuel refined especially for aircraft engines and incorporating exclusive climatic control features.

Products of the Sperry Gyroscope Company were invaluable adjuncts to many of the outstanding flight achievements of the year. On the Balbo expedition each of the twenty-five Italian seaplanes was equipped with a Sperry Horizon and two Directional Gyros, in all, seventy-five Sperry instruments. Perfect performance of every instrument was reported. Col. Lindbergh had his Lockheed Sirius monoplane equipped with a special vibration-proof instrument panel, complete with Sperry Horizon and Directional Gyro, designed and installed by the Sperry Company. When the United States Navy made its record-breaking, formation flight from Norfolk to Coco Solo, the six Consolidated Patrol Boats were equipped with Sperry Horizon and Directional Gyro. Wiley Post, on his record solo flight around the world, carried the Sperry Pilot for automatic

flying. This device is no longer electrical, but instead, is a pneumatic-hydraulic type developed during the year. Among the planes equipped with the Sperry automatic pilot were a United Air Lines Boeing transport and the first of the TWA Douglas airliners.

During the year the Sperry engineers developed specifications for soundproofing which were incorporated in the design and construction of the Curtiss-Wright Condor and the Douglas Airliner.

The Stanavo Specification Board, Inc., organized and supported by the Standard Oil Companies of New Jersey, California and Indiana, was formed for the primary purpose of developing and standardizing specifications for aviation petroleum products. In addition to providing a complete line of fuels to meet the requirements of every model of aviation engine now being manufactured, over a horsepower range from 25 to 1,000, as well as special blends for various high-speed flights here and abroad, the Stanavo Board cooperated closely with aeronautical engineers and manufacturers. The development of hydrogenated high flash fuels by the Standard Oil Company of New Jersey promises marked reduction in fuel consumption, with increased brake mean effective pressures and higher power output. Several lubrication specialties have been developed by the Board to meet the demands of the highly specialized precision instruments in modern aircraft.

The Standard Oil Company of Indiana continued to supply air lines and other aeronautical interests with fuels and lubricants.

The Stewart Hartshorn Company, of New York, continued to supply the aircraft manufacturing industry with streamline wire tie rods for external bracings, producing them by the cold reverse rolling method. The wires are drawn and cold rolled from electric furnace carbon rod, special heat-treating processes creating high tensile strength.

The Summerill Tubing Company of Bridgeport, Pa., continued to serve the trade by carrying a good stock of raw material, as well as warehouse stocks of finished, standard sizes. The same policy pursued from the beginning of the use of seamless steel tubing was being continued.

The Texas Company's fleet of airplanes, which the company's territorial aviation representatives use for travel throughout the country, were continued in service as flying laboratories for the research division of the refining department. Gasoline, oils, greases and other such products received major tests in craft flown by Commander Frank M. Hawks, J. D. "Duke" Jernigin and other Texaco pilots. In aviation, as with its other products, Texaco uses a

practical proving ground before adopting specifications for service to its transport, airport and other customers.

Thompson Products, Inc., of Cleveland, continued its development of aircraft engine valves of all designs, including tungsten, cobalt-chrome and silchrome, in both solid and hollow stem types.

The Thurston Cutting Corporation, of New York, continued to supply the industry with its special line of airplane fabric coverings, tape, balloon cloth and similar accessories. Their Dartmouth Tex airplane fabric was used by the Byrd expedition for windproof garments.

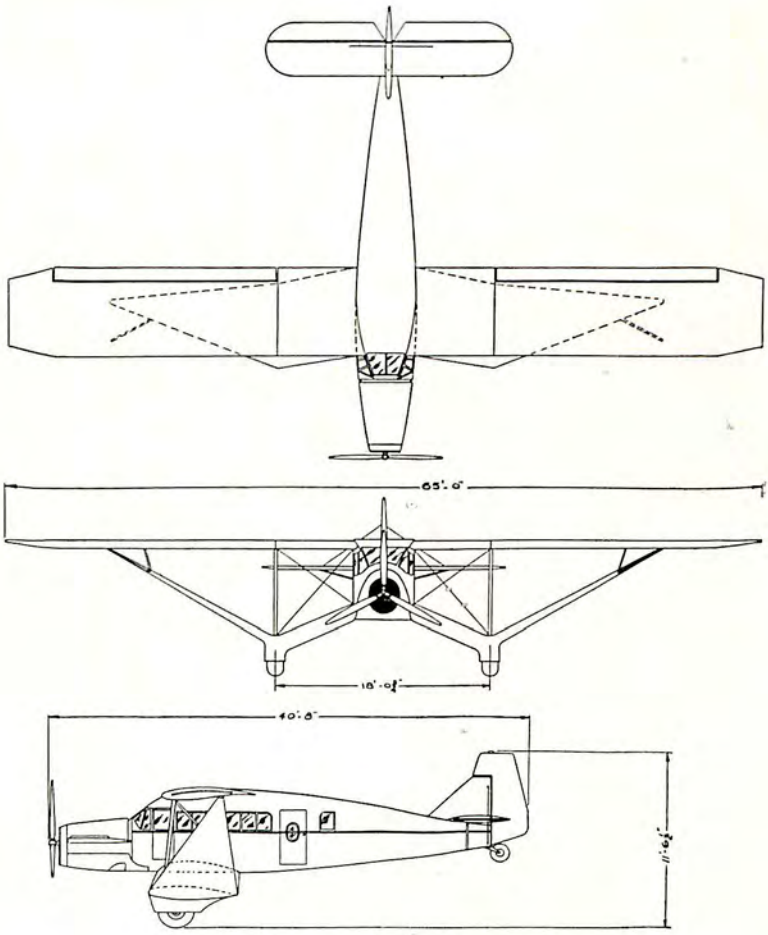
The Vellumoid Company, of Worcester, Mass., continued to market its special line of complete gasket assemblies for specific aircraft engines.

The Western Electric Company in collaboration with the Bell Telephone Laboratories continued its development work on aviation communication apparatus. Of particular interest was the work done with apparatus for blind landing. The Fairchild plane of the Bell Laboratories was fully equipped and used in making repeated checks on the blind landing beacon of the Department of Commerce at Newark, N. J. The newly designed radio telephone equipment, brought out in 1932, through the cooperation of transport operators was kept under close observation in 1933. Reports on its day-by-day operation under all conditions of transport service testified to its successful performance. The introduction of crystal control into receivers, similar to that already used in transmitters, serving to place the receivers on a fixed frequency and lock them there, added further to the dependability of radiophone communication. The Western Electric radiophone was installed in United Air Lines and Transcontinental & Western Air transport planes.

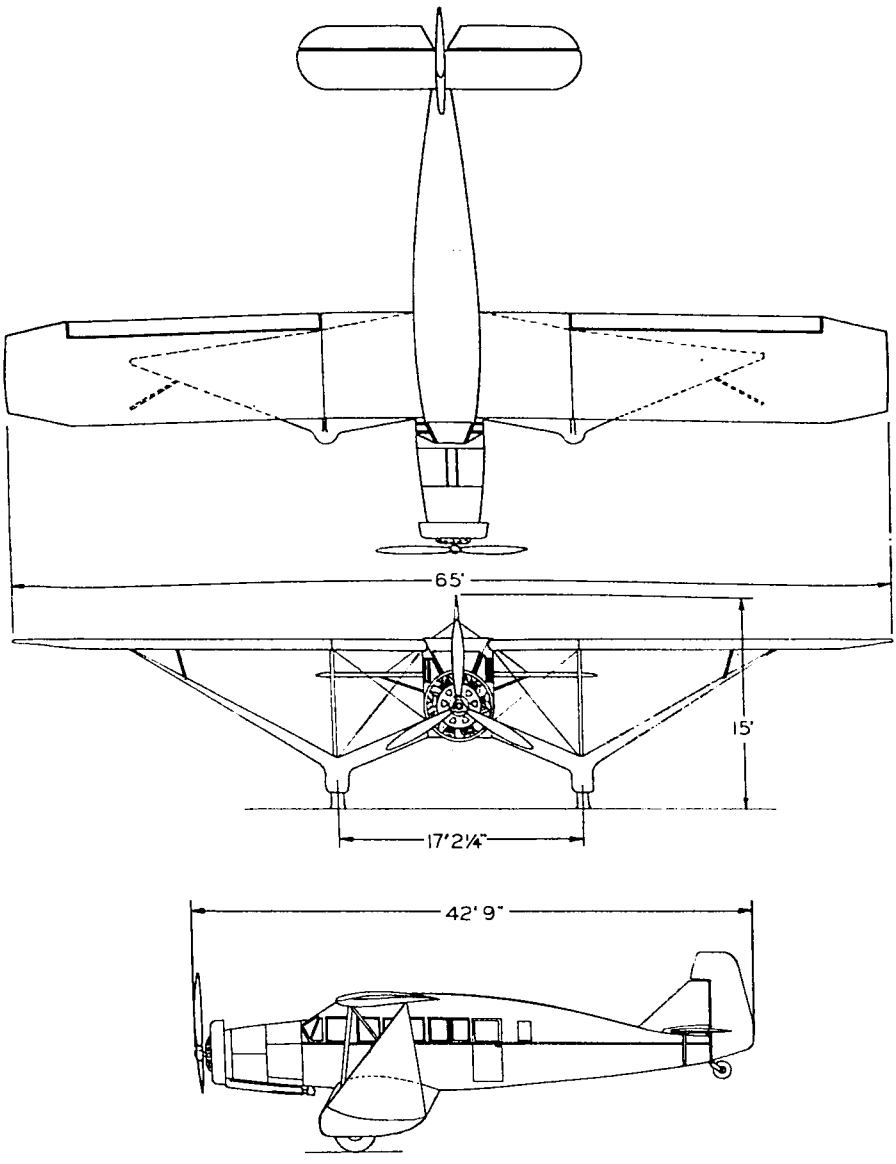
The Wyman-Gordon Company, of Worcester, Mass., continued production of aluminum alloy forgings, among them a forged aluminum-alloy piston and other forgings for crankshafts, connecting rods, cams, gears and hubs.

Among other accessory concerns purveying to the industry and forming important units of the national institution of aviation are the following: the Aero Supply Manufacturing Company of Corry, Pa.; Airplane Wheel & Rim Corporation, of Binghamton, N. Y.; the Bredouw-Hilliard Aeromotive Corporation of Kansas City, Mo.; the Elgin National Watch Company of Elgin, Ill.; Johnson Airplane & Supply Company, of Dayton, O.; Security Sportswear Company, of Chicago.

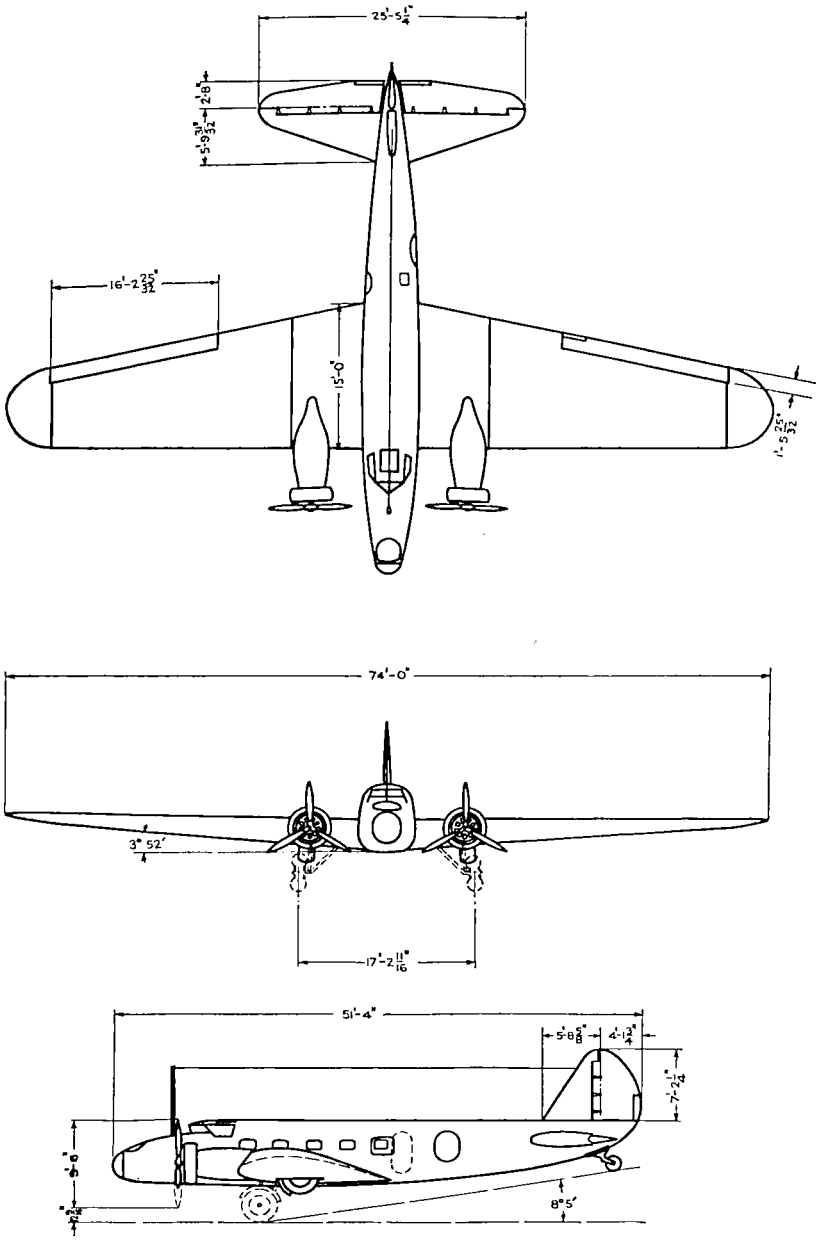
AIRCRAFT AND ENGINE DESIGNS



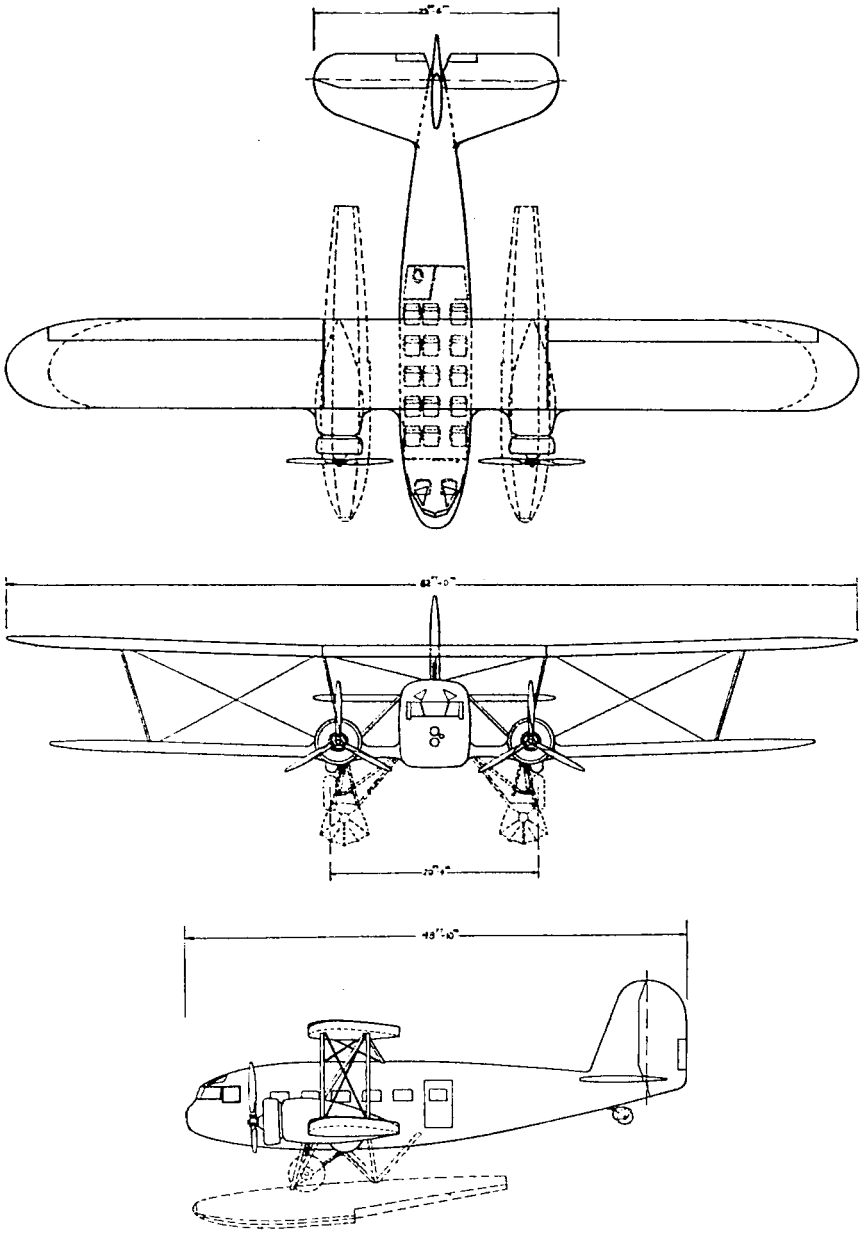
BELLANCA AIRCRAFT CORPORATION
New Castle, Del.
AIRBUS —— 12-15 PLACE
ENGINE: CURTISS CONQUEROR
PRATT & WHITNEY HORNET
WRIGHT CYCLONE



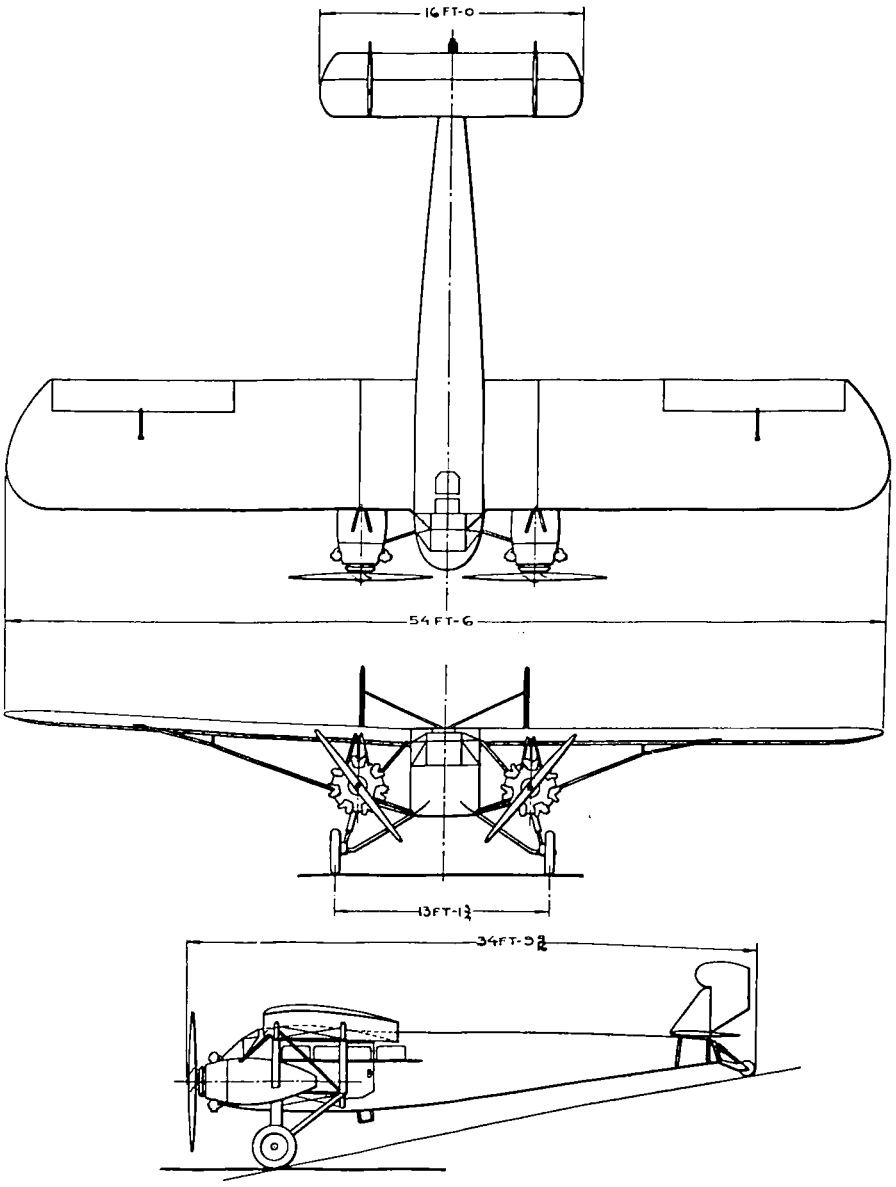
BELLANCA AIRCRAFT CORPORATION
New Castle, Del.
AIRCRUISER —— 12-15 PLACE
ENGINE: WRIGHT CYCLONE
PRATT & WHITNEY HORNET



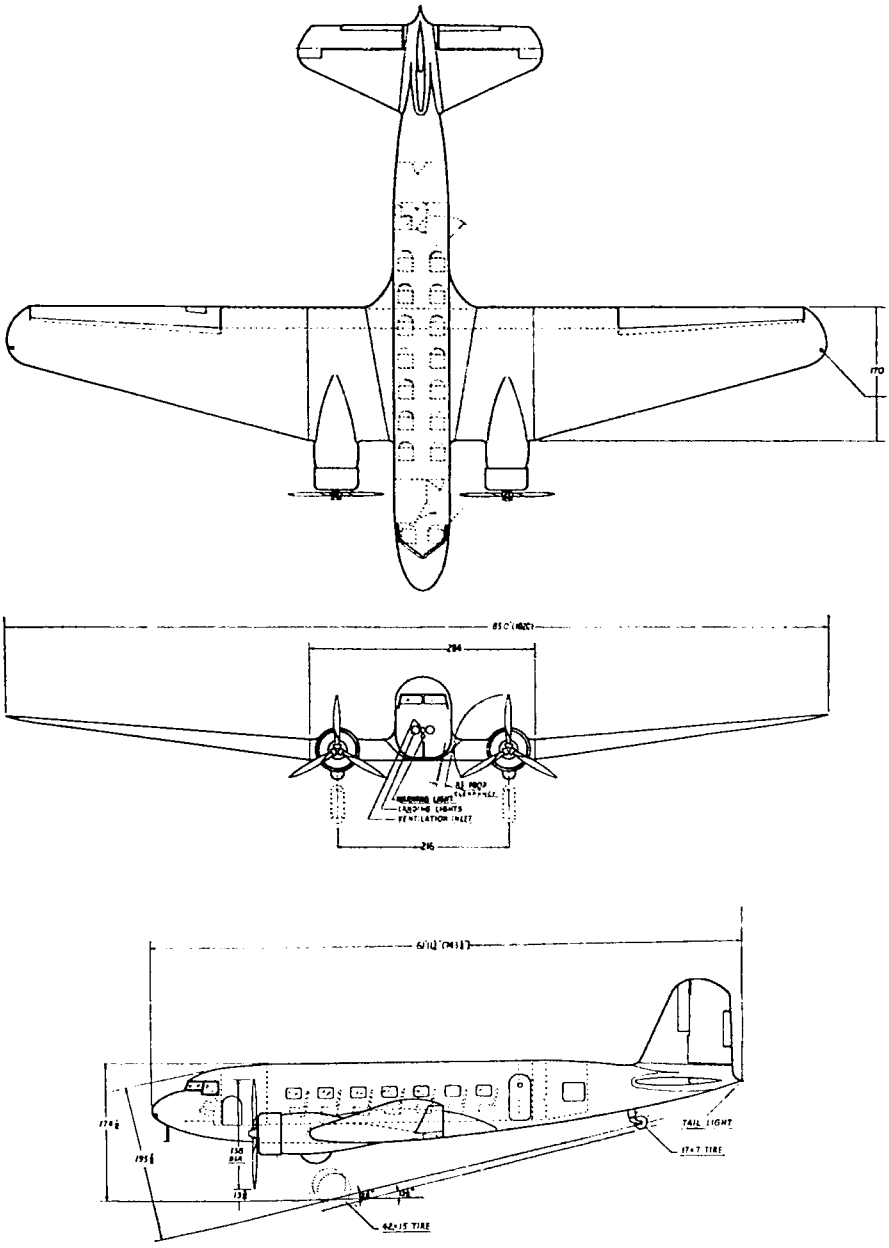
BOEING AIRPLANE COMPANY
Seattle, Wash.
MODEL 247 —— 12 PLACE
ENGINE: TWO PRATT & WHITNEY WASPS



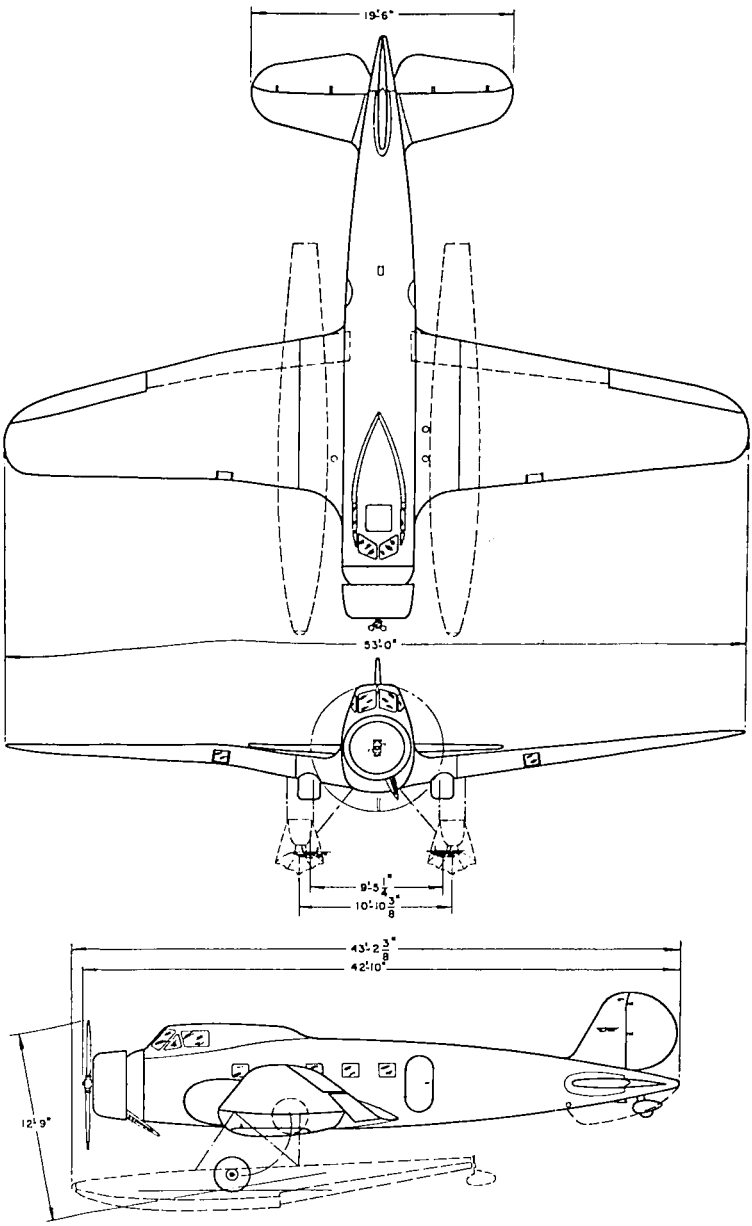
CURTISS-WRIGHT AIRPLANE COMPANY
St. Louis, Mo.
MODEL T-32 CONDOR —— 17 PLACE
ENGINE: TWO GEARED WRIGHT CYCLONE F



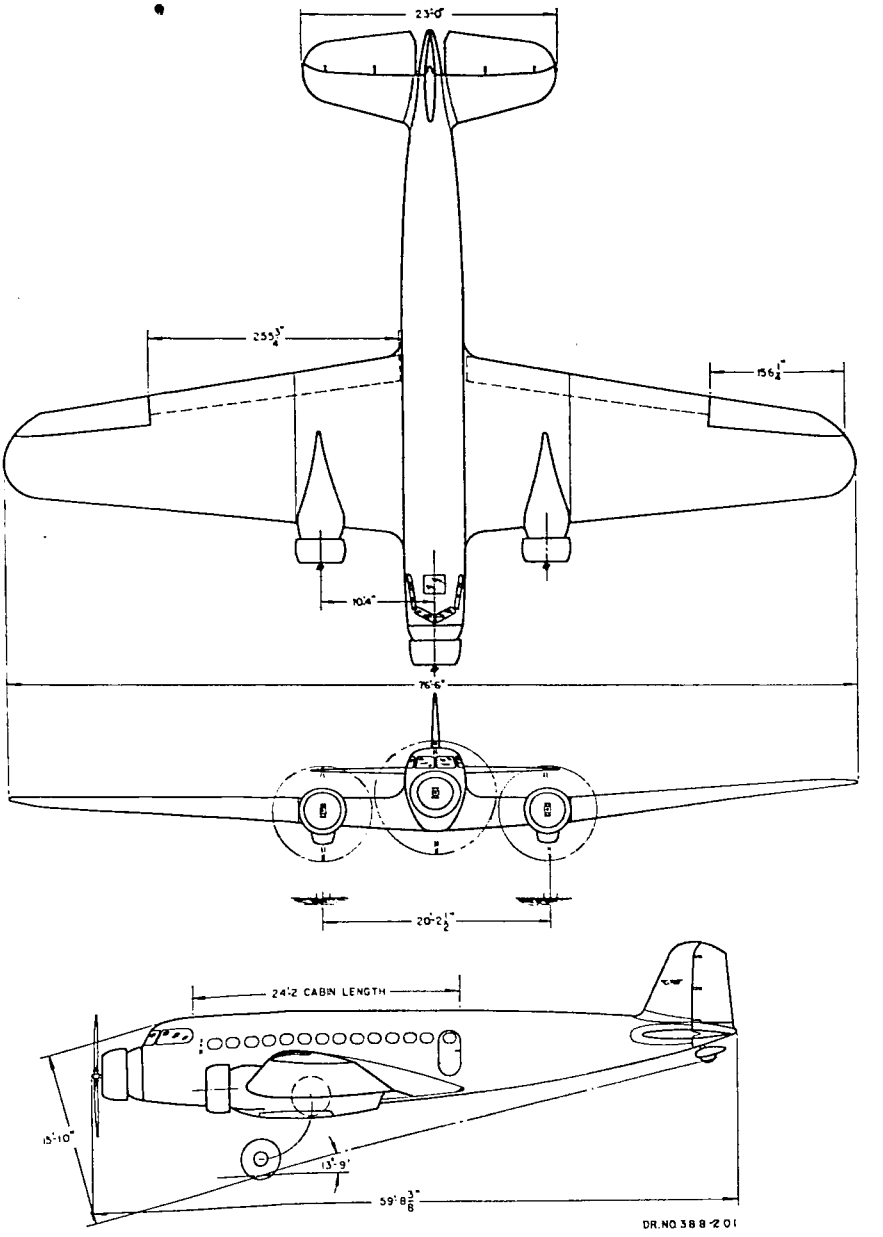
CURTISS-WRIGHT AIRPLANE COMPANY
St. Louis, Mo.
KINGBIRD —— 8 PLACE
ENGINES: TWO WRIGHT WHIRLWIND 330



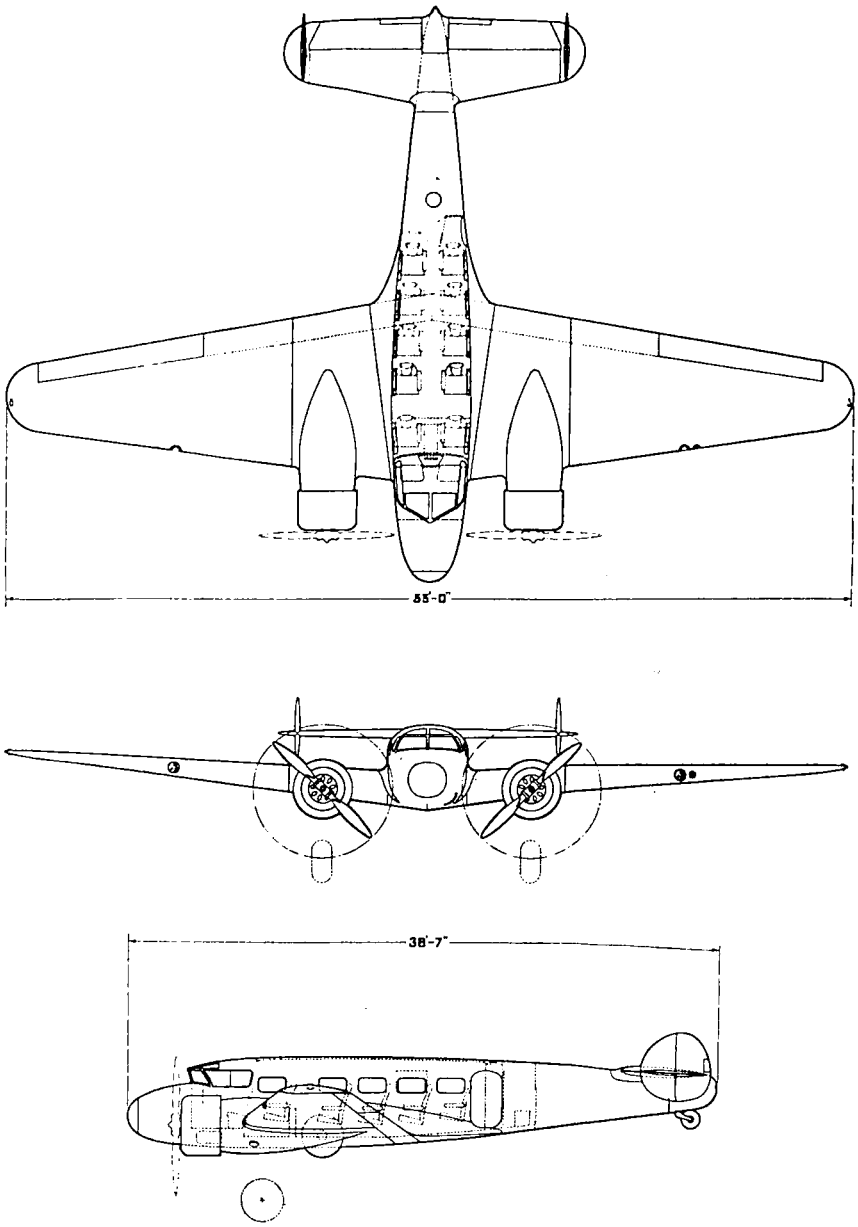
DOUGLAS AIRCRAFT COMPANY, INC.
Santa Monica, Calif.
TRANSPORT —— 16-20 PLACE
ENGINES: TWO PRATT & WHITNEY HORNETS
TWO WRIGHT CYCLONES



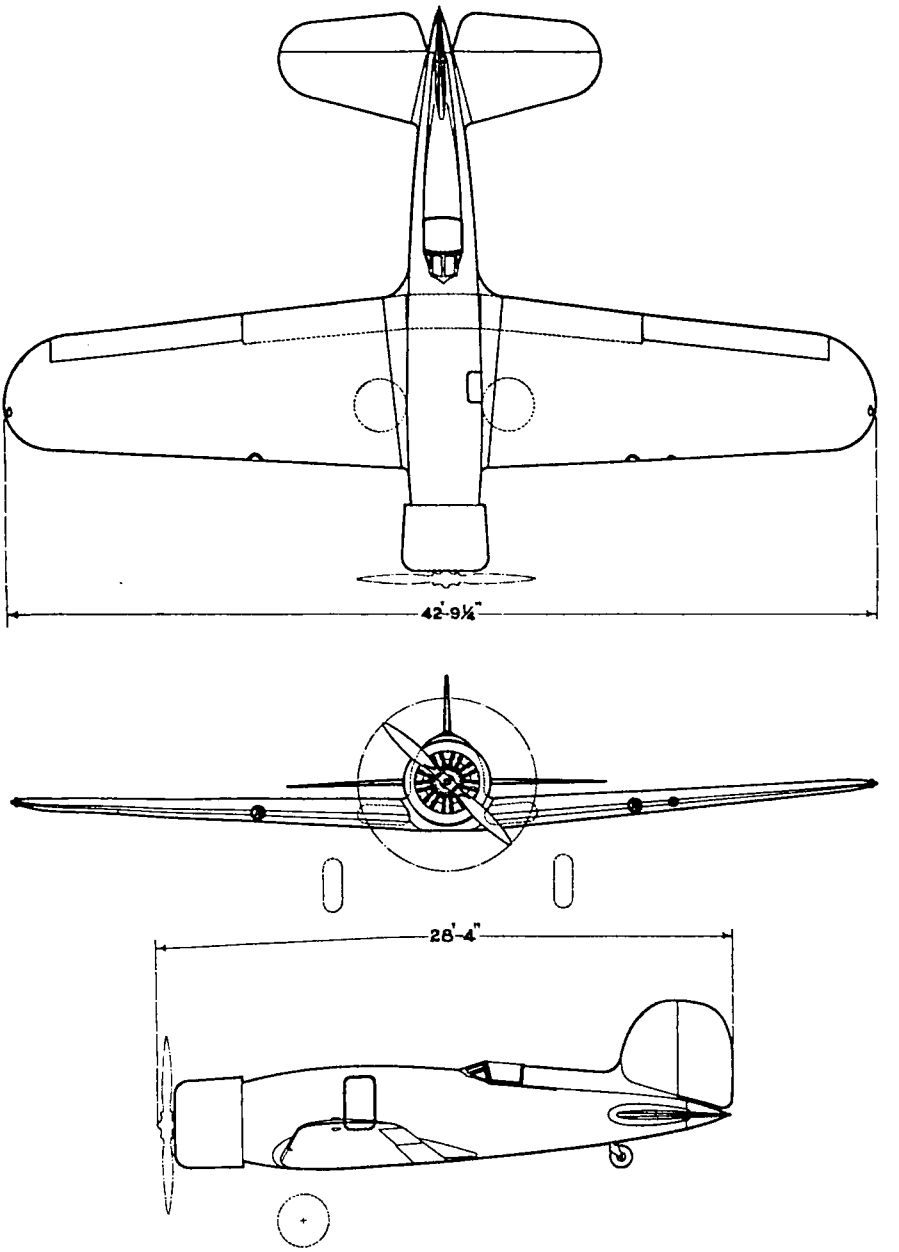
GENERAL AVIATION MANUFACTURING CORPORATION
Dundalk, Md.
GA-43 —— 10 PLACE
ENGINE: WRIGHT CYCLONE



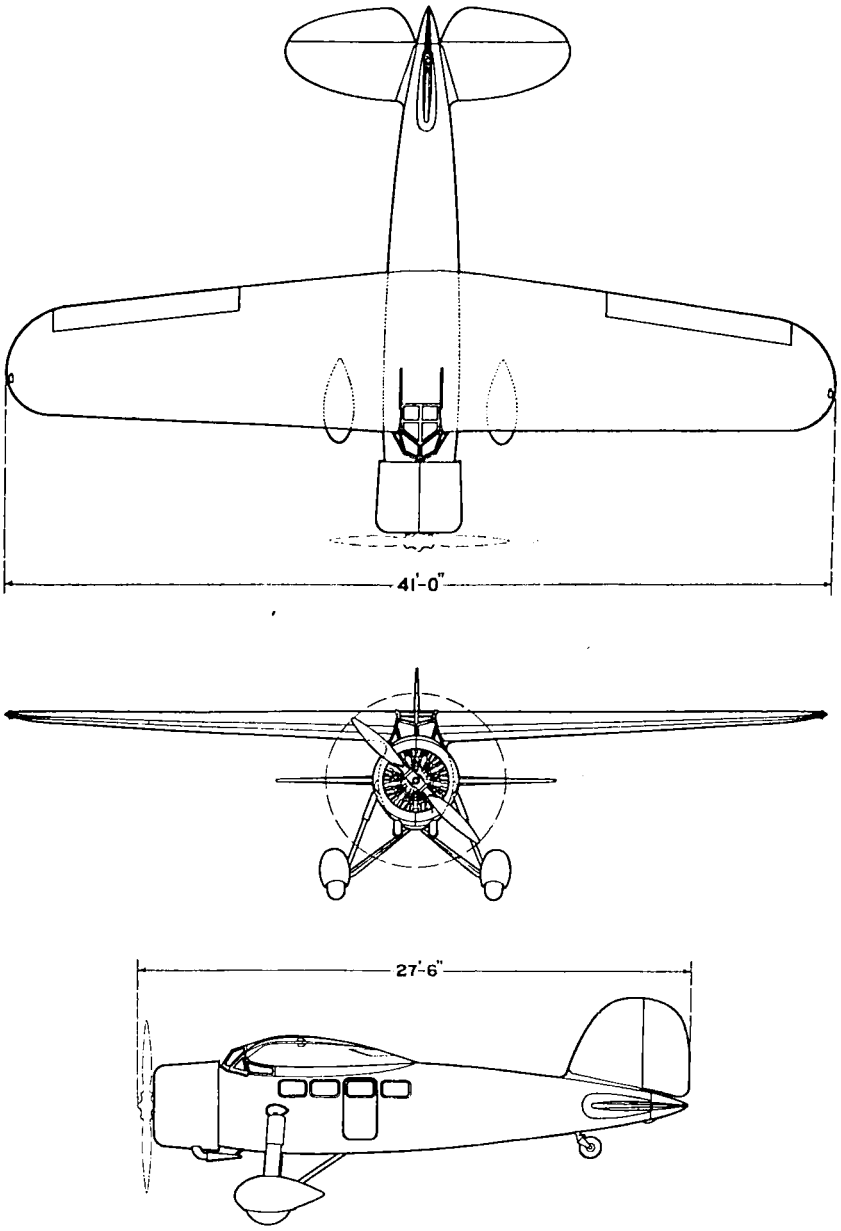
GENERAL AVIATION MANUFACTURING CORPORATION
Dundalk, Md.
GA-38X —— Transport
Engines: Three Pratt & Whitney Wasps



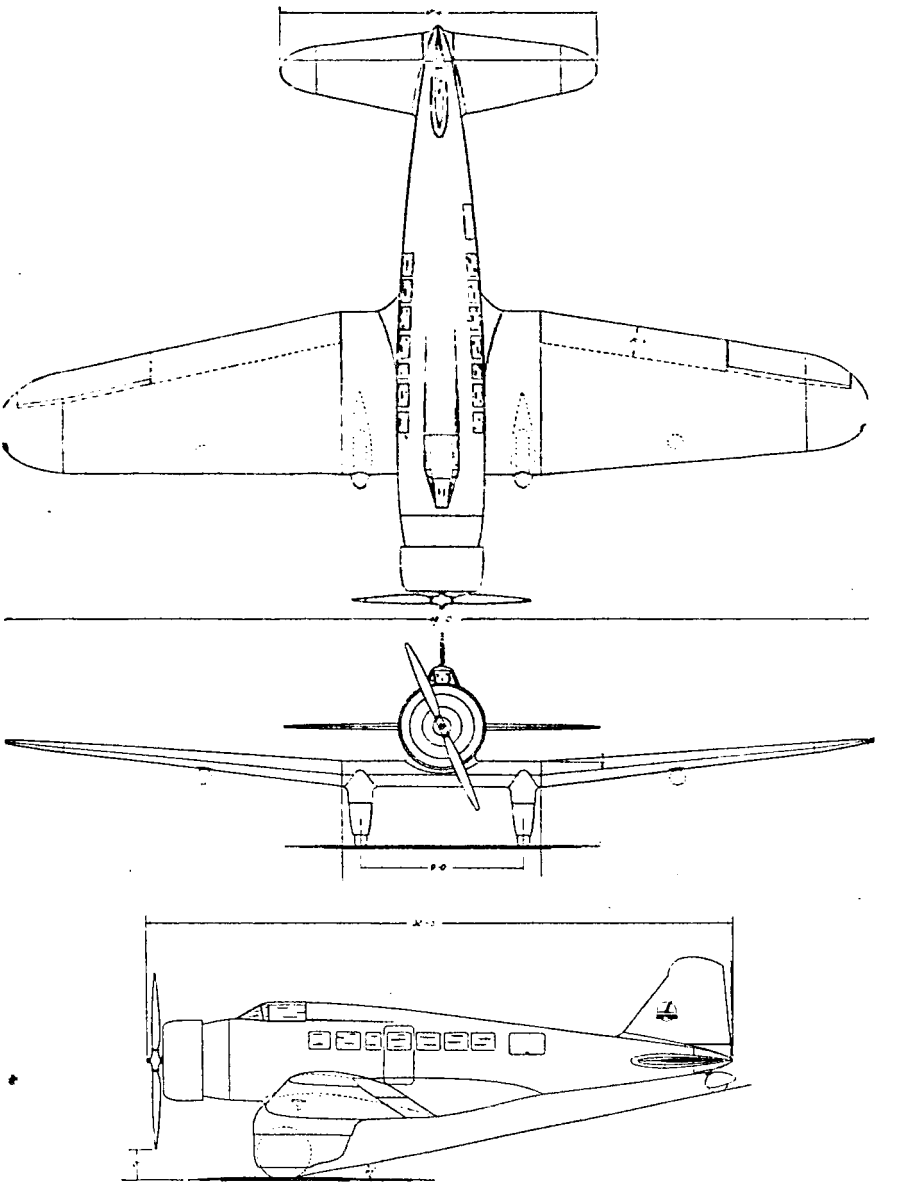
LOCKHEED AIRCRAFT CORPORATION
Burbank, Calif.
ELECTRA —— 12 PLACE
ENGINES: TWO PRATT & WHITNEY WASP JUNIOR



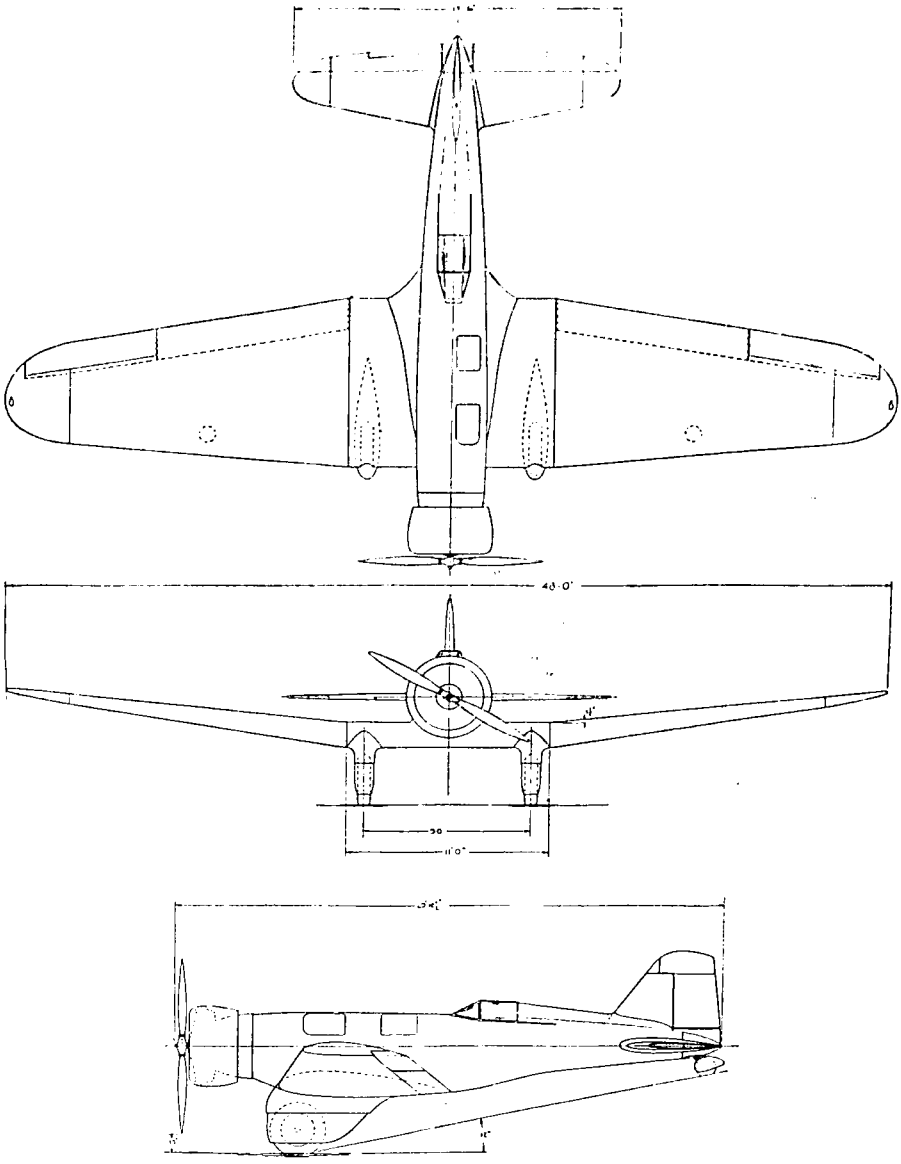
LOCKHEED AIRCRAFT CORPORATION
Burbank, Calif.
ORION —— 1-5 PLACE
ENGINE: PRATT & WHITNEY WASP S1D1
WRIGHT CYCLONE



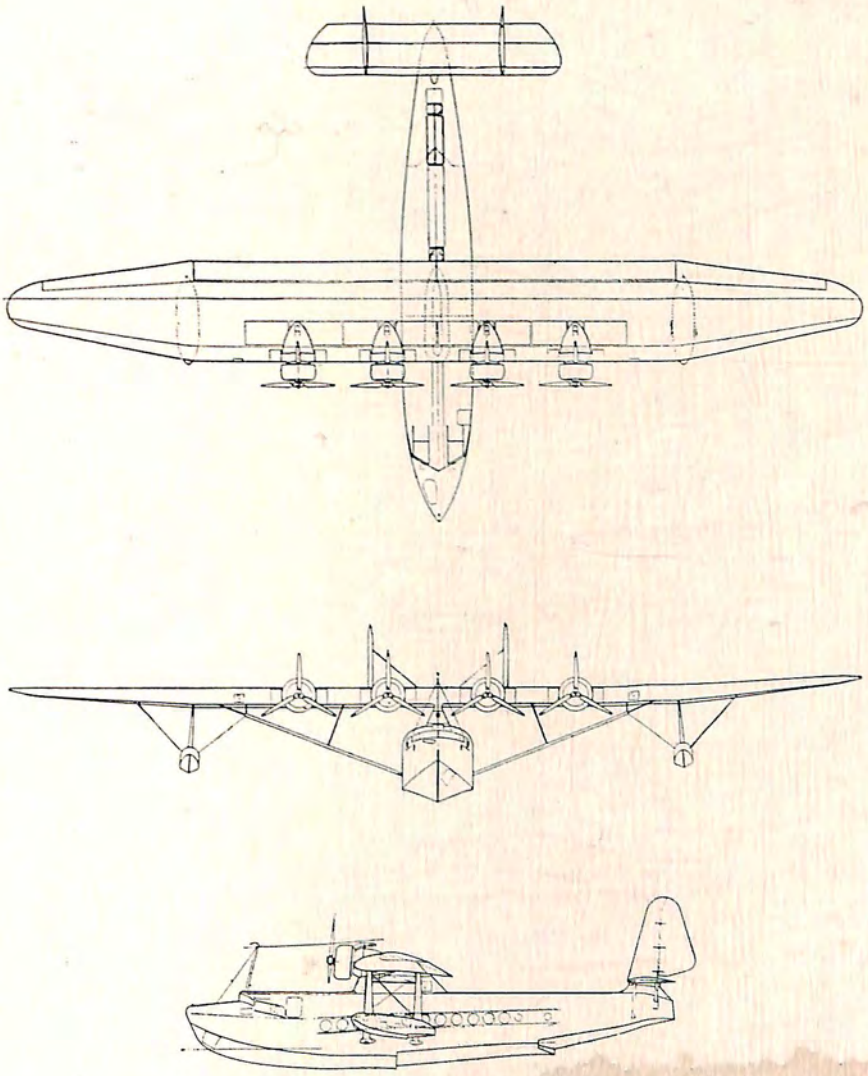
LOCKHEED AIRCRAFT CORPORATION
Burbank, Calif.
VEGA —— 7 PLACE
ENGINE: PRATT & WHITNEY WASP SC-1



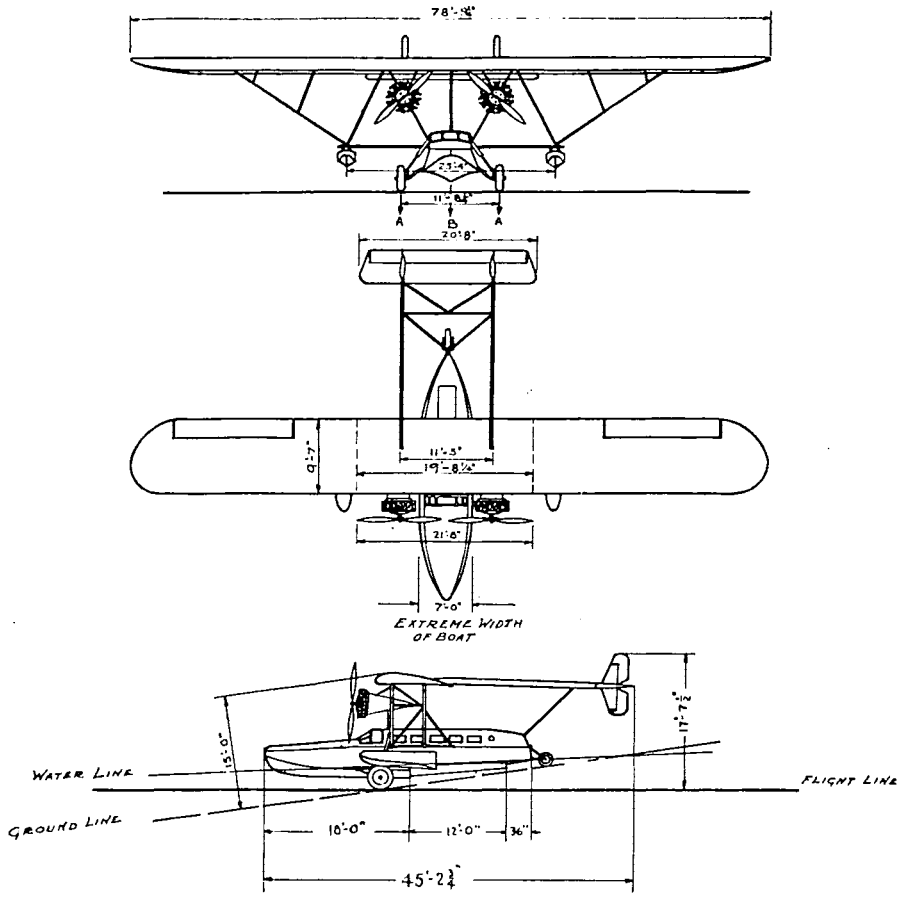
THE NORTHROP CORPORATION
Inglewood, Calif.
DELTA —— 8 PLACE
ENGINE: WRIGHT CYCLONE



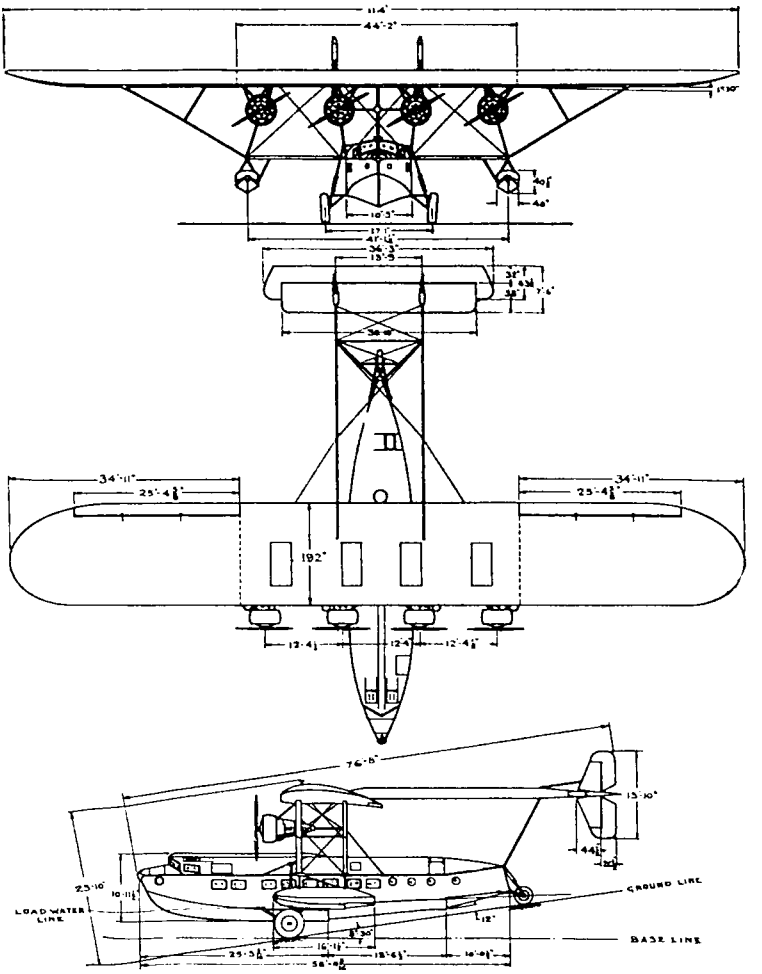
THE NORTHROP CORPORATION
Inglewood, Calif.
GAMMA —— 1 PLACE
ENGINE: PRATT & WHITNEY HORNET
WRIGHT CYCLONE



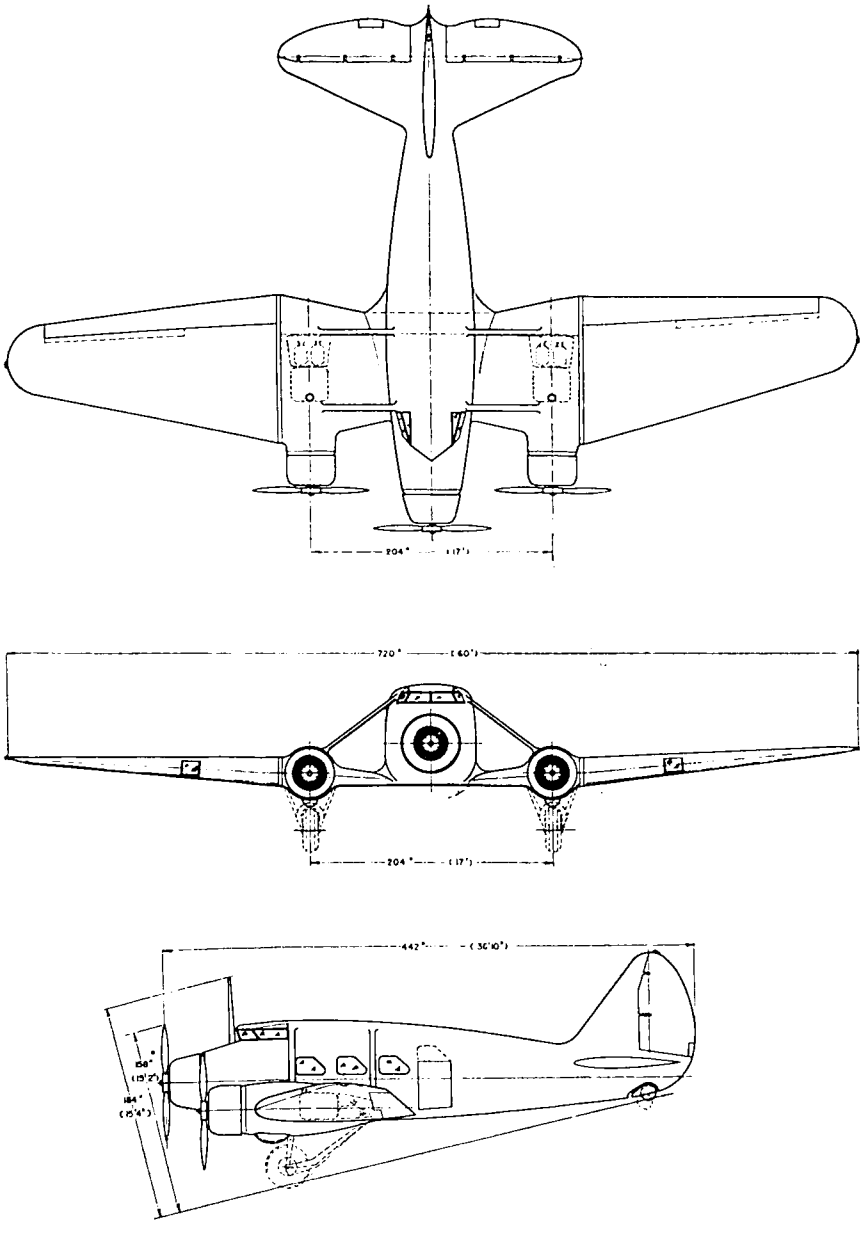
SIKORSKY AVIATION CORPORATION
Bridgeport, Conn.
MODEL S-42 —— 40-50 PLACE
ENGINES: FOUR PRATT & WHITNEY HORNETS



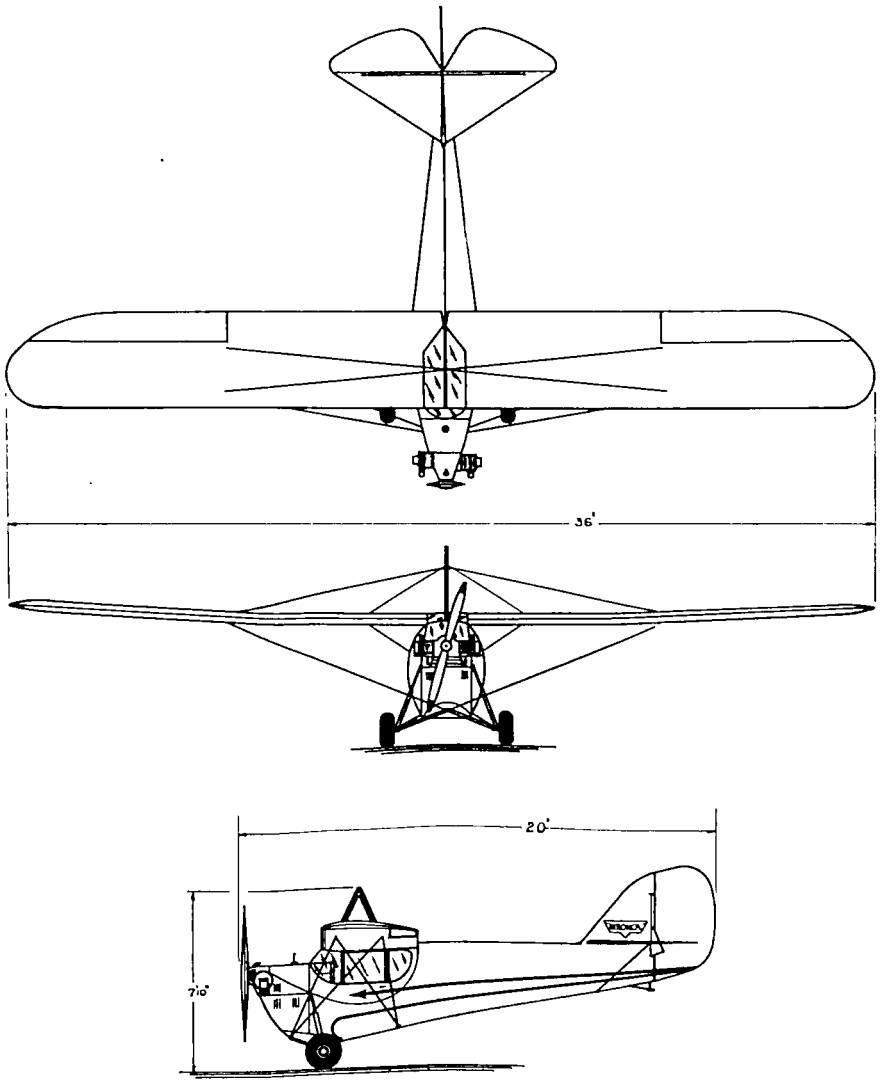
SIKORSKY AVIATION CORPORATION
Bridgeport, Conn.
AMPHIBION S-40 —— 38 PLACE
ENGINES: FOUR PRATT & WHITNEY HORNETS



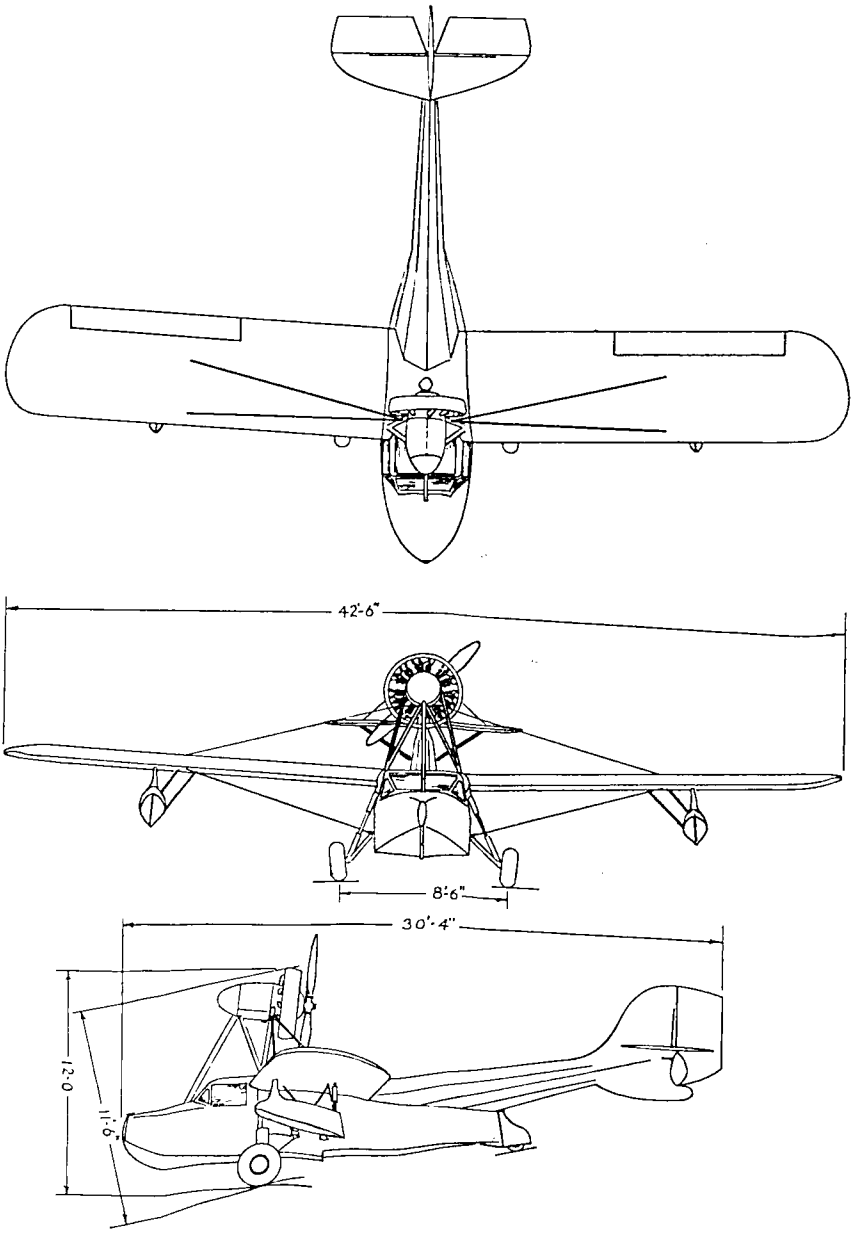
SIKORSKY AVIATION CORPORATION
Bridgeport, Conn.
MODEL S-41 —— 16 PLACE
ENGINES: TWO PRATT & WHITNEY HORNETS



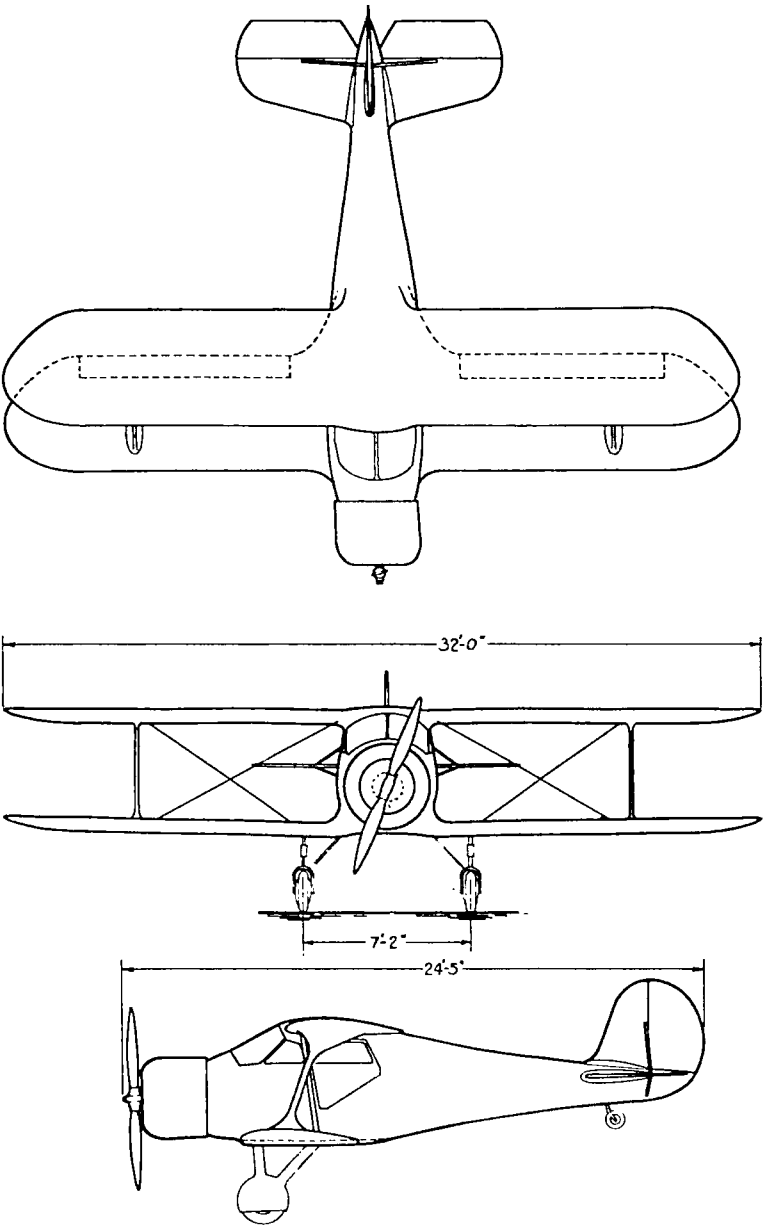
STINSON AIRCRAFT CORPORATION
Wayne, Mich.
MODEL A —— 10 PLACE
ENGINES: THREE LYCOMING R-680-5



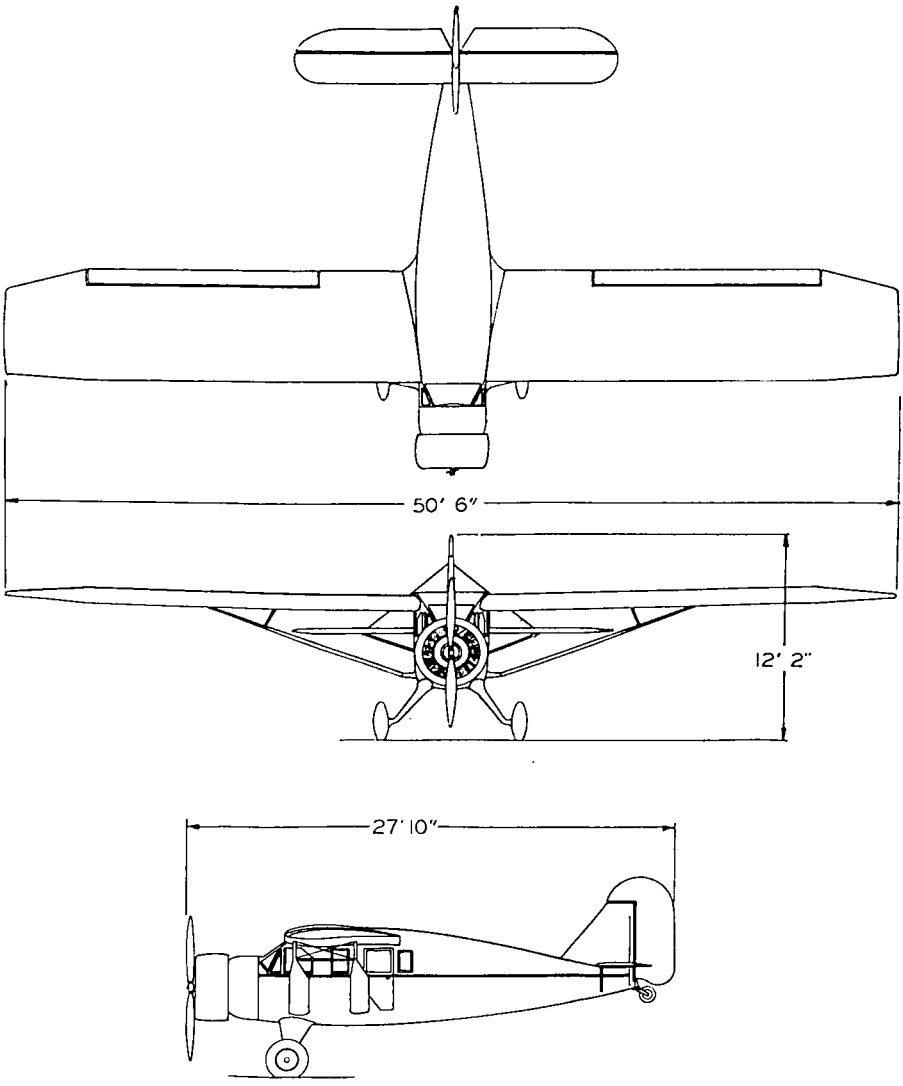
AERONAUTICAL CORPORATION OF AMERICA
Cincinnati, Ohio
AERONCA C-3 —— 2 PLACE
ENGINE: AERONCA E-113A



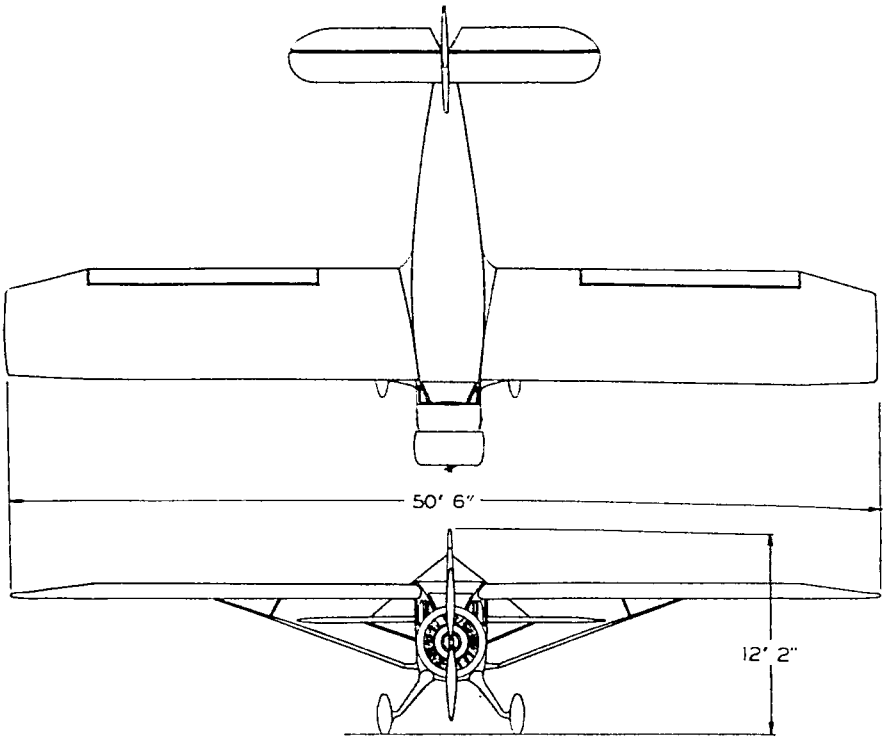
AMPHIBIONS, INCORPORATED
Garden City, L. I., N. Y.
PRIVATEER P-3B —— 3 PLACE
ENGINE: CONTINENTAL R-690

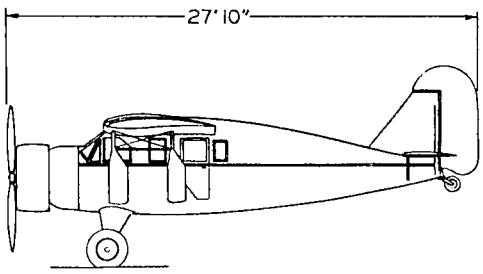


THE BEECH AIRCRAFT COMPANY
Wichita, Kans.
MODEL B17L —— 4 PLACE
ENGINE: WRIGHT WHIRLWIND

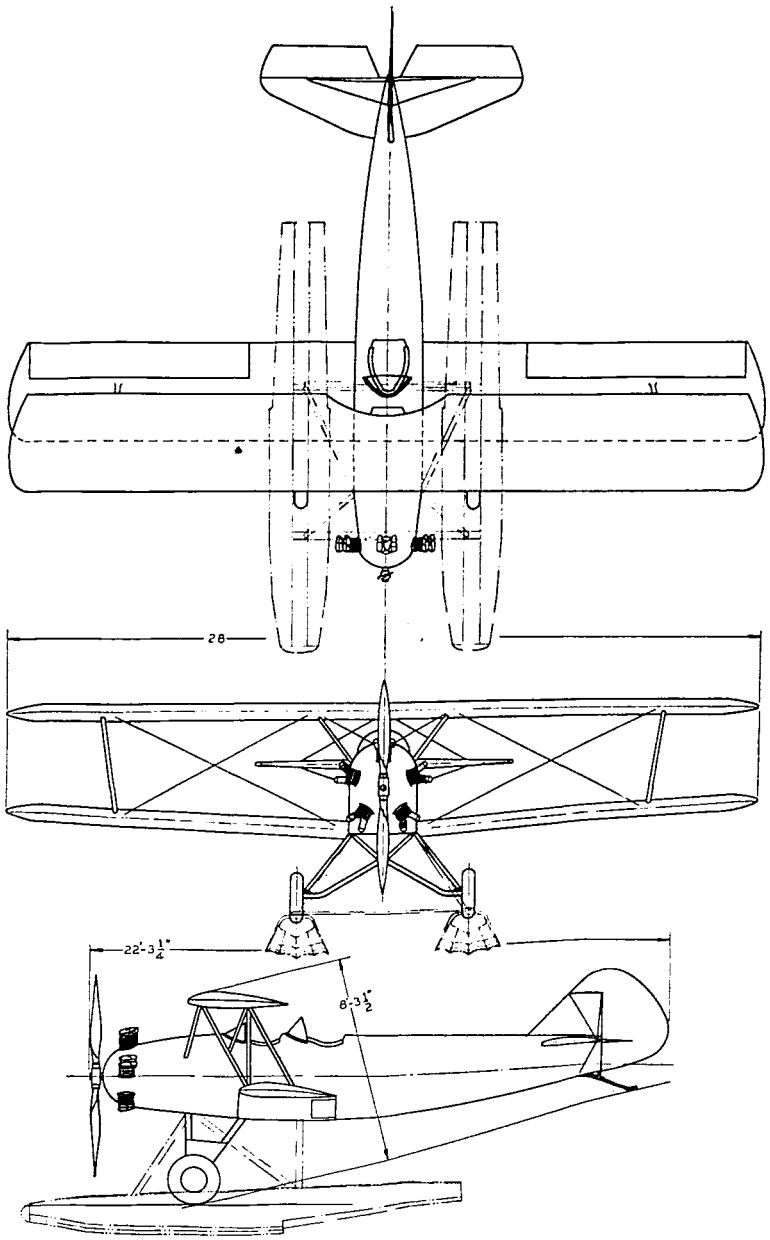


BELLANCA AIRCRAFT CORPORATION
New Castle, Del.
SENIOR PACEMAKER —— 6 PLACE
ENGINE: PRATT & WHITNEY WASP JUNIOR
WRIGHT WHIRLWIND

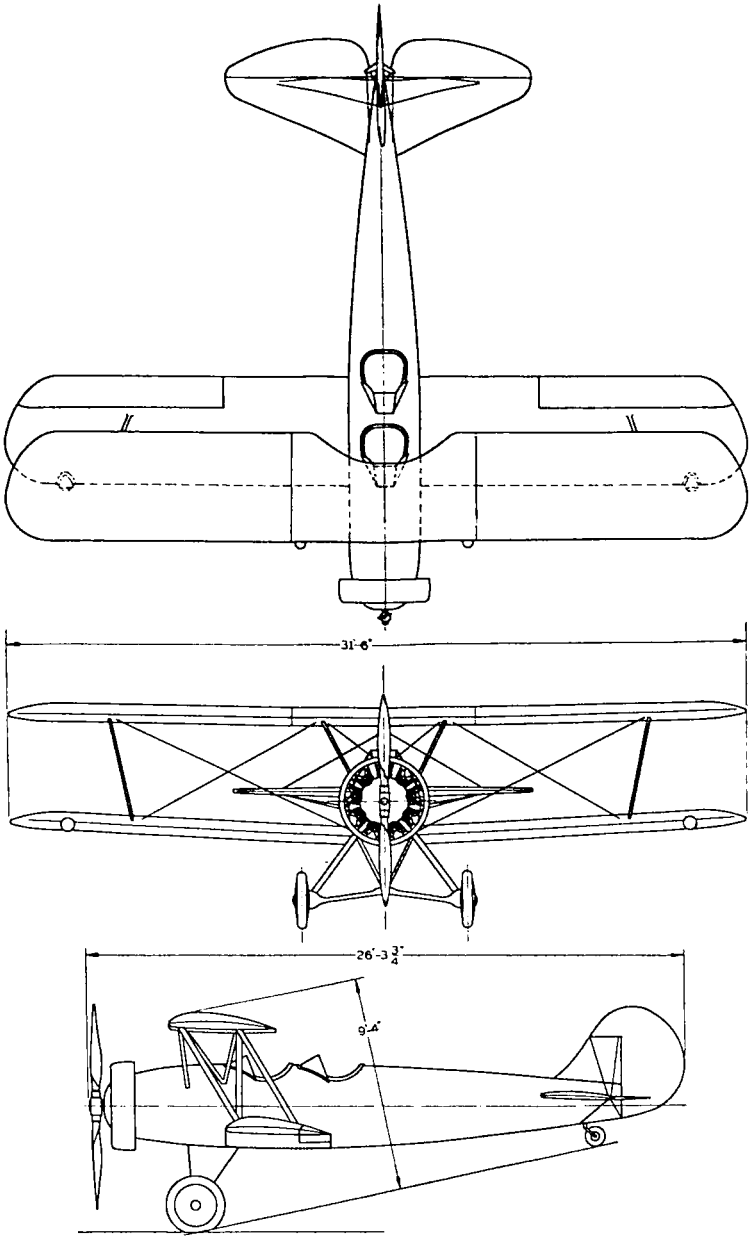




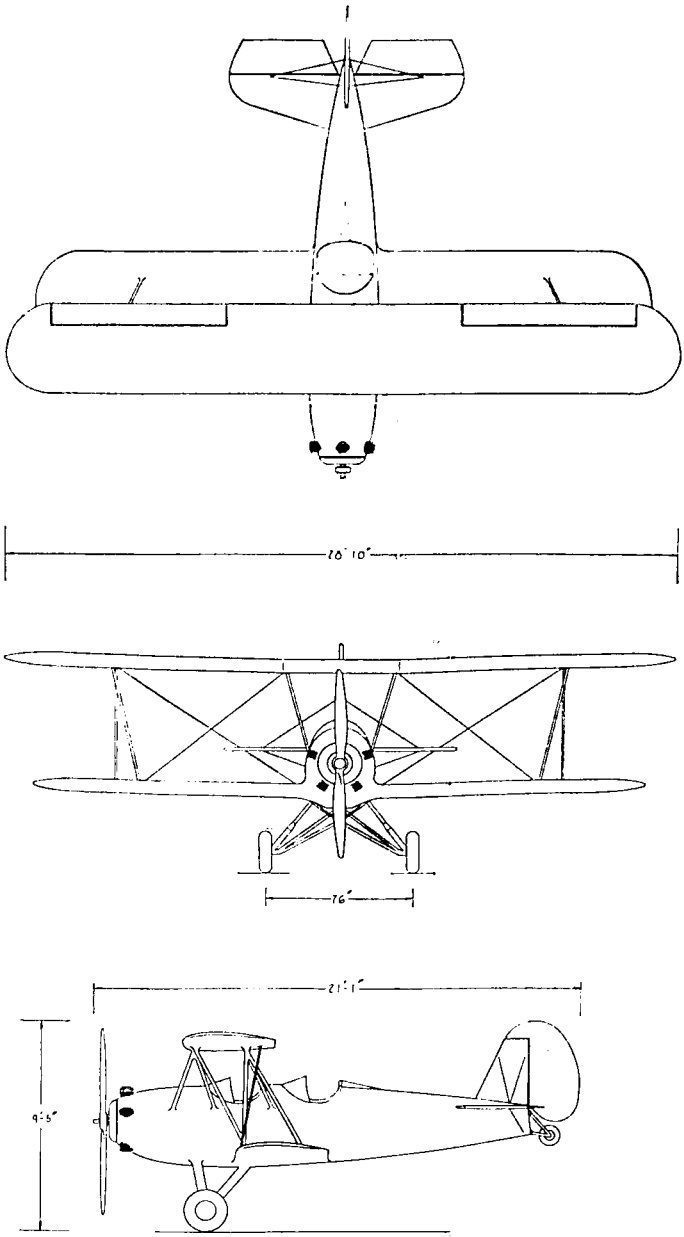
BELLANCA AIRCRAFT CORPORATION
New Castle, Del.
SENIOR SKYROCKET —— 6-8 PLACE
SENIOR SKYROCKET STANDARD
SENIOR SKYROCKET DELUXE
ENGINE: PRATT & WHITNEY WASP



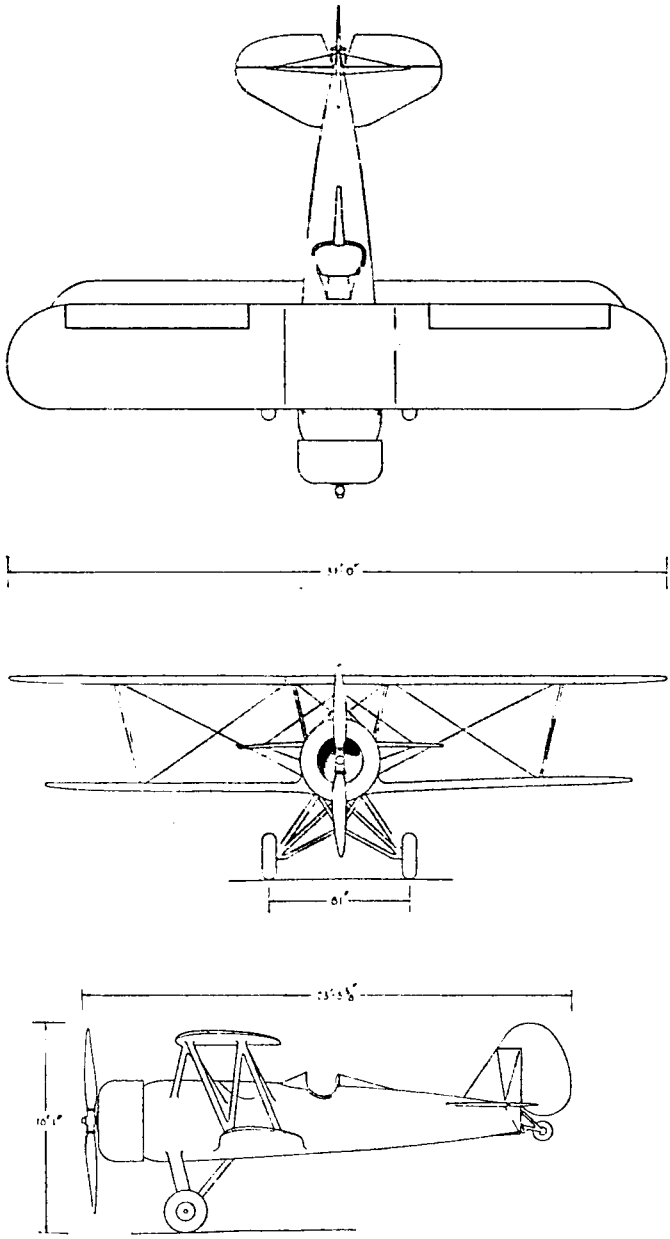
CONSOLIDATED AIRCRAFT CORPORATION
Buffalo, N. Y.
MODELS: F-5, 10 & 11 —— 2 PLACES
ENGINES: KINNER K-5, B-5 & R-5



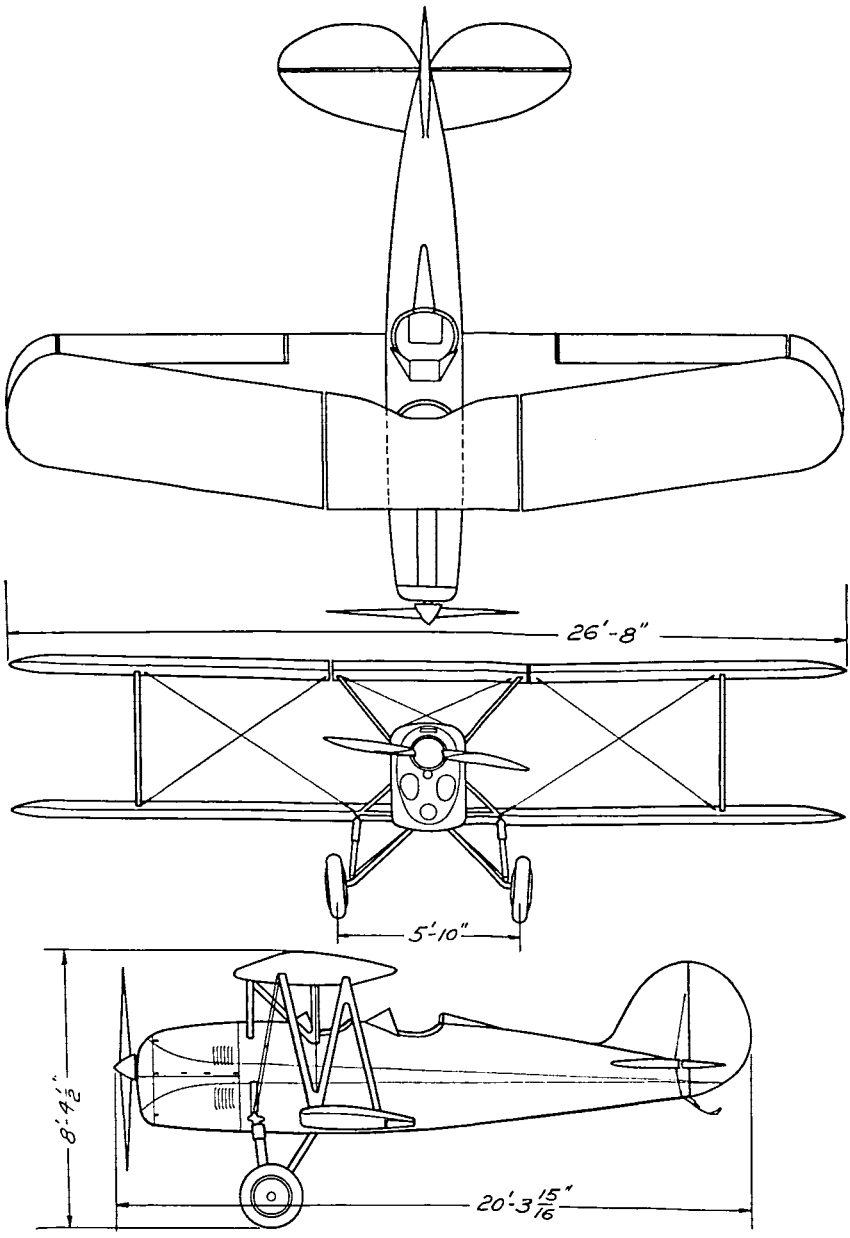
CONSOLIDATED AIRCRAFT CORPORATION
Buffalo, N. Y.
MODELS 21-C, D —— 2 PLACE
ENGINE: PRATT & WHITNEY WASP JUNIOR
LYCOMING



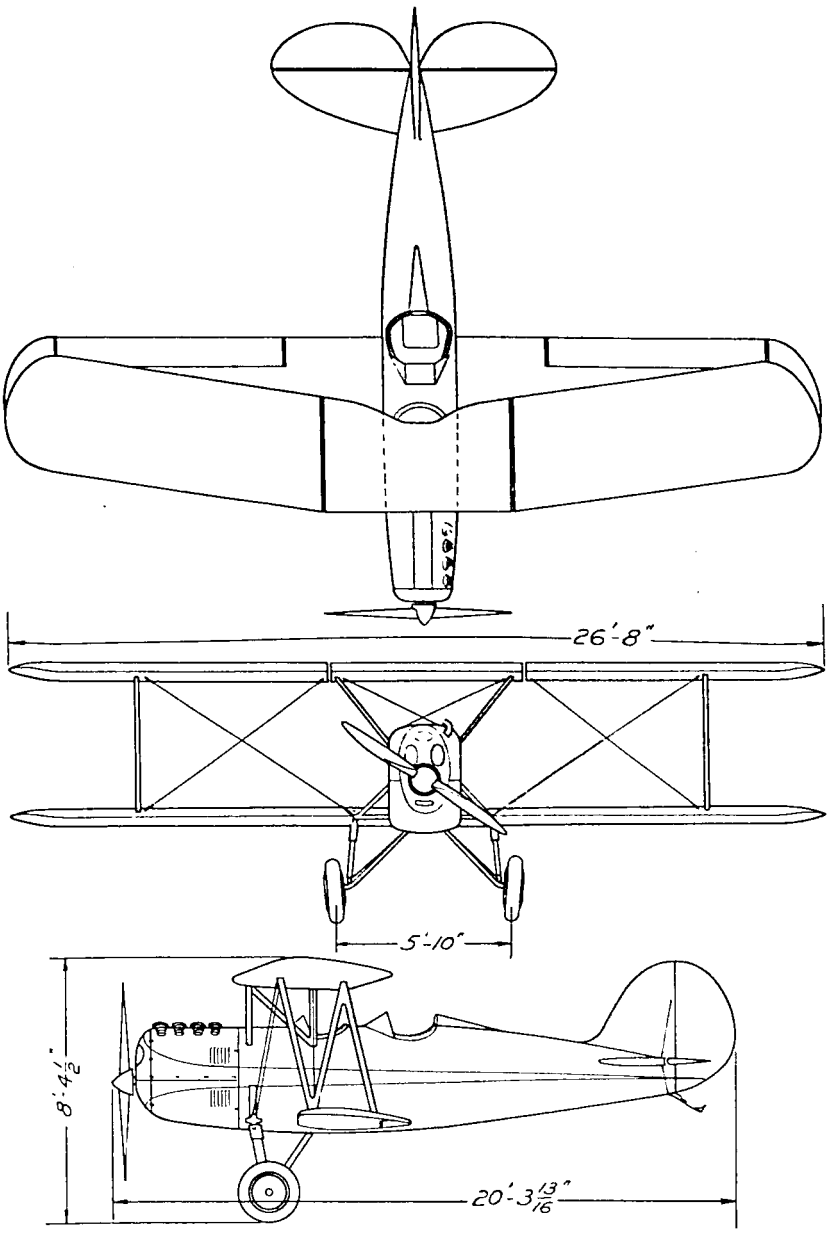
CURTISS-WRIGHT AIRPLANE COMPANY
St. Louis, Mo.
MODEL 16-E —— 3 PLACE
ENGINE: WRIGHT WHIRLWIND 175



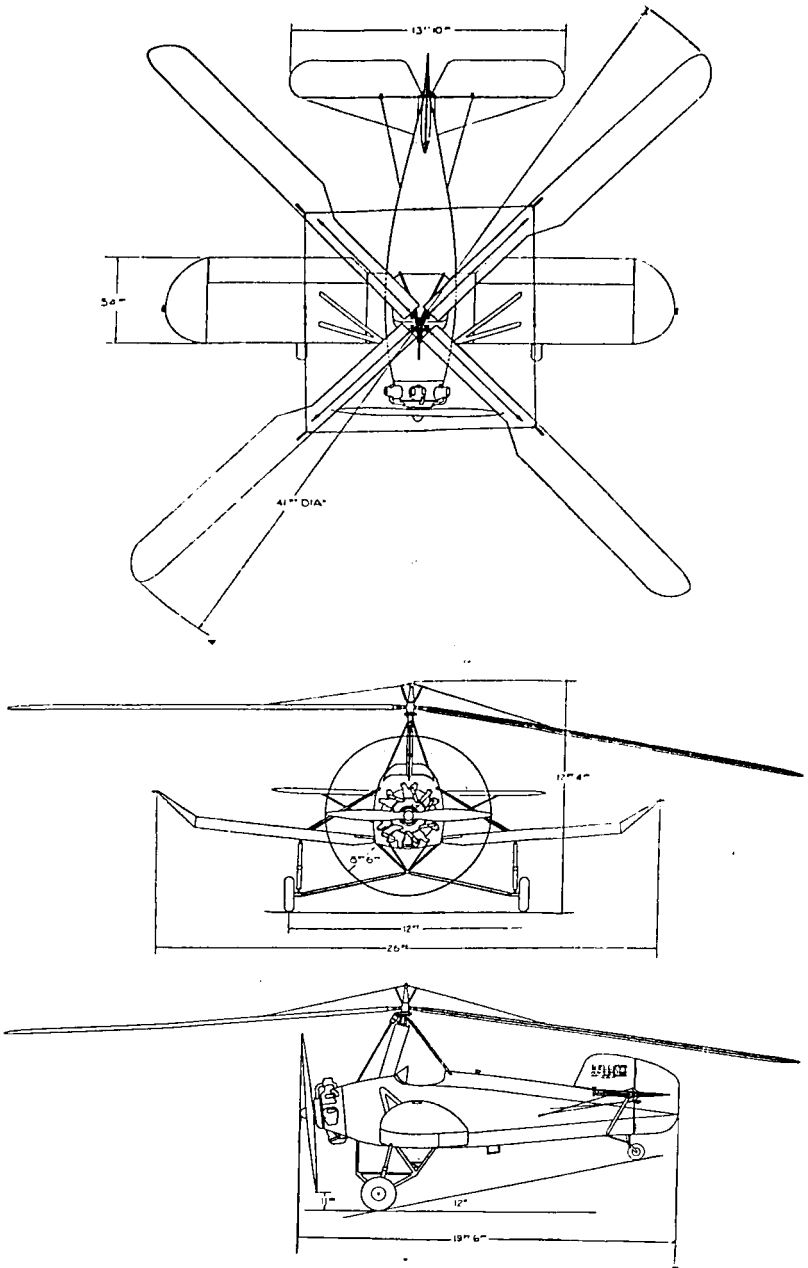
CURTISS-WRIGHT AIRPLANE COMPANY
St. Louis, Mo.
SPEEDWING —— 1-3 PLACE
ENGINES: WRIGHT WHIRLWIND



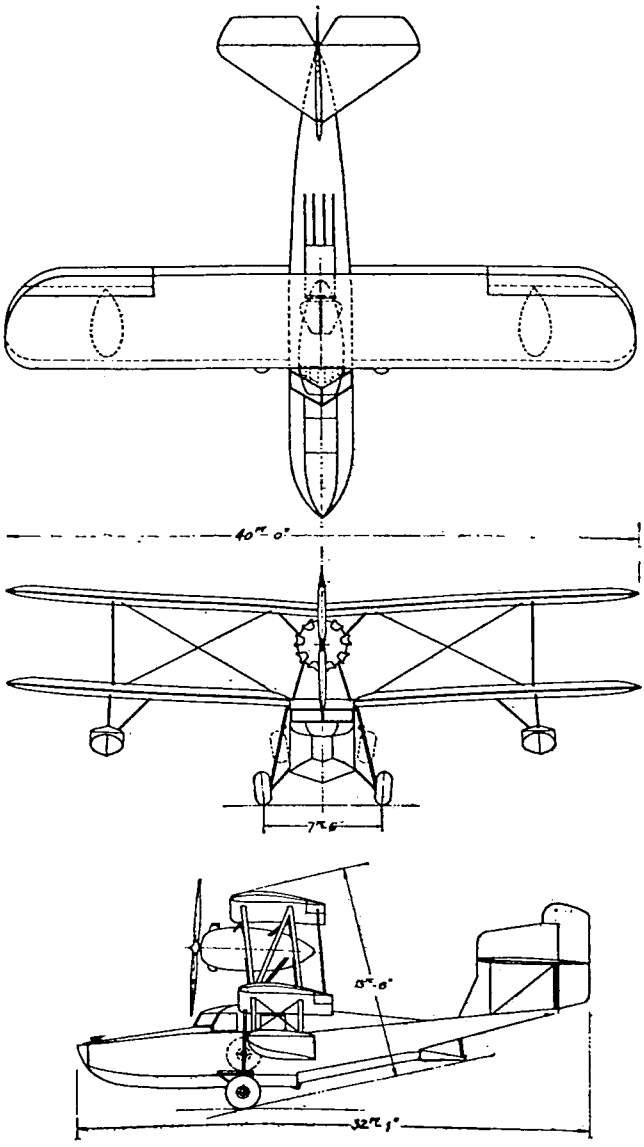
GREAT LAKES AIRCRAFT CORPORATION
Cleveland, Ohio
MODEL 2T-1E —— 2 PLACE
ENGINE: HI-DRIVE AMERICAN CIRRUS



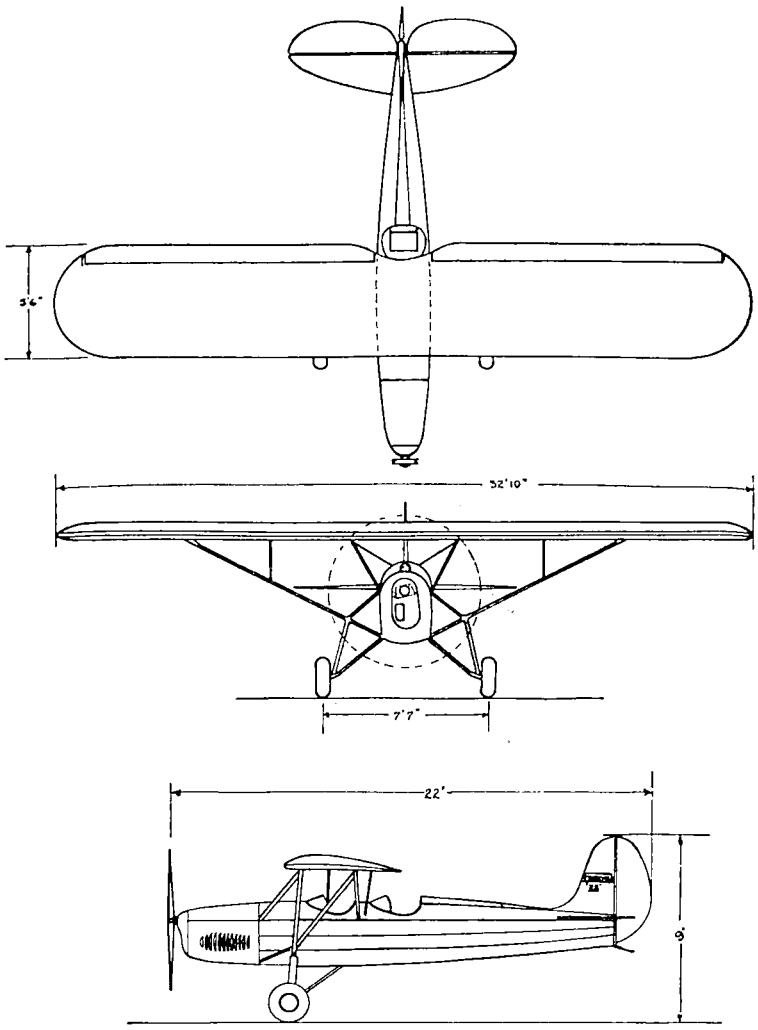
GREAT LAKES AIRCRAFT CORPORATION
Cleveland, Ohio
MODEL 2T-1A —— 2 PLACE
ENGINE: AMERICAN CIRRUS



KELLETT AUTOGIRO CORPORATION
Philadelphia, Pa.
MODEL K-4 —— 2 PLACE
ENGINE: CONTINENTAL 210 H.P.



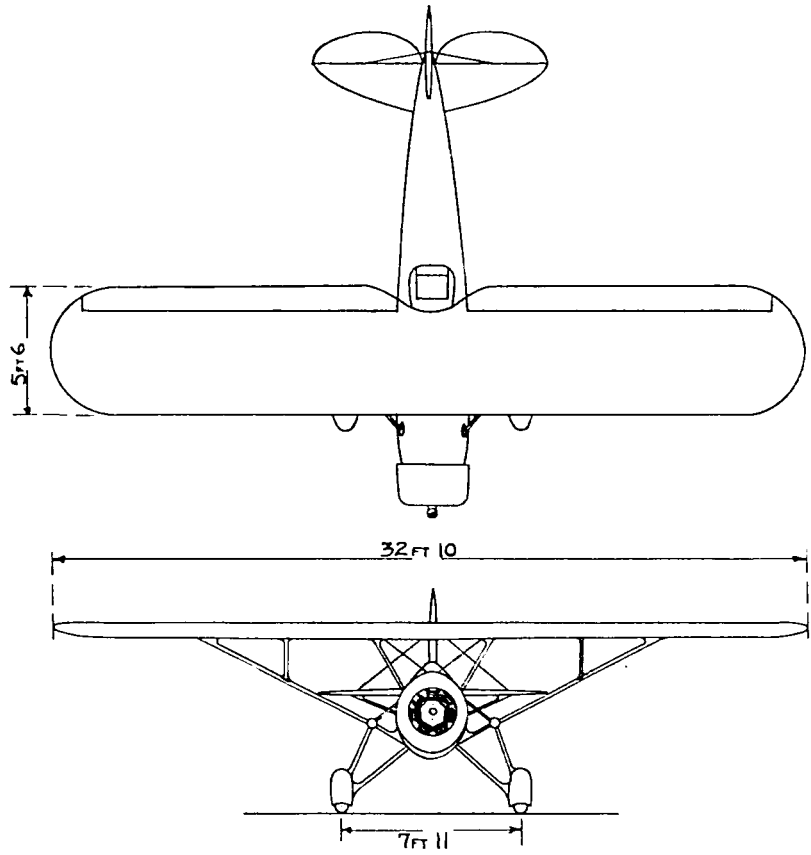
KEYSTONE AIRCRAFT CORPORATION
Bristol, Pa.
COMMUTER —— 4 PLACE
ENGINE: WRIGHT WHIRLWIND 330

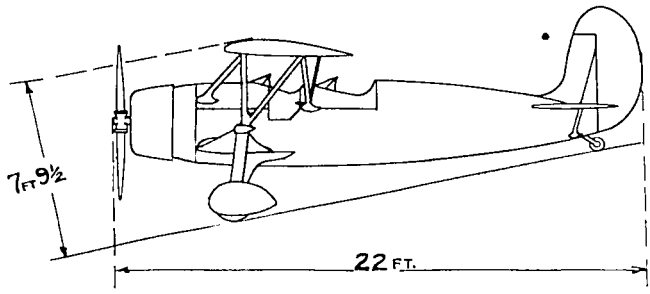


KREIDER-REISNER AIRCRAFT COMPANY, INC.
Hagerstown, Md.

FAIRCHILD 22 —— 2 PLACE

MODEL	C7	ENGINE: ROVER 75 H.P.
	C7-A	AMERICAN CIRRUS 95 H.P.
	C7-B	MENASCO 125 H.P.
	C7-D	WRIGHT GYPSY 90 H.P.

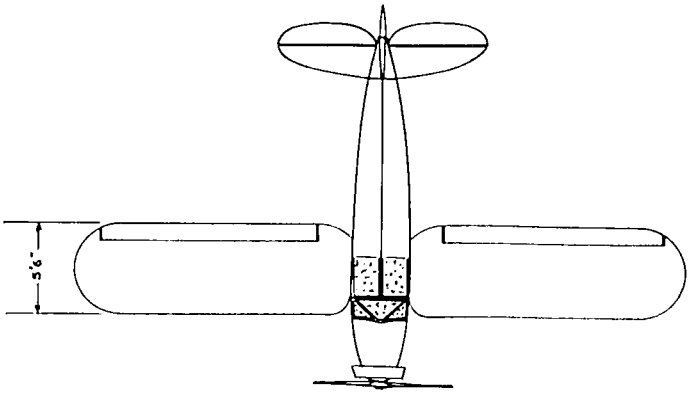


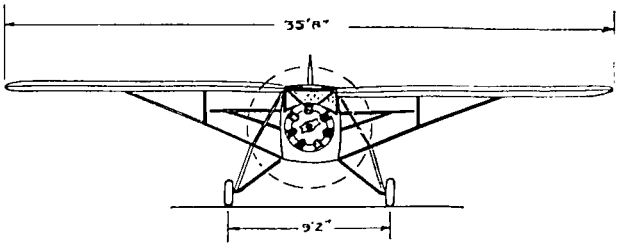


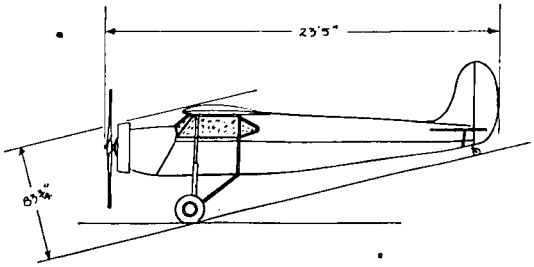
KREIDER-REISNER AIRCRAFT COMPANY, INC.
Hagerstown, Md.

FAIRCHILD 22 —— 2 PLACE

MODEL C7E ENGINE: WARNER SCARAB
C7F WARNER SUPER-SCARAB



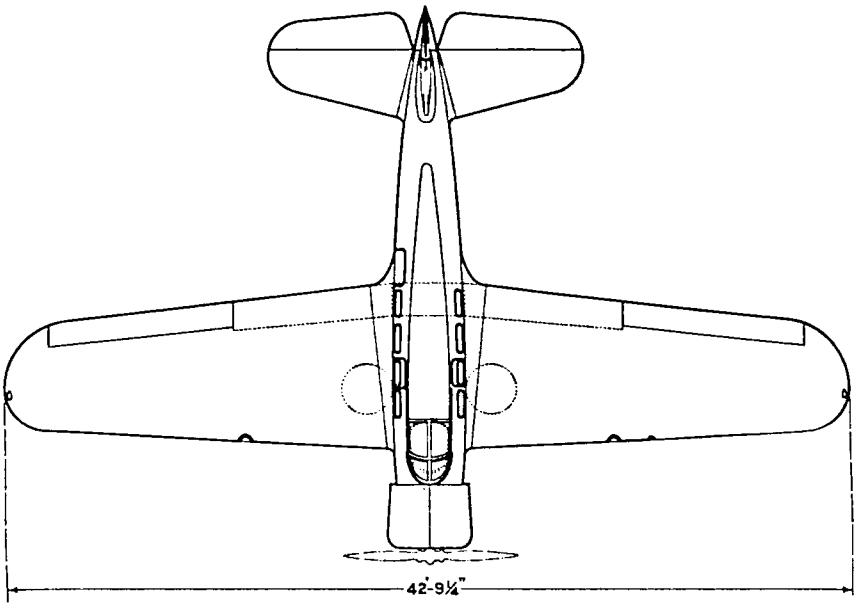




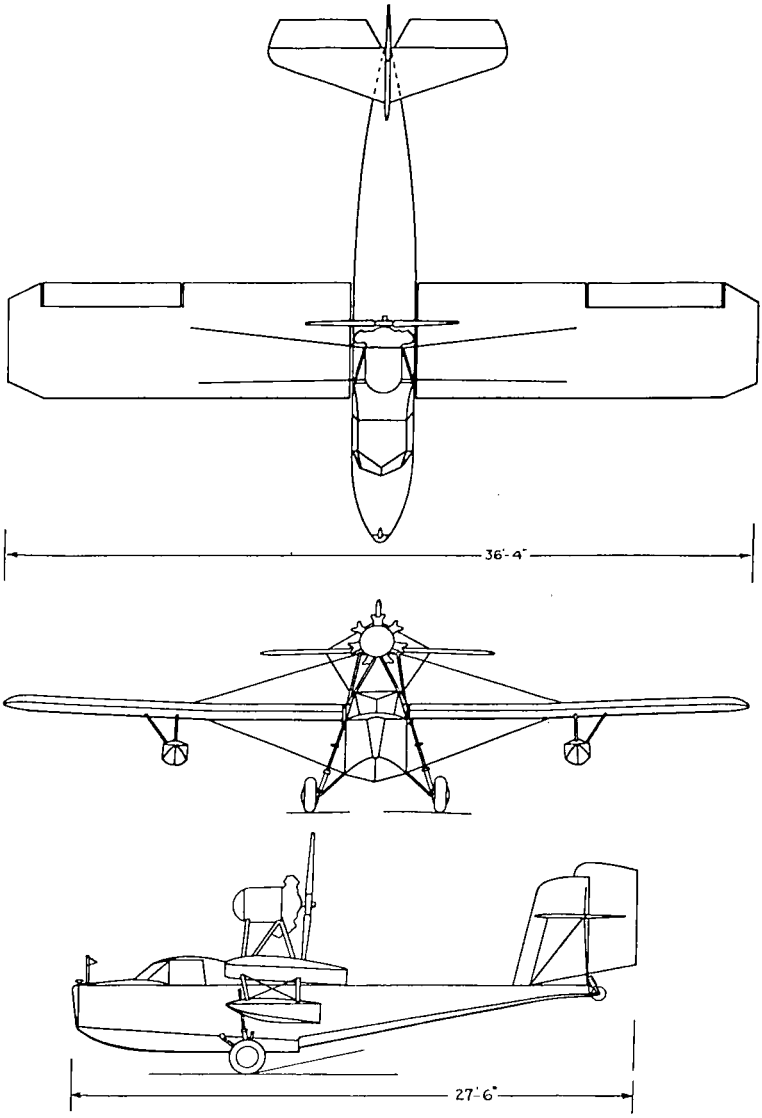
KREIDER-REISNER AIRCRAFT COMPANY, INC.
Hagerstown, Md.

FAIRCHILD 24 —— 2 PLACE

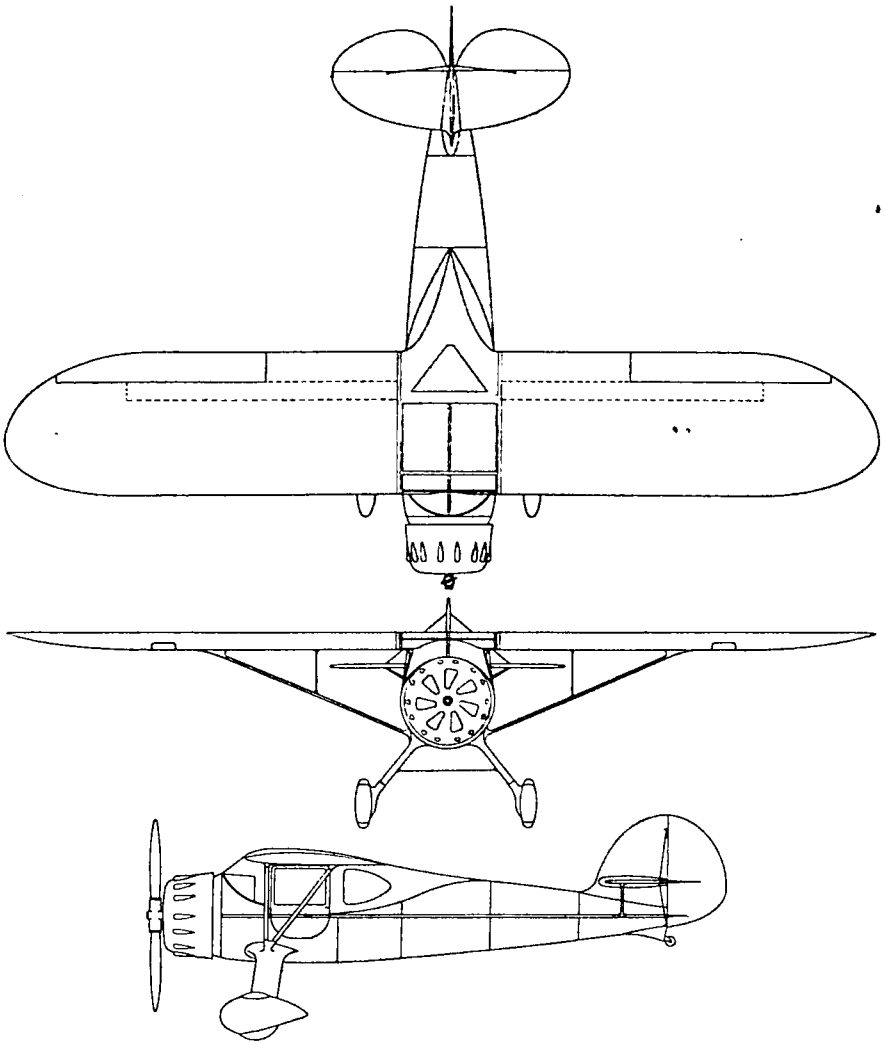
MODEL C8	ENGINE: AMERICAN CIRRUS
C8-A	WARNER SCARAB
C8-B	MENASCO



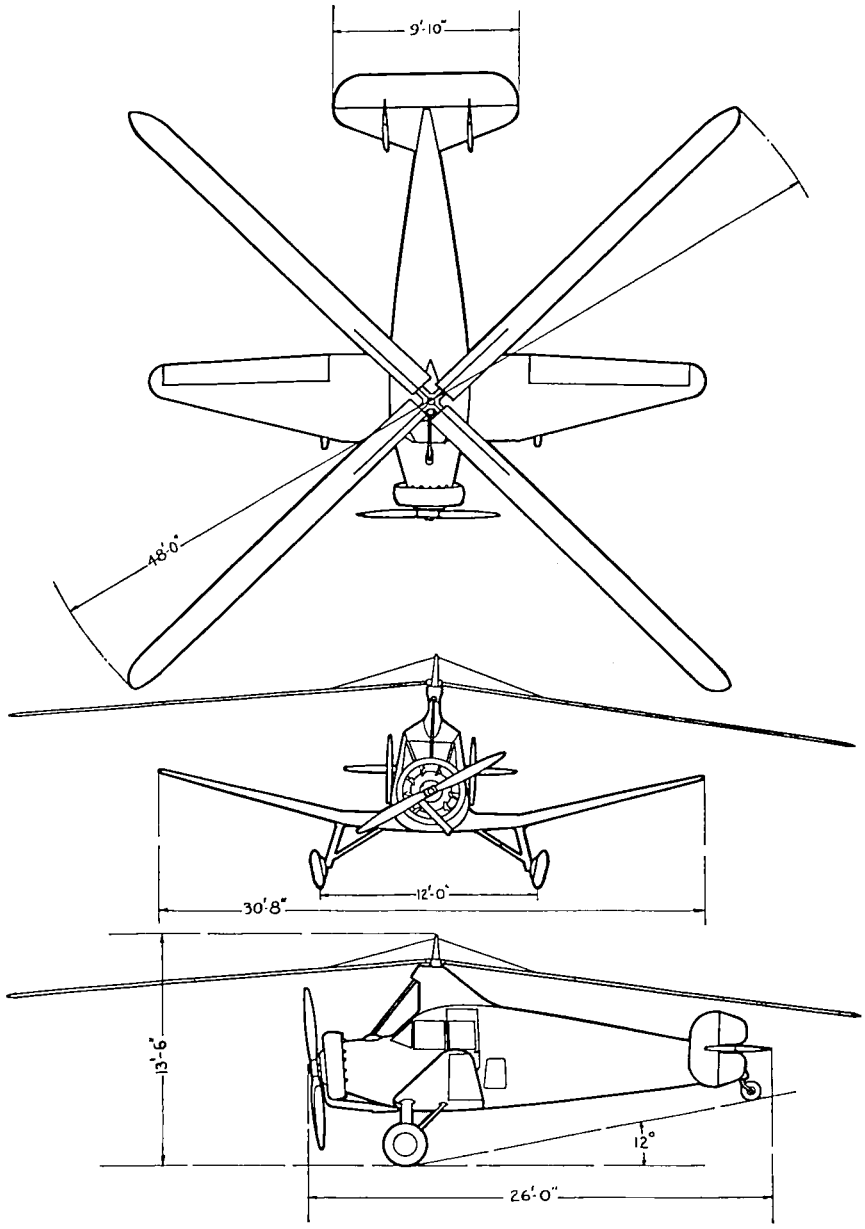
LOCKHEED AIRCRAFT CORPORATION
Burbank, Calif.
ALTAIR —— 1 PLACE
ENGINE: PRATT & WHITNEY WASP S1D1



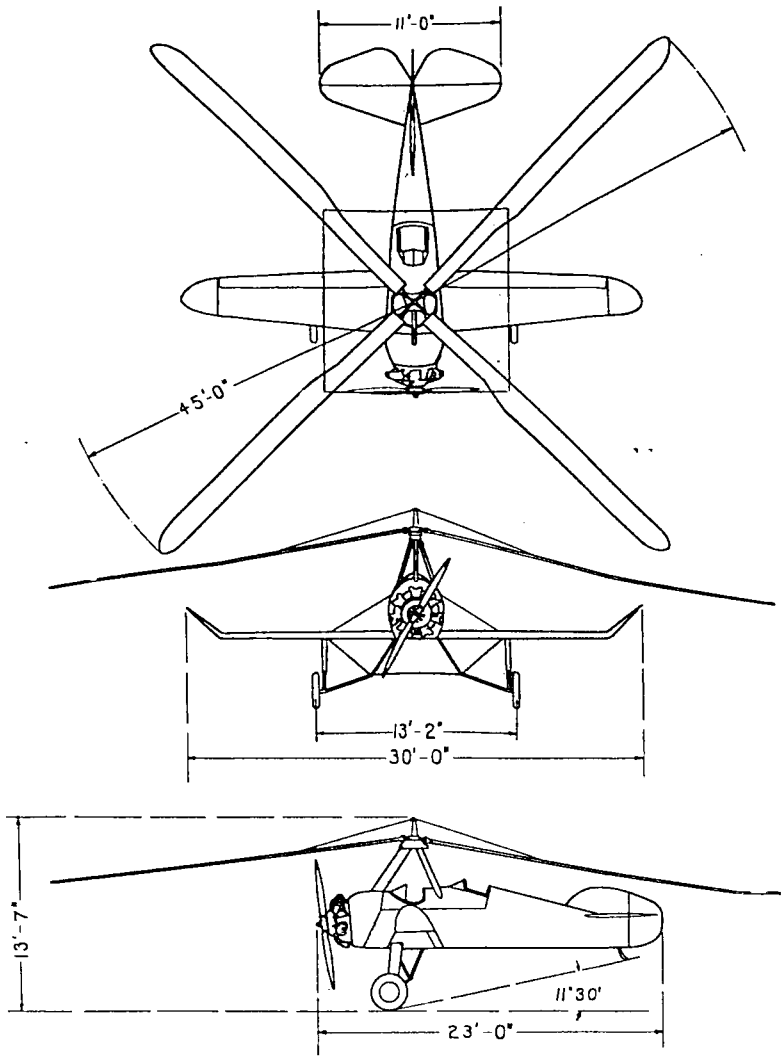
GROVER LOENING AIRCRAFT COMPANY, INC.
Garden City, L. I., N. Y.
DUCKLING —— 2 PLACE
ENGINE: WARNER SCARAB



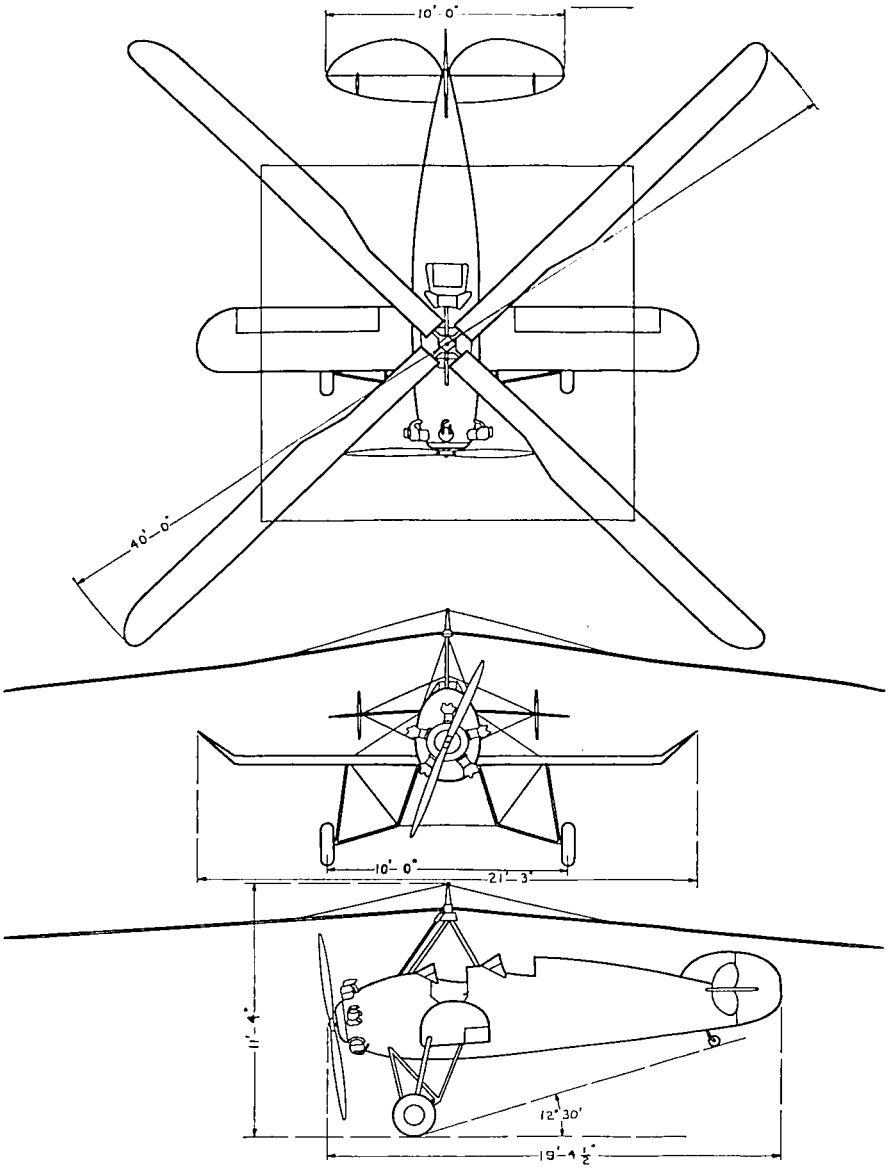
D. A. LUSCOMBE
Kansas City, Mo.
LUSCOMBE —— 2 PLACE
ENGINE: WARNER SUPER-SCARAB



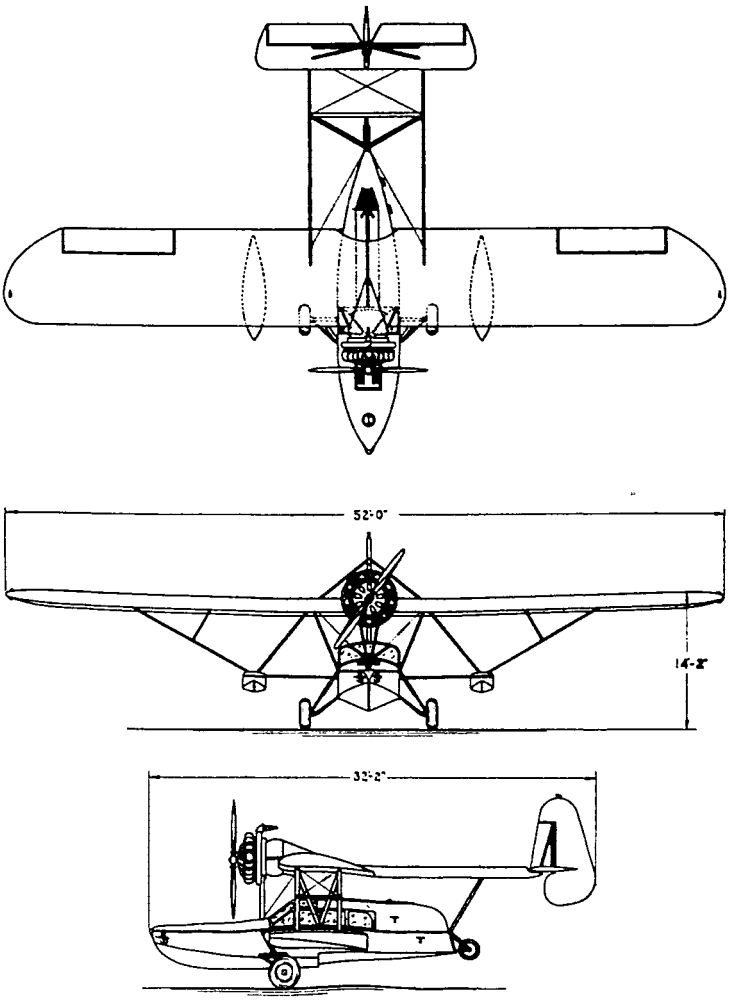
PITCAIRN AUTOGIRO COMPANY
Willow Grove, Pa.
MODEL PA-19 —— 4 PLACE
ENGINE: PRATT & WHITNEY WASP
WRIGHT WHIRLWIND 420



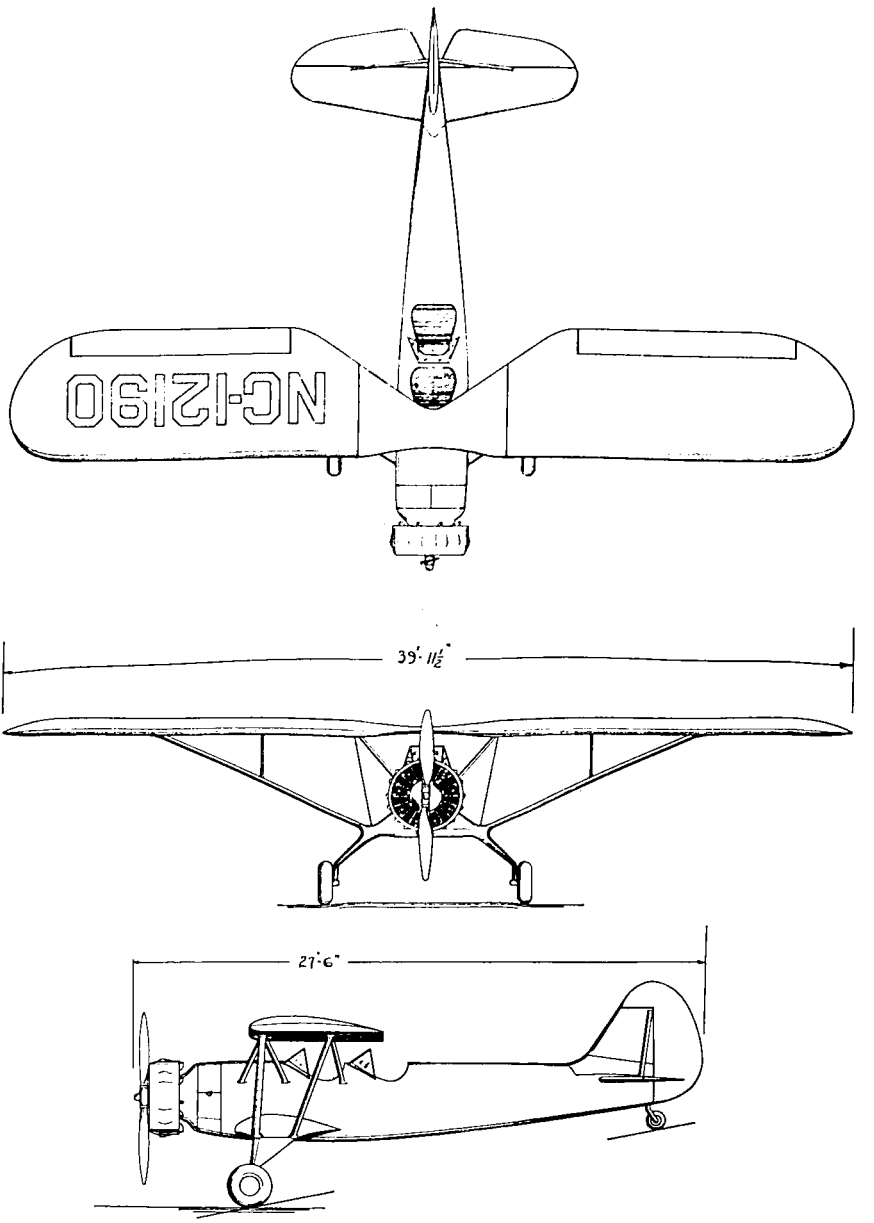
PITCAIRN AUTOGIRO COMPANY
Willow Grove, Pa.
MODEL PCA-2; PCA-3 —— 3 PLACE
ENGINE: PRATT & WHITNEY WASP JUNIOR
WRIGHT WHIRLWIND 300



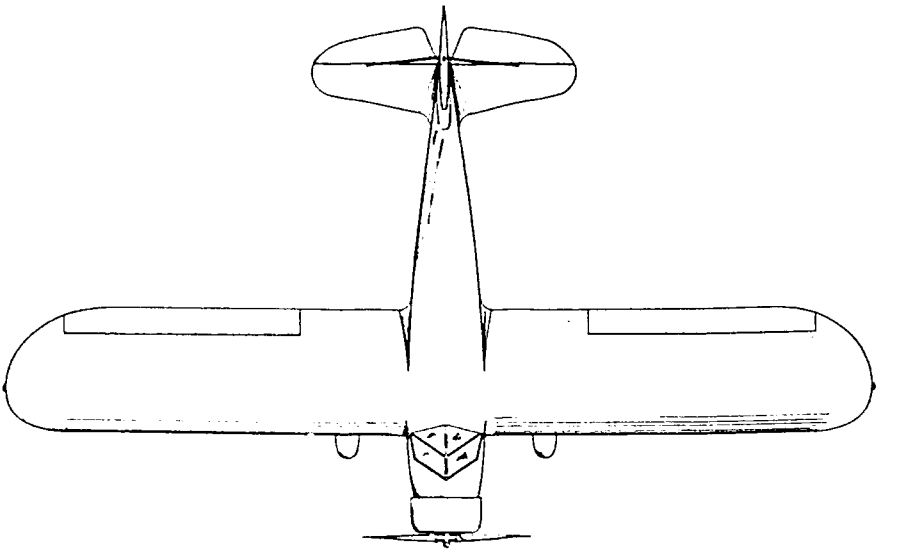
PITCAIRN AUTOGIRO COMPANY
Willow Grove, Pa.
MODEL PA-18 —— 2 PLACE
ENGINE: KINNER R-5

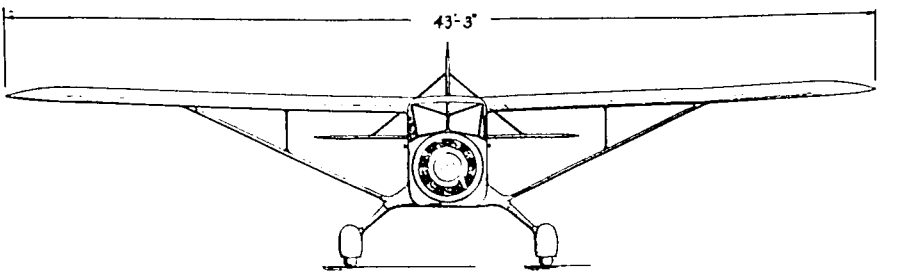


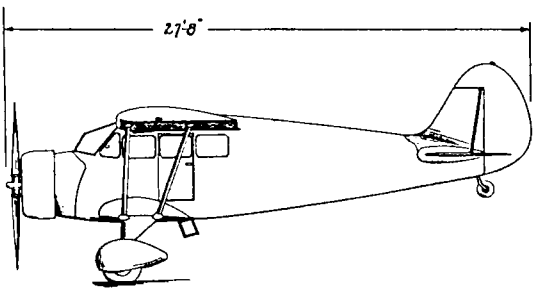
SIKORSKY AVIATION CORPORATION
Bridgeport, Conn.
AMPHIBION S-39 —— 5 PLACE
ENGINE: PRATT & WHITNEY WASP, JUNIOR



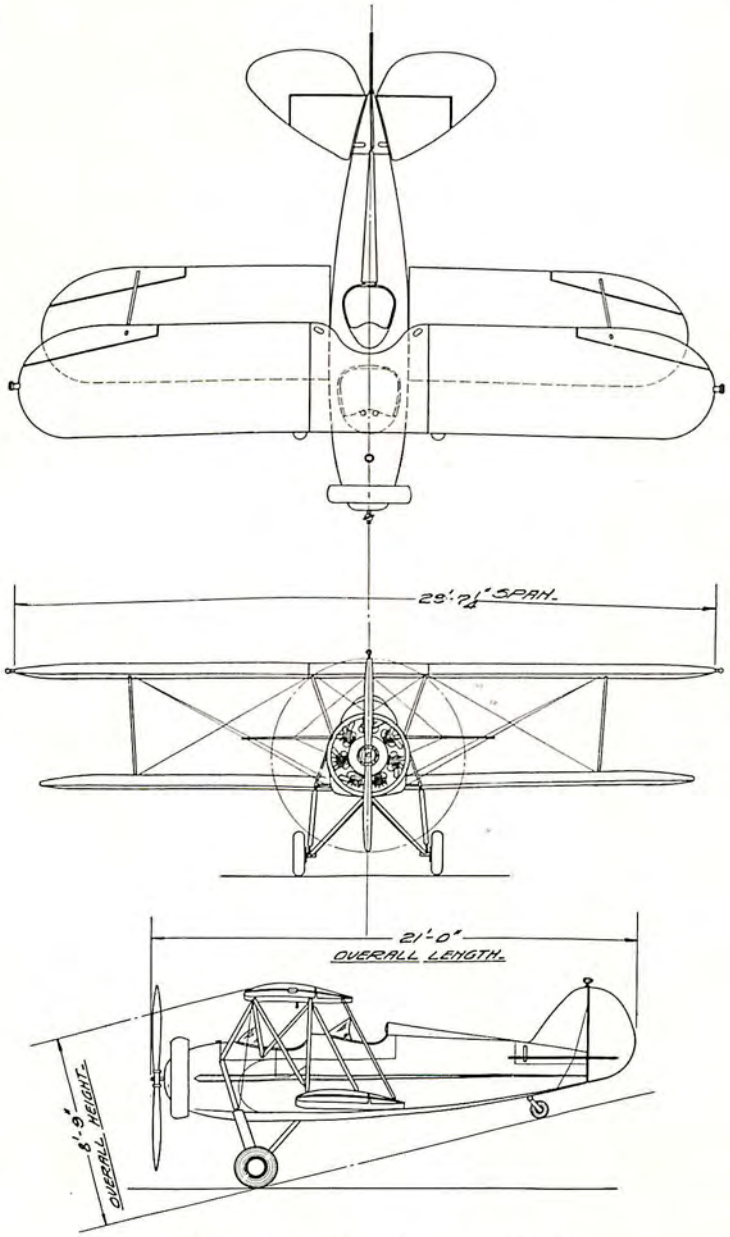
STINSON AIRCRAFT CORPORATION
Wayne, Mich.
MODEL O —— 2 PLACE
ENGINE: LYCOMING R-680-4



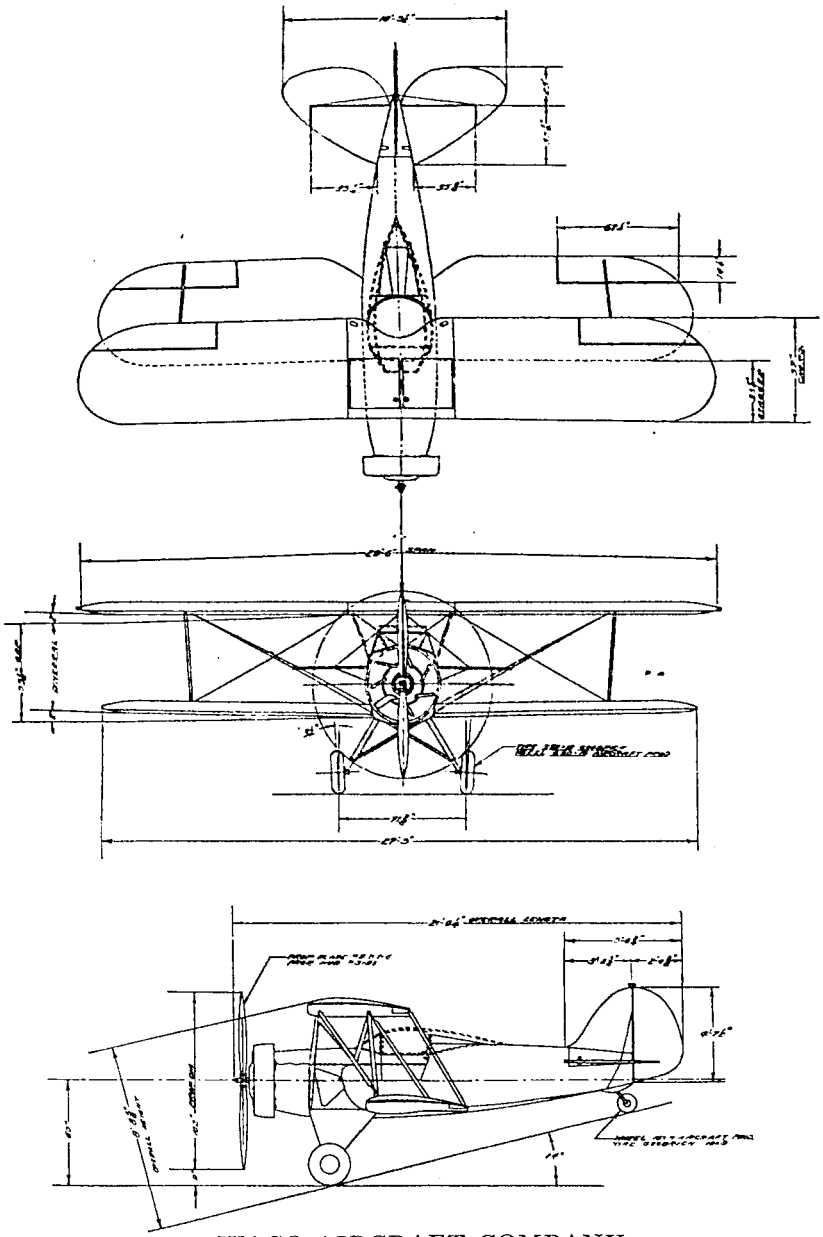




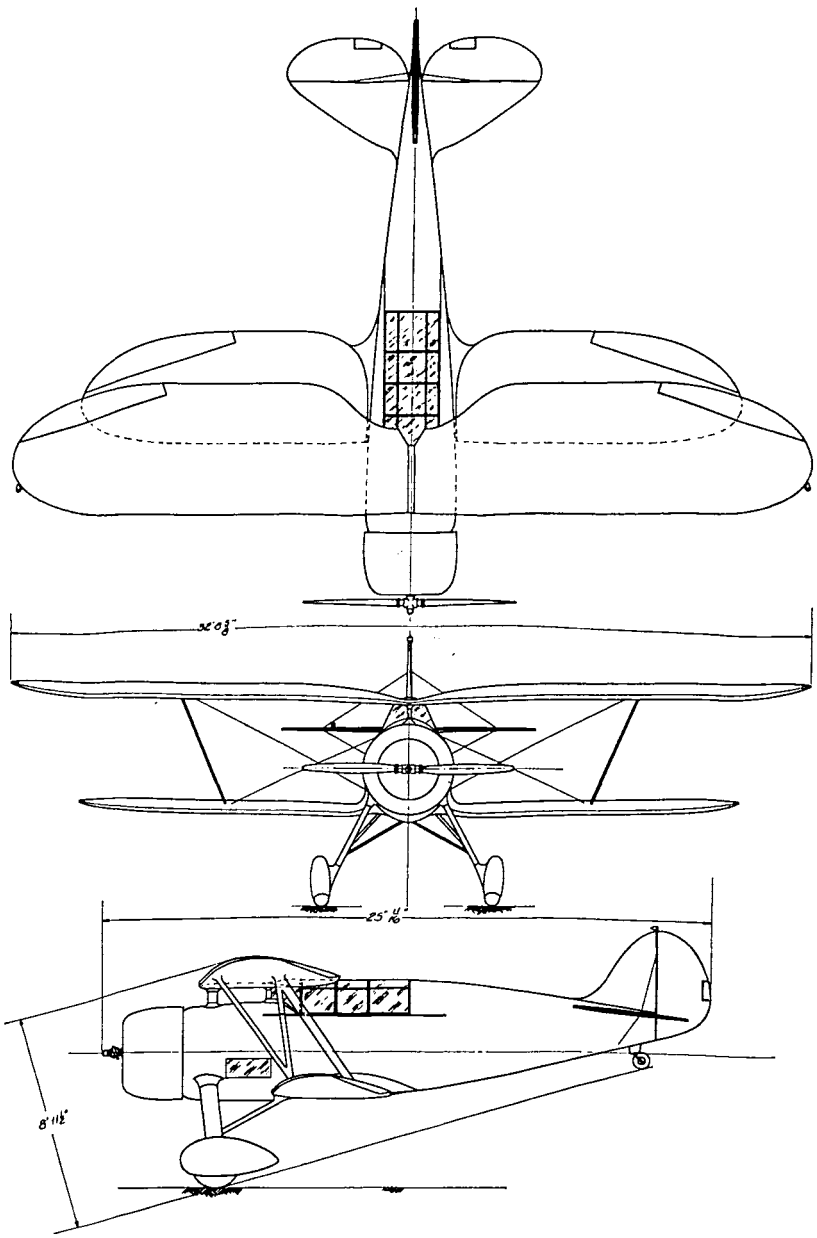
STINSON AIRCRAFT CORPORATION
Wayne, Mich.
MODEL SR —— 4 PLACE
ENGINE: LYCOMING R-680



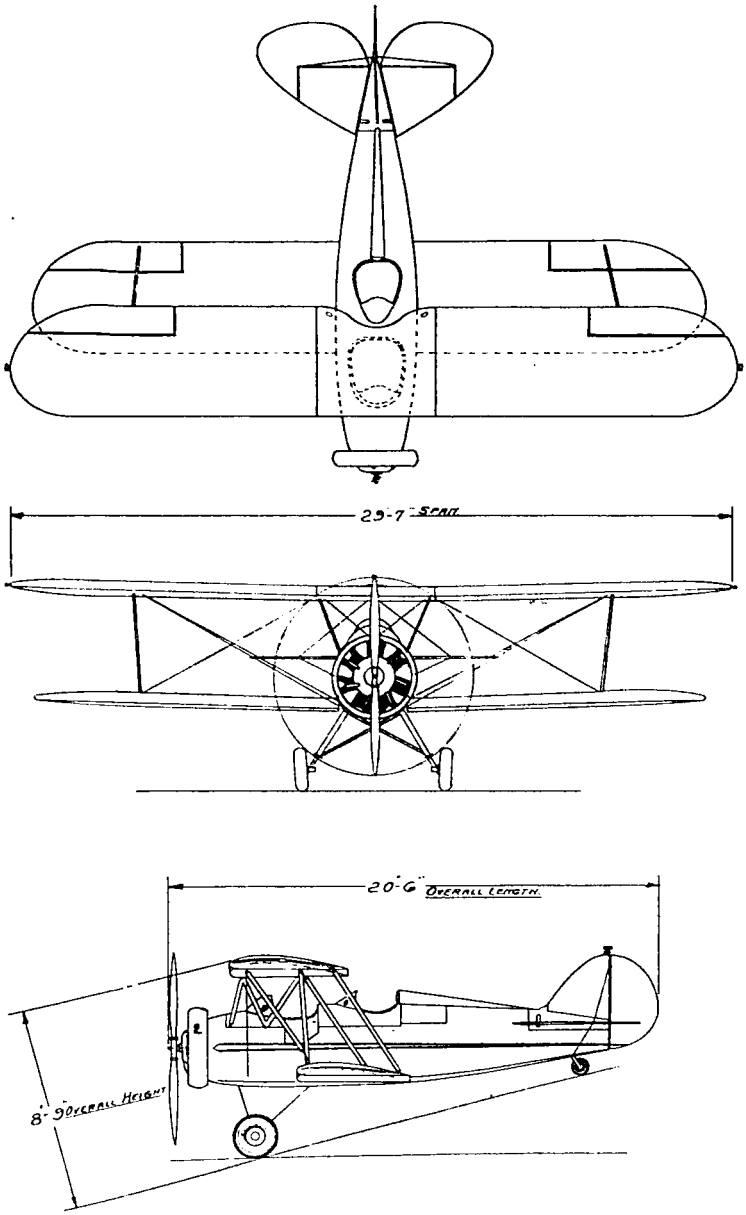
WACO AIRCRAFT COMPANY
Troy, Ohio
MODEL RNF —— 3 PLACE
ENGINE: WARNER SCARAB



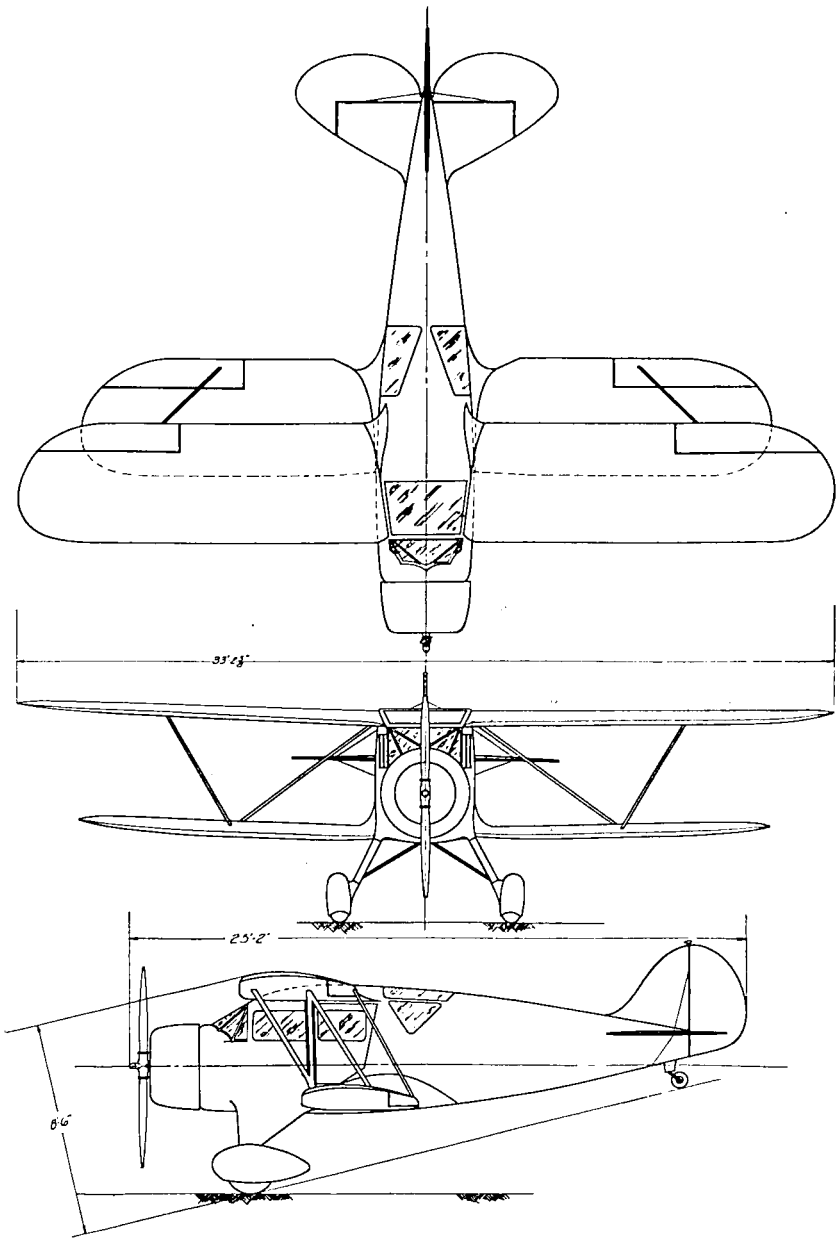
WACO AIRCRAFT COMPANY
Troy, Ohio
MODEL A —— 2 PLACE
ENGINE: CONTINENTAL
JACOBS LA-1



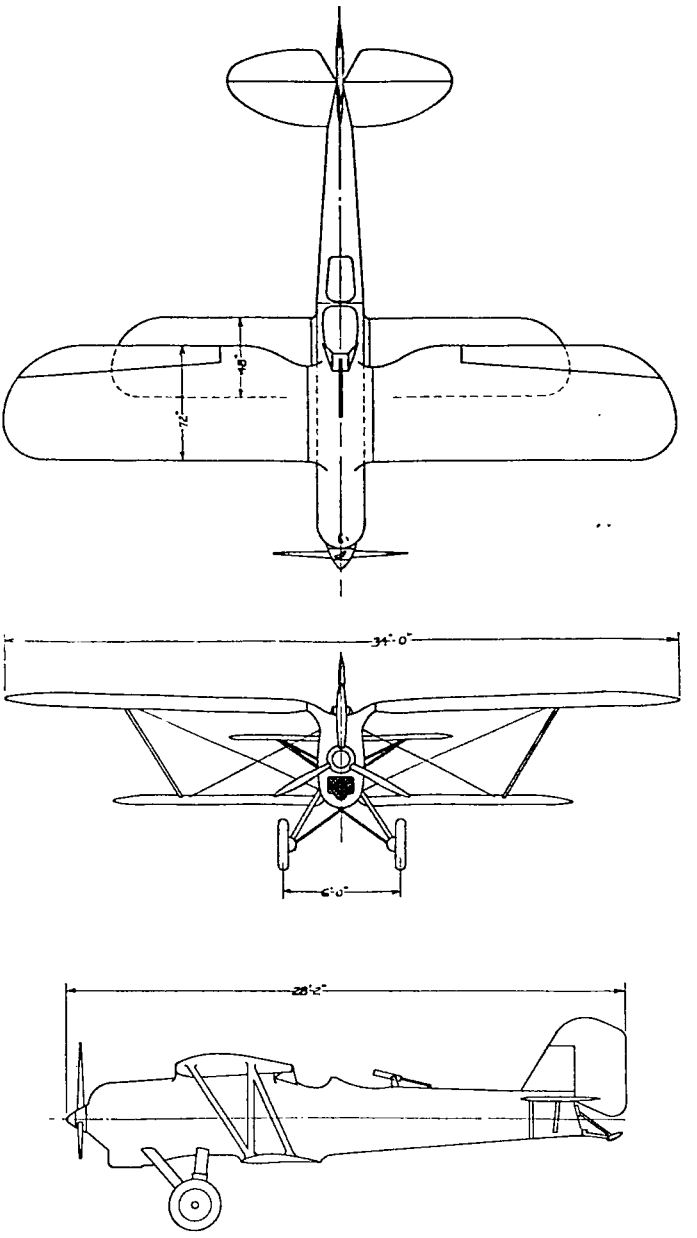
WACO AIRCRAFT COMPANY
Troy, Ohio
MODEL WHD —— 2 PLACE
ENGINE: WRIGHT WHIRLWIND



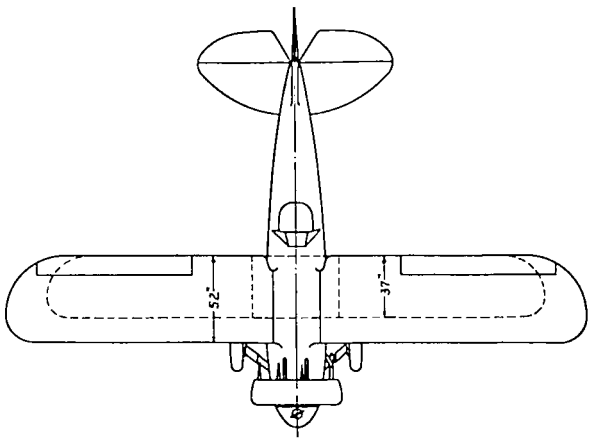
WACO AIRCRAFT COMPANY
Troy, Ohio
MODELS PBF & UBF —— 3 PLACE
ENGINE: JACOBS LA-1
CONTINENTAL R-670

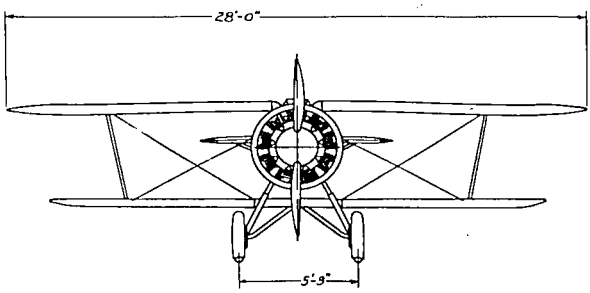


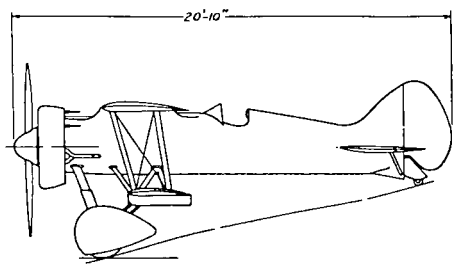
WACO AIRCRAFT COMPANY
Troy, Ohio
MODEL UIC —— 4 PLACE
ENGINE: CONTINENTAL R-670



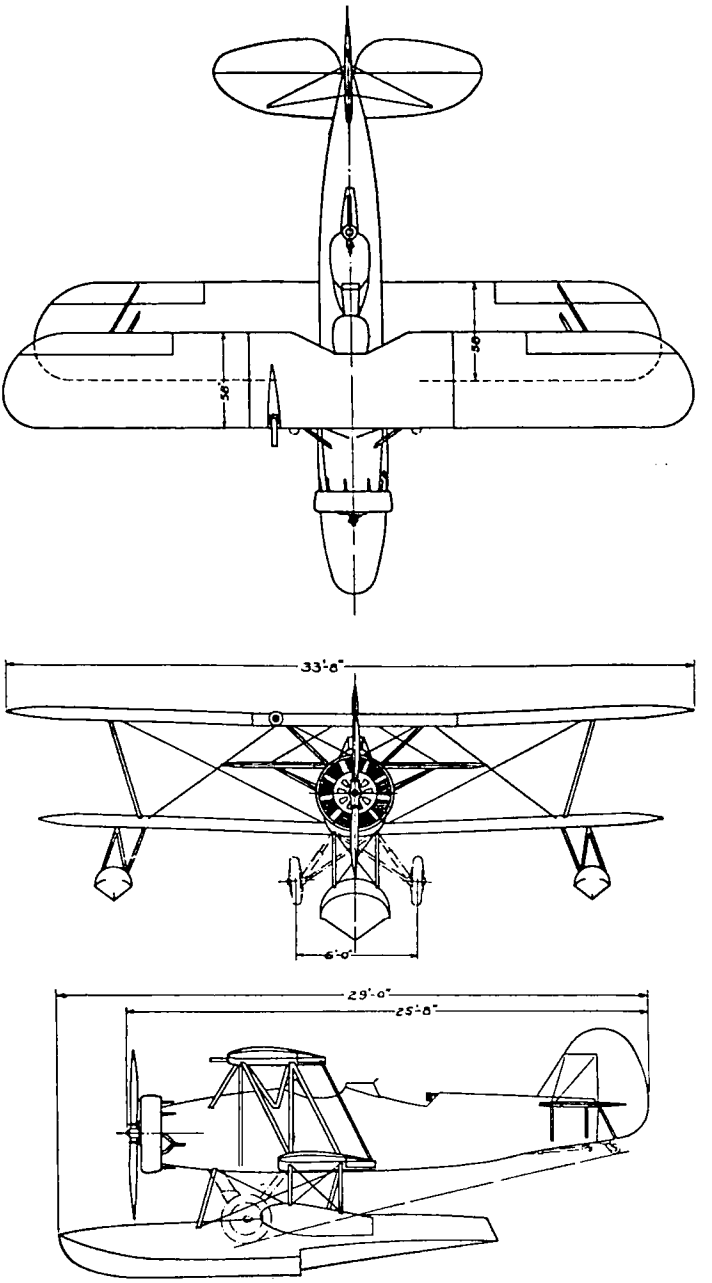
B/J AIRCRAFT CORPORATION
Baltimore, Md.
ARMY PURSUIT Y1P-16 —— 2 PLACE
ENGINE: CURTISS CONQUEROR



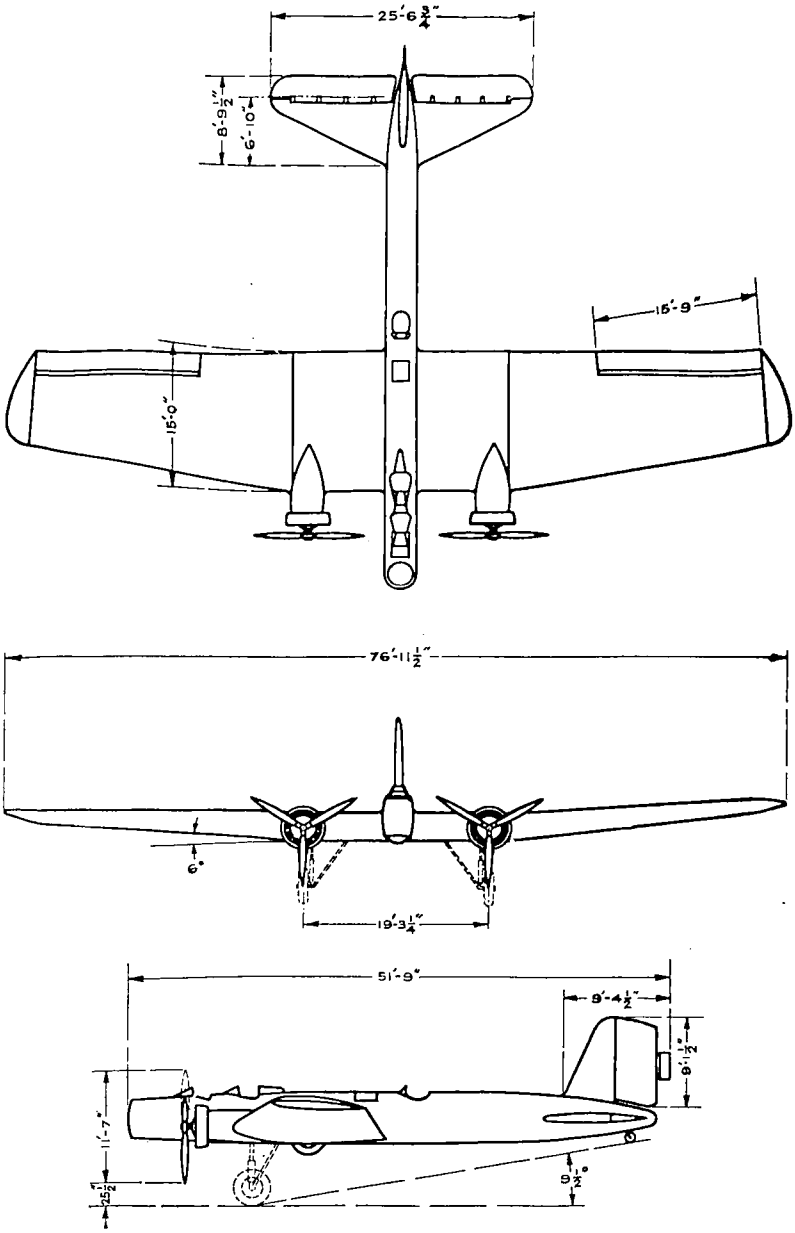




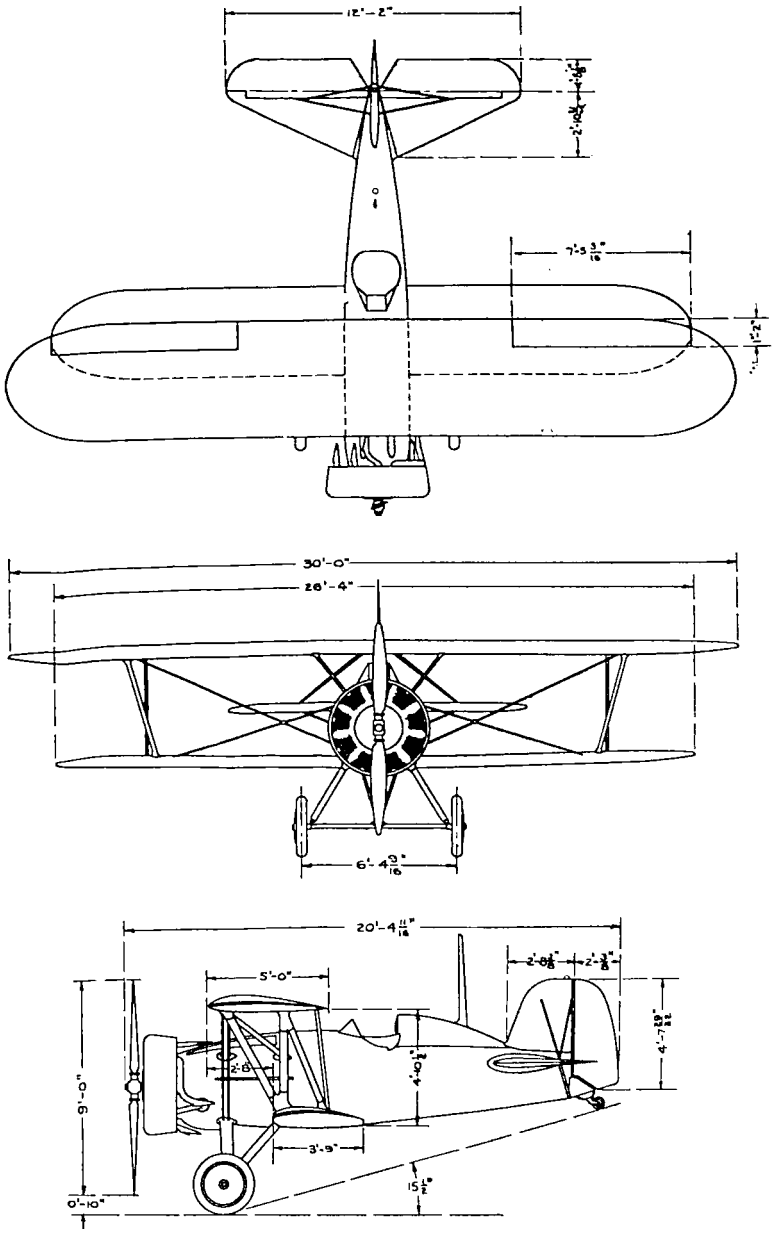
B/J AIRCRAFT CORPORATION
Baltimore, Md.
NAVY FIGHTER XF2J-1 —— 2 PLACE
ENGINE: WRIGHT WHIRLWIND



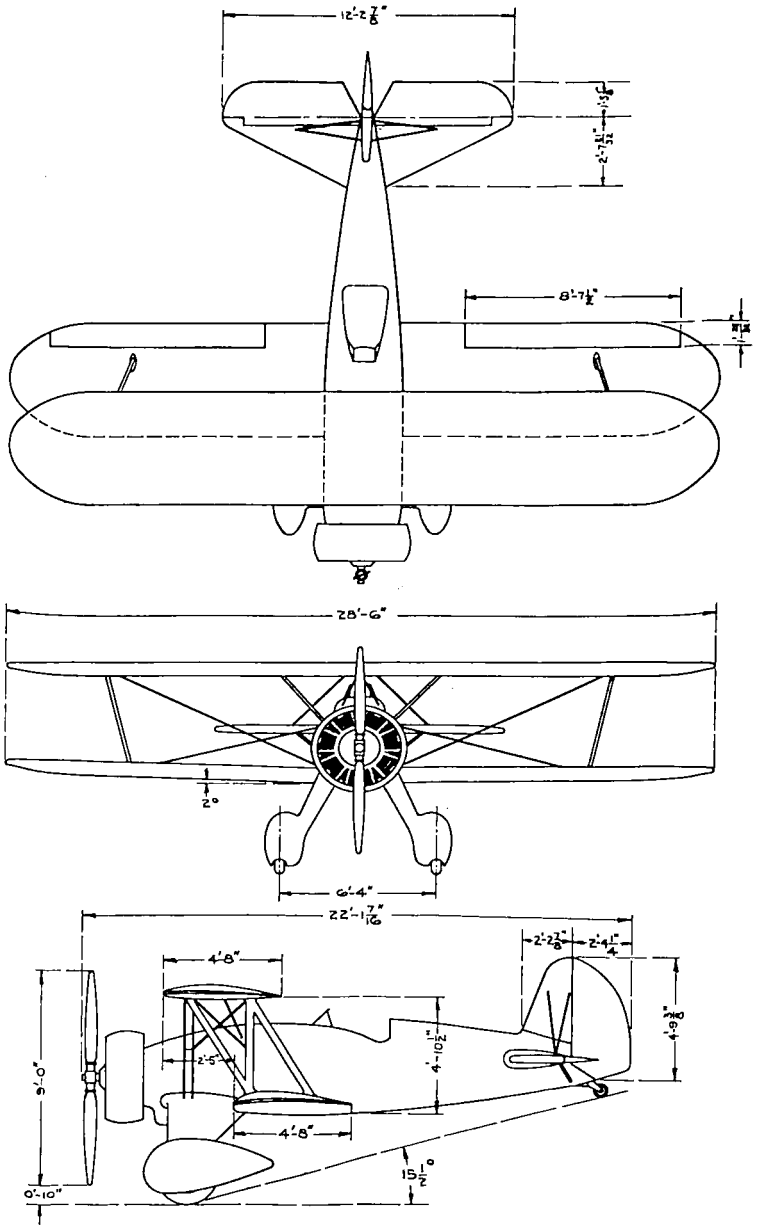
B/J AIRCRAFT CORPORATION
Baltimore, Md.
OBSERVATION OJ-2
ENGINE: PRATT & WHITNEY WASP JUNIOR



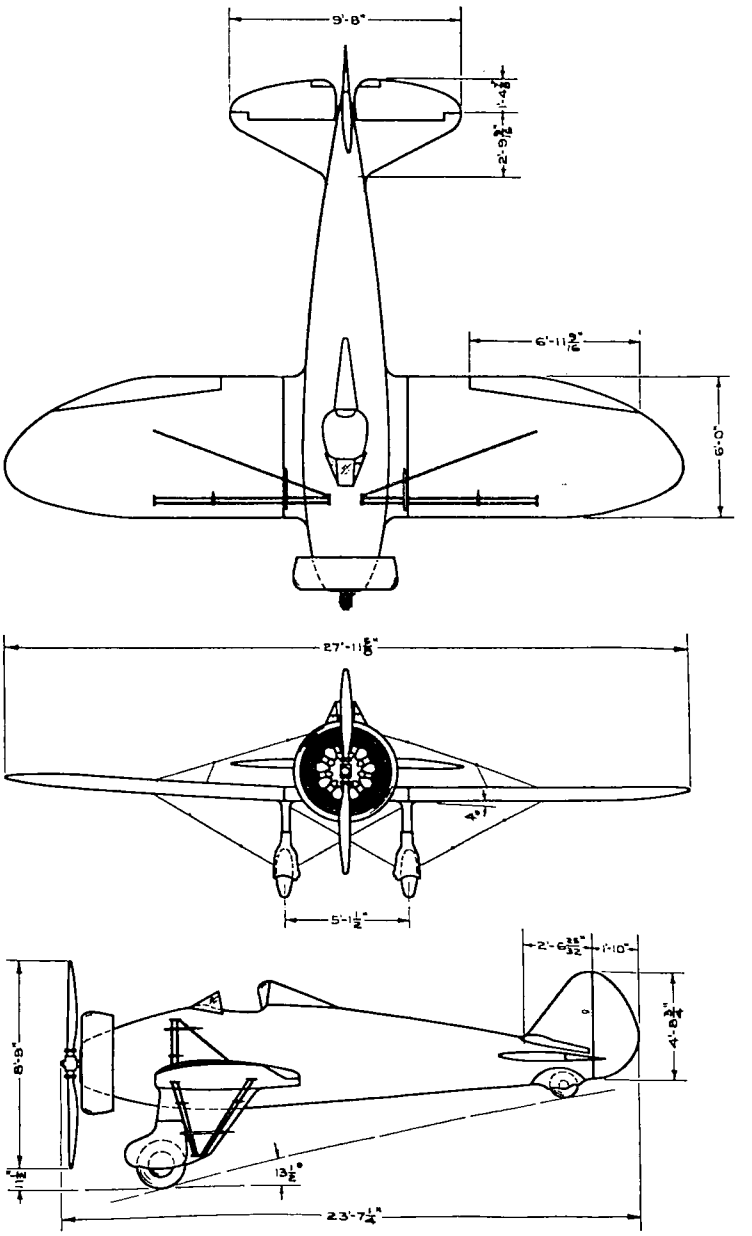
BOEING AIRPLANE COMPANY
Seattle, Wash.
BOMBER Y1B-9A
ENGINE: TWO PRATT & WHITNEY HORNETS



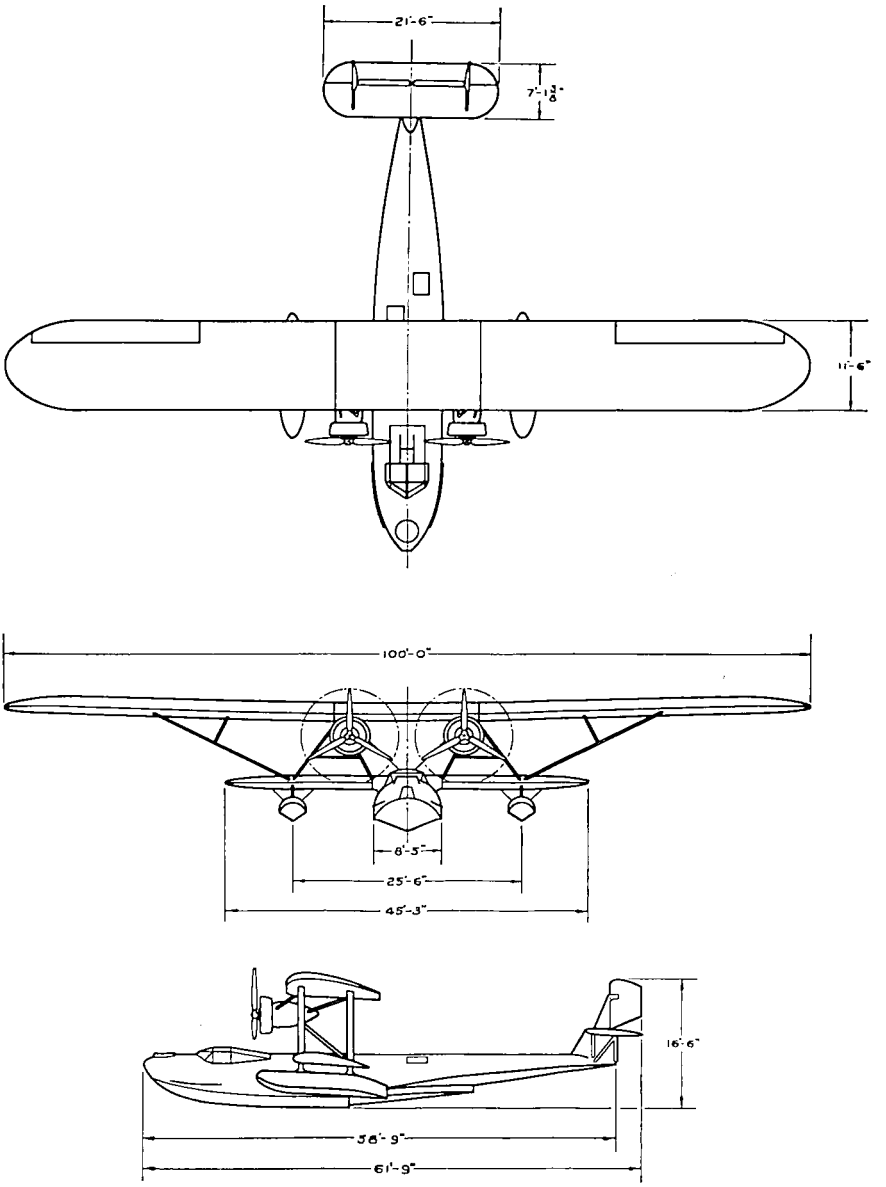
BOEING AIRPLANE COMPANY
Seattle, Wash.
FIGHTER F4B-4
ENGINE: PRATT & WHITNEY WASP



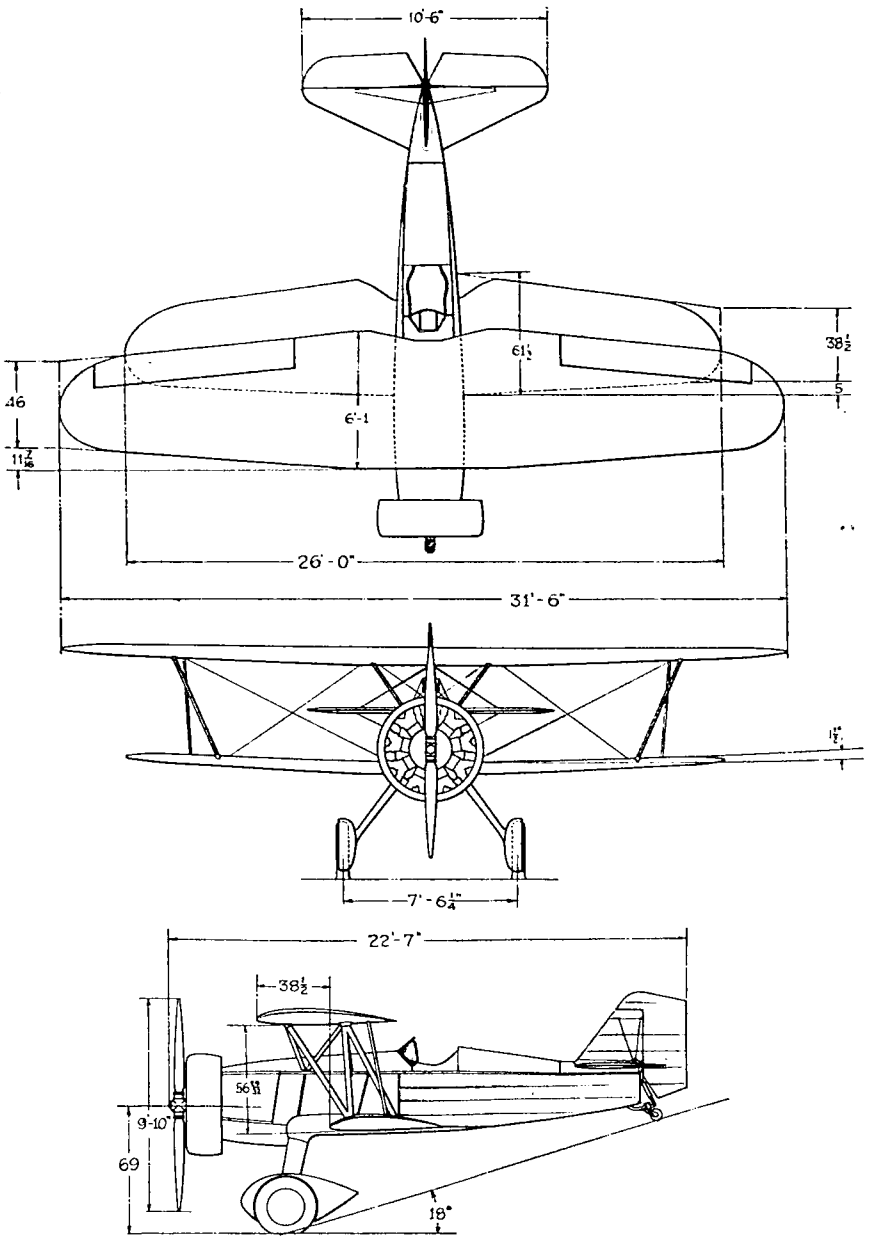
BOEING AIRPLANE COMPANY
Seattle, Wash.
FIGHTER XF6B-1
ENGINE: PRATT & WHITNEY TWIN WASP JUNIOR



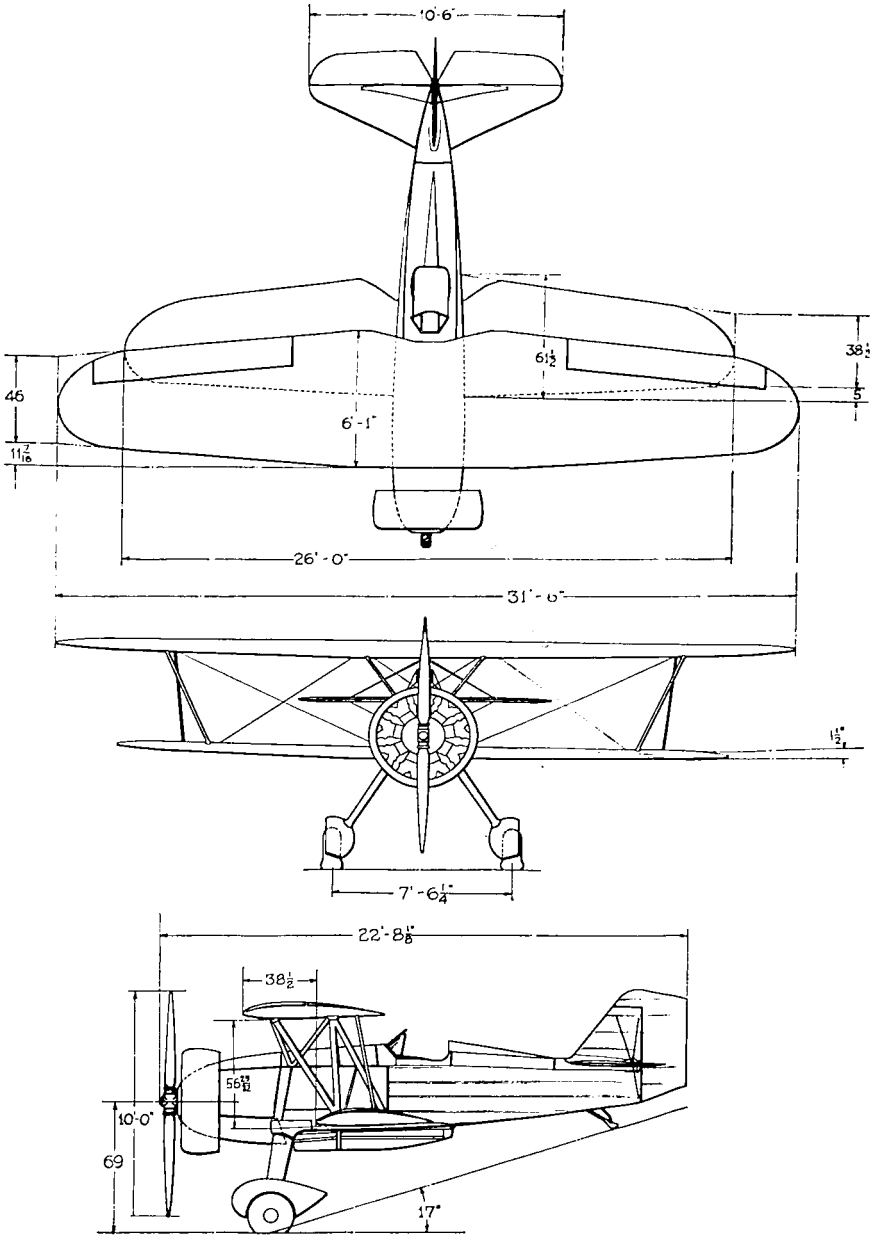
BOEING AIRPLANE COMPANY
Seattle, Wash.
PURSUIT P-26A
ENGINE: PRATT & WHITNEY WASP



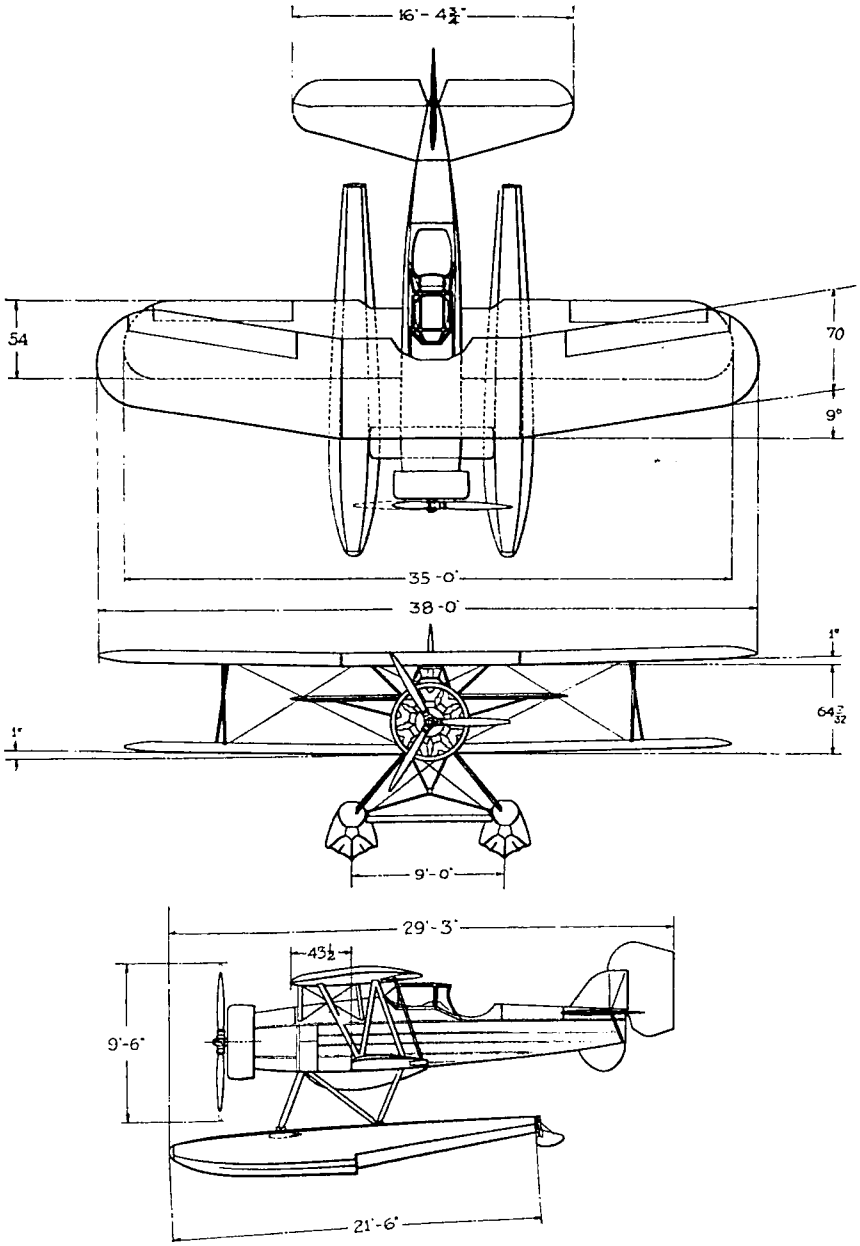
CONSOLIDATED AIRCRAFT CORPORATION
Buffalo, N. Y.
PATROL FLYING BOAT P2Y-1
ENGINES: TWO GEARED WRIGHT CYCLONES



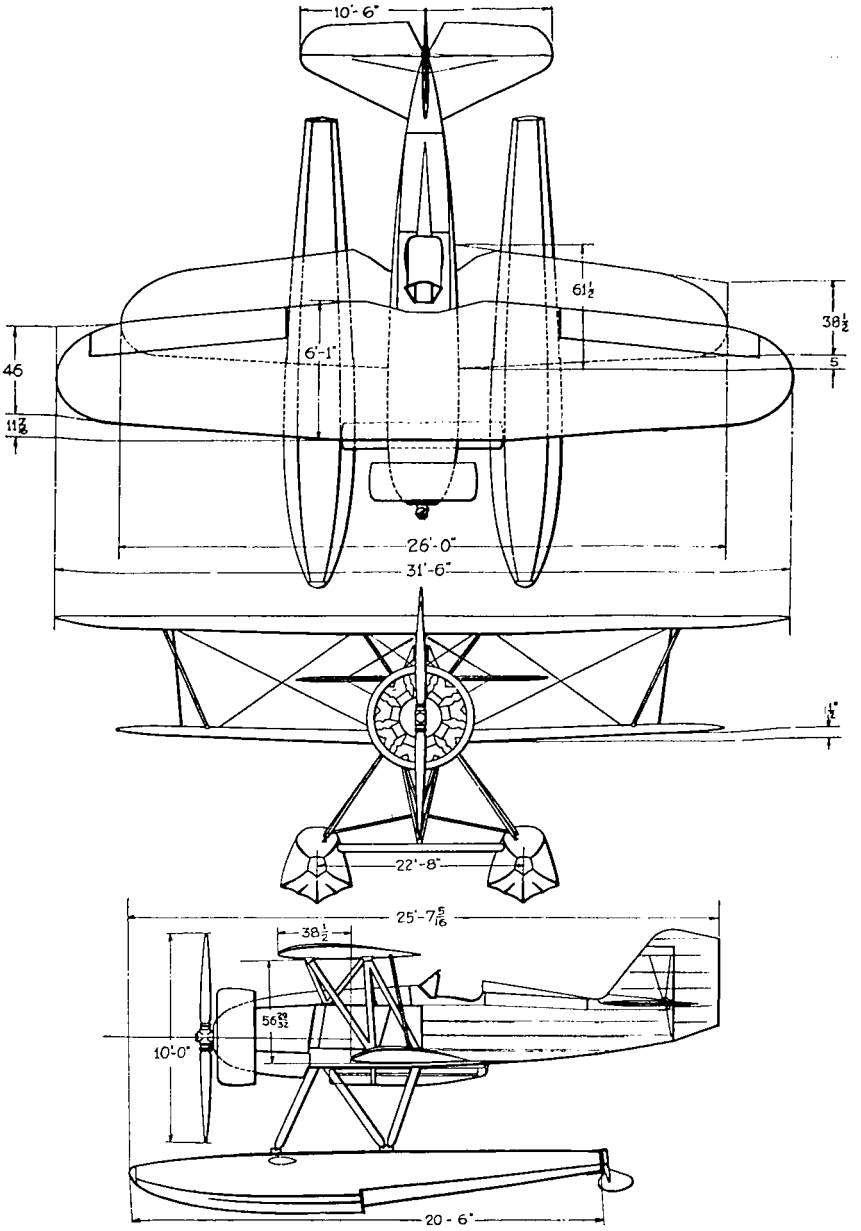
CURTISS AEROPLANE & MOTOR COMPANY
Buffalo, N. Y.
FIGHTER F11C-2 —— GOSHAWK
ENGINE: WRIGHT CYCLONE F —— 700 H.P.



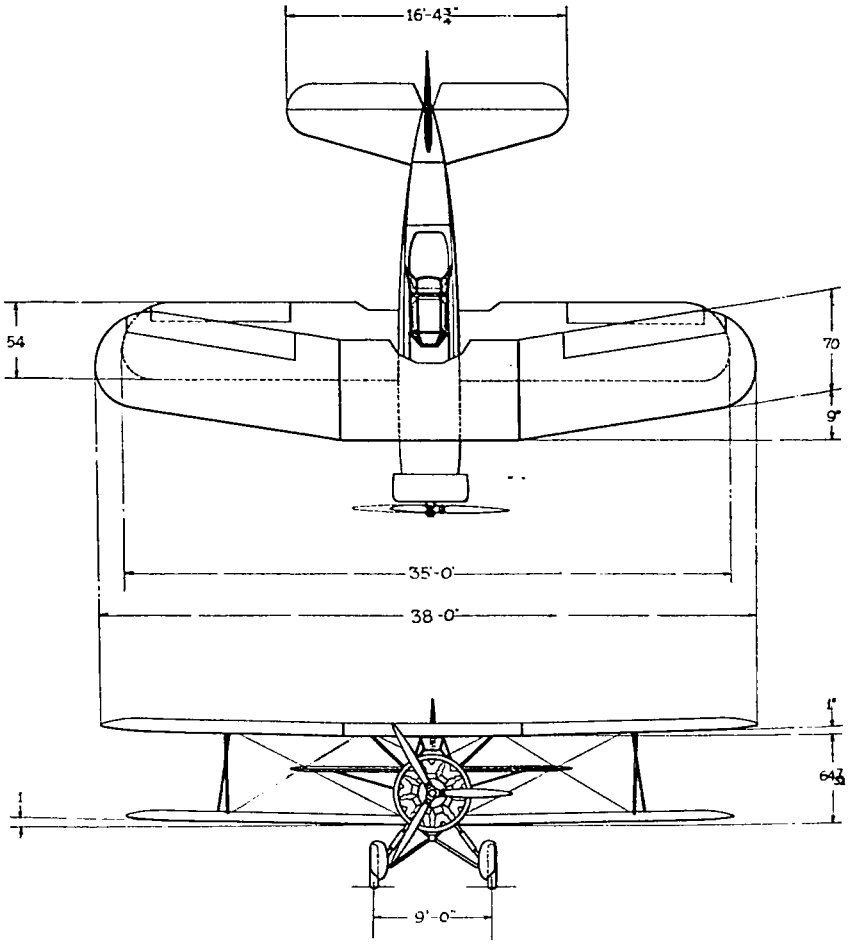
CURTISS AEROPLANE & MOTOR COMPANY
Buffalo, N. Y.
HAWK PURSUIT LAND PLANE
ENGINE: WRIGHT CYLCONE F —— 700 H.P.

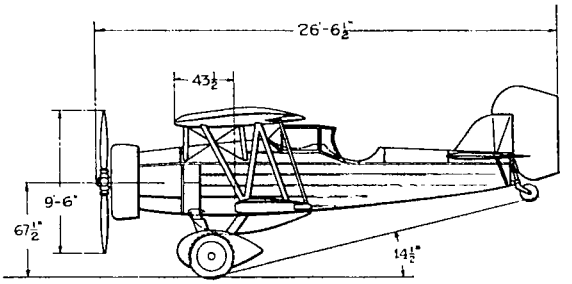


CURTISS AEROPLANE & MOTOR COMPANY
Buffalo, N. Y.
OBSERVATION & ATTACK —— FALCON SEAPLANE 2 PLACE
ENGINE: WRIGHT CYCLONE F —— 700 H.P.

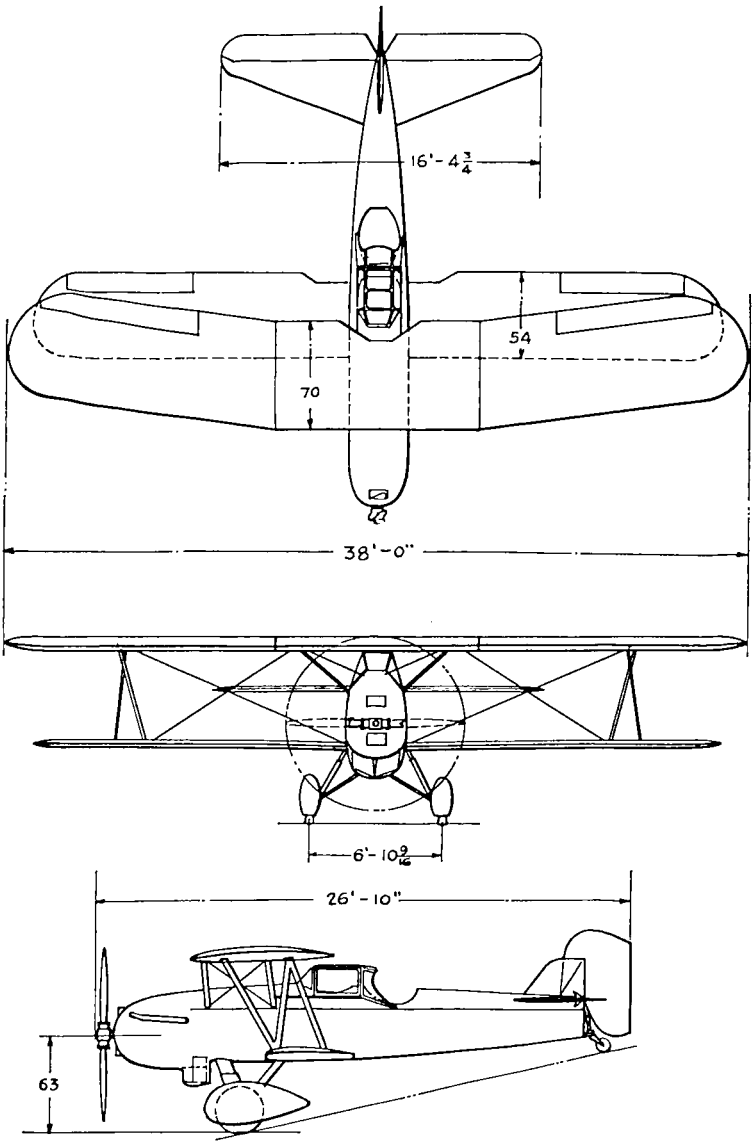


CURTISS AEROPLANE & MOTOR COMPANY
Buffalo, N. Y.
HAWK PURSUIT SEAPLANE
ENGINE: WRIGHT CYCLONE F —— 700 H.P.

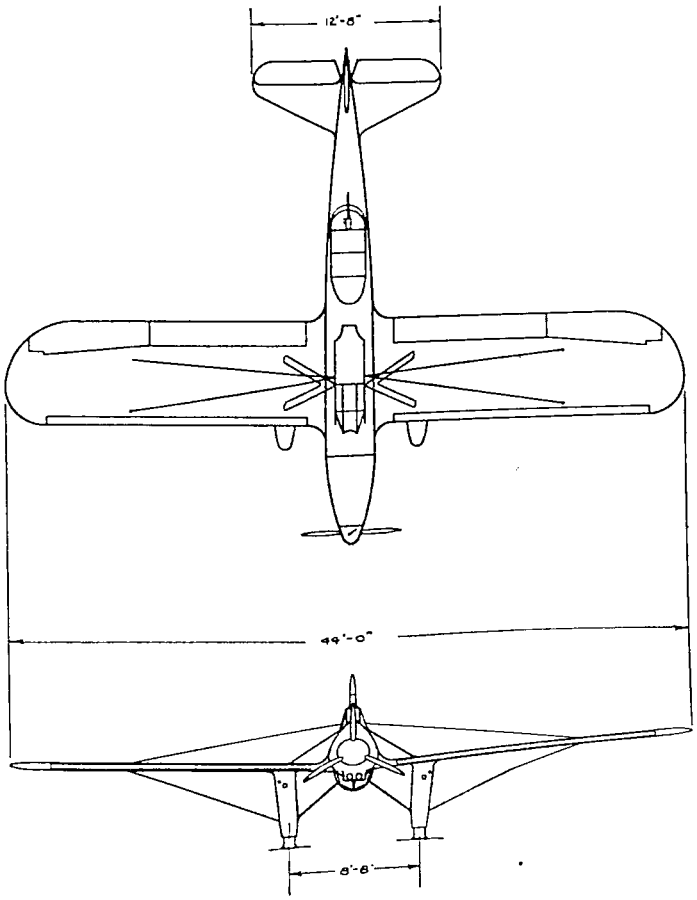


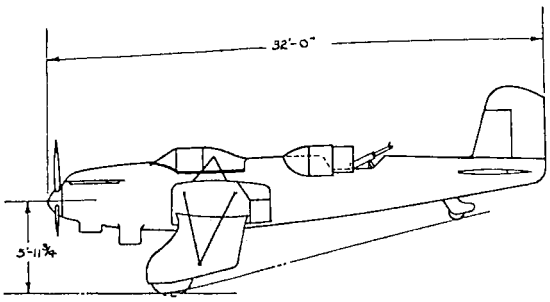


CURTISS AEROPLANE & MOTOR COMPANY
Buffalo, N. Y.
OBSERVATION & ATTACK —— FALCON 2 PLACE
ENGINE: WRIGHT CYCLONE F —— 700 H.P.

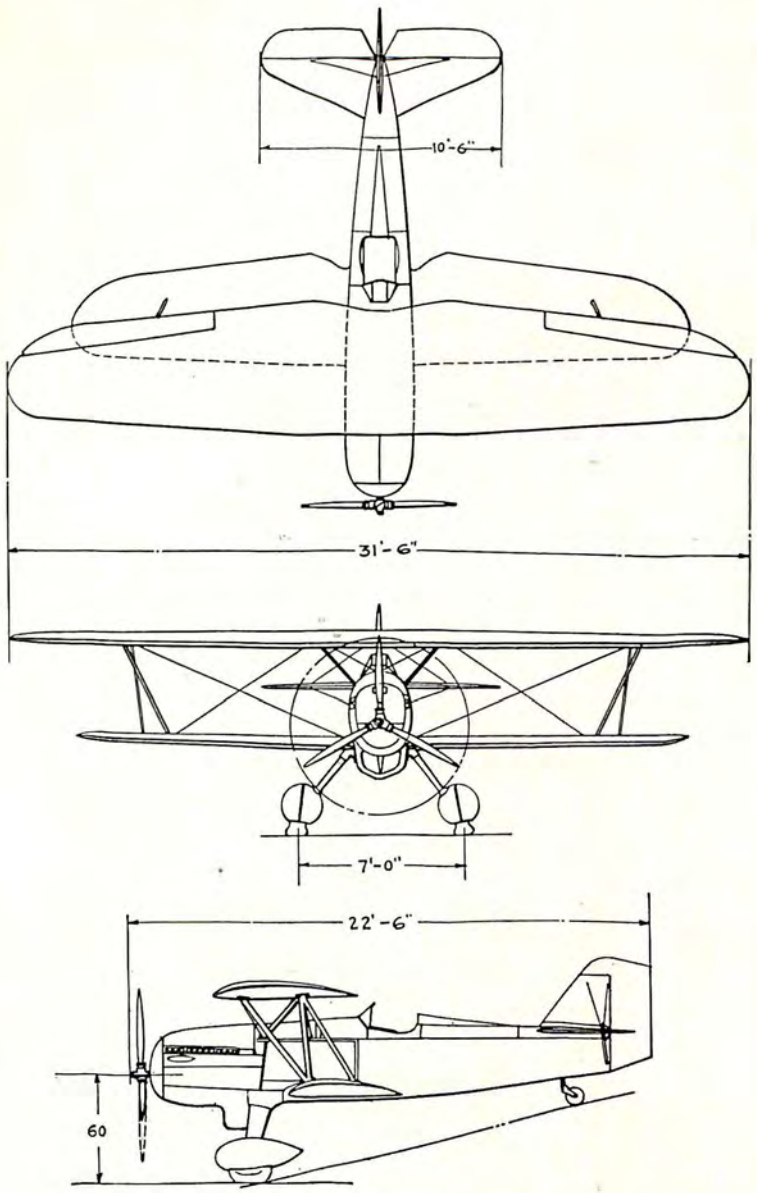


CURTISS AEROPLANE & MOTOR COMPANY
Buffalo, N. Y.
FALCON OBSERVATION O-39
ENGINE: CURTISS CONQUEROR 650 H.P.

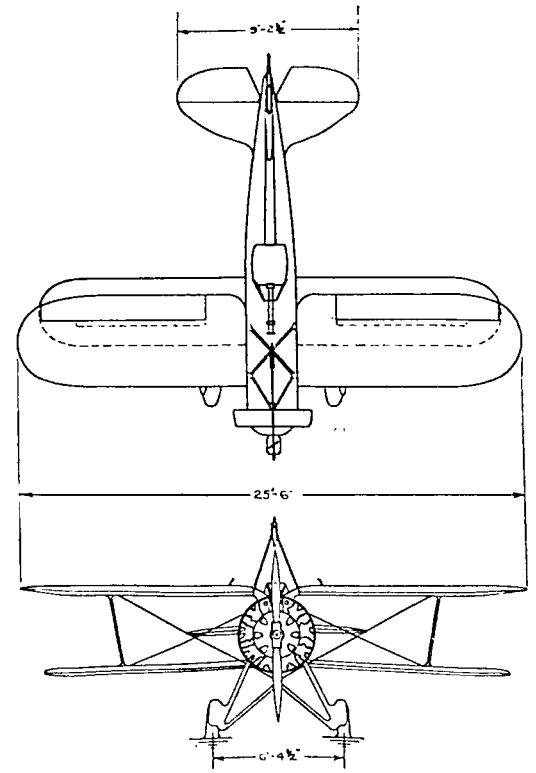


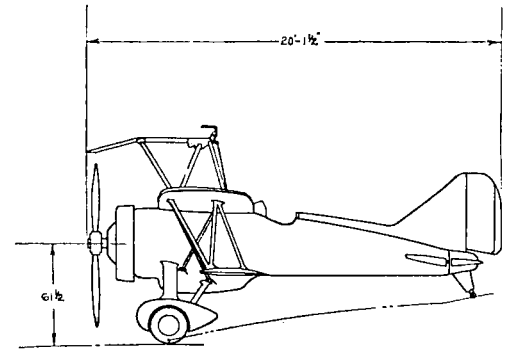


CURTISS AEROPLANE & MOTOR COMPANY
Buffalo, N. Y.
ATTACK YA-8 —— "SHRIKE"
ENGINE: CURTISS CONQUEROR 650 H.P.

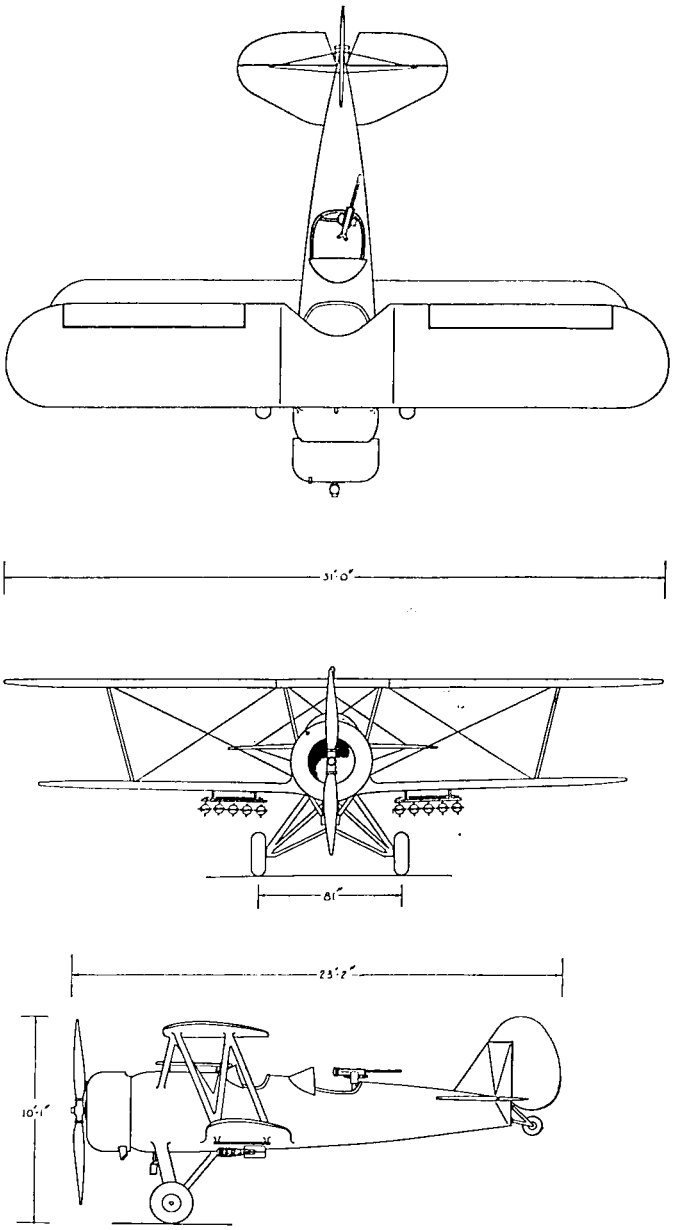


CURTISS AEROPLANE & MOTOR COMPANY
Buffalo, N. Y.
HAWK PURSUIT P 6-E
ENGINE: CURTISS CONQUEROR 650 H.P.

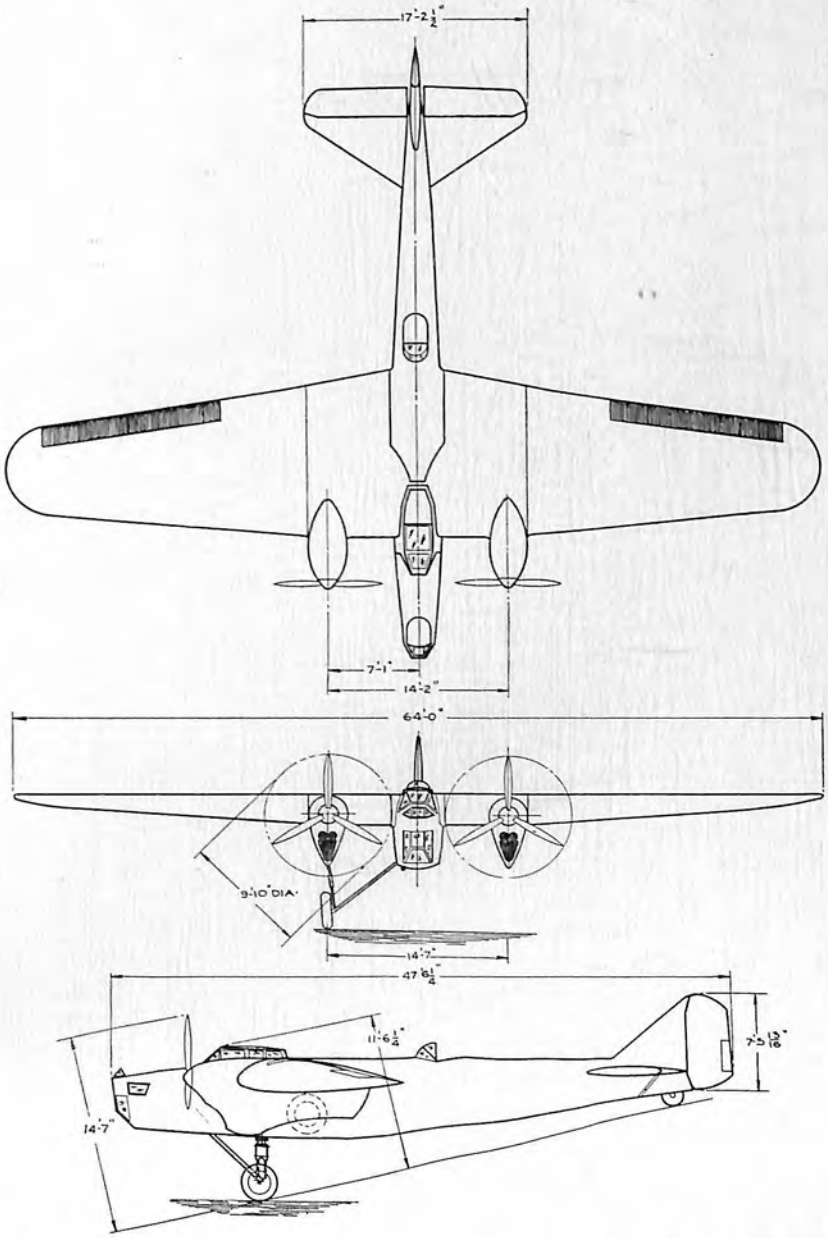




CURTISS AEROPLANE & MOTOR COMPANY
Buffalo, N. Y.
AIRSHIP FIGHTER F9C-2
ENGINE: WRIGHT WHIRLWIND 420



CURTISS-WRIGHT AIRPLANE COMPANY
St. Louis, Mo.
OSPREY —— 2 PLACE
ENGINE: WRIGHT WHIRLWIND 420

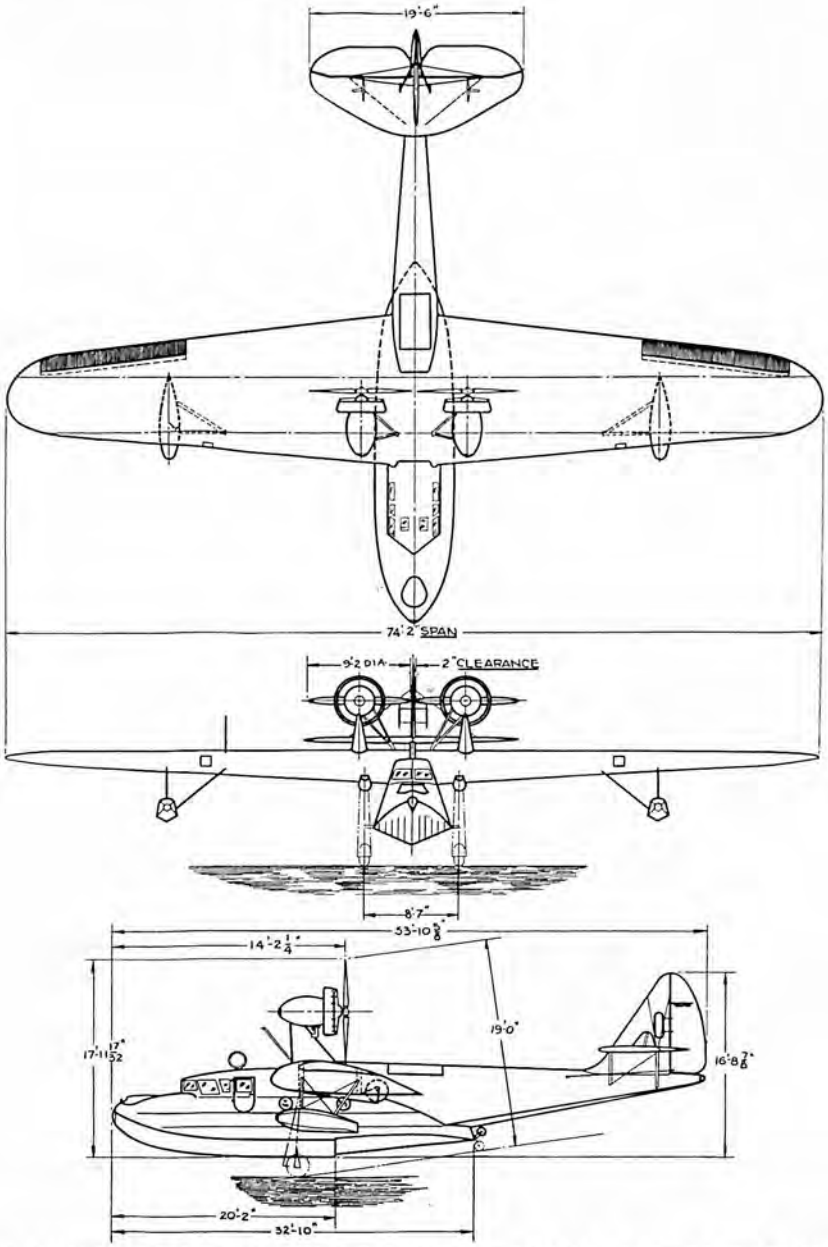


GENERAL AVIATION MANUFACTURING CORPORATION

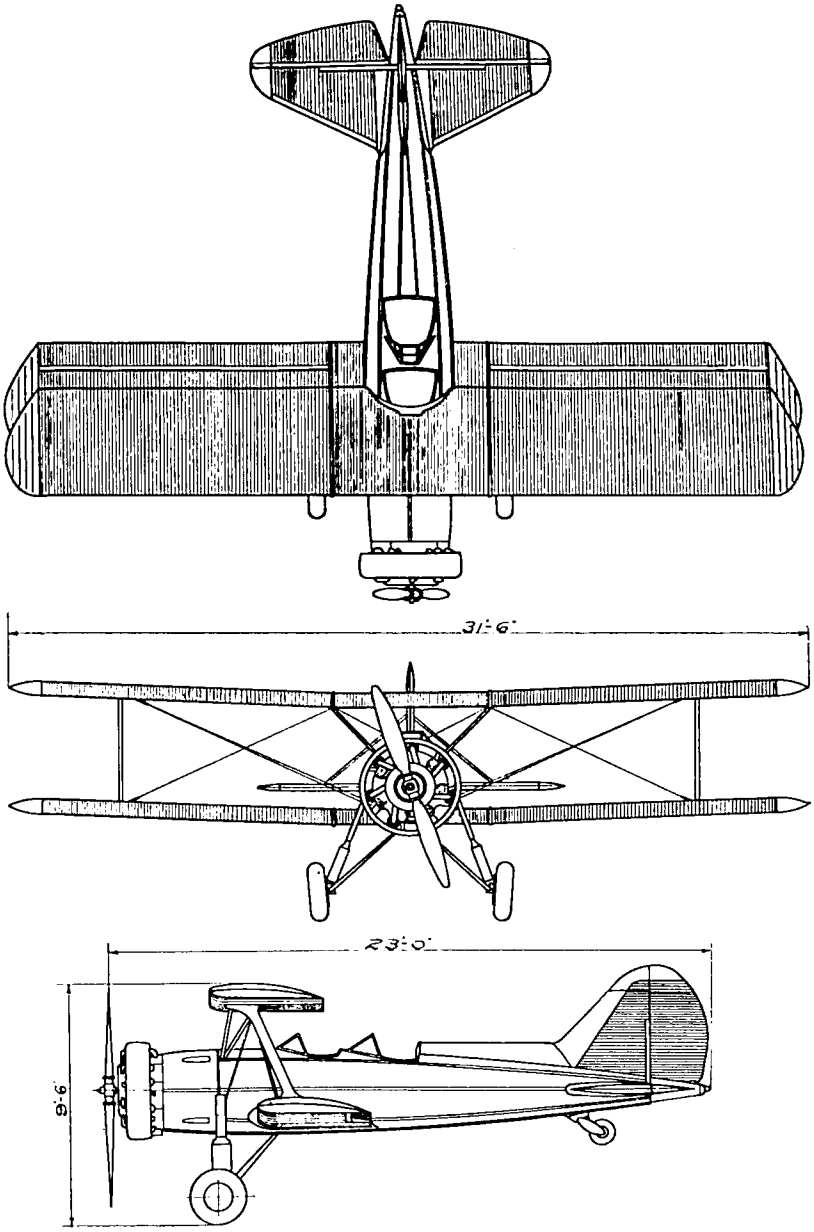
Dundalk, Md.

ARMY OBSERVATION YO-& Y10-27

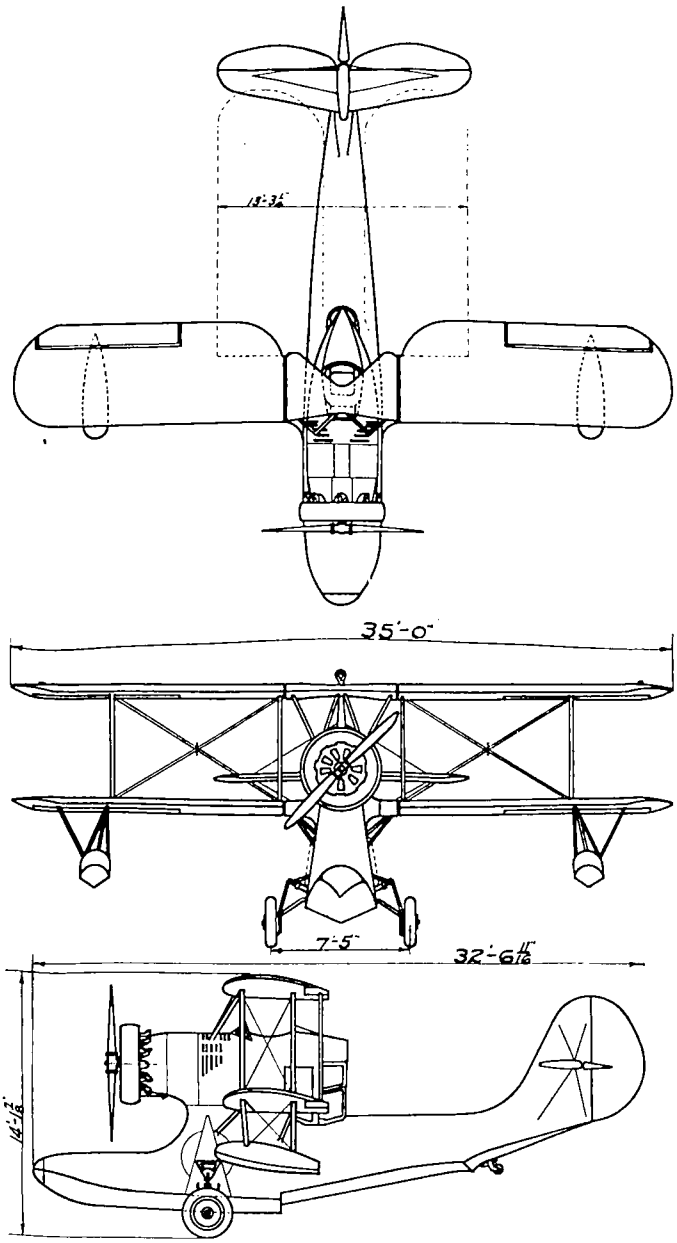
ENGINES: TWO CURTISS CONQUERORS



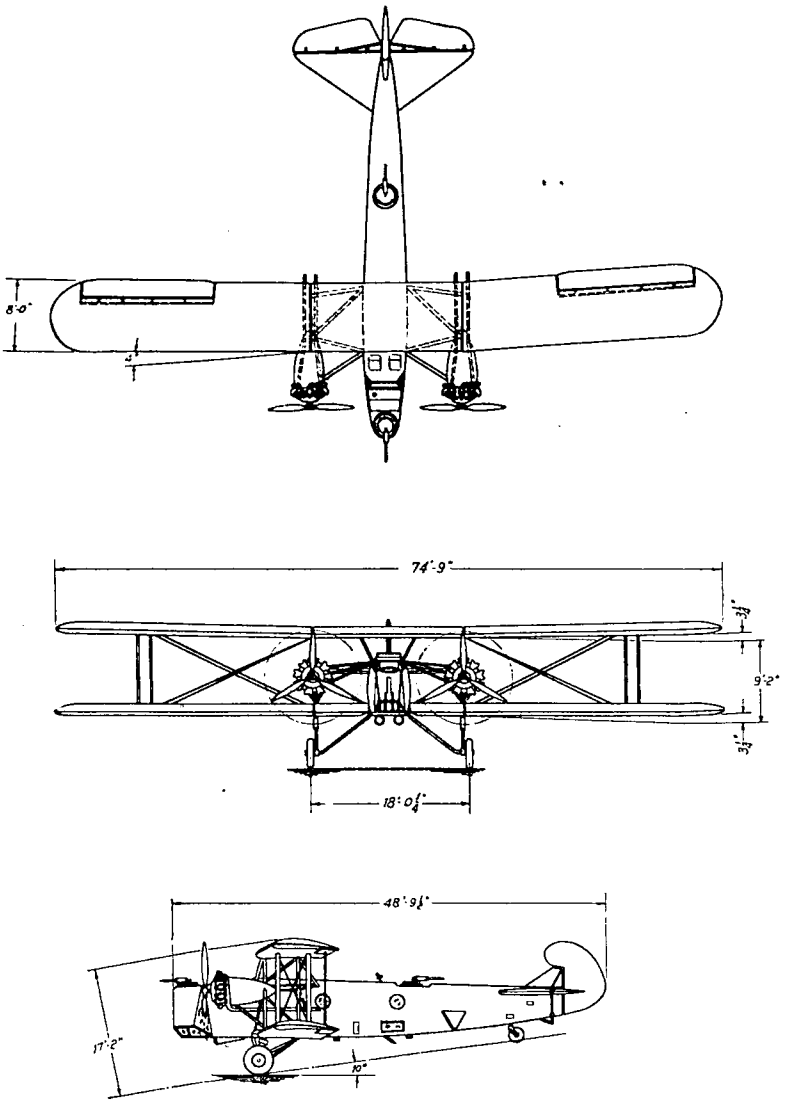
GENERAL AVIATION MANUFACTURING CORPORATION
Dundalk, Md.
U. S. Coast Guard —— AF-15
Engines: Two Pratt & Whitney Wasps



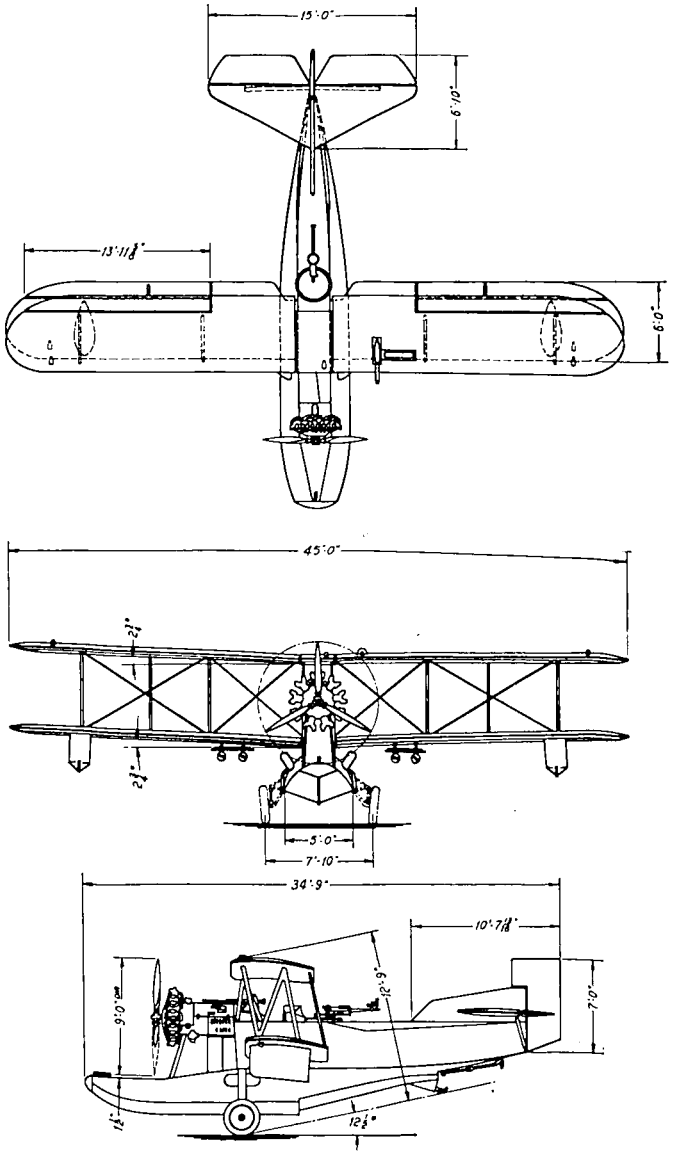
GREAT LAKES AIRCRAFT CORPORATION
Cleveland, Ohio
MODEL XPT-930
ENGINE: CONTINENTAL



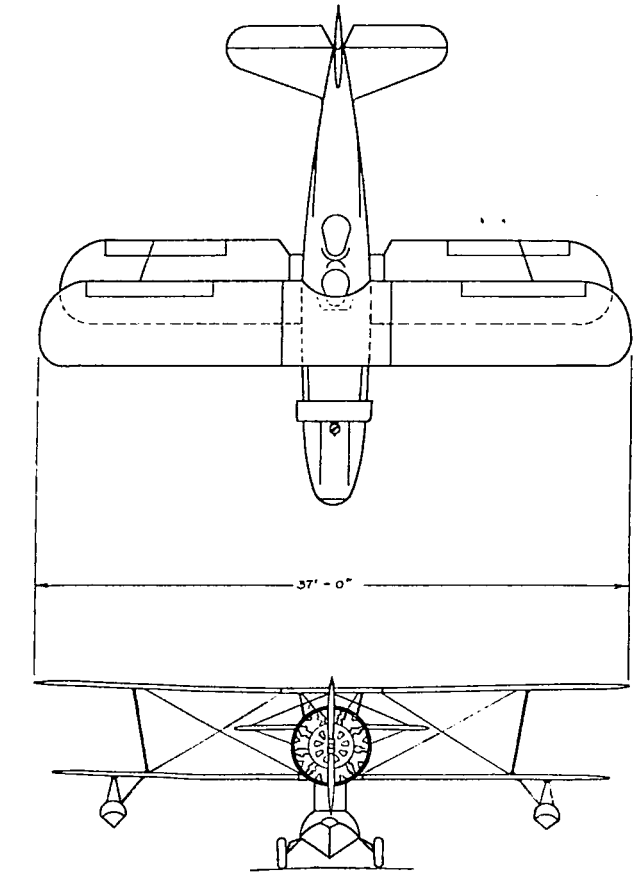
GREAT LAKES AIRCRAFT CORPORATION
Cleveland, Ohio
OBSERVATION AMPHIBION XSG-1
ENGINE: PRATT & WHITNEY WASP JUNIOR



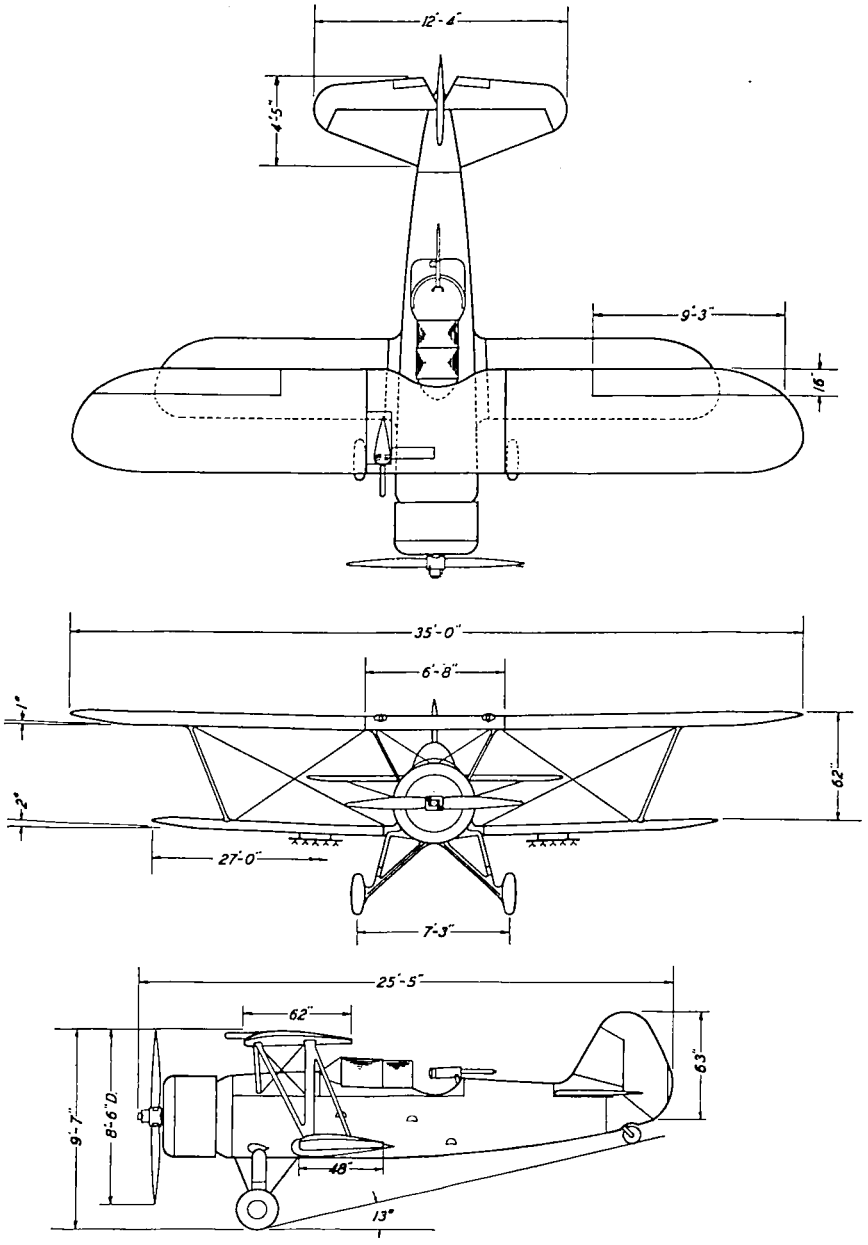
KEYSTONE AIRCRAFT CORPORATION
Bristol, Pa.
BOMBARDMENT B6-A
ENGINES: TWO WRIGHT CYCLONES



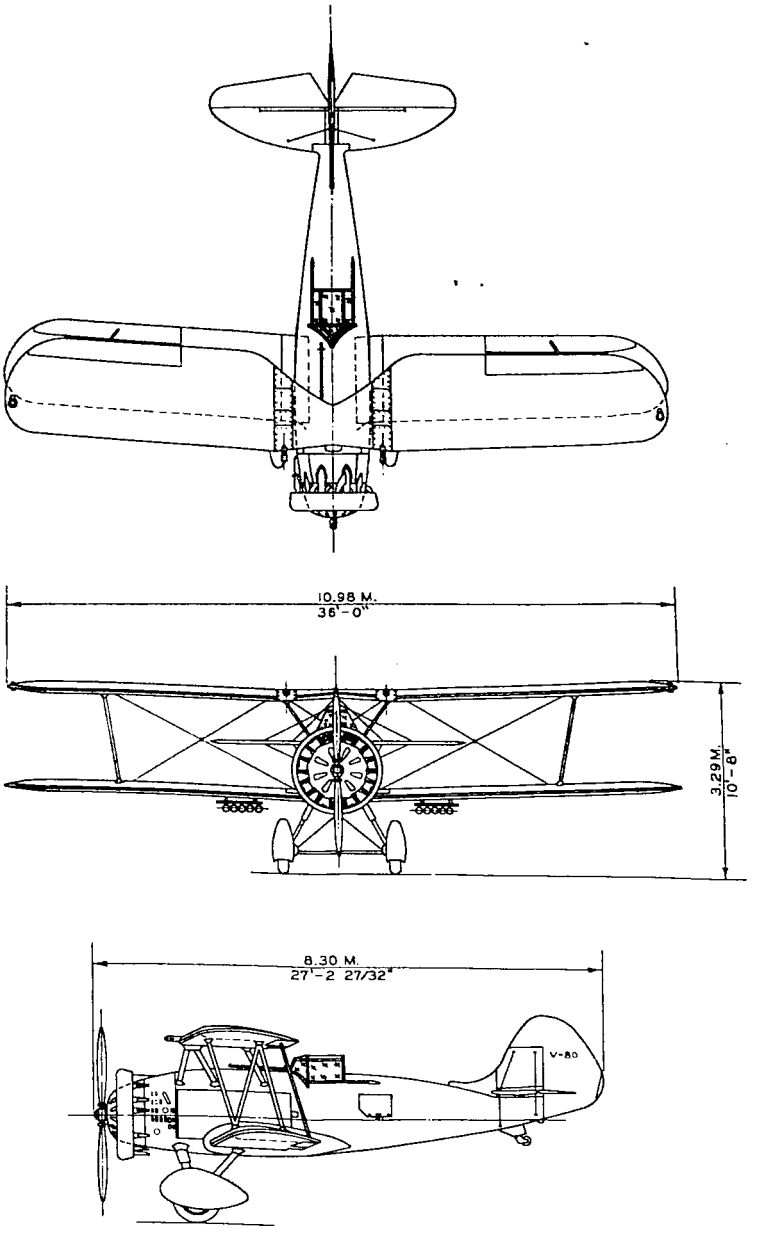
KEYSTONE AIRCRAFT CORPORATION
Bristol, Pa.
Model OL9
Engine: Pratt & Whitney Wasp



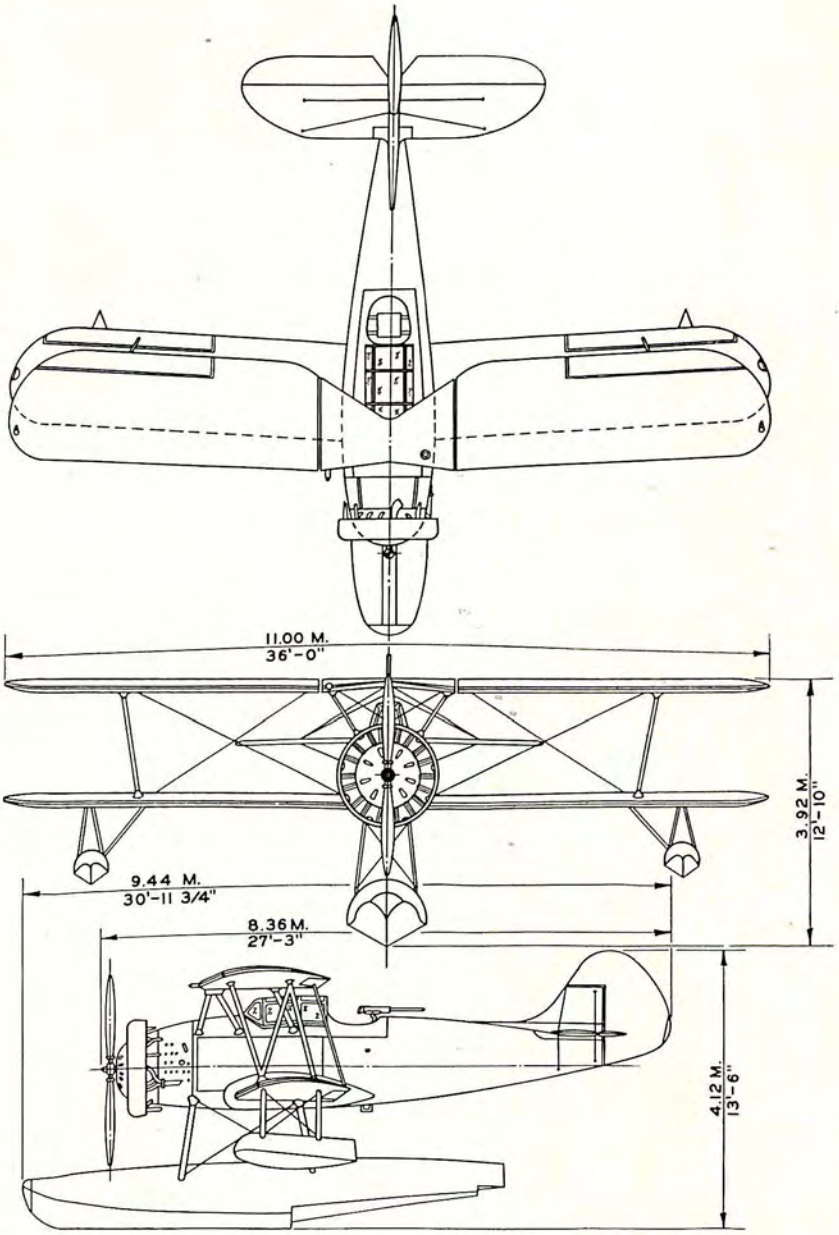
KEYSTONE AIRCRAFT CORPORATION
Bristol, Pa.
OBSERVATION O2L
ENGINE: PRATT & WHITNEY WASP



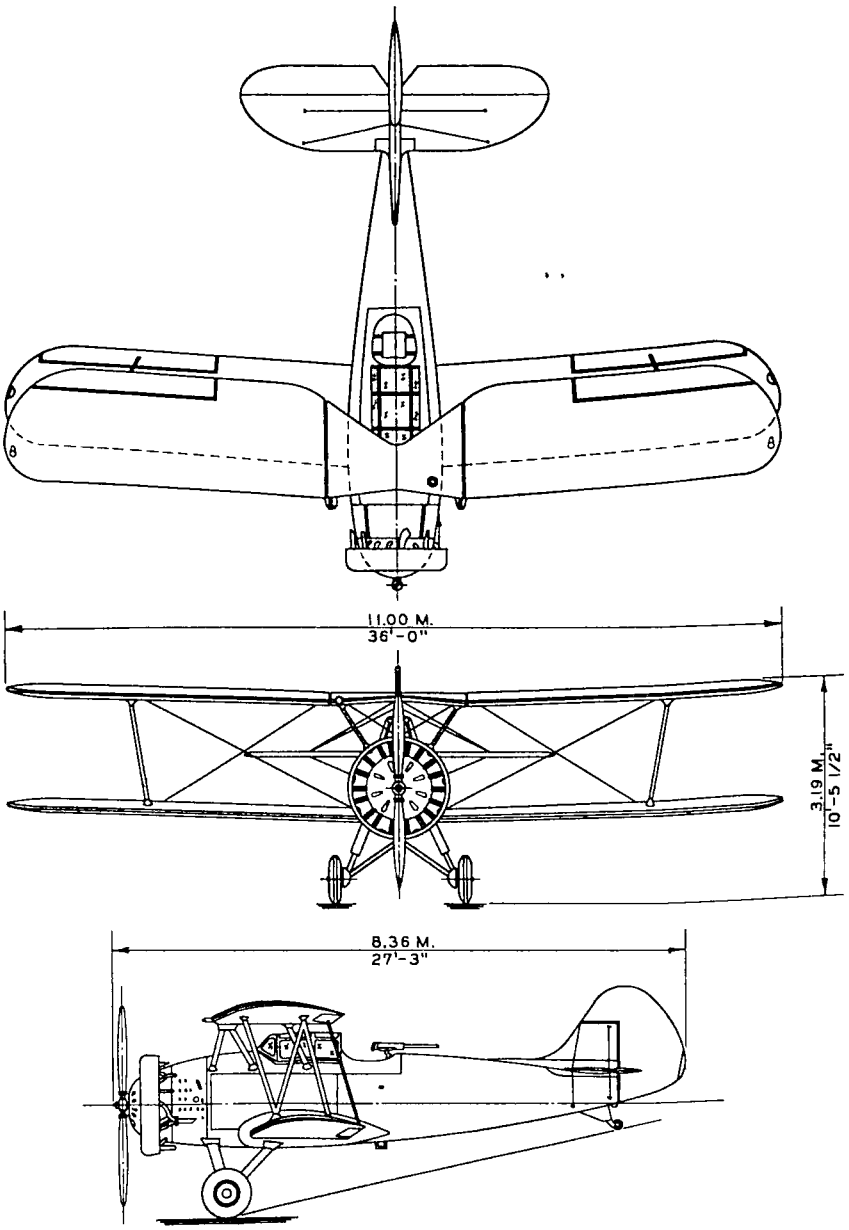
STEARMAN AIRCRAFT COMPANY
Wichita, Kans.
MODEL 82 —— 2 PLACE
ENGINE: PRATT & WHITNEY T3A WASP JUNIOR



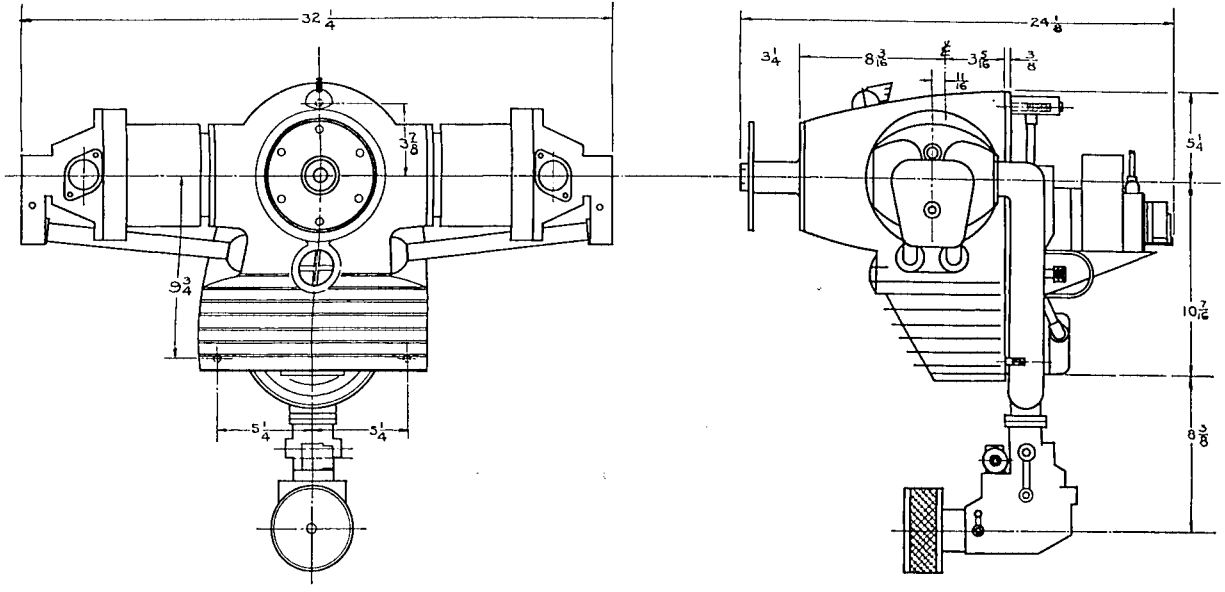
CHANCE VOUGHT CORPORATION
East Hartford, Conn.
CORSAIR V-80 —— 1 PLACE
ENGINE: PRATT & WHITNEY HORNET



CHANCE VOUGHT CORPORATION
East Hartford, Conn.
CORSAIR V-90 —— 2 PLACE
ENGINE: PRATT & WHITNEY HORNET



CHANCE VOUGHT CORPORATION
East Hartford, Conn.
CORSAIR V-90 —— 2 PLACE
ENGINE: PRATT & WHITNEY HORNET

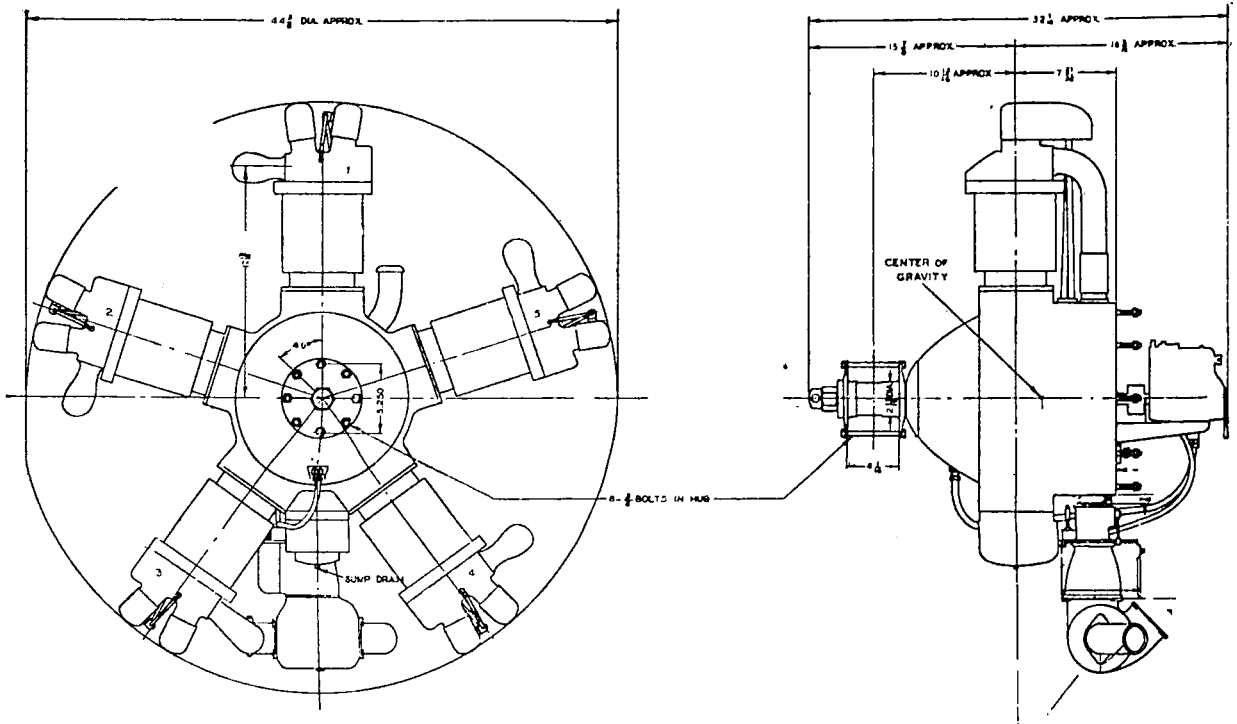


AERONAUTICAL CORPORATION OF AMERICA

Cincinnati, Ohio

AERONCA E-113A —— 36 H.P.

2 CYLINDER OPPOSED AIRCOOLED



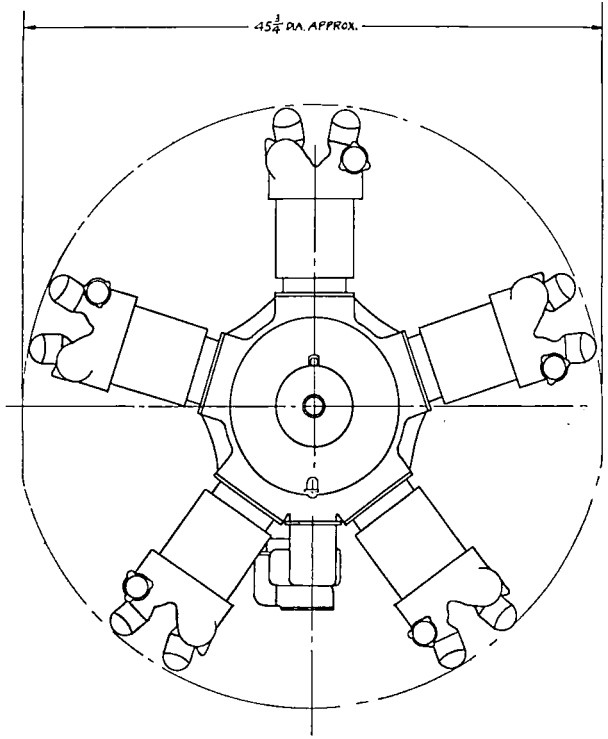
KINNER AIRPLANE & MOTOR CORPORATION, LTD.

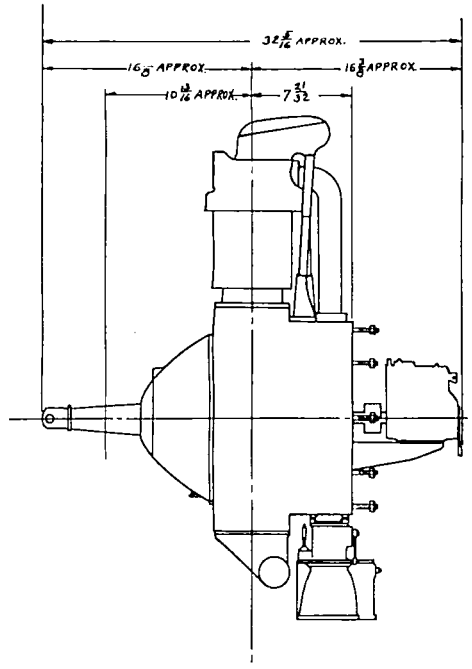
Glendale, Calif.

MODEL K-5 —— 100 H.P.

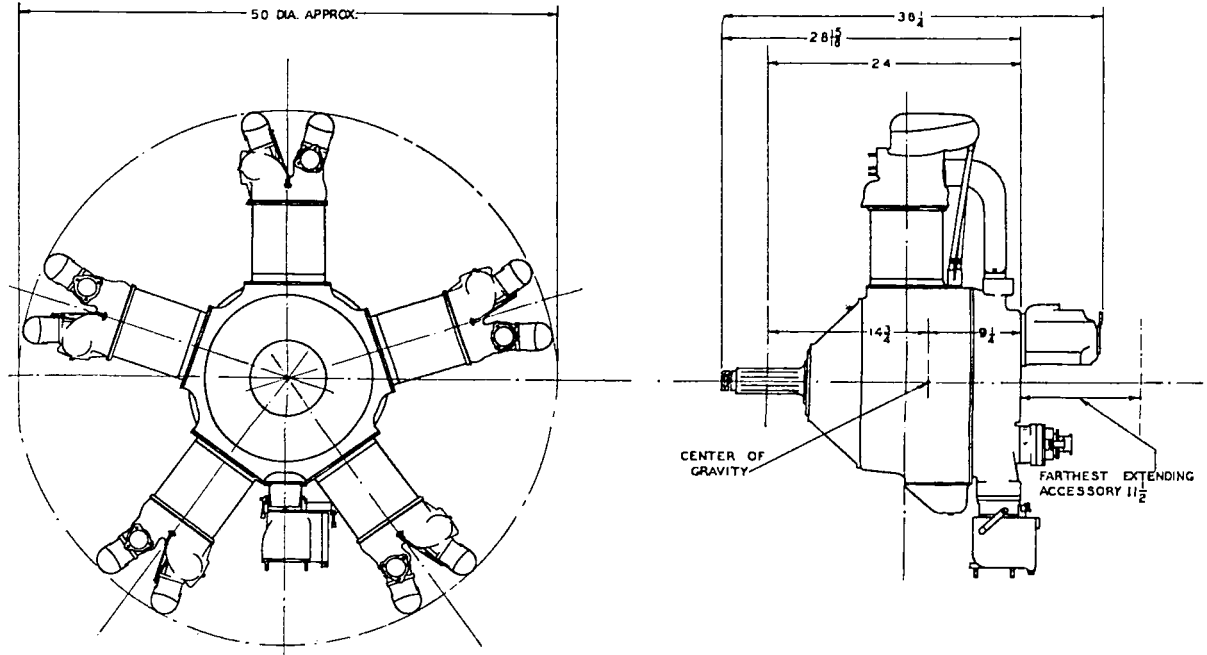
MODEL B-5 —— 125 H.P.

5 CYLINDER RADIAL AIRCOOLED

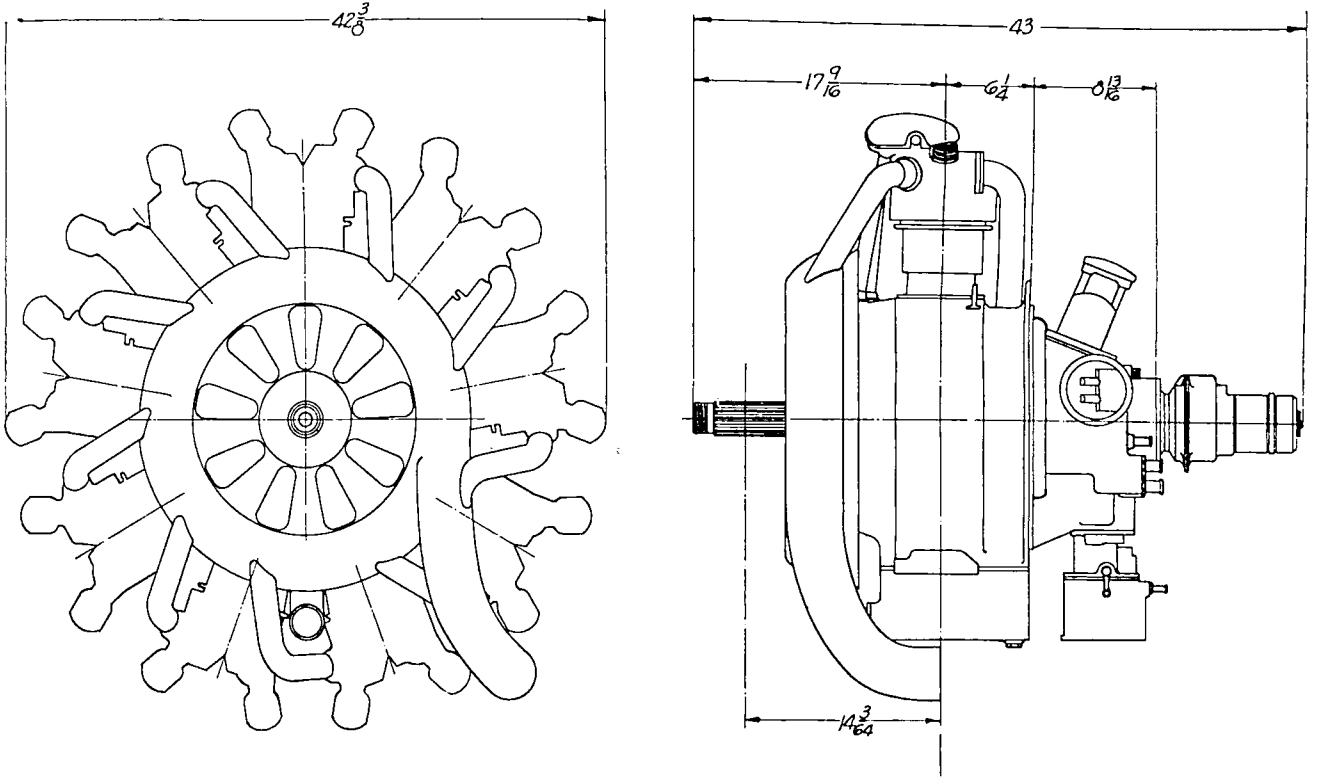




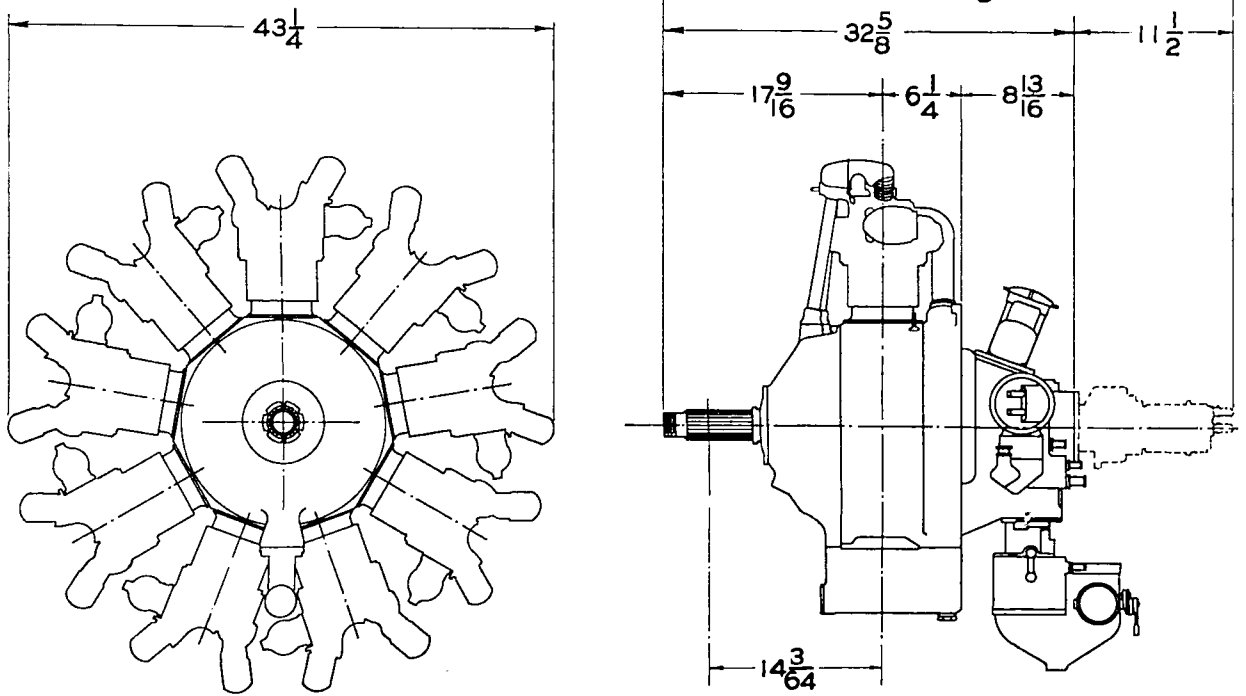
KINNER AIRPLANE & MOTOR CORPORATION, LTD.
Glendale, Calif.
MODEL R-5 —— 160 H.P.
5 CYLINDER RADIAL AIRCOOLED



KINNER AIRPLANE & MOTOR CORPORATION, LTD.
Glendale, Calif.
MODEL C-5 —— 210 H.P.
5 CYLINDER RADIAL AIRCOOLED



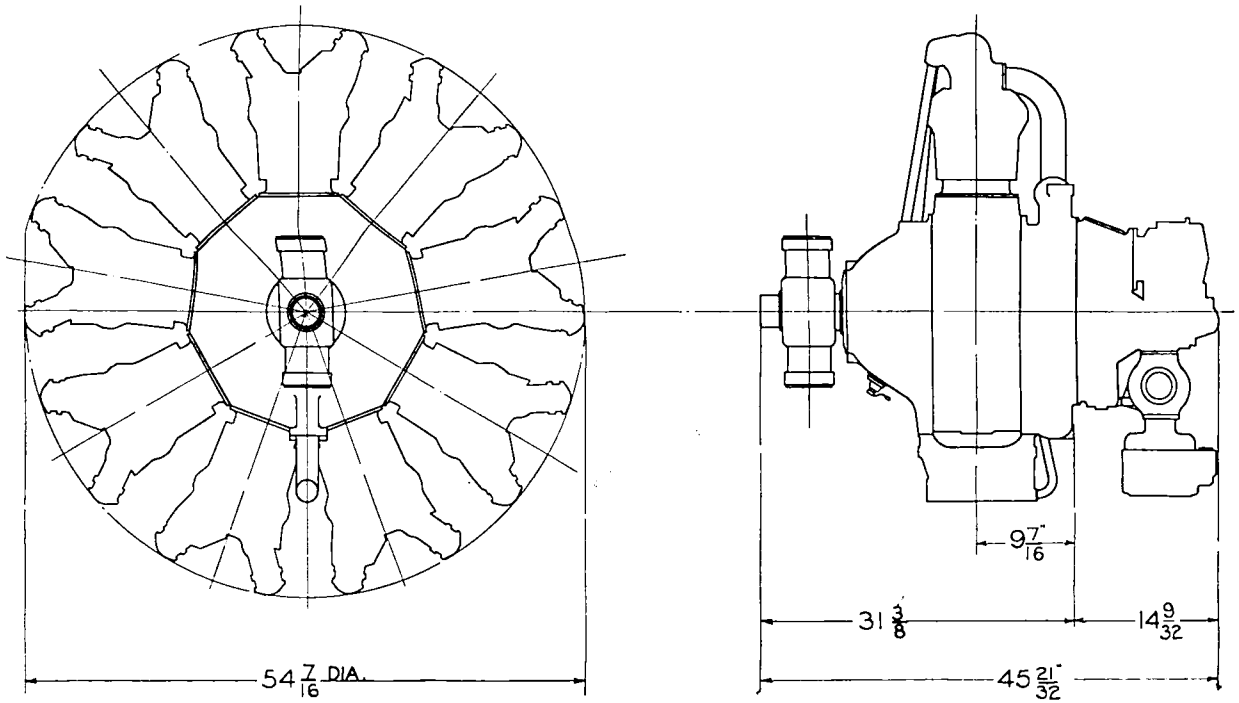
LYCOMING MANUFACTURING COMPANY
Williamsport, Pa.
Model R-680 —— 215 H.P.
9 Cylinder Radial Aircooled



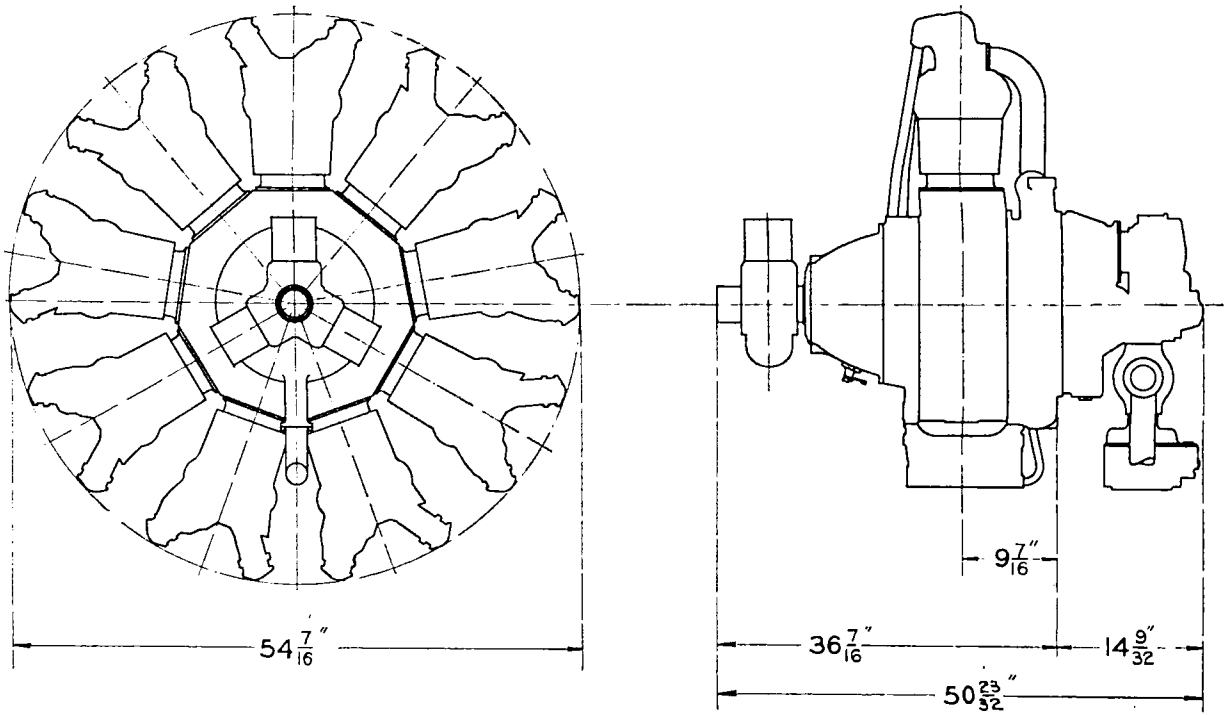
LYCOMING MANUFACTURING COMPANY
Williamsport, Pa.

MODEL R-680-4 —— 220 H.P.
R-680-2 —— 240 H.P.
R-680-6 —— 245 H.P.
R-680-5 —— 260 H.P.
R-680-7 —— 240 H.P.

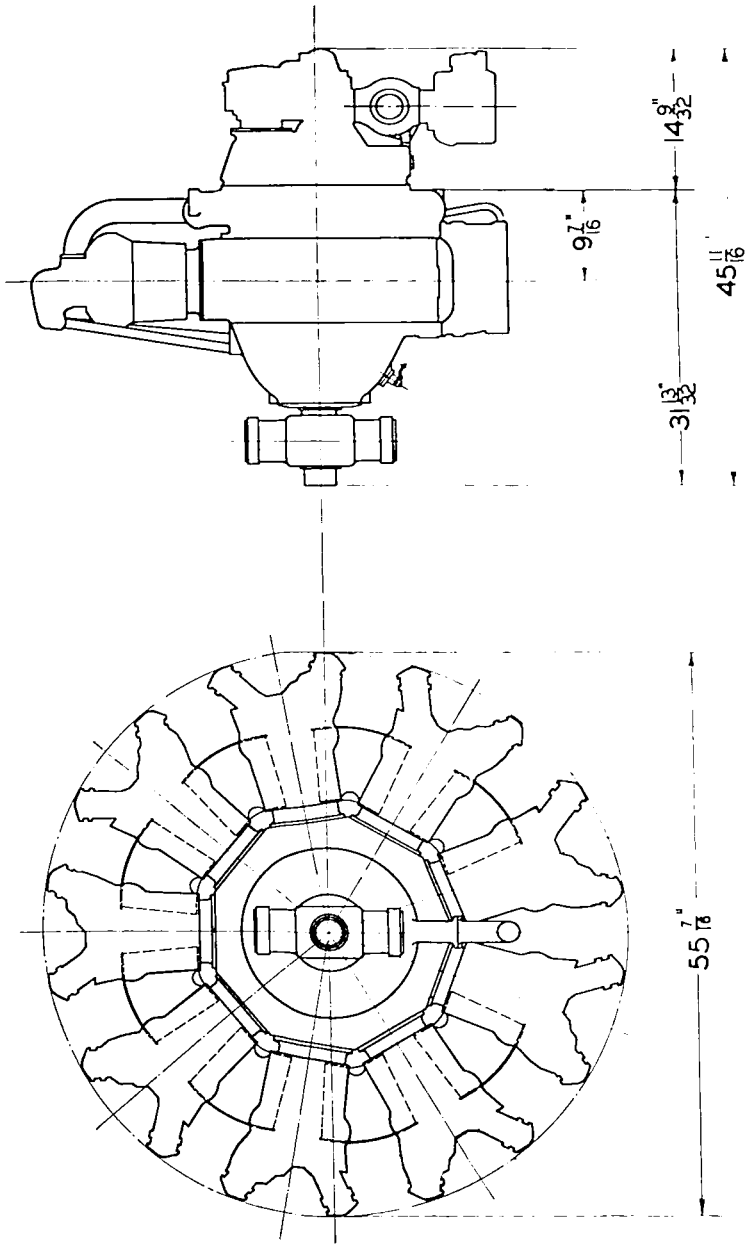
9 CYLINDER RADIAL AIRCOOLED



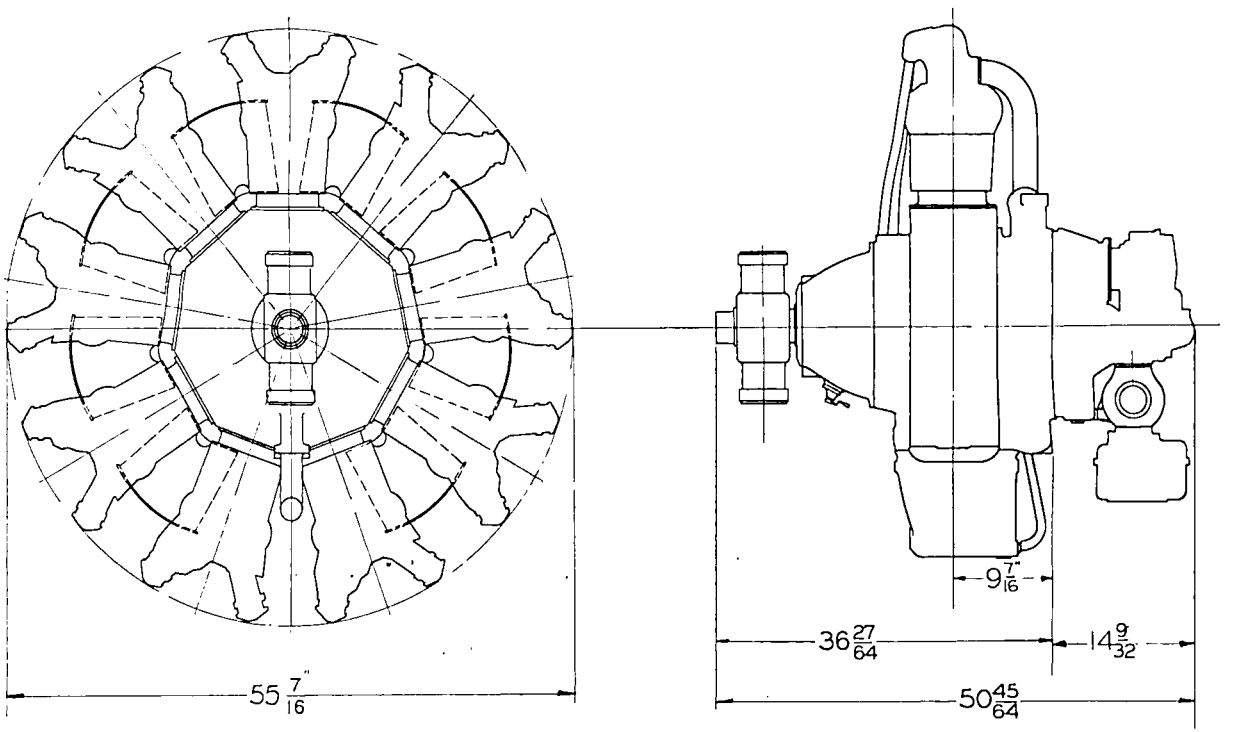
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
HORNET D —— 675-700 H.P.
9 CYLINDER RADIAL AIRCOOLED



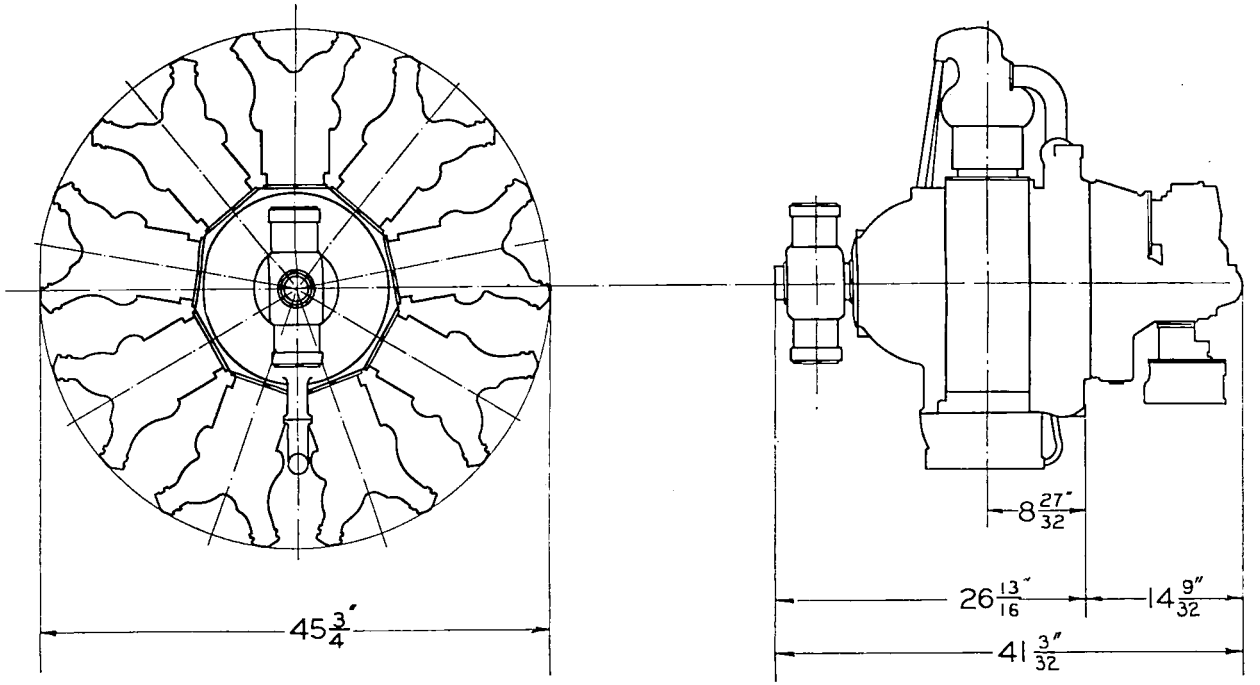
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
HORNET D (GEARED 3:2) —— 700 H.P.
9 CYLINDER RADIAL AIRCOOLED



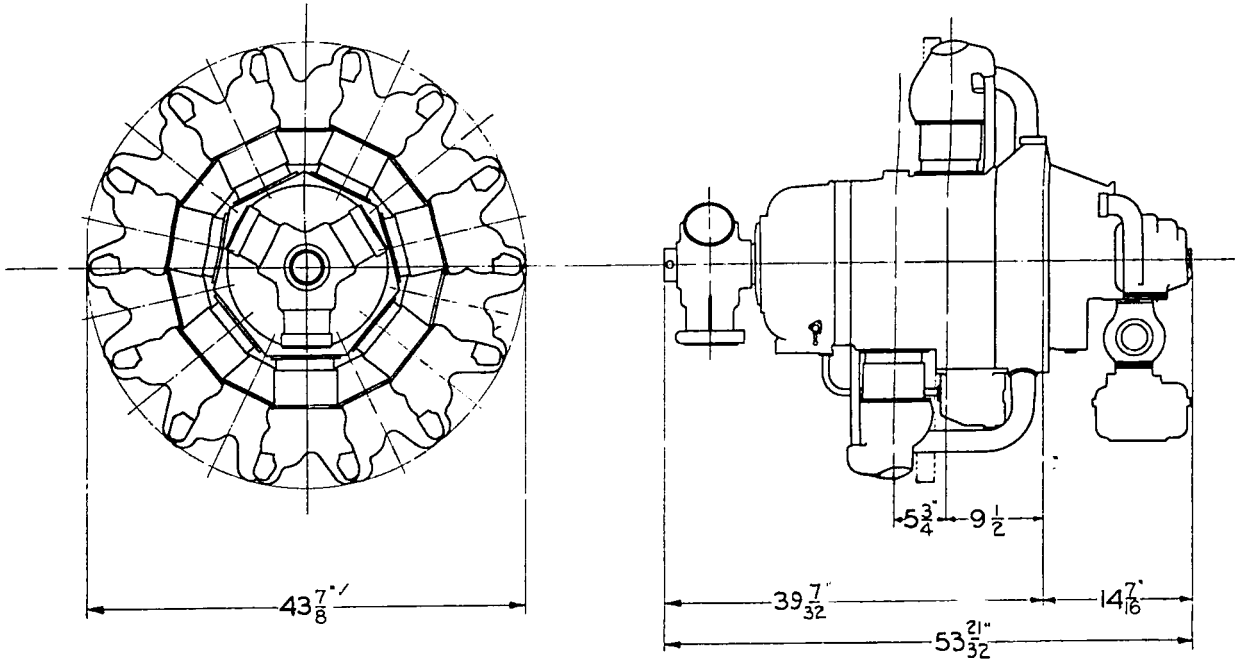
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
HORNET D1 —— 575-700 H.P.
9 CYLINDER RADIAL AIRCOOLED



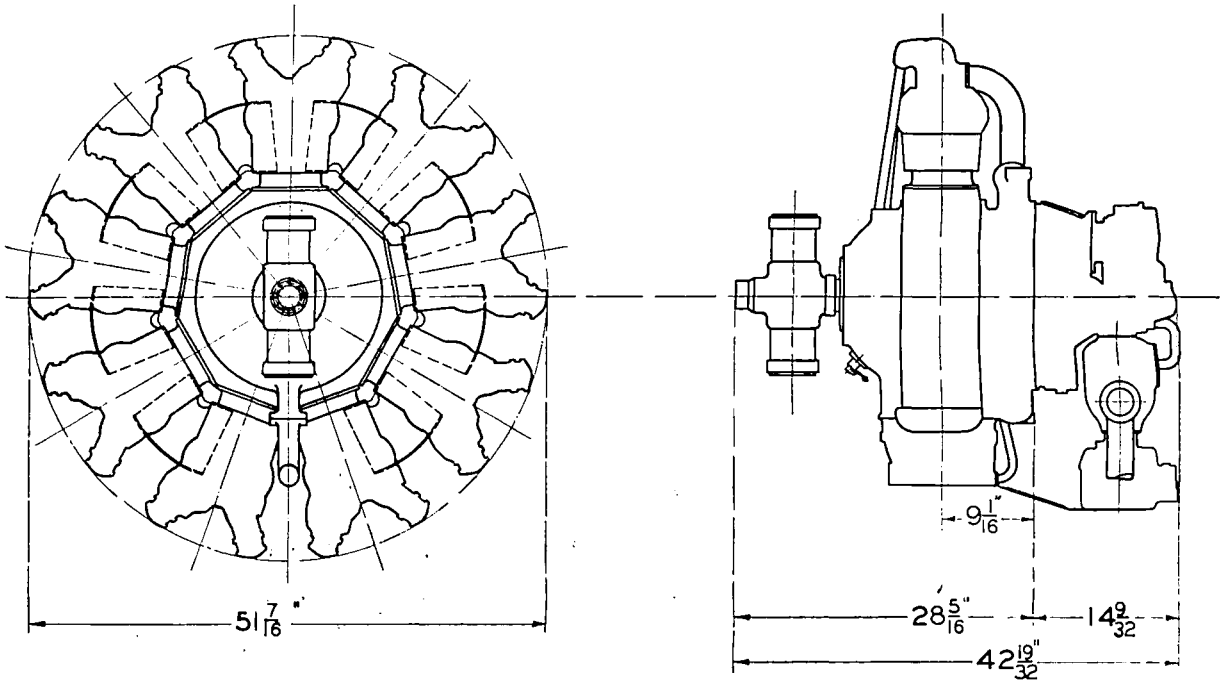
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
HORNET D1 (GEARED 3:2) —— 575-700 H.P.
9 CYLINDER RADIAL AIRCOOLED



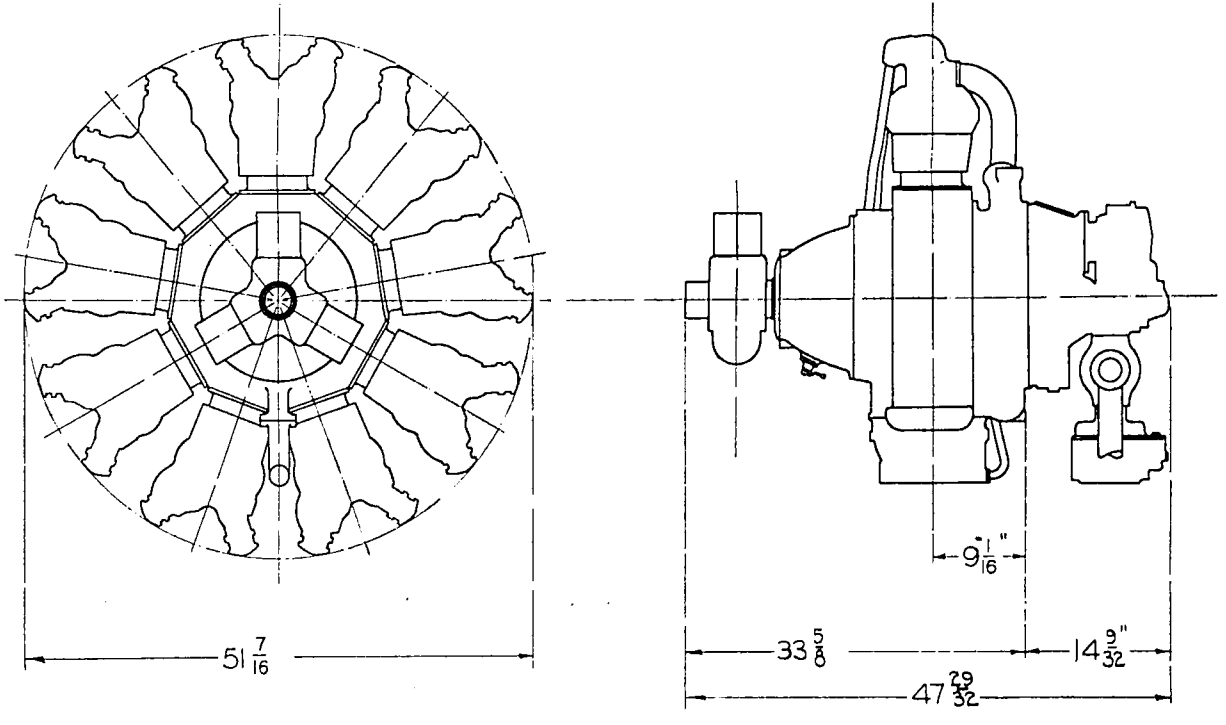
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
WASP JUNIOR —— 300-420 H.P.
9 CYLINDER RADIAL AIRCOOLED



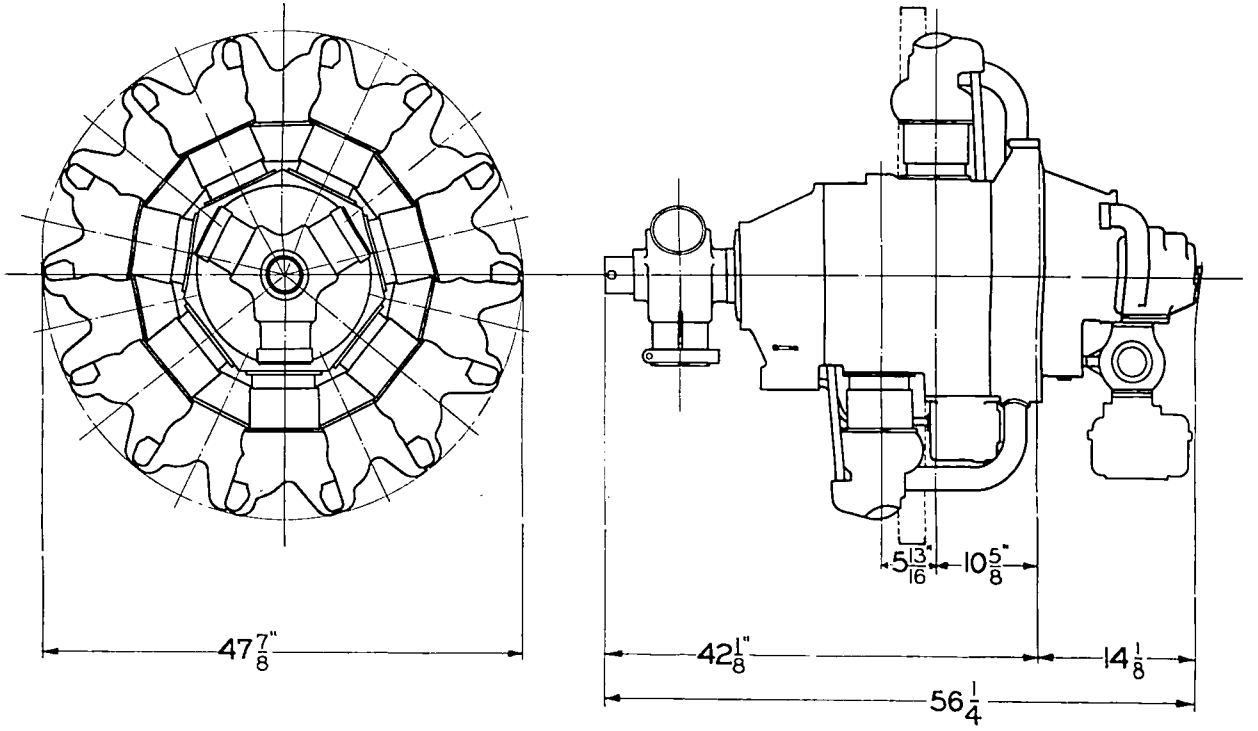
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
TWIN WASP JUNIOR (GEARED 3:2 AND 4:3) —— 650-700 H.P.
14 CYLINDER RADIAL AIRCOOLED



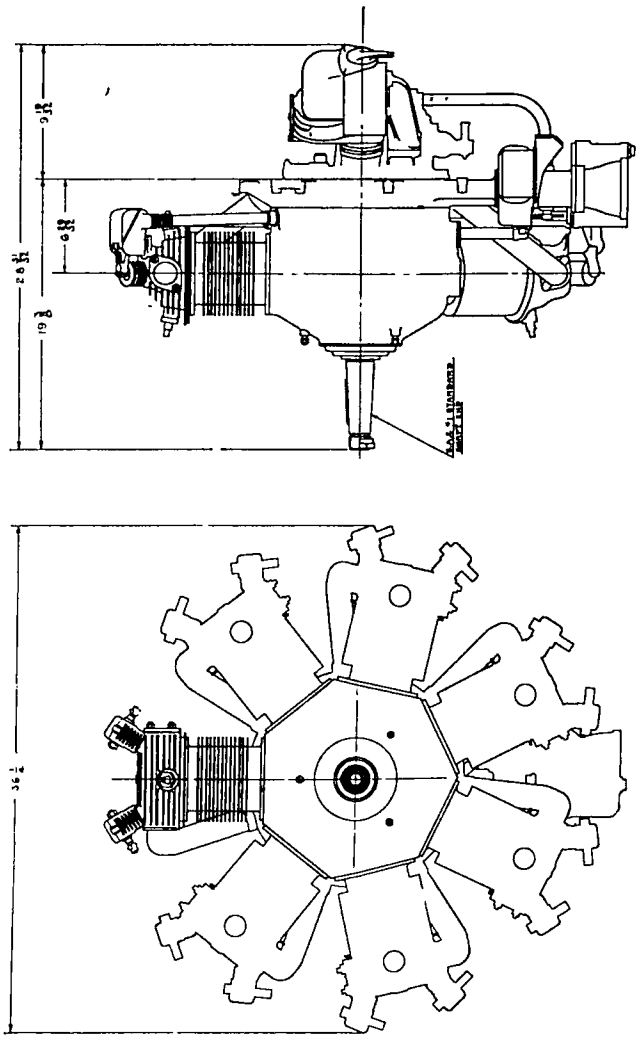
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
WASP —— 420-550 H.P.
9 CYLINDER RADIAL AIRCOOLED



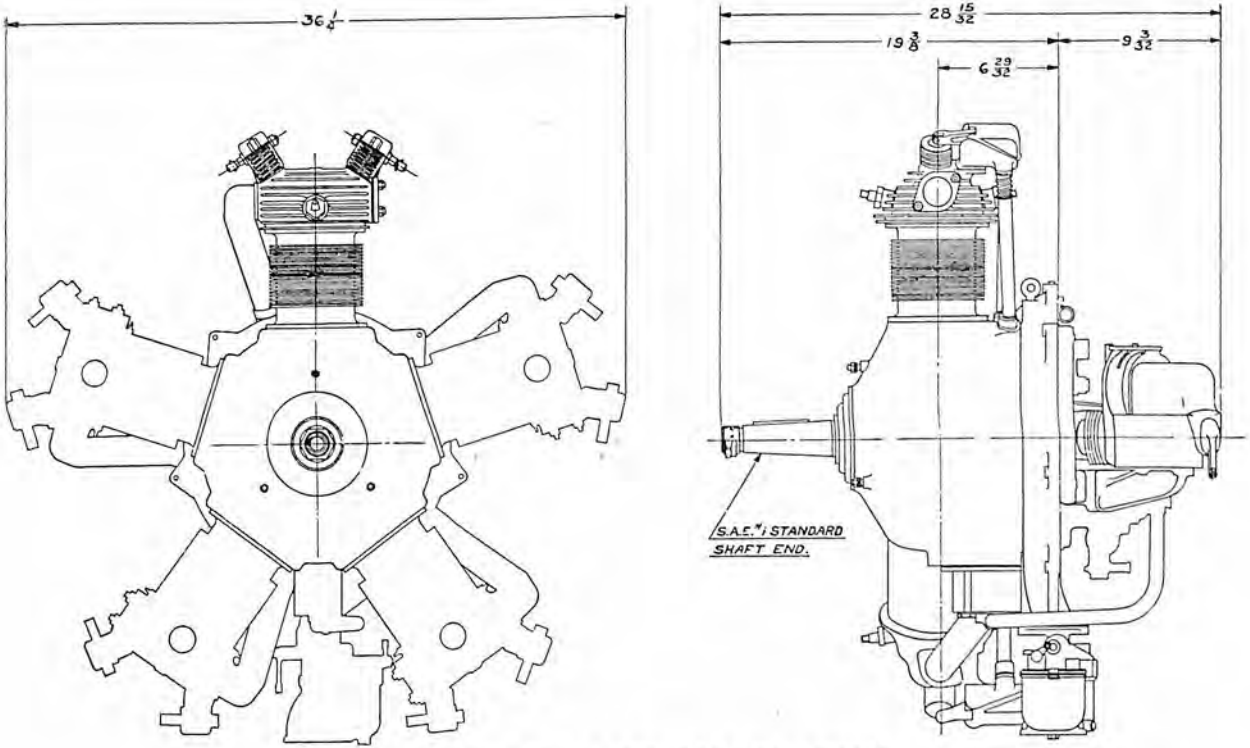
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
WASP (GEARED 3:2) —— 460-525 H.P.
9 CYLINDER RADIAL AIRCOOLED



PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
TWIN WASP (GEARED 3:2) —— 750-830 H.P.
14 CYLINDER RADIAL AIRCOOLED



WARNER AIRCRAFT CORPORATION
Detroit, Mich.
SCARAB —— 125 H.P.
SUPER-SCARAB —— 145 H.P.
7 CYLINDER RADIAL AIRCOOLED

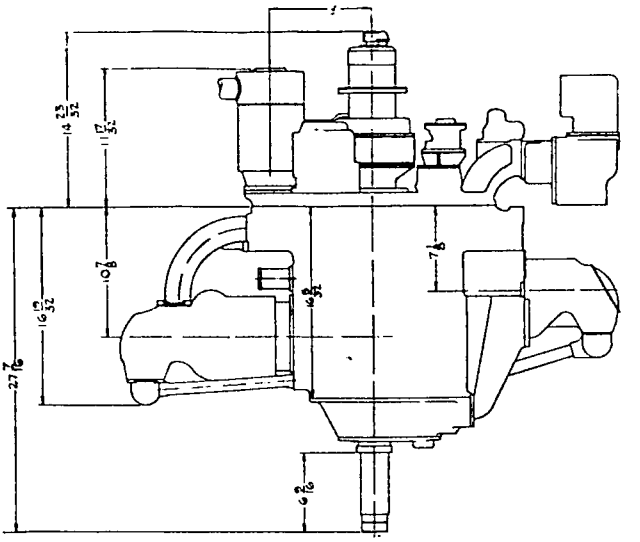


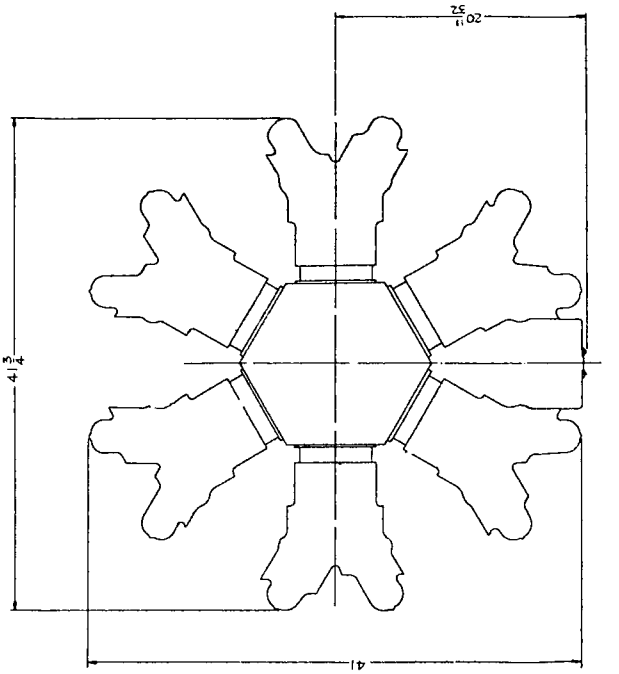
WARNER AIRCRAFT CORPORATION

Detroit, Mich.

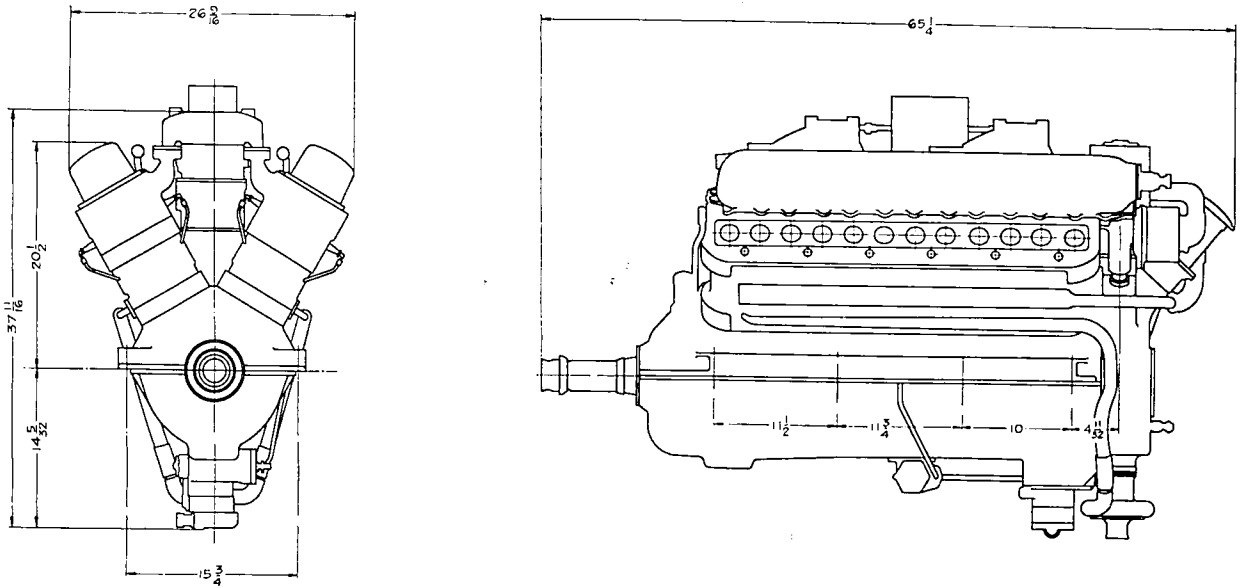
SCARAB, JR. —— 90 H.P.

5 CYLINDER RADIAL AIRCOOLED

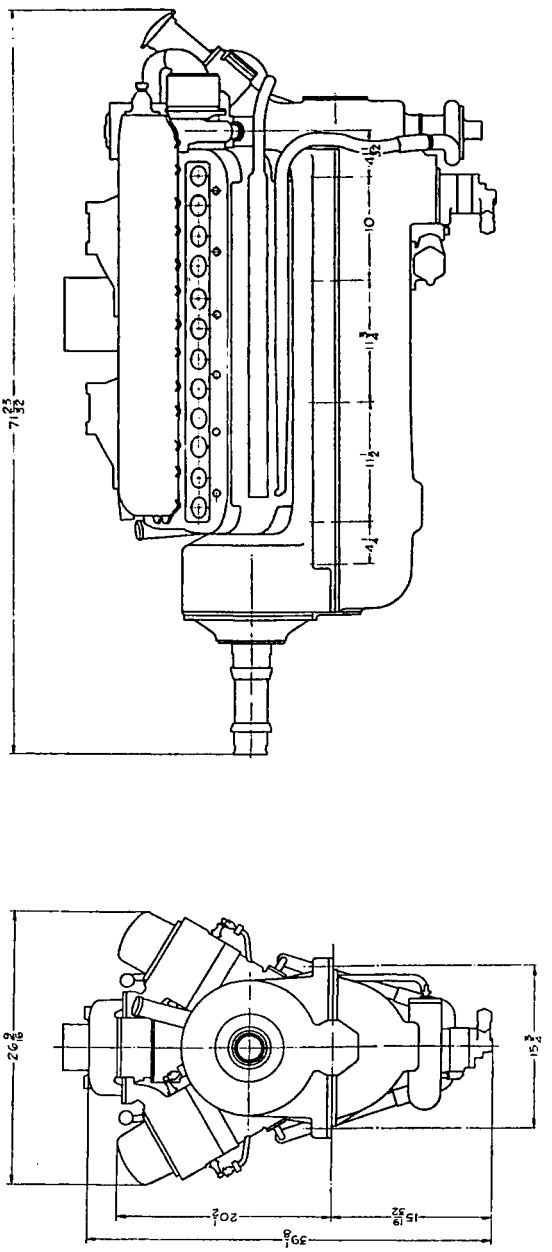




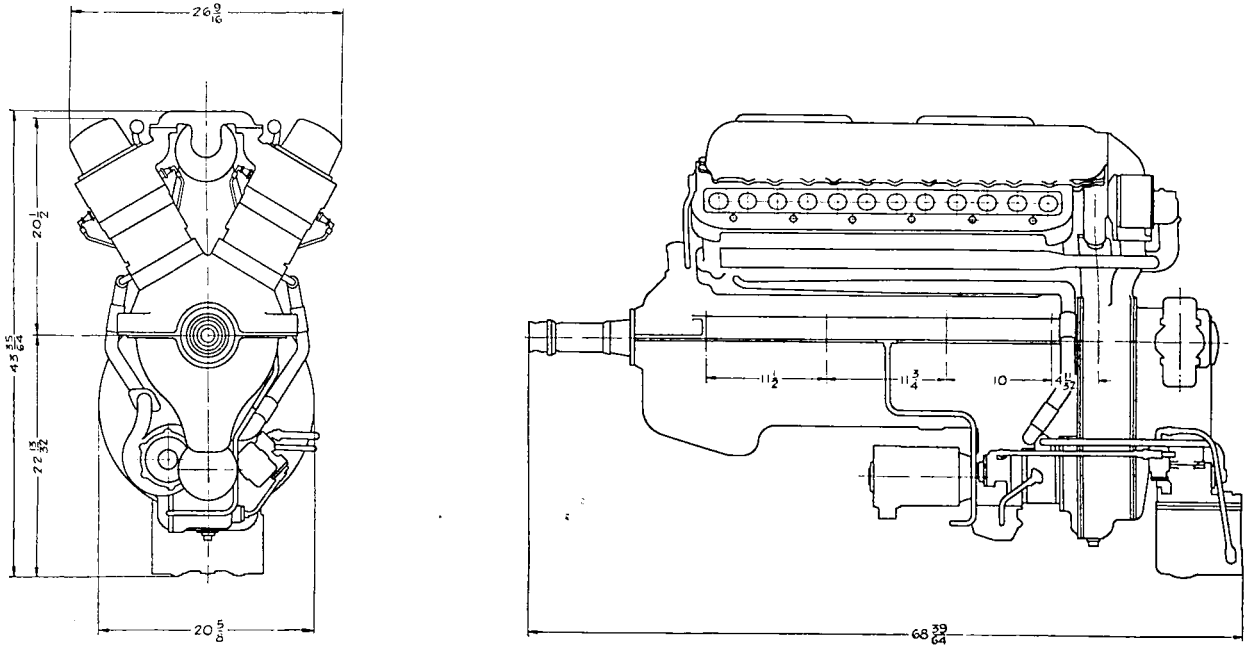
WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.
CURTISS CHALLENGER — 185 H.P.
6 CYLINDER RADIAL AIRCOOLED



WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.
CURTISS CONQUEROR —— 650 H.P.
12 CYLINDER V TYPE LIQUID COOLED



WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.
CURTISS CONQUEROR (GEARED) — 650 H.P.
12 CYLINDER V TYPE LIQUID COOLED

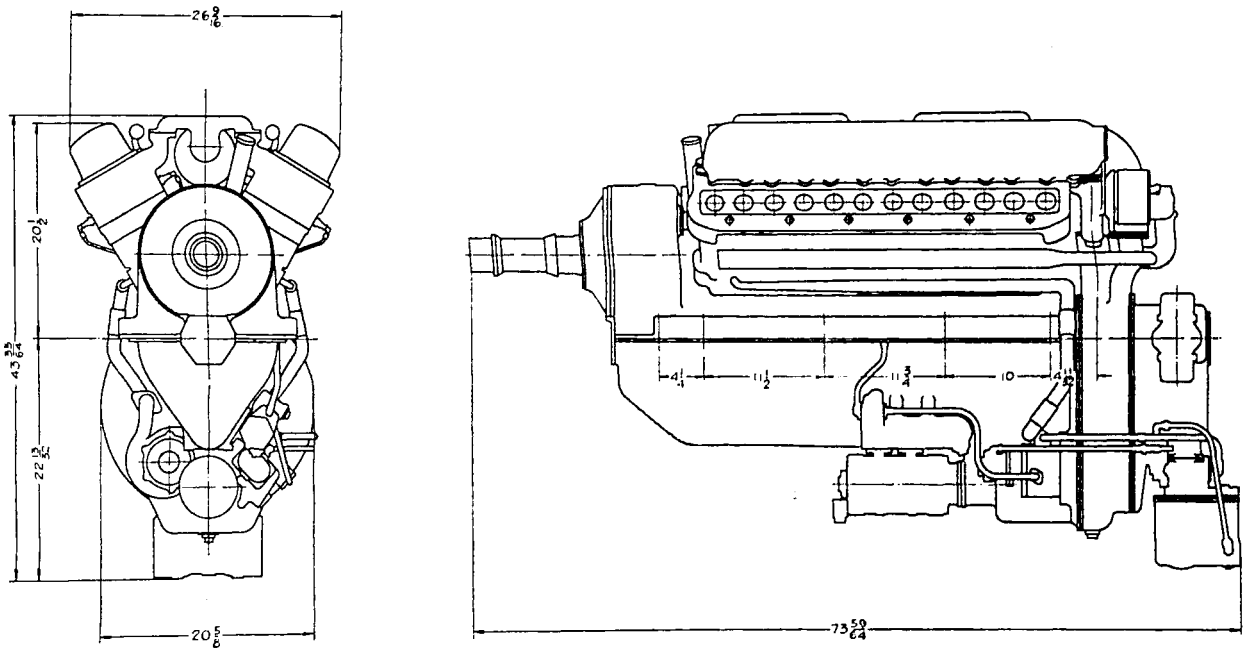


WRIGHT AERONAUTICAL CORPORATION

Paterson, N. J.

CURTISS SUPER CONQUEROR —— 750 H.P. AT SEA LEVEL
600 H.P. AT 12,000 FT.

12 CYLINDER V TYPE LIQUID COOLED

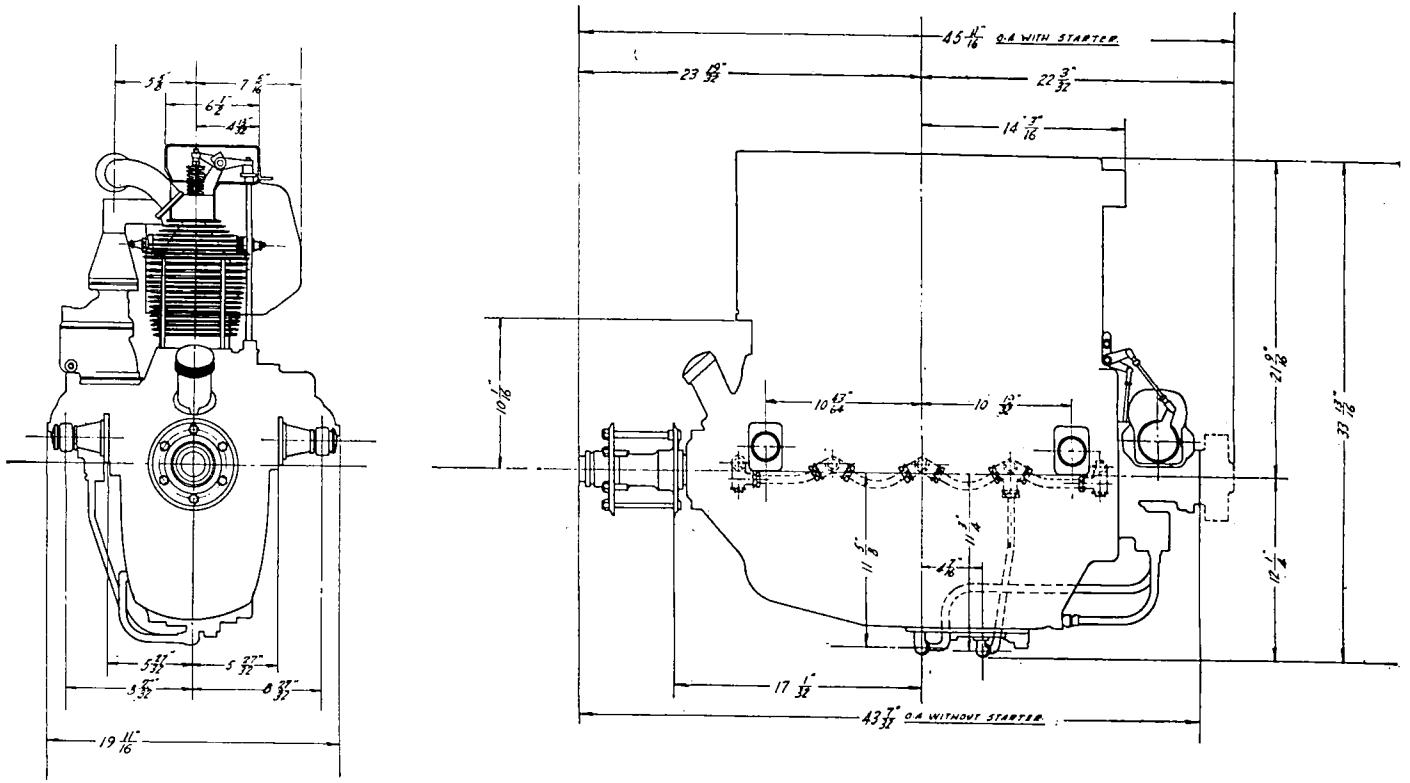


WRIGHT AERONAUTICAL CORPORATION

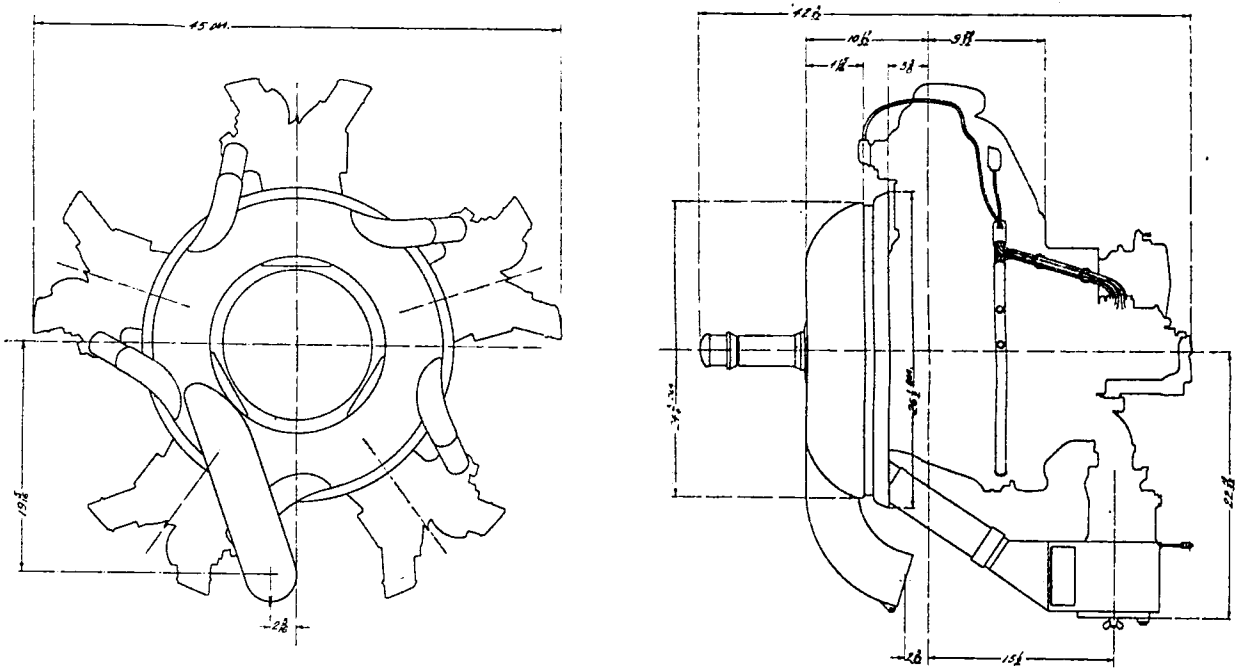
Paterson, N. J.

CURTISS SUPER CONQUEROR (GEARED) 750 H.P. AT SEA LEVEL
600 H.P. AT 12,000 FT.

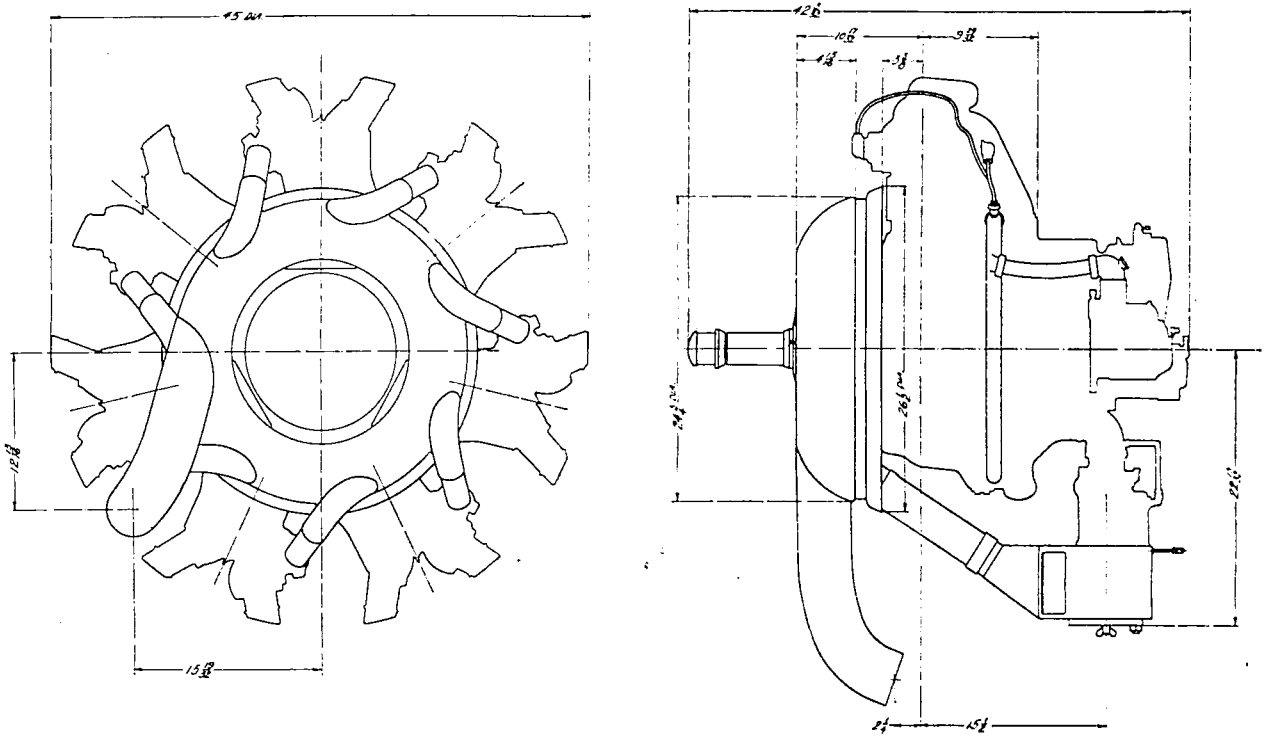
12 CYLINDER V TYPE LIQUID COOLED



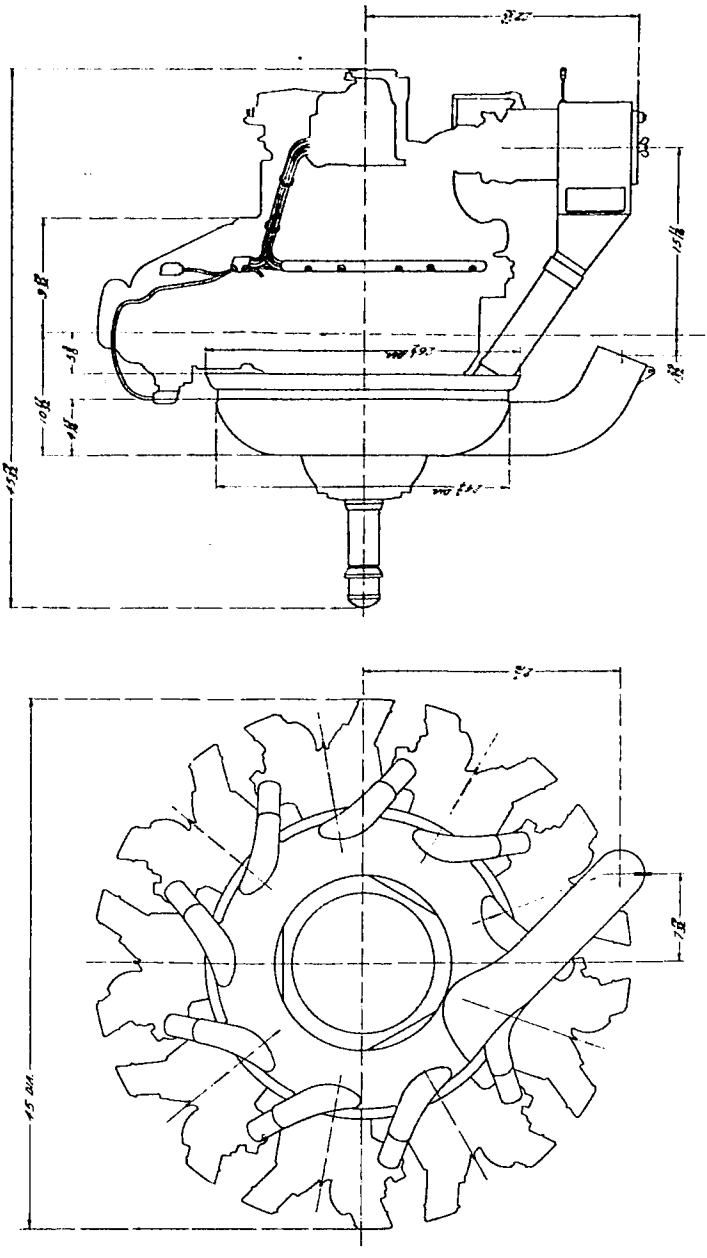
WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.
WRIGHT GIPSY —— 90 H.P.
4 CYLINDER IN LINE AIRCOOLED



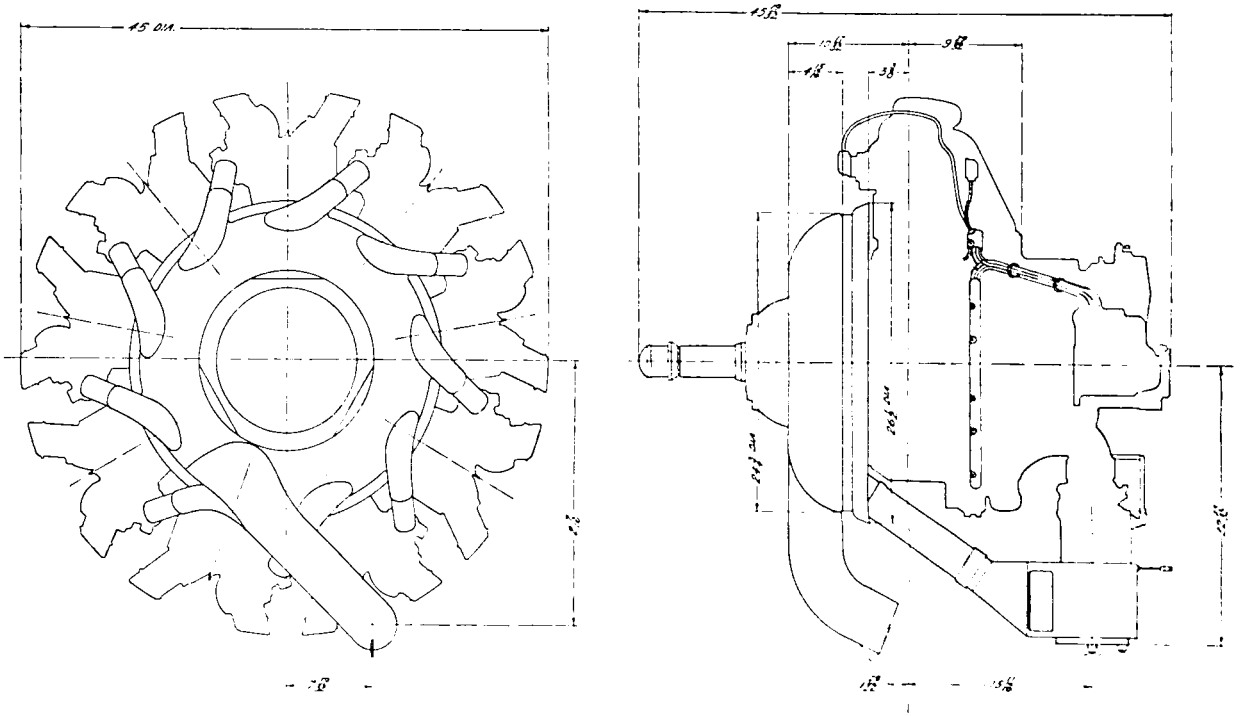
WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.
WRIGHT WHIRLWIND —— 175 H.P.
5 CYLINDER FIXED RADIAL AIRCOOLED



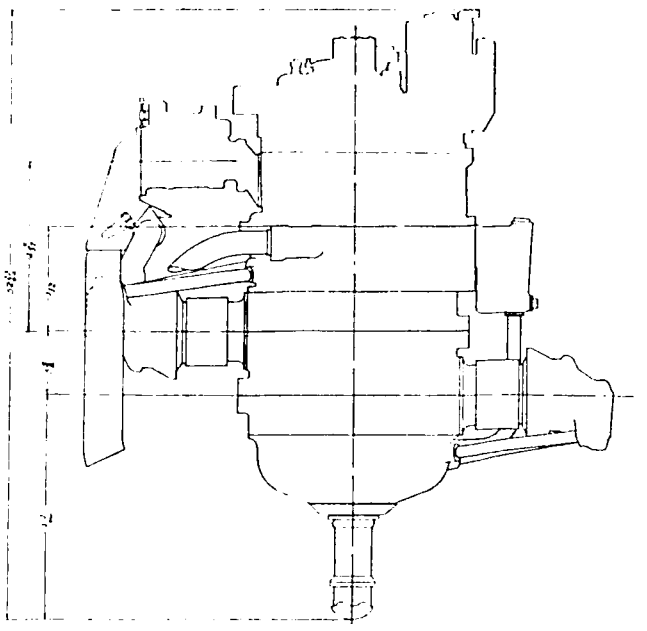
WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.
WRIGHT WHIRLWIND —— 250-285 H.P.
7 CYLINDER FIXED RADIAL AIRCOOLED

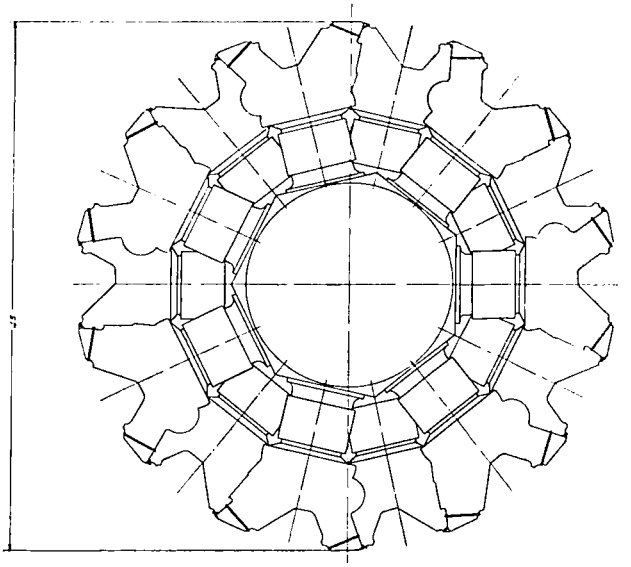


WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.
WRIGHT WHIRLWIND — 330-365-420 H.P.
9 CYLINDER FIXED RADIAL AIRCOOLED

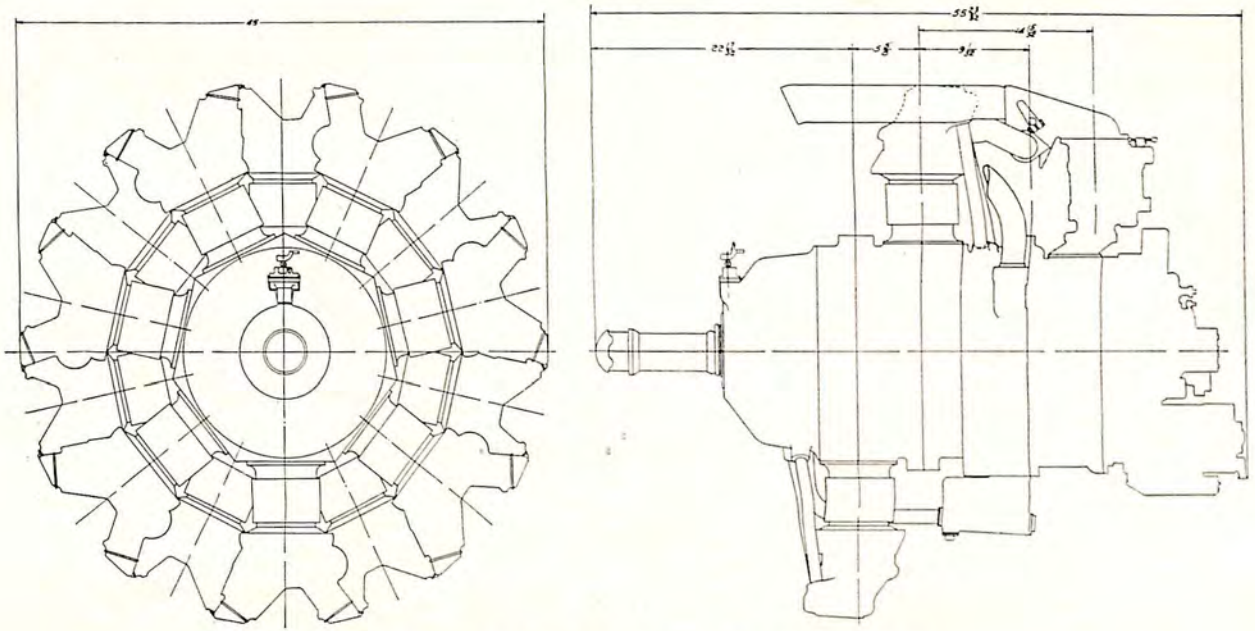


WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.
WRIGHT WHIRLWIND (GEARED) —— 330-365-420 H.P.
9 CYLINDER FIXED RADIAL AIRCOOLED





WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.
WRIGHT DOUBLE ROW WHIRLWIND — 700 H.P.
14 CYLINDER 2 ROW FIXED RADIAL AIRCOOLED

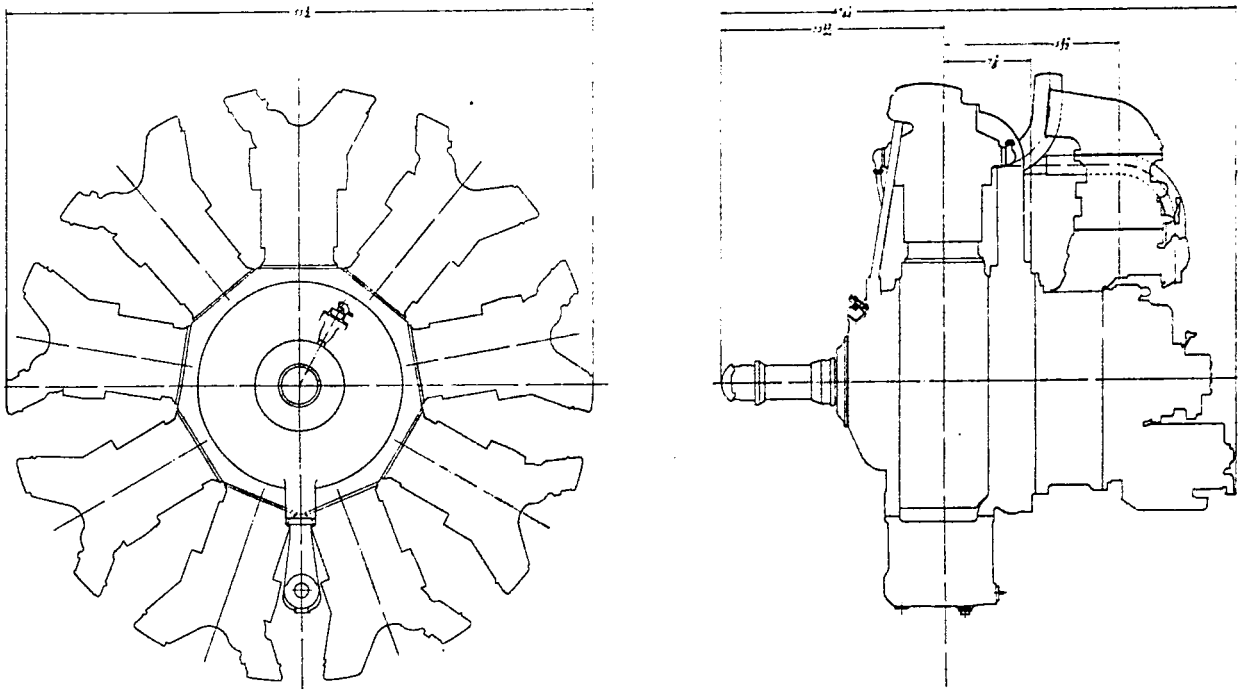


WRIGHT AERONAUTICAL CORPORATION

Paterson, N. J.

WRIGHT DOUBLE ROW WHIRLWIND (GEARED 4:3) —— 700 H.P.

14 CYLINDER 2 ROW FIXED RADIAL AIRCOOLED



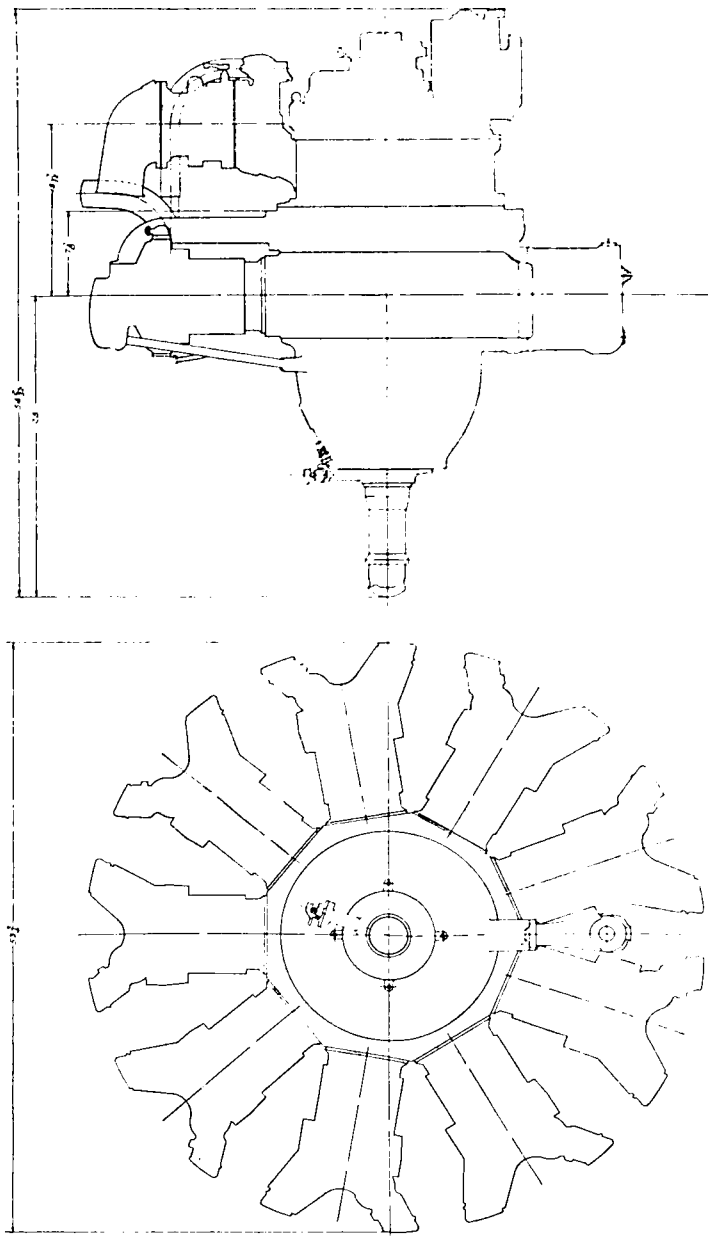
WRIGHT AERONAUTICAL CORPORATION

Paterson, N. J.

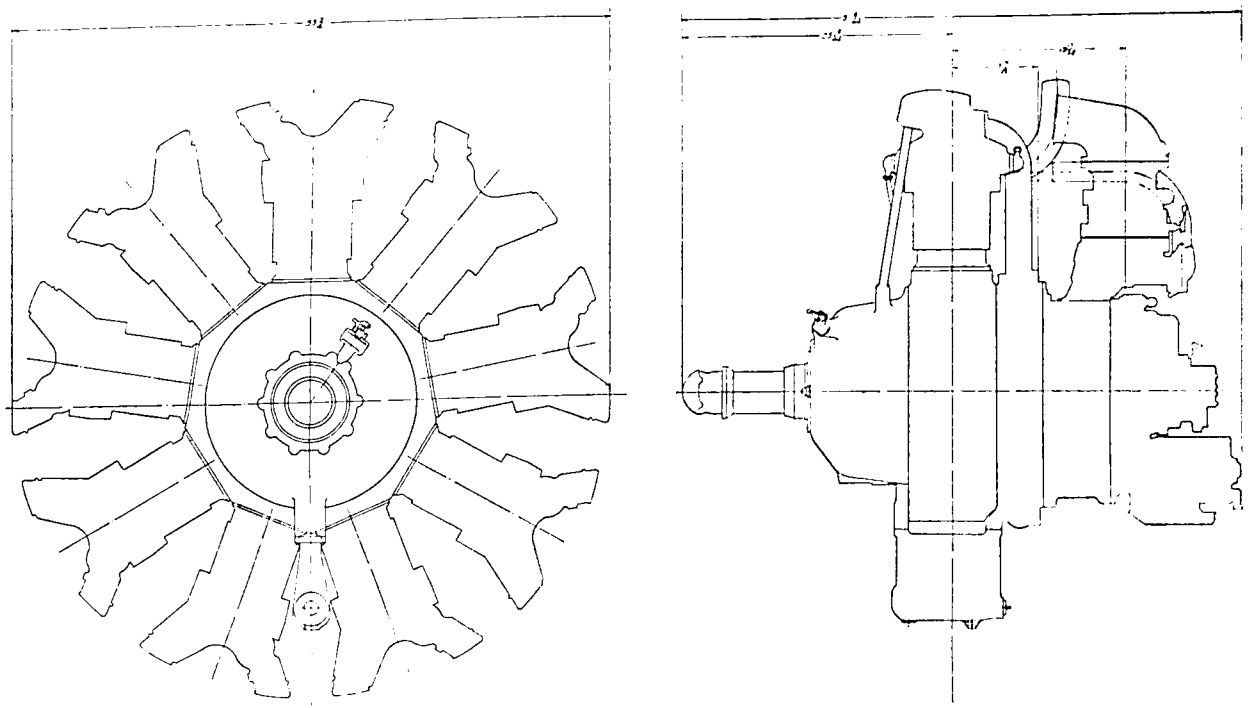
WRIGHT CYCLONE —— 715 H.P.

9 CYLINDER FIXED RADIAL AIRCOOLED

(This engine also has ratings of 645 and 675 H.P. at sea level, 735 H.P. at 4,000 feet altitude and 710 H.P. at 7,000 feet altitude.)



WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.
WRIGHT CYCLONE (GEARED 8:5) — 715 H.P.
9 CYLINDER FIXED RADIAL AIRCOOLED



WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.
WRIGHT CYCLONE (GEARED 16:11) —— 715 H.P.
9 CYLINDER FIXED RADIAL AIRCOOLED

Aviation Chronology and Records

CHRONOLOGY FOR 1933

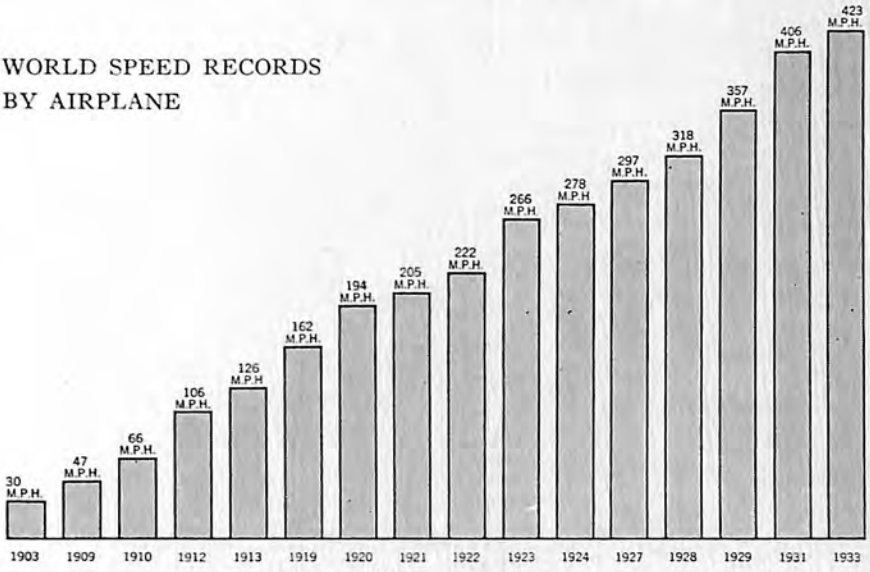
Jan. 2	Orville Wright receives first honorary fellowship of the Institute of the Aeronautical Sciences.
Jan. 5-8	Fifth Annual All-American Air Races held at Miami, Fla.
Jan. 11	Gold Medal of the Fédération Aéronautique Internationale for 1932 awarded to Juan de la Cierva.
Jan. 12-22	Jean Mermoz with five passengers, flies from Marseille, France, to Buenos Aires, Argentina, having made the transatlantic flight from St. Louis, Senegal, to Natal, Brazil, in 14 hrs. 27 min., on January 16. (Couzinet 70, 3 Hispano-Suiza motors.)
Feb. 1	Herbert Schiff Memorial Trophy for 1932 presented to Marine Fighting Plane Squadron 10-M.
Feb. 1	Transcontinental and Western Air, Inc., starts air mail service from Columbus, Ohio, to Fort Wayne, Ind.
Feb. 6-8	Squadron Leader O. R. Gayford and Flight Lieut. G. E. Nicholetts establish distance record of 5,308.985 miles flying from Cranwell, England, to Walvis Bay, Southwest Africa. (Fairey Long-Range monoplane, Napier Lion motored.)
Feb. 6-9	Capt. James A. Mollison flies from Lympne, England, to Natal, Brazil, covering 4,600 miles in 3 days, 10 hrs. 8 min., and making the transatlantic crossing from Thies, Senegal, to Natal in 17 hrs. 40 min. (De Havilland Puss Moth, De Havilland Gipsy Major motored.)
Feb. 10	American Airways, Inc., extends air mail service from Toledo, Ohio, to Columbus, Ohio.
Feb. 11	American Airways, Inc., starts air mail service between Buffalo, N. Y., and Detroit, Mich.
Feb. 12	American Airways, Inc., starts air mail service between Boston, Mass., and Albany, N. Y.
Feb. 17	Mackay Trophy for 1931 presented to Major General Benjamin D. Foulois.
Feb. 25	"U. S. S. Ranger," aircraft carrier, launched at Newport News, Va.
Mar. 2	Kohler Aviation Corporation extends air mail service from Muskegon, Mich., to Milwaukee, Wis.
Mar. 2	Northwest Airways, Inc., extends air mail service from Bismarck, N. D., to Billings, Mont.
Mar. 9-13	Victor Smith flies from Lympne, England, to Cape Province, South Africa, in about 4 days, on attempted flight to Cape Town. (Comper Swift, Pobjoy motored.)
Mar. 11	"U. S. S. Macon" christened at Akron, Ohio, by Mrs. W. A. Moffett.
Apr. 1-7	Maryse Hilsz flies from Paris, France, to Hanoi, French Indo-China, in 5 days, 22 hrs., establishing new record, later flying to Tokio, Japan, and back to Paris. (Farman, Gnôme-Rhone K-7 motored.)
Apr. 3	Two British planes, piloted by Lord Clydesdale and Flight Lieut. D. F. McIntyre and carrying Lt. Col. L. V. S. Blacker and S. R. Bonnett, fly over Mt. Everest. (Houston-Westland, Bristol Pegasus S.3 motored, and Westland Wallace, Bristol Pegasus S.3 motored.)
Apr. 4	"U. S. S. Akron" crashes at sea off New Jersey coast, with a loss of 73 officers, crew and guests.
Apr. 10	Francesco Agello establishes seaplane speed record of 423.822 m.p.h. at Desenzano, Italy. (Macchi-Castoldi 72, Fiat A.S.6 motored.)
Apr. 19	Second flight over Mt. Everest made by two British planes, piloted by Lord Clydesdale and Flight Lieut. D. F. McIntyre and carrying Lt. Col. L. V. S. Blacker and A. L. Fisher. (Houston-Westland, Bristol Pegasus S.3 motored, and Westland Wallace, Bristol Pegasus S.3 motored.)

Apr. 21	"U. S. S. Macon" makes first flight at Akron, Ohio, carrying 105 persons.
Apr. 29	Cheney Award presented to Private Arden M. Farley of the Army Air Corps.
May 3	Rear Admiral Ernest J. King becomes Chief of the Bureau of Aeronautics, Navy Department.
May 7-8	Captain Stanislaus Skarzynski flies from San Luis, Senegal, to Maceio, Brazil, in about 17½ hours. (R.W.D.5, De Havilland Gipsy Major motored.)
May 15	Jean Mermoz, with six passengers, flies from Natal, Brazil, to Dakar, Senegal, in 17 hrs. 10 min. (Couzinet, 3 Hispano-Suiza motors.)
May 17	Franklin Institute Medal awarded to Orville Wright.
May 19-21	International Austrian Alpine Flight won by S. Josipovich. (Klemm Kl 32, Argus A.S. 8R motored.)
May 26	Mackay Trophy for 1932 presented to Eleventh Bombardment Squadron of Army Air Corps.
May 29	First annual Deutsch de la Meurthe Cup Race won by Georges Détré. (Potez 53, Potez 9B motored.)
May 31	Collier Trophy for 1932 presented to Glenn L. Martin for the development of an outstanding bi-engined, high-speed, weight-carrying airplane.
June 2	Lt. Comdr. Frank M. Hawks flies non-stop from Los Angeles, Calif., to Floyd Bennett Field, Brooklyn, N. Y., in 13 hrs. 26 min. 15 sec., establishing new west-east non-stop record. (Northrop Gamma, Wright Whirlwind R-1510 motored.)
June 10-11	Capt. Mariano Barberan and Lieut. Joaquin Collar fly from Seville, Spain, to Camguey, Cuba, in about 40 hrs. (Breguet, Hispano-Suiza motored.)
June 11-12	Capt. J. Errol Boyd, with Robert G. Lyon and Harold P. Davis, flies non-stop from Floyd Bennett Field, Brooklyn, N. Y., to St. Marc, Haiti, in about 24 hrs. (Bellanca monoplane, Wright Whirlwind motored.)
June 15	James J. Mattern, on an attempted flight around the world, flies from Floyd Bennett Field, Brooklyn, N. Y., across the Atlantic and as far as Siberia, where he is forced down, later flying part of the way back to New York. (Lockheed Vega, Pratt and Whitney Wasp motored.)
June 24	Royal Air Force Display held at Hendon, England.
July 1	Col. Roscoe Turner flies from Floyd Bennett Field, Brooklyn, N. Y., to Los Angeles, Calif., in 11 hrs. 30 min., establishing new east-west record. (Wedell-Williams, Pratt and Whitney Wasp motored.)
July 1-4	American Air Races held at Chicago, Ill., under the sponsorship of the Chicago Tribune.
July 1-4	National Air Races held at Los Angeles, Calif., under the sponsorship of the National Aeronautic Association.
July 1-Aug. 12	General Italo Balbo, leaving from Orbetello, Italy, with 25 seaplanes of the Italian Air Force, flies to Chicago, Ill., via Iceland and Labrador, 23 of the planes returning to Rome via New York, Newfoundland, and the Azores. (Savoia-Marchetti S-55X, 2 Isotta Fraschini Asso motors.)
July 7-8	Amelia Earhart Putnam flies from Los Angeles, Calif., to Newark, N. J., in 17 hrs. 7 min. 30 sec., establishing new record for women. (Lockheed Vega, Pratt and Whitney Wasp motored.)
July 8	King's Cup Race won by Capt. Geoffrey de Havilland at Hatfield, England. (De Havilland Leopard Moth, De Havilland Gipsy Major motored.)

July 10-23	Fourth Annual National Soaring Contest held at Elmira, N. Y., under auspices of the Soaring Society of America, Inc.
July 15-17	Capt. Stephen Darius and Stanley T. Girenas fly from Floyd Bennett Field, Brooklyn, N. Y., to Soldin, Germany, where they crash and are killed. (Bellanca, Wright Whirlwind motored.)
July 15-22	Wiley Post, starting from Floyd Bennett Field, Brooklyn, N. Y., flies around the world in 7 days, 18 hrs. 49½ min., covering 15,596 miles in 4 days, 19 hrs. 36 min. flying time and establishing new record. (Lockheed Vega, Pratt and Whitney Wasp motored.)
July 22-23	Capt. James A. Mollison and Amy Johnson Mollison fly from Pendine Sands, Pendine, Wales, to Stratford, Conn., in about 39 hrs. (De Havilland Dragon, 2 De Havilland Gipsy Major motors.)
Aug. 3-4	Kurt Schmidt establishes duration record for gliders of 36 hrs. 35 min. at Korschenruh, Germany. (Grunau glider.)
Aug. 5-7	Lieut. Maurice Rossi and Paul Codos fly from Floyd Bennett Field, Brooklyn, N. Y., to Rayak, Syria, establishing a distance record of 5,657.387 miles in about 55 hrs. (Bleriot 110, Hispano-Suiza motored.)
Aug. 31	Daniel Guggenheim medal for 1933 awarded to Comdr. Jerome C. Hunsaker.
Sept. 1-4	International Air Races held at Chicago, Ill., under the sponsorship of the Chicago Daily News and the sanction of the National Aeronautic Association.
Sept. 2	General Francesco de Pinedo is killed at Floyd Bennett Field, Brooklyn, N. Y., in taking off on a transatlantic flight.
Sept. 2-4	Gordon Bennett Balloon Race won by Capt. Franciszek Hynek and Lieut. Zbigniew Burzynsky of Poland, flying 846 miles from Chicago, Ill., to Launiere, Quebec, Canada.
Sept. 4	James R. Wedell establishes landplane speed record of 304.98 m.p.h. at Glenview, Ill. (Wedell-Williams special racer, Pratt and Whitney Wasp motored.)
Sept. 7-8	Six flying boats of Navy Squadron VP-5F fly non-stop from Norfolk, Va., to Coco Solo, C. Z., making a record distance formation flight of 2,059 miles. (Consolidated P2Y-1, 2 Wright Cyclone motors.)
Sept. 20	Eugene L. Vidal is appointed Director of Aeronautics, Department of Commerce.
Sept. 21	Richard C. DuPont establishes American distance record for gliders of 121.6 miles from Rock Fish Gap, Va., to Frederick, Md. (Bowlus 1-P-S sailplane.)
Sept. 25	Col. Roscoe Turner flies from Burbank, Calif., to Floyd Bennett Field, Brooklyn, N. Y., in 10 hrs. 4 min. 55 sec., establishing a new west-east record. (Wedell-Williams, Pratt and Whitney Wasp motored.)
Sept. 28	Gustave Lemoine establishes altitude landplane record of 44,819.418 feet at Villacoublay, France. (Potez 50, Gnôme-Rhone K-14 motored.)
Sept. 30	Soviet balloon "U. S. S. R.", carrying George Prokofiev, Konstantin Godunov, and Ernest Birnbaum, ascends to a height of 62,335 feet near Moscow, U. S. S. R.
Oct. 4-11	Air Commodore Sir Charles Kingsford-Smith flies from Lympne, England, to Wyndham, Western Australia, in 7 days, 4 hrs. 43 min., establishing new record. (Percival Gull, De Havilland Gipsy Major motored.)
Oct. 7-8	National Charity Air Pageant held at Roosevelt Field, Mineola, N. Y., under auspices of Sportsman Pilot Association.
Oct. 9	Major Alexander P. de Seversky establishes amphibion speed record of 179.76 m.p.h. at Roosevelt Field, Mineola, N. Y. (Seversky S.3, Wright Whirlwind motored.)

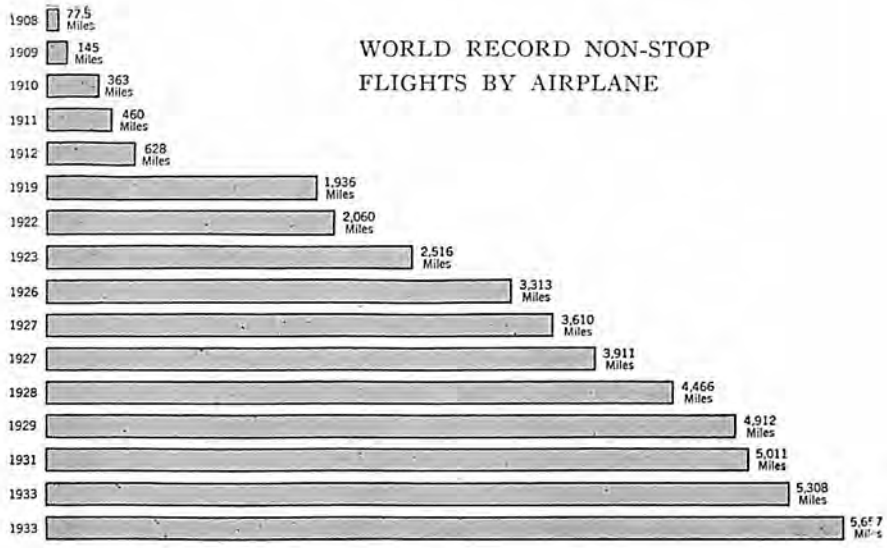
Oct. 12-15	"U. S. S. Macon" flies non-stop from Lakehurst, N. J., to its base at Sunnyvale, Calif.
Oct. 12-20	Charles T. P. Ulm, G. U. Allen, P. S. G. Taylor and J. Edwards, navigator, fly from Harmondsworth, England, to Derby, Western Australia, in 6 days, 17 hrs. 56 min., establishing new record. (Avro 10, 3 Wright Whirlwind motors.)
Oct. 14-Nov. 2	"Graf Zeppelin" extends its regular scheduled South American trip to include Miami, Fla., Akron, Ohio, and Chicago, Ill.
Oct. 20-21	Annual convention of National Aeronautic Association held in Washington, D. C.
Oct. 21	Bleriot Cup won by Capt. Pietro V. Scapinelli, flying 30 minutes at a speed of 384.86 m.p.h., from Porto Corsino to Porto Recanati, Italy. (Macchi-Castoldi 72, Fiat A. S. 6 motored.)
Nov. 7-8	Flying boat of the Deutsche Luft Hansa makes test flight from Bathurst, Africa, to Natal, Brazil, with stop in mid-ocean at the steamer Westfalen.
Nov. 20	Lt. Comdr. Thomas G. W. Settle and Maj. Chester L. Fordney established an official altitude record of 61,236.691 feet in a balloon, flying from Akron, Ohio, to Bay Side, N. J.
Dec. 15	Air Mail Fliers' Medal presented to Mal B. Freeburg of Northwest Airways, Inc.
Dec. 16-17	Pacific International Air Pageant held at Curtiss-Wright San Francisco Airport, San Mateo, Calif.
Dec. 19	Col. and Mrs. Charles A. Lindbergh return to New York, having left Glenn Curtiss Airport, North Beach, Queens, N. Y., July 9 on a 29,081 mile survey flight for Pan American Airways, including Greenland, Iceland, Moscow, the Azores, West Africa and South America. (Lockheed Sirius, Wright Cyclone motored.)
Dec. 20-30	Frances H. Marsalis and Helen Richey establish women's refueling duration record of 9 days, 21 hrs. 42 min. at Miami, Fla. (Curtiss Thrush, Wright Whirlwind. motored.)
Dec. 21	Col. Charles A. Lindbergh presents his airplane and equipment used on survey flight to American Museum of Natural History.
Dec. 22	Rear Admiral Richard E. Byrd, with Harold I. June, pilot, William Bowlin, J. A. Pelter, and Carl O. Petersen, makes four-hour exploration flight from his ship in the Antarctic. (Curtiss-Wright Condor seaplane, 2 Wright Cyclone motors.)

WORLD SPEED RECORDS
BY AIRPLANE



SPEED RECORDS
by airplane

Date	*Place*	*Airplane*	*Pilot*	*Speed*
1903	United States (First Flight)	Wright (US)	O. Wright	30 m.p.h.
1909	France	Curtiss (US)	Curtiss	47 m.p.h.
1910	United States	Bleriot (Fr)	LeBlanc	66 m.p.h.
1912	France	Deperdussin (Fr)	Vedrines	106 m.p.h.
1913	France	Deperdussin (Fr)	Prevost	126 m.p.h.
1919	United States	Curtiss (US)	Rohlfs	162 m.p.h.
1920	France	Nieuport (Fr)	Lecointe	194 m.p.h.
1921	France	Nieuport (Fr)	Lecointe	205 m.p.h.
1922	United States	Curtiss (US)	Mitchell	222 m.p.h.
1923	United States	Curtiss (US)	Williams	266 m.p.h.
1924	France	Ferbois (Fr)	Bonnett	278 m.p.h.
1927	Italy	Macchi (It)	de Bernardi	297 m.p.h.
1928	Italy	Macchi (It)	de Bernardi	318 m.p.h.
1929	England	Supermarine (Br)	Orlebar	357 m.p.h.
1931	England	Supermarine (Br)	Stainforth	406 m.p.h.
1933	Italy	Macchi (It)	Agello	423 m.p.h.



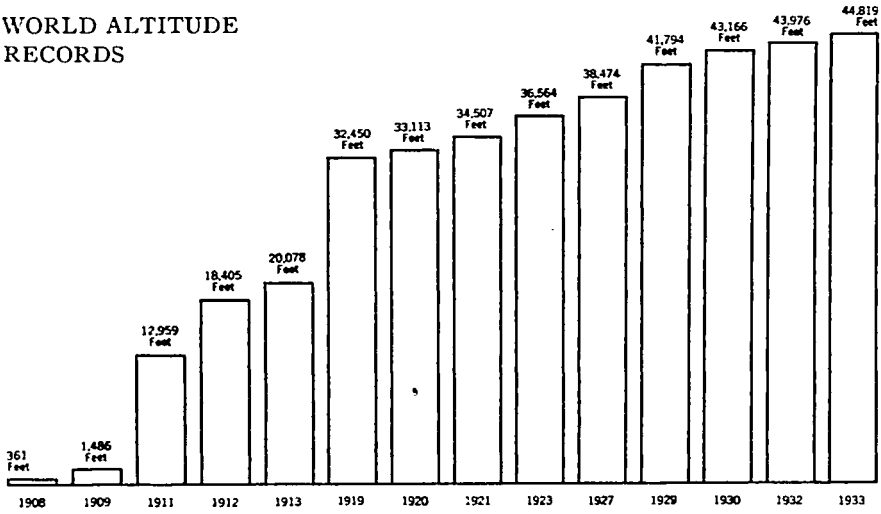
The record flight of today is a commonplace tomorrow.

RECORD NON-STOP FLIGHTS

by airplane

Date	*Place*	*Airplane*	*Pilot*	*Distance*
1908	France	Wright (US)	W. Wright	77.5 mi.
1909	France	Farman (Fr)	Farman	145 mi.
1910	France	Farman (Fr)	Tabuteau	363 mi.
1911	France	Nieuport (Fr)	Gobe	460 mi.
1912	France	Farman (Fr)	Fourny	628 mi.
1919	St. Johns, Newf. to Ireland	Vickers (Br)	Alcock and Brown	1,936 mi.
1922	San Diego, Cal. to Indianapolis, Ind.	Fokker (US)	Kelley and Macready	2,060 mi.
1923	New York to San Diego, Cal.	Fokker (US)	Kelley and Macready	2,516 mi.
1926	Paris to Djask, Persia	Breguet (Fr)	Coste and Rignot	3,313 mi.
1927	New York to Paris, France	Ryan (US)	Lindbergh	3,610 mi.
1927	New York to Germany	Bellanca (US)	Chamberlin	3,911 mi.
1928	Rome to Brazil	Savoia (It)	Ferrarin and del Prete	4,466 mi.
1929	Paris to Coulart, China	Breguet (Fr)	Coste and Bellonte	4,912 mi.
1931	New York to Istanbul, Turkey	Bellanca (US)	Boardman and Polando	5,011 mi.
1933	Cranwell, Eng. to Walvis Bay, South Africa	Fairey (Br)	Gayford and Nicholetts	5,308 mi.
1933	New York to Rayak, Syria	Pleriot (Fr)	Codos and Rossi	5,653 mi.

WORLD ALTITUDE RECORDS



ALTITUDE RECORDS BY AIRPLANE

Date	*Place*	*Airplane*	*Pilot*	*Altitude*
1908	France	Wright (US)	W. Wright	361 ft.
1909	France	Antoinette (Fr)	Latham	1,486 ft.
1911	France	Bleriot (Fr)	Garros	12,959 ft.
1912	Algeria	Morane (Fr)	Garros	18,405 ft.
1913	France	Nieuport (Fr)	Legagneux	20,078 ft.
1919	United States	Curtiss (US)	Rohlfs	32,450 ft.
1920	United States	Lepere (US)	Schroeder	33,113 ft.
1921	United States	Lepere (US)	Macready	34,507 ft.
1923	France	Nieuport (Fr)	Lecointe	36,564 ft.
1927	United States	Wright (US)	Champion	38,474 ft.
1929	Germany	Junkers (Ger)	Neuenhofen	41,794 ft.
1930	United States	Wright (US)	Soucek	43,166 ft.
1932	England	Vickers (Br)	Uwins	43,976 ft.
1933	France	Potez (Fr)	Lemoine	44,819 ft.

OFFICIAL AIR RECORDS

Established under Rules and Regulations of the

FEDERATION AERONAUTIQUE INTERNATIONALE

Translated and Compiled by the Contest Committee, The National Aeronautic Association, Washington, D. C.
December 31, 1933

OFFICIAL WORLD AIR RECORDS

World records are defined as maximum performance regardless of the class or type of aircraft used.

MAXIMUM SPEED OVER A 3 KILOMETER COURSE
682.078 km.p.h. (423.822 m.p.h.)
Francesco Agello, Italy, April 10, 1933.

AIRLINE DISTANCE.....9,104.700 kilometers (5,657.387 miles)
M. Rossi and P. Codos, France, August 5, 6, and 7, 1933.

ALTITUDE.....18,665 meters (61,236.691 feet)
Lt. Comdr. T. G. W. Settle, USN, and Major Chester L. Fordney, USMC, United States, November 20, 1933.

CIRCUIT OF WORLD.....(No record established).

AIRLINE DISTANCE WITH REFUELING.....(No record established).

OFFICIAL INTERNATIONAL AND NATIONAL "CLASS" RECORDS

AIRPLANES—CLASS C

DISTANCE, AIRLINE

International Record.....9,104.700 kilometers (5,657.387 miles)
M. Rossi and P. Codos, France, Bleriot-Zapata monoplane, "Joseph Le Brix," Hispano-Suiza 500 HP engine, from Floyd Bennett Field, Brooklyn, New York, U. S. A. to Rayack, Syria, August 5, 6, and 7, 1933.

National (U.S.) Record.....8,065.736 kilometers (5,011.800 miles)
Russell N. Boardman and John Polando, Bellanca monoplane, Wright J-6 300 HP engine, from Brooklyn, New York, to Istanbul, Turkey, July 28, 29, and 30, 1931.

DISTANCE, BROKEN LINE

International Record.....9,106.330 kilometers (5,658.400 miles)
M. Rossi and P. Codos, France, Bleriot-Zapata monoplane, "Joseph Le Brix," Hispano-Suiza 500 HP engine, from Floyd Bennett Field, Brooklyn, New York, U. S. A., to Rayack, Syria, August 5, 6, and 7, 1933.

National (U.S.) Record.....None established.

ALTITUDE

International Record.....13,661 meters (44,819.418 feet)
G. Lemoine, France, Potez 506 biplane, Gnome-Rhone engine, at Villacoublay, September 28, 1933.

National (U.S.) Record.....13,157 meters (43,165.880 feet)
Lt. Apollo Soucek, Wright "Apache," Pratt and Whitney 450 HP engine, at Anacostia, D. C., June 4, 1930.

MAXIMUM SPEED

International Record.....Speed, 490.80 km.p.h. (304.98 m.p.h.)
James R. Wedell, United States, Wedell-Williams monoplane, Pratt and Whitney Wasp Senior engine, supercharged, Glenview, Illinois, September 4, 1933.

National (U.S.) Record.....Same as above.

SPEEDS FOR SPECIFIED DISTANCES WITHOUT PAY LOAD

SPEED FOR 100 KILOMETERS (62.137 MILES)

International Record.....Speed, 401.279 km.p.h. (249.342 m.p.h.)
Lieut. Cyrus Bettis, United States, Curtiss R3C-1, Curtiss V-1400 HP engine, Mitchell Field, New York, October 12, 1925.

National (U.S.) Record.....Same as above.

SPEED FOR 1000 KILOMETERS (621.369 MILES)

International Record.....Speed, 347.477 km.p.h. (215.912 m.p.h.)
Flight Captain Robert Untucht, Germany, Heinkel He 70 airplane, BMW V1 630 HP engine, at Berlin-Staaken, March 22, 1933.

National (U.S.) Record.....Speed, 205.06 km.p.h. (127.418 m.p.h.)
Lieut. Harold R. Harris, U.S.A., and Ralph Lockwood, DH-4L, Liberty 400 HP engine, at Wright Field, Dayton, Ohio, March 29, 1923.

SPEED FOR 2000 KILOMETERS (1242.739 MILES)

International Record.....Speed, 345.310 km.p.h. (214.565 m.p.h.)
Flight Captain Robert Untucht, Germany, Heinkel 70 monoplane, BMW 630 HP engine, Berlin-Staaken, March 24, 1933.

National (U.S.) Record.....Speed, 183.83 km.p.h. (114.226 m.p.h.)
Lieut. Harold R. Harris, U.S.A., DH-4L, Liberty 375 HP engine, Wright Field, Dayton, Ohio, April 17, 1923.

SPEED FOR 5000 KILOMETERS (3106.849 MILES)

International Record.....Speed, 208.152 km.p.h. (130.189 m.p.h.)
Carlos de Haya Gonzales and Cipriano Rodriguez Diaz, Spain, Breguet airplane, Hispano-Suiza 600 HP engine, Seville-Utrera-Carmona course, October 7 and 8, 1930.

National (U.S.) Record.....None established.

SPEED FOR 10,000 KILOMETERS (6213.698 MILES)

International Record.....Speed, 149.853 km.p.h. (93.114 m.p.h.)
J. Le Brix, and M. Doret, France, Dewoitine airplane, Hispano-Suiza 650 HP engine, Istres, June 7, 8, 9, and 10, 1931.

National (U.S.) Record.....None established.

CLASS C—WITH PAY LOAD OF 500 KILOGRAMS (1102.311 lbs.)

ALTITUDE

International Record.....10,285 meters (33,743.334 feet)
M. Signerin, France, Breguet 198 airplane, Gnome-Rhone 620 HP engine, Villacoublay, September 21, 1932.

National (U.S.) Record.....8,578 meters (28,143 feet)
Lieut. H. R. Harris, U.S.A.S., USA-TP-1, Liberty 400 HP engine, at Wright Field, Dayton, Ohio, May 21, 1924.

SPEED FOR 1000 KILOMETERS
International Record.....Speed, 347.477 km.p.h. (215.912 m.p.h.)
Flight Captain Robert Untucht, Germany, Heinkel 70 monoplane, BMW V1 630 HP engine, at Berlin, March 22, 1933.
National (U.S.) Record.....None established.

SPEED FOR 2000 KILOMETERS
International Record.....Speed, 255.253 km.p.h. (158.606 m.p.h.)
M. Doret, Captain Terrasson and Lieutenant Lecarme, France, Dewoitine monoplane, 3 Hispano-Suiza 575 HP engines, Villacoublay—Orleans—Le Boullay course, September 7, 1933.
National (U. S.) Record.....None established.

SPEED FOR 5000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

CLASS C—WITH PAY LOAD OF 1000 KILOGRAMS

(2204.622 lbs.)

ALTITUDE

International Record.....8,980 meters (29,461.853 feet)
M. Signerin, France, Breguet 198 airplane, Gnome-Rhone 620 HP engine, Villacoublay, September 23, 1932.
National (U.S.) Record.....6,346 meters (20,820 feet)
Waldo Waterman, Bach airplane, Wright J-6 engine, Los Angeles Airport, Los Angeles, California, July 26, 1929.

SPEED FOR 1000 KILOMETERS
International Record.....Speed, 281.250 km.p.h. (174.760 m.p.h.)
M. Lemoine, France, Potez 50 airplane, Gnome-Rhone 700 HP engine, Villacoublay-Angers, March 8, 1933.
National (U.S.) Record.....Speed, 245.750 km.p.h. (152.700 m.p.h.)
Leland F. Schoenhair, Lockheed Vega "Executive" monoplane, Pratt and Whitney 450 HP engine, supercharged, Jacksonville, Florida, February 20, 1930.

SPEED FOR 2000 KILOMETERS
International Record.....Speed, 255.253 km.p.h. (158.606 m.p.h.)
M. Doret, Captain Terrasson and Lieutenant Lecarme, France, Dewoitine monoplane, 3 Hispano-Suiza 575 HP engines, Villacoublay—Orleans—Le Boullay course, September 7, 1933.
National (U.S.) Record.....None established.

SPEED FOR 5000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

CLASS C—WITH PAY LOAD OF 2000 KILOGRAMS

(4409.244 lbs.)

ALTITUDE

International Record.....7,507 meters (24,629.215 feet)
Lucien Coupet, France, Farman 160 biplane No. 3, 2 Farman 500 HP engines, Toussus-le-Noble, April 28, 1931.
National (U.S.) Record.....2,049 meters (6,722 feet)
Lieut. H. R. Harris, U.S.A.S., Barling Bomber, 6 Liberty 400 HP engines, Wright Field, Dayton, Ohio, October 25, 1923.

SPEED FOR 1000 KILOMETERS
International Record.....Speed, 259.556 km.p.h. (161.280 m.p.h.)
M. Doret, Captain Terrasson and Lieutenant Lecarme, France, Dewoitine monoplane, 3 Hispano-Suiza 575 HP engines, Villacoublay—Orleans—Le Boullay course, September 7, 1933.
National (U.S.) Record.....None established.

SPEED FOR 2000 KILOMETERS
International Record.....Speed, 255.253 km.p.h. (158.606 m.p.h.)
M. Doret, Captain Terrasson and Lieutenant Lecarme, France, Dewoitine monoplane, 3 Hispano-Suiza 575 HP engines, Villacoublay—Orleans—Le Boullay course, September 7, 1933.
National (U.S.) Record.....None established.

SPEED FOR 5000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

CLASS C—WITH PAY LOAD OF 5000 KILOGRAMS
(11,023 lbs.)

ALTITUDE
International Record.....3,586 meters (11,765 feet)
L. Bossoutrot, France, super Farman-Goliath, 4 Farman 500 HP engines, at Le Bourget, November 16, 1925.
National (U.S.) Record.....None established.
SPEED FOR 1000 KILOMETERS
Neither International nor National (U.S.) Record has been established.
SPEED FOR 2000 KILOMETERS
Neither International nor National (U.S.) Record has been established.
SPEED FOR 5000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

CLASS C—WITH PAY LOAD OF 10,000 KILOGRAMS
(22,046 lbs.)

ALTITUDE
International Record.....3,231 meters (10,597 feet)
Cav. Domenico Antonini, Italy, Caproni "Ca 90" airplane, 6 Isotta-Fraschini Asso engines, 1000 HP each, Cascina Malpensa, February 22, 1930.
National (U.S.) Record.....None established.
SPEED FOR 1000 KILOMETERS
Neither International nor National (U.S.) Record has been established.
SPEED FOR 2000 KILOMETERS
Neither International nor National (U.S.) Record has been established.
SPEED FOR 5000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

CLASS C—GREATEST PAY LOAD CARRIED TO AN ALTITUDE OF 2000 METERS
(6,561.66 feet)

International Record.....10,000 kilograms (22,046.222 lbs.)
Cav. Domenico Antonini, Italy, Caproni "Ca 90" airplane, 6 Isotta-Fraschini Asso engines, 1000 HP each, Cascina Malpensa, February 22 1930.
National (U.S.) Record.....2,000 kilograms (4,409.244 lbs.)
Lt. H. R. Harris, U.S.A.S., Barling Bomber, 6 Liberty 400 HP engines, at Wright Field, Dayton, Ohio, October 25, 1923.

CLASS C—REFUELING IN FLIGHT

AIRLINE DISTANCE WITH REFUELING
Neither International nor National (U.S.) Record has been established.
BROKEN LINE DISTANCE WITH REFUELING
Neither International nor National (U.S.) Record has been established.

LIGHT AIRPLANES—CLASS C—FIRST CATEGORY
Multi-seaters weight empty less than 560 kgs. (1,234.576 lbs.)

AIRLINE DISTANCE
International Record.....2,912 kilometers (1,809.429 miles)
Lalouette and de Permangle, France, Farman 231 airplane, Renault 95 HP engine, from Istres airport to Ville-Cisneros, January 11 and 12, 1931.
National (U.S.) Record.....None established.
ALTITUDE
International Record.....9,282 meters (30,453 feet)
Comm. Renato Donati, pilot, M. Lanciani, passenger, Italy, Fiat A.S.I.c.n.a. airplane, C.N.A.c. 7 engine, Littorio airport, December 30, 1932.
National (U.S.) Record.....5,652 meters (18,543 feet)
Willfred G. Moore, Inland Sport monoplane, Warner 110 HP engine, Kansas City, Missouri, September 30, 1929.
SPEED FOR 100 KILOMETERS
International Record .....Speed, 250.591 km.p.h. (155.709 m.p.h.)
Arnoux and Brabant, France, Farman 357 monoplane, Renault 120 HP engine, Villesauvage-La Marmogne course, November 29, 1933.
National (U.S.) Record.....Speed, 204.313 km.p.h. (126.950 m.p.h.)
Willfred G. Moore, pilot; W. S. Glodfelty, passenger; Inland sport monoplane, Warner 110 HP engine, Kansas City, Missouri, February 12, 1930.
SPEED FOR 1000 KILOMETERS
International Record .....Speed, 225.705 km.p.h. (140.246 m.p.h.)
Arnoux and Brabant, France, Farman 357 monoplane, Renault 120 HP engine,

Villesauvage-La Marmogne course, October 14, 1933.
National (U. S.) Record .....None established.

SPEED FOR 2000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

LIGHT AIRPLANES—CLASS C—SECOND CATEGORY
Single-seaters weight empty less than 450 kgs. (992.070 lbs.)

AIRLINE DISTANCE
International Record.....3,582 kilometers (2,225.747 miles)
Captain Skerzinski, Poland, R. W. D. 5-2 monoplane, Gipsy Major 130 HP engine, from St. Louis, Senegal, to Maccio, Brazil, May 7, 1933.
National (U.S.) Record.....2,655 kilometers (1,650 miles)
D. S. Zimmerly, Barling NB-3 airplane, 60 HP LeBlond engine, Brownsville, Texas, to Winnipeg, Canada, July 17, 1929.

ALTITUDE
International Record .....10,008 meters (32,834.546 feet)
Furio Niclot, Italy, E.T.A., C.N.A. airplane, C.N.A.C. 7, 160 HP engine, Littorio Airport, December 24, 1933.
National (U.S.) Record.....7,338 meters (24,074 feet)
D. S. Zimmerly, Barling NB-3 monoplane, Lambert R266 90 HP engine, Forest Park Flying Field, St. Louis, Missouri, February 16, 1930.

SPEED FOR 100 KILOMETERS
International Record .....Speed, 334.666 km.p.h. (207.951 m.p.h.)
R. Delmotte, France, Caudron monoplane, type 362, Renault-Bengali 150 HP engine, at Istres, December 26, 1933.
National (U.S.) Record.....None established.

SPEED FOR 1000 KILOMETERS
International Record .....Speed, 332.883 km.p.h. (206.843 m.p.h.)
R. Delmotte, France, Caudron monoplane, type 362, Renault-Bengali 150 HP engine, at Istres, December 26, 1933.
National (U. S.) Record .....None established.

SPEED FOR 2000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

LIGHT AIRPLANES—CLASS C—THIRD CATEGORY
Multi-seaters weight empty less than 280 kgs. (617.288 lbs.)

AIRLINE DISTANCE
International Record.....886.677 kilometers (550.954 miles)
Sebastiano Bedendo and P. Nuvoli, Italy, N. S. airplane, Pobjoy 75 HP engine, from Cinisello-Milano to San Vito dei Normani-Brindisi, April 24, 1933.
National (U.S.) Record.....None established.

ALTITUDE
International Record .....6,951 meters (22,805.049 feet)
Giovanni Zappetta, pilot; Ragusa Francesco, passenger, Italy, N5 monoplane, Pobjoy 75 HP engine, Montecelio, December, 1933.
National (U.S.) Record.....4,244 meters (13,923.843 feet)
Edna Rudolph, Pilot, Thornton Waggoner, Passenger, Curtiss Wright Junior airplane, Szekely 43 HP engine, East St. Louis, Illinois, May 31, 1931.

SPEED FOR 100 KILOMETERS
International Record .....Speed, 212.139 km. p. h. (131.816 m.p.h.)
Bailly and Reginensi, France, Farman 239 airplane, Pobjoy 75 HP engine, Villesauvage-La Marmogne course, October 4, 1933.
National (U.S.) Record.....None established.

SPEED FOR 500 KILOMETERS
International Record .....Speed, 200.271 km.p.h. (124.442 m.p.h.)
Bailly and Reginensi, France, Farman 239 airplane, Pobjoy 75 HP engine, Villesauvage-La Marmogne course, October 6, 1933.
National (U.S.) Record.....None established.

SPEED FOR 1000 KILOMETERS
International Record .....Speed, 195.760 km.p.h. (121.639 m.p.h.)
Bailly and Reginensi, France, Farman 239 airplane, Pobjoy 75 HP engine, Villesauvage-La Marmogne course, October 6, 1933.
National (U. S.) Record .....None established.

LIGHT AIRPLANES—CLASS C—FOURTH CATEGORY
Single-seaters weight empty less than 200 kgs. (440.920 lbs.)

AIRLINE DISTANCE
International Record.....852.100 kilometers (529.469 miles)
G. Fauvel, France, Maubaussin Peyret Type 10, No. 1 airplane, A.B.C. Scorpion engine, Saint-Inglebert to Pau, September 10, 1929.
National (U.S.) Record.....None established.

ALTITUDE
International Record.....5,193 meters (17,037 feet)
G. Fauvel, France, Maubaussin Peyret Type 10, No. 1 airplane, A.B.C. Scorpion engine, Le Bourget, September 5, 1929.
National (U.S.) Record.....5,324 meters (17,467 feet)
Kenneth W. Scholter, Aeronca airplane, Aeronca 38 HP engine, Detroit, Michigan, April 12, 1931.
(Note: F.A.I. requirement that previous record be beaten by 200 meters (656.166 feet) in order to establish a new international mark prevents international recognition of the above national record.)

SPEED FOR 100 KILOMETERS
International Record.....Speed, 162.940 km.p.h. (101.246 m.p.h.)
Clarence O. Prest, United States, Prest Baby Pursuit monoplane, Szekely 40 HP engine, San Bernardino, California, May 28, 1930.
National (U.S.) Record.....Same as above.

SPEED FOR 500 KILOMETERS
Neither International nor National (U.S.) Record has been established.

SPEED FOR 1000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

SEAPLANES—CLASS C2

AIRLINE DISTANCE
International Record .....3,679.400 kilometers (2,286.268 miles)
Capt. de Corvette Bonnot and Lieut. de Vaisseau Jeanpierre, France, Latecoere 300 seaplane, 4 Hispano-Suiza 650 HP engines, from l'Etang de Berre, to St. Louis, Senegal, December 31, 1933, and January 1, 1934.
National (U.S.) Record.....2,963 kilometers (1,841 miles)
Comdr. John Rodgers, U.S.N., and Lieut. B. J. Connell, PN-9, 2 Packard 1-A-1500, 500 HP each, San Pablo Bay, California, to near Hawaii, August 31 and September 1, 1925.

ALTITUDE
International Record.....11,753 meters (38,560 feet)
Lieut. Apollo Soucek, U.S.N., United States, "Apache," Pratt and Whitney 425 HP engine, supercharged, at Washington, D. C., June 4, 1929.
National (U.S.) Record.....Same as above.

MAXIMUM SPEED
International Record.....Speed, 682.078 km.p.h. (423.822 m.p.h.)
Francesco Agello, Italy, M.C. 72 seaplane, Fiat A.S. 6 engine, at de Desenzano, Italy, April 10, 1933.
National (U.S.) Record.....Speed, 395.439 km.p.h. (245.713 m.p.h.)
Lieut. James H. Doolittle, U.S.A.S., Curtiss R3C-2 Curtiss V-1400, 600 HP engine, Bay Shore, Baltimore, Maryland, October 27, 1925.

SPEEDS FOR SPECIFIED DISTANCES WITHOUT PAY LOAD

SPEED FOR 100 KILOMETERS (62.137 MILES)
International Record.....Speed, 629.370 km.p.h. (391.072 m.p.h.)
Guglielmo Cassinelli, Italy, Macchi C.72 seaplane, 2400 HP Fiat AS 6 engine, Falconara-Pesaro permanent course, October 8, 1933.
National (U.S.) Record.....Speed, 338.944 km.p.h. (241.679 m.p.h.)
Lieut. G. T. Cuddihy, U.S.N., Curtiss R3C-2 Curtiss V-1500, 700 HP, at Norfolk, Virginia, November 13, 1926.

SPEED FOR 1000 KILOMETERS (621.369 MILES)
International Record.....Speed, 222.277 km.p.h. (138.116 m.p.h.)
Rolf Starke, Germany, Heinkel HE9, BMW V1, 600 HP engine, Warnemunde, June 10, 1929.
National (U.S.) Record.....Speed, 210.716 km.p.h. (130.932 m.p.h.)
Lieut. R. Irvine, Vought "Corsair," Pratt and Whitney "Wasp" 425 HP engine, Hampton Roads, Virginia, May 21, 1927.

SPEED FOR 2000 KILOMETERS (1242.739 MILES)
International Record.....Speed, 185.931 km.p.h. (117.396 m.p.h.)
Lts. de Vaisseau Paris and M. Hebert, France, Latecoere 28, Hispano-Suiza 600 HP, St. Laurent de Salanque, June 21, 1930.
National (U.S.) Record.....Speed, 126.567 km.p.h. (78.644 m.p.h.)
Lieuts. B. J. Connell and H. C. Rodd, U.S.N., PN-10, 2 Packard 600 HP each, at San Diego, California, August 15 and 16, 1927.

SPEED FOR 5000 KILOMETERS (3106.849 MILES)
International Record.....Speed, 139.567 km.p.h. (86.723 m.p.h.)
Lieut. de Vaisseau Paris, and M. Gonord, France, Latecoere 28-3 seaplane, Hispano-Suiza 600 HP engine, at Arcachon, June 4 and 5, 1931.
National (U.S.) Record.....None established.

SPEED FOR 10,000 KILOMETERS (6213.698 MILES)
Neither International nor National (U.S.) Record has been established.

CLASS C2—WITH PAY LOAD OF 500 KILOGRAMS
(1102.311 lbs.)

ALTITUDE
International Record.....8,208 meters (26,929.080 feet)
Boris Sergievsky, United States, Sikorsky S-38 seaplane, 2 Pratt and Whitney "Wasp" 420 HP engines, supercharged, Bridgeport, Connecticut, July 21, 1930.
National (U.S.) Record.....Same as above.

SPEED FOR 1000 KILOMETERS
International Record.....Speed, 222.277 km.p.h. (138.116 m.p.h.)
Rolf Starke, Germany, Heinkel HE9, BMW VI, 600 HP engine at Warnemunde, June 10, 1929.
National (U.S.) Record.....Speed, 142.74 km.p.h. (88.694 m.p.h.)
Lieut. B. J. Connell and S. R. Pope, PN-10, 2 Packard 600 HP each, at San Diego, California, July 8, 1927.

SPEED FOR 2000 KILOMETERS
International Record.....Speed, 185.931 km.p.h. (117.396 m.p.h.)
Lieuts. de Vaisseau Paris and M. Hebert, France, Latecoere 28, Hispano-Suiza 600 HP engine, at St. Laurent de Salanque, June 21, 1930.
National (U.S.) Record.....Speed, 126.567 km.p.h. (78.664 m.p.h.)
Lieuts. B. J. Connell and H. C. Rodd, U.S.N., PN-10, 2 Packard 600 HP each, at San Diego, California, August 15 and 16, 1927.

SPEED FOR 5000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

CLASS C2—WITH PAY LOAD OF 1000 KILOGRAMS
(2204.622 lbs.)

ALTITUDE
International Record .....8,864 meters (29,081.277 feet)
M. Bourdin, France, Liore and Oliver seaplane, 2 Hispano-Suiza 690 HP engines, at Antibes, December 26, 1933.
National (U. S.) Record .....8,208 meters (26,929.080 feet)
Boris Sergievsky, Sikorsky S-38 seaplane, 2 Pratt and Whitney Hornets, 575 HP each, at Bridgeport, Connecticut, July 21, 1930.

SPEED FOR 1000 KILOMETERS
International Record.....Speed, 190.004 km.p.h. (118.085 m.p.h.)
Lieuts. de Vaisseau Paris and M. Hebert, France, Latecoere 28, Hispano-Suiza 650 HP engine, at St. Laurent de Salanque, June 22, 1930.
National (U.S.) Record.....Speed, 142.74 km.p.h. (88.694 m.p.h.)
Lieut. B. J. Connell and S. R. Pope, PN-10, 2 Packard 600 HP each, at San Diego, California, July 8, 1927.

SPEED FOR 2000 KILOMETERS
International Record.....Speed. 185.931 km.p.h. (117.396 m.p.h.)
Lieuts. de Vaisseau Paris and M. Hebert, France, Latecoere 28, Hispano-Suiza 650 HP engine, at St. Laurent de Salanque, June 22, 1930.
National (U.S.) Record.....Speed, 130.427 km.p.h. (81.043 m.p.h.)
Lieut. A. W. Gorton and Chief Boatswain E. E. Reber, U.S.N., PN-12, 2 Pratt and Whitney, 525 HP each, at Philadelphia, Pennsylvania, July 11 and 12, 1928.

SPEED FOR 5000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

CLASS C2—WITH PAY LOAD OF 2000 KILOGRAMS
(4409.244 lbs.)

ALTITUDE
International Record.....6,074 meters (19,709.258 feet)
Boris Sergievsky, United States, Sikorsky S-38, 2 Pratt and Whitney 425 HP "Wasp" engines, at Stratford, Connecticut, August 11, 1930.
National (U.S.) Record.....Same as above.

SPEED FOR 1000 KILOMETERS
International Record.....Speed, 177.279 km.p.h. (110.155 m.p.h.)
Richard Wagner, Germany, Dornier Superwal, DR-142, 4 Gnome-Rhone-Jupiter 480 HP engines, Friedrichshafen, February 5, 1928.
National (U.S.) Record.....Speed, 142.74 km.p.h. (88.694 m.p.h.)
Lieut. B. J. Connell and S. R. Pope, PN-10, 2 Packard 600 HP engines, San Diego, California, July 8, 1927.

SPEED FOR 2000 KILOMETERS
International Record.....Speed, 163.628 km.p.h. (101.674 m.p.h.)
Lt. de Vaisseau Demougeot and M. Gonord, France, Latecoere 38 seaplane, 2 Hispano-Suiza 650 HP engines, Cape Martin-Cape Magnan course, September 2, 1931.
National (U.S.) Record.....Speed, 130.427 km.p.h. (81.043 m.p.h.)
Lt. A. W. Gorton and Chief Boatswain E. E. Reber, U.S.N., PN-12, 2 Pratt and Whitney 525 HP engines, Philadelphia, Pennsylvania, July 11 and 12, 1928.

SPEED FOR 5000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

CLASS C2—WITH PAY LOAD OF 5000 KILOGRAMS (11,023.11 lbs.)

ALTITUDE
International Record .....2,000 meters (6,561.660 feet) Steindorf, Germany, Rohrbach Romar, 3 BMW 500 HP engines, at Travemunde, April 17, 1929.
National (U.S.) Record.....None established.

SPEED FOR 1000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

SPEED FOR 2000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

SPEED FOR 5000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

CLASS C2—WITH PAY LOAD OF 10,000 KILOGRAMS (22,046.22 lbs.)

ALTITUDE
Neither International nor National (U.S.) Record has been established.

SPEED FOR 1000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

SPEED FOR 2000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

SPEED FOR 5000 KILOMETERS
Neither International nor National (U.S.) Record has been established.

CLASS C2—GREATEST PAY LOAD CARRIED TO AN ALTITUDE OF 2000 METERS (6,561.660 feet)

International Record.....Weight, 6,450 kgs. (14,220 lbs.) Steindorf, Germany, Rohrbach Romar, 3 BMW 500 HP engines, at Travemunde, April 17, 1929.
National (U.S.) Record.....Weight, 3,504 kgs. (7,726 lbs.) Lieuts. B. J. Connell and H. C. Rodd, U.S.N., PN-10, 2 Packard 660 HP engines, at San Diego, California, August 18, 1927.

LIGHT SEAPLANES—CLASS C2—FIRST CATEGORY

Multi-seaters weight empty less than 680 kgs. (1,499.128 lbs.)

AIRLINE DISTANCE
International Record.....122.560 kilometers (76.155 miles) Lallouette and Albert, France, Farman 231 Seaplane, Renault 95 HP engine, from Le Pecq to Caudebec-en-Caux, May 13, 1931.
National (U.S.) Record.....None established.

ALTITUDE
International Record.....7,362 meters (24,153.470 feet) Ingenieur Furio Niclot, pilot; Mariano Lanciani, passenger; Italy, Fiat A.S.I.C.N.A. seaplane, C.N.A. C-7 engine, Littorio airport, December 28, 1932.
National (U.S.) Record.....None established.

SPEED FOR 100 KILOMETERS (62.137 MILES)
International Record.....Speed, 189.433 km.p.h. (117.708 m.p.h.) Lallouette and Boulanger, France, Farman 231 seaplane, Renault 95 HP engine, Draveil-Montereau course, March 28, 1931.
National (U.S.) Record.....None established.

SPEED FOR 1000 KILOMETERS (621.369 MILES)
Neither International nor National (U.S.) Record has been established.

SPEED FOR 2000 KILOMETERS (1242.739 MILES)
Neither International nor National (U.S.) Record has been established.

LIGHT SEAPLANES—CLASS C2—SECOND CATEGORY

Single-seaters weight empty less than 570 kgs. (1,256.622 lbs.)

AIRLINE DISTANCE
Neither International nor National (U.S.) Record has been established.

ALTITUDE
International Record.....8,411 meters (27,595.061 feet)

Furio Niclot, Italy, ETA-CNA Seaplane, CNA C7 160 HP engine, Littorio airport, Rome, Italy, November 6, 1933.
National (U.S.) Record.....None established.
SPEED FOR 100 KILOMETERS (62.137 MILES)
International Record.....Speed, 165.004 km.p.h. (102.554 m.p.h.)
Alfred Grundke, Germany, Junkers J 50-W seaplane, Armstrong Sideley Genet 85 HP engine, at Dessau, June 13, 1930.
National (U.S.) Record.....None established.
SPEED FOR 1000 KILOMETERS (621.369 MILES)
Neither International nor National (U.S.) Record has been established.
SPEED FOR 2000 KILOMETERS (1242.739 MILES)
Neither International nor National (U.S.) Record has been established.

LIGHT SEAPLANES—CLASS C2—THIRD CATEGORY

Multi-seaters weight empty less than 350 kgs. (771.610 lbs.)

AIRLINE DISTANCE
Neither International nor National (U.S.) Record has been established.
ALTITUDE
International Record.....3,231 meters (10,600.361 feet)
Jean de Viscaya and Forestier, France, Farman F-231 seaplane, Salmson 40 HP engine, Farman-Le Pecq course, June 11, 1931.
National (U.S.) Record.....None established.
SPEED FOR 100 KILOMETERS (62.137 MILES)
International Record.....Speed, 143.540 km.p.h. (89.191 m.p.h.)
De Viscaya and Chaudet, France, Farman 230 seaplane, Salmson 40 HP engine, Le Pecq-Bonnieres-Le Rhoule, June 26, 1931.
National (U.S.) Record.....None established.
SPEED FOR 500 KILOMETERS (310.685 MILES)
Neither International nor National (U.S.) Record has been established.
SPEED FOR 1000 KILOMETERS (621.369 MILES)
Neither International nor National (U.S.) Record has been established.

LIGHT SEAPLANES—CLASS C2—FOURTH CATEGORY

Single-seaters weight empty less than 250 kgs. (551.150 lbs.)

AIRLINE DISTANCE
Neither International nor National (U.S.) Record has been established.
ALTITUDE
International Record.....3,461 meters (11,354.964 feet)
Vercruysse, France, Mayboussin-Peyret seaplane, A.B.C. Scorpion 34 HP engine, at Argenteuil, December 10, 1930.
National (U.S.) Record.....None established.
SPEED FOR 100 KILOMETERS (62.137 MILES)
International Record.....Speed, 122.783 km.p.h. (76.293 m.p.h.)
Vercruysse, France, Mayboussin-Peyret seaplane, A.B.C. Scorpion 34 HP engine, Chatou-Epinay course, December 22, 1930.
National (U.S.) Record.....None established.
SPEED FOR 500 KILOMETERS (310.685 MILES)
Neither International nor National (U.S.) Record has been established.
SPEED FOR 1000 KILOMETERS (621.369 MILES)
Neither International nor National (U.S.) Record has been established.

AMPHIBIONS—CLASS C3

AIRLINE DISTANCE
Neither International nor National (U.S.) Record has been established.
BROKEN LINE DISTANCE
Neither International nor National (U.S.) Record has been established.
ALTITUDE
Neither International nor National (U.S.) Record has been established.
MAXIMUM SPEED
International Record.....Speed, 289.29 km.p.h. (179.76 m.p.h.)
Alexander P. de Seversky, United States, Seversky Amphibion, Wright Whirlwind 420 HP engine, at Roosevelt Field, Mineola, New York, October 9, 1933.
National (U.S.) Record.....Same as above.
SPEED FOR 100 KILOMETERS (62.137 MILES) WITHOUT PAY LOAD
Neither International nor National (U.S.) Record has been established.
SPEED FOR 1000 KILOMETERS (621.369 MILES) WITHOUT PAY LOAD
Neither International nor National (U.S.) Record has been established.
SPEED FOR 2000 KILOMETERS (1242.739 MILES) WITHOUT PAY LOAD
Neither International nor National (U.S.) Record has been established.
SPEED FOR 5000 KILOMETERS (3106.849 MILES) WITHOUT PAY LOAD
Neither International nor National (U.S.) Record has been established.
SPEED FOR 10,000 KILOMETERS (6213.698 MILES) WITHOUT PAY LOAD
Neither International nor National (U.S.) Record has been established.

LIGHT AMPHIBIONS—CLASS C3

Multi-seaters weight empty less than 750 kgs. (1,653.450 lbs.)

AIRLINE DISTANCE
Neither International nor National (U.S.) Record has been established.
ALTITUDE
Neither International nor National (U.S.) Record has been established.
SPEED FOR 100 KILOMETERS (62.137 MILES)
Neither International nor National (U.S.) Record has been established.
SPEED FOR 1000 KILOMETERS (621.369 MILES)
Neither International nor National (U.S.) Record has been established.
SPEED FOR 2000 KILOMETERS (1242.739 MILES)
Neither International nor National (U.S.) Record has been established.

BALLOONS—CLASS A

First Category (600 *cubic meters*)

DURATION
International Record.....22 hrs. 34 min.
Georges Cormier, France, August 10 and 11, 1924.
National (U.S.) Record.....None has been established.
DISTANCE
International Record.....804.173 kilometers (499.69 miles)
Georges Cormier, France, July 1, 1922.
National (U.S.) Record.....None has been established.
ALTITUDE
Neither International nor National (U.S.) Record has been established.

Second Category (601-900 *cubic meters*)

DURATION
International Record.....23 hrs. 28 min.
Jules Dubois, France, May 14 and 15, 1922.
National (U.S.) Record.....19 hours.
W. C. Naylor and K. W. Warren, "Skylark," Little Rock, Arkansas, to Crawford, Tennessee, April 29-30, 1926.
DISTANCE
International Record.....804.173 kilometers (499.69 miles)
Georges Cormier, France, July 1, 1922.
National (U.S.) Record.....660 kilometers (410 miles)
W. C. Naylor and K. W. Warren, "Skylark," Little Rock, Arkansas, to Crawford, Tennessee, April 29-30, 1926.
ALTITUDE
Neither International nor National (U.S.) Record has been established.

Third Category (901-1200 *cubic meters*)

DURATION
International Record.....26 hrs., 46 min.
E. J. Hill and A. G. Schlosser, United States, Ford Airport to Montvale, Virginia, July 4-5, 1927.
National (U.S.) Record.....Same as above.
DISTANCE
International Record.....1,238 kilometers (769.256 miles)
Georges Ravaine, France, from Basle, Switzerland, to Tokary, Poland, September 25 and 26, 1932.
National (U.S.) Record.....920.348 kilometers (571.877 miles)
S. A. U. Rasmussen, Ford airport to Hookerton, North Carolina, July 4-5, 1927.
ALTITUDE
Neither International nor National (U.S.) Record has been established.

Fourth Category (1201-1600 *cubic meters*)

DURATION
International Record.....26 hrs., 46 min.
E. J. Hill and A. G. Schlosser, United States, Ford airport to Montvale, Virginia, July 4-5, 1927.
DISTANCE
International Record.....1,238 kilometers (769.256 miles)
Georges Ravaine, France, from Basle, Switzerland, to Tokary, Poland, September 25 and 26, 1932.
National (U.S.) Record.....920.348 kilometers (571.877 miles)
S. A. U. Rasmussen, Ford airport to Hookerton, North Carolina, July 4-5, 1927.
ALTITUDE
Neither International nor National (U.S.) Record has been established.

FIFTH CATEGORY (1601-2200 *cubic meters*)

DURATION
International Record .....51 hours.
Lt. Comdr. T. G. W. Settle and Lt. Charles H. Kendall, United States, Gordon-Bennett Balloon Race, Chicago, Illinois, September 2, 3, and 4, 1933.
National (U. S.) Record .....Same as above.

DISTANCE
International Record.....1,550 kilometers (963.123 miles)
Lt. Comdr. T. G. W. Settle, USN, and Lieutenant Wilfred Bushnell, USN, United States, from Basle, Switzerland, to Daugieliski, Poland, September 25, 26, and 27, 1932. (Gordon-Bennett)
National (U.S.) Record.....Same as above.

ALTITUDE
Neither International nor National (U.S.) Record has been established.

SIXTH CATEGORY (2201-3000 *cubic meters*)

DURATION
International Record .....51 hours.
Lt. Comdr. T. G. W. Settle and Lt. Charles H. Kendall, United States, Gordon-Bennett Balloon Race, Chicago, Illinois, September 2, 3, and 4, 1933.
National (U. S.) Record .....Same as above.

DISTANCE
International Record.....1,550 kilometers (963.123 miles)
Lt. Comdr. T. G. W. Settle and Lt. Wilfred Bushnell, United States, from Basle, Switzerland, to Daugieliski, Poland, September 25, 26, and 27, 1932. (Gordon-Bennett)
National (U.S.) Record.....Same as above.

ALTITUDE
International Record.....8,690 meters (28,508.413 feet)
Capt. Hawthorne C. Gray, United States, Scott Field, Belleville, Illinois, March 9, 1927.
National (U.S.) Record.....Same as above.

SEVENTH CATEGORY (3001-4000 *cubic meters*)

DURATION
International Record .....51 hours.
Lt. Comdr. T. G. W. Settle and Lt. Charles H. Kendall, United States, Gordon-Bennett Balloon Race, Chicago, Illinois, September 2, 3, and 4, 1933.
National (U. S.) Record .....Same as above.

DISTANCE
International Record.....1,550 kilometers (963.123 miles)
Lt. Comdr. T. G. W. Settle, USN, and Lieutenant Wilfred Bushnell, USN, United States, from Basle, Switzerland, to Daugieliski, Poland, September 25, 26 and 27, 1932. (Gordon-Bennett)
National (U.S.) Record.....Same as above.

ALTITUDE
International Record .....8,690 meters (28,508.413 feet)
Capt. Hawthorne C. Gray, United States, at Scott Field, Belleville, Illinois, March 9, 1927.
National (U.S.) Record.....Same as above.

EIGHTH CATEGORY (4001 *cubic meters or more*)

DURATION
International Record.....87 hours.
H. Kaulen, Germany, December 13 to 17, 1913.
National (U. S.) Record .....51 hours.
Lt. Comdr. T. G. W. Settle and Lt. Charles H. Kendall, Gordon-Bennett Balloon Race, Chicago, Illinois, September 2, 3, and 4, 1933.

DISTANCE
International Record.....3,052.7 kilometers (1,896.856 miles)
Berliner, Germany, February 8, 9, and 10, 1914.
National (U.S.) Record.....1,887.6 kilometers (1,172.898 miles)
A. R. Hawley, St. Louis, Missouri, to Lake Tschotogama, Canada, October 17-19, 1910.

ALTITUDE
International Record.....18,665 meters (61,237 feet)
Lt. Comdr. T. G. W. Settle, USN, and Major C. L. Fordney, USMC, United States, take-off from Akron, Ohio, landing near Bay Side, New Jersey, November 20, 1933.
National (U.S.) Record.....Same as above.

AIRSHIPS—CLASS B

AIRLINE DISTANCE
International Record.....6,384.500 kilometers (3,967.137 miles)
Dr. Hugo Eckener, Germany, L.Z. 127, "Graf Zeppelin," 5 Maybach 450-550 HP engines, from Lakehurst, N. J., U.S.A., to Friedrichshafen, Germany, October 29, 30, 31, and November 1, 1928.
National (U.S.) Record.....None established

GLIDERS—CLASS D

AIRLINE DISTANCE
International Record.....220.270 kilometers (136.869 miles)
Gunther Groenhoff, Germany, "Fafnir" Glider, from the Wasserkuppe/Rhon to Meitzendorf, near Magdeburg, July 25, 1931.
National (U.S.) Record.....195.697 kilometers (121.600 miles)
Richard C. du Pont, Bowlus 1-P-S Sailplane, from Rock Fish Gap, Va., to Frederick, Md., Sept. 21, 1933.

DISTANCE WITH RETURN TO POINT OF DEPARTURE
International Record.....455.800 kilometers (283.220 miles)
Ferdinand Schulz, Germany, "Westpreussen" glider, Rossitten Field, May 3, 1927.
National (U.S.) Record.....None established.

DURATION WITH RETURN TO POINT OF DEPARTURE
International Record.....36 hrs., 35 min.
Kurt Schmidt, Germany, Grunau Baby glider, "D-Loerzer" at Korschenruh, Prusse Orientale, August 3 and 4, 1933.
National (U.S.) Record.....21 hrs., 34 min.
Lieut. William A. Cocke, Jr., Cocke "Nighthawk" glider, Honolulu, Hawaii, December 17 and 18, 1931.

ALTITUDE
International Record.....2,589 meters (8,493.869 feet)
Robert Kronfeld, Austria, Wien glider, Rhon-Rossiter, Lienlas, July 30, 1929.
National (U.S.) Record.....1,457 meters (4,780.169 feet)
J. K. O'Meara, Darmstadt glider, Elmira, New York, July 24, 1932.

AUTOGIROS—CLASS E

AIRLINE DISTANCE
Neither International nor National (U.S.) Record has been established.

BROKEN LINE DISTANCE
Neither International nor National (U.S.) Record has been established.

ALTITUDE
Neither International nor National (U.S.) Record has been established.

MAXIMUM SPEED
Neither International nor National (U.S.) Record has been established.

SPEED FOR 100 KILOMETERS (62.137 MILES) WITHOUT PAY LOAD
Neither International nor National (U.S.) Record has been established.

SPEED FOR 1000 KILOMETERS (621.369 MILES) WITHOUT PAY LOAD
Neither International nor National (U.S.) Record has been established.

SPEED FOR 2000 KILOMETERS (1242.739 MILES) WITHOUT PAY LOAD
Neither International nor National (U.S.) Record has been established.

SPEED FOR 5000 KILOMETERS (3106.849 MILES) WITHOUT PAY LOAD
Neither International nor National (U.S.) Record has been established.

SPEED FOR 10,000 KILOMETERS (6213.698 MILES) WITHOUT PAY LOAD
Neither International nor National (U.S.) Record has been established.

HELICOPTERS—CLASS G

DURATION, CLOSED CIRCUIT
International Record.....8 min., 45 sec.
Marinello Nelli, Italy, Ascanio helicopter, Fiat A 50 engine, October 8, 1930, at Rome.
National (U.S.) Record.....None has been established.

AIRLINE DISTANCE
International Record.....1,078.60 meters (3538.706 feet)
Marinello Nelli, Italy, Ascanio helicopter, Fiat A 50 engine, October 10, 1930, at Rome.
National (U.S.) Record.....None has been established.

ALTITUDE
International Record.....18 meters (59.055 feet)
Marinello Nelli, Italy, Ascanio helicopter, Fiat A 50 engine, October 13, 1930, at Rome.
National (U.S.) Record.....None has been established.

FEMININE RECORDS

AIRPLANES—CLASS C

AIRLINE DISTANCE
International Record.....3,939.245 kilometers (2,447.728 m.p.h.)
Miss Amelia Earhart, United States, Lockheed Vega monoplane, Wasp 450 HP engine, from Los Angeles, Calif., to Newark, New Jersey, August 24 and 25, 1932.
National (U.S.) Record.....Same as above.

ALTITUDE
International Record.....9,791 meters (32,122.606 feet)
Miss Mary Hilsz, France, Morane-Saulnier airplane, Gnome and Rhone 420 HP engine, Villacoublay, August 19, 1932.
National (U.S.) Record.....8,761 meters (28,743.352 feet)
Miss Ruth Nichols, Lockheed Vega monoplane, Pratt and Whitney 420 HP "Wasp" engine, at Jersey City Airport, New Jersey, March 6, 1931.

MAXIMUM SPEED
International Record.....Speed, 405.92 km.p.h. (252.226 m.p.h.)
Mrs. May Haizlip, United States, Wedell-Williams monoplane, Pratt and Whitney 540 HP supercharged "Wasp Jr." engine, Cleveland, Ohio, Sept. 5, 1932.
National (U.S.) Record.....Same as above.

SPEED FOR 100 KILOMETERS (62.137 MILES) WITHOUT PAY LOAD
International Record.....Speed, 281.470 km.p.h.) (174.987 m.p.h.)
Miss Amelia Earhart, United States, Lockheed Vega monoplane, Pratt and Whitney "Wasp" 420 HP engine, Detroit, Michigan, June 25, 1930.
National (U.S.) Record.....Same as above.

LIGHT AIRPLANES—CLASS C

Second Category—Single-seaters weight empty less than 450 kgs. (992.070 lbs.)

AIRLINE DISTANCE (SECOND CATEGORY)
International Record.....2,976.910 kilometers (1,849.763 miles)
Madame Mary Bastie, France, Klemm monoplane, Salmson 40 HP engine, from Le Bourget to Urino, Russia, June 28 and 29, 1931.
National (U.S.) Record.....None established.

ALTITUDE (SECOND CATEGORY)
International Record.....5,900 meters (19,356.897 feet)
Miss Helene Boucher, France, Mauboussin-Peyret monoplane, Zodiac type, Salmson 60 HP engine, at d'Orly airport, August 2, 1933.
National (U.S.) Record.....5,516 meters (18,097.058 feet)
Mrs. May Haizlip, Buhl "Bull Pup" monoplane, Szekely 85 HP engine, at St. Clair, Michigan, June 13, 1931.

SEAPLANES—CLASS C2

AIRLINE DISTANCE
Neither International nor National (U.S.) Record has been established.

BROKEN LINE DISTANCE
Neither International nor National (U.S.) Record has been established.

ALTITUDE
International Record.....4,103 meters (13,461.259 feet)
Mrs. Marion Eddy Conrad, United States, Savoia-Marchetti, Kinner 125 HP engine, Port Washington, Long Island, New York, October 20, 1930.
National (U.S.) Record.....Same as above.

MAXIMUM SPEED
Neither International nor National (U.S.) Record has been established.

NATIONAL AIR RACES

Los Angeles, Calif. July 1-4, 1933

OFFICIAL STANDING OF CONTESTANTS

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Money*
BENDIX TRANSCONTINENTAL SPEED DASH						
1st	Roscoe Turner	Wedell-Williams	Wasp Sr	11:30:00	214:78	$5,050.00
2nd	J. R. Wedell	Wedell-Williams	Wasp Jr	11:58:18	209:23	2,250.00
EVENT NO. 2—375 CU. IN. DISPLACEMENT (6 Laps of a 5-Mile Course)						
1st	George Hague	Keith-Ryder	Menasco 4	10:54:79	164:938	360.00
2nd	S. J. Wittman	Wittman Spec.	Hermies Cirrus	11:15:70	159:834	200.00
3rd	L. S. Miles	M & A Spec.	Menasco C4S	11:32:82	155:88	120.00
4th	A. C. Chester	Chester Spec.	Menasco C4	12:12:42	147:456	80.00
EVENT NO. 3—WOMEN'S SHELL SPEED DASH						
Race Not Run—Prizes Paid on Basis of Standing in Aerol Trophy Race						
				Total Purse Paid		1,425.00
EVENT NO. 4—550 CU. IN. DISPLACEMENT (10 Laps of a 5-Mile Course)						
1st	Ray Moore	Keith-Ryder Spec.	Menasco 6	15:49:24	189:625	900.00
2nd	Roy Minor	Howard DGA5	Menasco B6	15:50:50	189:374	500.00
3rd	Gordon Israel	Israel Racer	Menasco C6S	17:05:81	175:471	300.00
4th	George Hague	Keith-Ryder	Menasco 4	17:24:46	172:338	200.00
5th	L. S. Miles	M & A Spec.	Menasco C4S	17:58:06	166:966	100.00
6th	S. J. Wittman	Wittman Spec.	Hermies Cirrus	18:01:01	166:511	
EVENT NO.6—375 CU. IN. DISPLACEMENT (6 Laps of a 5-Mile Course)						
1st	A. C. Chester	Chester Spec.	Menasco C4	12:17:53	146:43	360.00
2nd	S. J. Wittman	Wittman Spec.	Hermies Cirrus	No	No	200.00
3rd	L. S. Miles	M & A Spec.	Menasco C4S	Official	Official	120.00
4th	George Hague	Keith-Ryder	Menasco 4	Time	Speed	80.00
The last three completed only 5 laps						

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Money*

EVENT NO. 7—550 CU. IN. DISPLACEMENT
(10 Laps of a 5-Mile Course)

1st	Roy Minor	Howard DGA-5	Menasco B6	15:13:96	196:95	$900.00
2nd	Ray Moore	Keith-Ryder Spec.	Menasco 6	15:38:57	191:58	500.00
3rd	George Hague	Keith-Ryder Spec.	Menasco 4	18:03:51	166:13	300.00
	Gordon Israel	Israel Racer	Menasco C6S		Did not finish	

EVENT NO. 8—1000 CU. IN. DISPLACEMENT
(10 Laps of a 5-Mile Course)

1st	J. R. Wedell	Wedell-Williams Spec.	Wasp Jr	14:27:62	207:46	1,125.00
2nd	Roy Minor	Howard DGA5	Menasco B6	17:13:92	174:09	625.00
3rd	George Hague	Keith-Ryder	Menasco 4	18:10:01	165:14	375.00
4th	Lee Shoenhair	Brown Spec.	Menasco 6	21:48:88	137:52	250.00

EVENT NO. 9—AEROL TROPHY RACE
(5 Laps of a 10-Mile Course)

1st	May Haizlip	Wedell-Williams	Wasp Jr	17:50:04	168:216	1,350.00
2nd	Marty Bowman	Gee-Bee	Wasp Jr	18:33:12	161:708	750.00
3rd	Gladys O'Donnell	Waco	Wright J6-7	22:23:24	134:004	450.00
4th	Henrietta Sumner	Travel Air Speedwing	Wright J5	23:05:53	129:933	300.00

EVENT NO. 11—375 CU. IN. DISPLACEMENT
(6 Laps of a 5-Mile Course)

1st	L. S. Miles	M & A Spec.	Menasco C4S	11:11:26	168:91	260.00
2nd	George Hague	Keith-Ryder	Menasco 4	11:13:47	160:363	200.00
3rd	S. J. Wittman	Wittman Spec.	Hermies Cirrus	11:32:05	156:058	120.00
4th	A. C. Chester	Chester Spec.	Menasco C4	11:41:92	153:864	80.00

EVENT NO. 12—550 CU. IN. DISPLACEMENT
(10 Laps of a 5-Mile Course)

1st	Roy Minor	Howard DGA5	Menasco B6	15:28:17	193:930	900.00
2nd	Ray Moore	Keith-Ryder Spec.	Menasco 6	15:42:92	190:896	500.00
3rd	Gordon Israel	Israel Racer	Menasco C6S	17:14:30	174:031	300.00
4th	George Hague	Keith-Ryder	Menasco 4	17:26:32	172:032	200.00
5th	L. S. Miles	M & A Spec.	Menasco C4S	18:40:82	160:597	100.00
	Lee Shoenhair	Brown Spec.	Menasco 6		Did not finish	

EVENT NO. 14—1000 CU. IN. DISPLACEMENT
(10 Laps of a 5-Mile Course)

Place	Pilot	Plane	Engine	Time	Speed	Money
1st	J. R. Wedell	Wedell-Williams	Wasp Jr	14:17:61	209:886	$1,125.00
2nd	Lee Gehlbach	Wedell-Williams	Wasp Jr	15:36:56	192:93	625.00
3rd	Roy Minor	Howard DGA5	Menasco B6	15:56:70	188:147	375.00
4th	Ray Moore	Keith-Ryder Spec.	Menasco 6	16:19:20	183:824	250.00
5th	Gordon Israel	Israel Racer	Menasco C6S	17:19:27	173:198	125.00
	George Hague	Keith-Ryder	Menasco 4	17:30:01	171:427	
	L. S. Miles	M & A Spec.	Menasco C4S	19:33:67	153:365	

EVENT NO. 16—375 CU. IN. DISPLACEMENT
(6 Laps of a 5-Mile Course)

1st	L. S. Miles	M & A Spec.	Menasco C4S	11:14:46	160:128	360.00
2nd	George Hague	Keith-Ryder	Menasco 4	11:15:18	159:957	200.00
3rd	S. J. Wittman	Wittman Spec.	Hermies Cirrus	11:21:05	158:579	120.00
4th	A. C. Chester	Chester Spec.	Menasco C4	11:39:64	154:365	80.00

EVENT NO. 17—550 CU. IN. DISPLACEMENT
(10 Laps of a 5-Mile Course)

1st	Roy Minor	Howard DGA5	Menasco B6	15:48:35	189:803	900.00
2nd	Ray Moore	Keith-Ryder Spec.	Menasco 6	16:06:56	186:227	500.00
3rd	Gordon Israel	Israel Racer	Menasco C6S	17:23:89	172:432	300.00
4th	George Hague	Keith-Ryder	Menasco 4	17:31:28	171:220	200.00
5th	L. S. Miles	M & A Spec.	Menasco C4S	17:37:97	170:137	100.00
	S. J. Wittman	Wittman Spec.	Hermies Cirrus	18:01:09	166:499	

EVENT NO. 18—THOMPSON TROPHY RACE
(10 Laps of a 10-Mile Course)

1st	J. R. Wedell	Wedell-Williams	Wasp Jr	25:12:91	237:952	3,375.00
2nd	Lee Gahlbach	Wedell-Williams	Wasp Jr	26:40:38	224:947	1,875.00
3rd	Roy Minor	Howard DGA5	Menasco B6	30:01:17	199:870	1,125.00
4th	George Hague	Keith-Ryder	Menasco 4	32:45:00	183:206	750.00
5th	Z. D. Granville	Gee-Bee	Wasp Sr	34:39:97	173:079	375.00
	Roscoe Turner	Wedell-Williams	Wasp Sr	24:53:46	241:031	

(Who finished first but disqualified for cutting pylon No. 3—case appealed to National Aeronautic Association, Washington, D. C.)

EVENT NO. 23—SHELL SPEED DASH—550 CU. IN. DISPLACEMENT
(3-Kilometers)

Place	Pilot	Plane	Engine	Time	Speed	Money
1st	Roy Minor	Howard DGA5	Menasco 6		241:612	$450.00
2nd	Ray Moore	Keith-Ryder	Menasco 6		231:702	250.00
3rd	Gordon Israel	Israel Racer	Menasco C6S		221:746	150.00
4th	L. S. Miles	M & A Spec.	Menasco C4S		210:640	100.00
5th	George Hague	Keith-Ryder	Menasco 4		210:124	50.00
	S. J. Wittman	Wittman Spec.	Hermies Cirrus		201:989	
	Z. D. Granville	Gee-Bee	Wasp Sr		193:153	
	W. A. McDonald	Wedell-Williams	Menasco Buccaneer		185:223	
	A. C. Chester	Chester Spec.	Menasco 4		183:575	
	Riley Burrows				143:131	

EVENT NO. 13—SHELL SPEED DASH—UNLIMITED
(3-Kilometers)

1st	Roscoe Turner	Wedell-Williams	Wasp Sr		280:247	1,125.00
2nd	J. R. Wedell	Wedell-Williams	Wasp Jr		278:92	625.00
3rd	Lee Gehlbach	Wedell-Williams	Wasp Jr		251:93	375.00
4th	Roy Minor	Howard DGA5	Menasco 6		241:612	250.00
5th	Ray Moore	Keith-Ryder	Menasco 6		231:702	125.00

SWEEPSTAKE AWARD NO. 3—EVENTS NOS. 4-7-12-17
(550 CU. IN. DISPLACEMENT)

					Points	
1st	Roy Minor	Howard DGA5	Menasco 6		19	900.00
2nd	Ray Moore	Keith-Ryder	Menasco 6		17	500.00
3rd	Gordon Israel	Israel Racer	Menasco C6S		9	250.00
4th	George Hague	Keith-Ryder	Menasco 4		9	250.00
5th	L. S. Miles	M & A Spec.	Menasco C4S		3	100.00

SWEEPSTAKE AWARD NO. 2—EVENTS NOS. 2-6-11-16
(375 CU. IN. DISPLACEMENT)

					Points	
1st	S. J. Wittman	Wittman Spec.	Hermies Cirrus		14	360.00
2nd	George Hague	Keith-Ryder	Menasco 4		13	160.00
3rd	L. S. Miles	M & A Spec.	Menasco C4S		13	160.00
4th	A. C. Chester	Chester Spec.	Menasco 4		11	80.00

PARACHUTE JUMPING

Jumper	*Distance from Mark*	*Money*

EVENT NO. 19

Jerry Wessling	576 feet 6 inches	$90.00
George Cook	633 feet 5 inches	50.00
Claude Swanson	655 feet 3 inches	30.00
W. T. Dodson	744 feet 3 inches	20.00
Rex G. Finney	750 feet	10.00

EVENT NO. 20

Jerry Wessling		90.00
Henry J. Novakoski	61 feet 2 inches	50.00
Troy S. Colboch	146 feet 5 inches	30.00
W. T. Dodson	244 feet 6 inches	20.00
George Cook	318 feet 1 inch	10.00

EVENT NO. 21

Jerry Wessling	23 feet	90.00
Bert White	30 feet 6 inches	50.00
Rex G. Finney	94 feet	30.00
Henry J. Novakoski	125 feet	20.00
Troy S. Colboch	175 feet 6 inches	10.00

EVENT NO. 22

Jerry Wessling	90.00
George Cook	50.00
Claude Swanson	30.00
W. T. Dodson	20.00
Rex G. Finney	10.00

SWEEPSTAKE AWARD NO. 4—PARACHUTE JUMPS

	Points	*Money*
Jerry Wessling	20	$90.00
George Cook	9	50.00
Henry J. Novakoski	6	20.00
W. T. Dodson	6	20.00
Claude Swanson	6	20.00

TROPHIES AWARDED IN 1933 NATIONAL AIR RACES

Donor	*Trophy*	*Awarded To*	*Event*
Bendix Aviation Corporation	Vincent Bendix Trophy	Col. Roscoe Turner	Pendix Trophy Race
Charles E. Thompson	Charles E. Thompson Trophy	J. R. Wedell	No. 18
Fred E. Keeler	Fred E. Keeler Trophy	J. R. Wedell	No. 8
Will Rogers	Will Rogers Challenge Trophy	No Award—Race not finished.	
Cleveland Pneumatic Tool Co.	Aerol Trophy Race	1st. May Haizlip	
		2nd. Marty Bowman	No. 9
		3rd. Gladys O'Donnell.	
Shell Oil Company	Shell Speed Dash	Awarded on merits of Aerol Trophy Race.	Women only
Shell Oil Company	Shell Speed Dash	1st. Roscoe Turner	
		2nd. J. R. Wedell	
		3rd. Lee Gehlbach	World's Record Attempt
Shell Oil Company	Shell Speed Dash	1st. Roy Minor	3 Kilometer Speed Dash
		2nd. Ray Moore	550 cu. in. or less
		3rd. Gordon Israel	
Frank A. Tichenor	Aero Digest Trophy	J. R. Wedell	No. 4
Los Angeles Breakfast Club	Breakfast Club Trophy	George Hague	No. 2
Clifford W. Henderson	Clifford W. Henderson Trophy	Col. Roscoe Turner	Championship Pilot Award
Foreman & Clark	Foreman & Clark Trophy	Jerry Wessling	Sweepstakes Parachute Precision Award

INTERNATIONAL AIR RACES

Curtiss-Wright-Reynolds Airport—Chicago, Illinois
September 1, 2, 3, 4, 1933

OFFICIAL STANDING OF CONTESTANTS

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Money*
EVENT NO. 1—200 CU. IN. DISPLACEMENT—Race not run						
EVENT NO. 2—375 CU. IN. DISPLACEMENT						
1st	A. C. Chester	Chester Spec.	Menasco C4S	10:59:46	163:77	$360.00
2nd	L. S. Miles	Miles & Atwood Spec.	Menasco C4S	11:05:84	162:20	200.00
3rd	G. O. Hague	Keith Ryder R1	(Menasco 4 (Pirate C4S	11:13:54	160:35	120.00
4th	S. J. Wittman	Wittman Spec.	Hermies Cirrus	11:54:07	151:25	80.00
5th	Roy Liggett	Falkerts Spec.	Cirrus-Mark III	11:53:68	151:33	40.00
EVENT NO. 3—550 CU. IN. DISPLACEMENT						
1st	Roy Minor	Howard	Menasco B6	14:48:86	202:51	$10.00
2nd	Roy Liggett	Cessna	Warner 145	15:41:74	191:14	450.00
3rd	A. C. Chester	Chester Spec.	Menasco C4S	17:08:72	174:97	270.00
4th	G. O. Hague	Keith Ryder R1	Menasco 4	17:49:75	168:2[illegible]	180.00
	Gordon Israel	Israel Racer	Menasco C6S-3	(Dropped out in 6th lap)		
EVENT NO. 4—1000 CU. IN. DISPLACEMENT						
1st	Lee Gehlbach	Wedell-Williams	Wasp Jr	15:03:88	199:14	900.00
2nd	A. C. Chester	Chester Spec.	Menasco C4S	15:55:12	188:48	500.00
3rd	L. S. Miles	Miles & Atwood Spec.	Menasco C4S	16:08:74	185:81	300.00
EVENT NO. 5—200 CU. IN. DISPLACEMENT						
1st	S. J. Wittman	Popjoy Spec.	Popjoy	11:15:71	106:55	180.00
2nd	Lyman Voelpel	Tilbury Flash	Church	11:47:26	101:80	100.00
3rd	Walter Bagnick	Heath	Continental A-40	12:15:70	97:87	60.00
	Bill Reedholm	Loose	Loose-Lambert	(Dropped out in 3rd lap)		

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Money*
EVENT NO. 6—375 CU. IN. DISPLACEMENT						
1st	A. C. Chester	Chester Spec.	Menasco C4S	10:12:76	176:25	$360.00
2nd	L. S. Miles	Miles & Atwood Spec.	Menasco C4S	10:24:24	173:01	200.00
3rd	G. O. Hague	Keith Ryder R1	(Menasco 4 (Pirate C4S	10:34:00	170:35	120.00
4th	S. J. Wittman	Wittman Spec.	Hermies Cirrus	11:09:98	161:20	80.00
5th	Russell Hosler	Falkerts Spec.	Cirrus-Mark III	11:31:17	156:26	40.00
EVENT NO. 7—550 CU. IN. DISPLACEMENT						
1st	Roy Minor	Howard	Menasco B6	15:18:66	195:94	810.00
2nd	Gordon Israel	Israel Racer	Menasco C6S-3	16:16:42	184:54	450.00
3rd	A. C. Chester	Chester Spec.	Menasco C4S	16:16:32	184:37	270.00
4th	L. S. Miles	Miles & Atwood Spec.	Menasco C4S	16:23:49	183:02	180.00
	G. O. Hague	Keith Ryder R1	(Menasco 4 (Pirate C4S	(Dropped out in the 6th lap)		
	S. J. Wittman	Keith-Ryder	Menasco	(Dropped out in the 4th lap)		
	J. R. Wedell	Wedell-Williams	Menasco "Buccaneer"	(Dropped out in the 1st lap)		
EVENT NO. 9—200 CU. IN. DISPLACEMENT						
1st	S. J. Wittman	Popjoy Spec.	Popjoy	10:53:52	110:17	180.00
2nd	Lyman Voelpel	Tilbury Flash	Church	11:19:34	105:99	100.00
3rd	Walter Bagnick	Heath	Continental A-40	11:37:66	103:20	60.00
	Bill Reedholm	Loose	Loose-Lambert	(Dropped out in 1st lap)		
EVENT NO. 10—375 CU. IN. DISPLACEMENT						
1st	A. C. Chester	Chester Spec.	Menasco C4S	9:56:37	181:10	360.00
2nd	L. S. Miles	Miles & Atwood Spec.	Menasco C4S	10:02:12	179:37	200.00
3rd	S. J. Wittman	Wittman Spec.	Hermies Cirrus	10:45:14	167:41	120.00
4th	Russell Hosler	Falkerts Spec.	Cirrus-Mark III	11:03:95	162:66	80.00
5th	Arthur Gross	Howard Spec.	Gypsy	11:56:61	150:71	40.00
EVENT NO. 11—550 CU. IN. DISPLACEMENT						
1st	Roy Minor	Howard	Menasco B6	15:21:21	195:40	810.00
2nd	A. C. Chester	Chester Spec.	Menasco C4S	16:01:24	187:26	450.00
3rd	Gordon Israel	Israel Racer	Menasco C6S-3	16:24:18	182:89	270.00
4th	L. S. Miles	Miles & Atwood Spec.	Menasco C4S	17:11:70	174:47	180.00
	G. O. Hague	Keith Ryder R1	(Menasco 4 (Pirate C4S	(Dropped out in 4th lap)		

Place	Pilot	Plane	Engine	Time	Speed	Money
EVENT NO. 12—WOMEN'S INTERNATIONAL FREE-FOR-ALL						
1st	May Haizlip	Wedell-Williams	Wasp Jr	15:41:84	191:11	$1,125.00
2nd	Florence Klingensmith	Gee Bee	Wright Whirlwind J-6-E-3..	15:52:16	189:04	625.00
3rd	Martie Bowman	Gee Bee	Wasp C-1	17:45:95	168:86	375.00
4th	Henrietta Lantz	Howard Spec.	Gypsy	24:22:10	123:11	250.00
EVENT NO. 14—200 CU. IN. DISPLACEMENT						
1st	S. J. Wittman	Popjoy Spec.	Popjoy	9:54:94	120:01	180.00
2nd	Lyman Voelpel	Tilbury Flash	Church	10:37:47	112.95	100.00
3rd	Walter Bagnick	Heath	Continental A-40	10:55:96	109:76	60.00
4th	W. A. C. Stoudt	Church Midwing	Church J-3	14:27:72	82:98	40.00
EVENT NO. 15—375 CU. IN. DISPLACEMENT						
1st	A. C. Chester	Chester Spec.	Menasco C4S	9:25:59	190:95	360.00
2nd	L. S. Miles	Miles & Atwood Spec.	Menasco C4S	9:37:07	187:15	200.00
3rd	G. O. Hague	Keith Ryder R1	(Menasco 4 (Pirate C4S	10:31:31	171:07	120.00
4th	Russell Hosler	Falkerts Spec.	Cirrus-Mark III	10:32:68	170:70	80.00
5th	S. J. Wittman	Wittman Spec.	Hermies Cirrus	10:46:99	166:93	40.00
6th	Gordon Israel	Howard Spec.	Gypsy	11:31:39	156:21	
EVENT NO. 16—550 CU. IN. DISPLACEMENT						
1st	Roy Minor	Howard	Menasco B6	14:51:99	201:80	810.00
2nd	Gordon Israel	Israel Racer	Menasco C6S-3	15:10:35	197:73	450.00
3rd	A. C. Chester	Chester Spec.	Menasco C4S	15:12:54	197:25	270.00
4th	S. J. Wittman	Keith-Ryder		16:11:04	185:37	180.00
	L. S. Miles	Miles & Atwood Spec.	Menasco C4S	(Dropped out in the 8th lap)		
	G. O. Hague	Keith-Ryder	(Menasco 4 (Pirate C4S	(Failed to get started)		
EVENT NO. 17—FRANK PHILLIPS TROPHY RACE						
1st	J. R. Wedell	Wedell-Williams	Wasp Sr	24:23:65	245:95	3,600.00
2nd	Lee Gehlbach	Wedell-Williams	Wasp Jr	27:35:27	217:48	2,000.00
3rd	Roy Minor	Howard	Menasco B6	27:53:20	215:15	1,200.00
	S. J. Wittman	Keith-Ryder	Menasco	(Out in the 9th lap)		
	Florence Klingensmith	Gee Bee	Wright Whirlwind J-6-E-3..	(Crashed after finishing 8th lap)		
	Roscoe Turner	"Ring Free" Spec.	Wasp Sr	(Out in the 8th lap)		
	L. S. Miles	Miles & Atwood Spec.	Menasco C4S	(Out in the 3rd lap)		

SHELL STRAIGHTAWAY SPEED DASHES

Place	Pilot	Plane	Engine	Time	Speed	Money
1st	J. R. Wedell	Wedell-Williams	Wasp Sr	305:33		$1,000.00
2nd	Roscoe Turner	"Ring Free" Spec.	Wasp Sr	289:9		600.00
3rd	Lee Gehlbach	Wedell-Williams	Wasp Jr	272:06		400.00

SWEEPSTAKE AWARDS NO. 1B—EVENTS NOS. 1, 5, 9, 14

(None—Race No. 1 Was Not Run)

SWEEPSTAKE AWARDS NO. 2B—EVENTS NOS. 2, 6, 10, 15

				Points	
1st	A. C. Chester	Chester Spec.	Menasco C4S	20	360.00
2nd	L. S. Miles	Miles & Atwood Spec.	Menasco C4S	16	200.00
3rd	S. J. Wittman	Wittman Spec.	Hermies Cirrus	8	120.00

SWEEPSTAKE AWARDS NO. 3B—EVENTS NOS. 3, 7, 11, 16

				Points	
1st	Roy Minor	Howard	Menasco B6	20	675.00
2nd	A. C. Chester	Chester Spec.	Menasco C4S	13	375.00
3rd	Gordon Israel	Israel Racer	Menasco C6S-3	9	225.00

LAP PRIZES EVENT NO. 17—FRANK PHILLIPS TROPHY RACE

				Laps	
1st	J. R. Wedell	Wedell-Williams	Wasp Sr	10	1,666.70
2nd	Roscoe Turner	"Ring Free" Spec.	Wasp Sr	2	333.30

PARACHUTE JUMPING

EVENT NO. 20

Jumper	Distance from Mark	Money
Jerry Wessling	21 feet 8 inches	$90.00
Joe Brown	352 feet	50.00
Lieut. E. V. Stewart	1080 feet	30.00
Henry J. Novakoski	(Disqualified—Jumped from too low altitude)	
Ralph Nyborg	(Landed outside of the field)	

EVENT NO. 21—Did not take place

EVENT NO. 22

(Joe Crane	54 feet 11 inches	70.00
(Joe Brown	54 feet 11 inches	70.00

Jumper	*Distance from Mark*	*Money*
Ralph Nyborg	67 feet 9 inches	$30.00
Jerry Wessling	101 feet 4 inches	20.00
Henry J. Novakoski	102 feet 6 inches	10.00
Lieut. E. V. Stewart	141 feet 9 inches	
Jack Cope	(Broke his ankle)	

EVENT NO. 23

Jerry Wessling	31 feet 1 inch	180.00
Joe Brown	55 feet 8 inches	100.00
Joe Crane	56 feet 8 inches	60.00
Lieut. E. V. Stewart	104 feet 4 inches	40.00
Henry J. Novakoski	198 feet 9 inches	20.00
Ralph Nyborg	(Landed outside of the field)	

SWEEPSTAKE AWARDS NO. 4B-PARACHUTE JUMPING, EVENTS NOS. 20, 21, 22, 23

	Points	
Jerry Wessling	17	90.00
Joe Brown	16½	50.00
Lieut. E. V. Stewart	7	30.00
Ralph Nyborg	3	30.00

TROPHIES AWARDED

International Air Races and Gordon Bennett Balloon Race

1933

Donor	*Trophy*	*Awarded To*	*Event*
Phillips Petroleum Corporation	Frank Phillips Trophy	J. R. Wedell	No. 17
The Chicago Daily News	Chicago Daily News Trophy	Roy Minor—1st day	No. 3
		Roy Minor—2nd day	No. 7
		Roy Minor—3rd day	No. 11
		Roy Minor—4th day	No. 16
Fred E. Keeler	Fred E. Keeler Trophy	A. C. Chester	No. 2
South Bend Chamber of Commerce	South Bend Trophy	A. C. Chester	No. 6
Eddie Rickenbacker	Eddie Rickenbacker Trophy	A. C. Chester	No. 10
Pixley & Ehlers	Pixley Trophy	G. O. Hague	Sportsmanship
Olson Rug Company	Walter E. Olson Trophy	May Haizlip	No. 12
Shell Oil Company	Shell Speed Dash	J. R. Wedell	World's Record Attempt

INTERNATIONAL GORDON-BENNETT BALLOON RACE

Starting from Chicago, Ill.

September 2, 1933

Place	*Nationality*	*Pilot and Aide*	*Place of Landing*	*Distance*
1	Poland	Franciszek Hynek Z. Burzynsky	NE of Lake Aulnes, Portneuf County, Quebec, Canada	846 miles
2	United States Navy	T. G. W. Settle C. A. Kendall	Branford, Conn.	776 miles
3	United States	W. T. Van Orman Frank A. Trotter	50 mi. N. Thor Lake Sudbury, Ontario	492 miles
4	Germany	Richard Schuetze Dr. Erich Koerner	Kingstone, Mich.	251 miles
5	Belgium	Philippe Quersin Marcel Van Schelle	Roscommon, Mich.	229 miles
6	France	Georges Ravaine Georges Blanchet	Homer Township, Michigan	155 miles

Flying Facts and Figures

AMERICAN FLYING ACTIVITIES

Calendar Years

Summary of Air Transport Operations

All American Air Lines

Year	Operators	Planes in Service	Miles Scheduled	Miles Flown	Passengers	Passenger Miles	Express (pounds)	Mail (pounds)
1926	19	95	.....	4,608,880 (a)	5,782	.....	6,467(c)	433,649
1927	24	144	.....	5,242,839 (b)	12,594	.....	12,495(c)	1,222,843(d)
1928	32	294	.....	10,472,024	52,934	.....	35,376(c)	3,632,059(e)
1929	27	619	.....	20,242,891	165,263	.....	197,538(c)	7,772,014(f)
1930	35	685	30,703,119	28,833,967	385,910	94,545,784	286,798(c)	8,513,675(g)
1931	41	720	47,463,673	43,395,478	457,753	116,232,153	885,164(c)	9,351,195(h)
1932	33	655	51,932,868	48,344,358	504,575	143,169,682	1,324,428(c)	7,658,332(i)
1933	28	615	54,072,467	50,800,705	546,235	183,695,784	1,884,545(c)	7,644,646(j)

(a) Includes 2,583,056 miles flown on government operated mail routes.
(b) Includes 1,320,535 miles flown on government operated mail routes.
(c) Includes only express poundage carried on regular schedules and not freight flown by special order.
(d) Includes 121,439 pounds mail flown on government operated routes.
(e) Includes 631,541 pounds mail flown on F.A.M. routes.
(f) Includes 675,084 pounds mail flown on F.A.M. routes.
(g) Includes 508,474 pounds mail flown on F.A.M. routes.
(h) Includes 346,116 pounds mail flown on F.A.M. routes.
(i) Includes 286,162 pounds mail flown on F.A.M. routes.
(j) Includes 277,293 pounds mail flown on F.A.M. routes.

Summary of Aerial Service

Year	Operators Reporting	Planes in Service	Miles Flown	Hours Flown	Passengers Carried	Employees
1926 ..	420	969	7,656,492	.....	380,201	1,537
1927 ..	357	768	8,341,517	.....	476,724	1,674
1928 ..	108	489	8,411,889	.....	526,203	1,988
1929* .	800	7,695	104,336,560	1,304,207	2,995,530	20,944
1930* .	600	5,324	95,959,645	1,128,937	2,621,769	12,283
1931* .	352	2,818	71,582,750	842,150	1,875,992	9,141
1932* .	280	1,979	50,296,880	591,728	1,118,587	4,030
1933* .	215	1,810	45,145,400	457,427	962,212	3,752

(*) Statistical estimates based on a large number of typical reports.

Summary of Private Flying

(Corporate and Personal)
Estimated

	1928	1929	1930	1931	1932	1933
Miles flown	12,000,000	25,000,000	40,000,000	30,000,000	25,000,000	25,000,000
Planes in Service...	1,500	3,125	4,974	6,057	5,128	4,778

Government Flying Operations

Miles Flown

Year	U. S. Army	U. S. Navy	U. S. Coast Guard	U. S. Dept. Commerce
1926	16,764,540	8,352,800	16,300	.....
1927	14,871,870	10,452,720	28,960	.....
1928	19,546,450(a)	14,135,490(b)	83,083	900,000
1929	27,405,790(a)	19,513,095(b)	48,254	1,000,000
1930	32,500,000	26,478,700(b)	67,655	1,427,000
1931	44,000,000	28,889,835(b)	53,440	969,000
1932	42,914,655(a)	26,508,715(b)	93,750	975,500
1933	56,077,344(a)	22,989,300(b)	184,965	1,364,200

(a) Includes National Guard
(b) Includes Marine Corps and Naval Reserve.

General Flying Summary

	1928*	1929	1930	1931	1932	1933
Civilian and Commercial.	30,883,913	149,579,451	164,793,612	144,978,228	123,641,238	120,946,105
Government	34,665,023	47,967,139	60,473,355	73,912,275	70,492,620	80,615,809

* For 1926 and 1927 figures see "The Aircraft Year Book for 1931."

MONTHLY AIR TRANSPORT OPERATIONS

All American Air Lines

1932	Miles Scheduled	Miles Flown	Passengers	Passenger Miles	Mail (pounds)	Express (pounds)
January	4,612,388	3,733,820	23,990	6,248,262	694,867	83,903
February	4,004,430	3,393,657	26,396	6,887,651	660,327	105,015
March	4,604,819	4,137,022	36,377	9,419,479	748,920	94,708
April	4,368,499	4,112,278	41,949	10,691,060	704,611	131,570
May	4,258,179	4,158,802	47,549	11,990,212	711,848	125,498
June	4,187,605	4,097,637	47,573	12,417,553	719,449	127,556
July	4,442,625	4,376,630	53,843	15,742,187	568,488	114,999
August	4,506,446	4,449,816	58,732	18,315,581	590,593	120,073
September	4,350,589	4,236,147	54,191	16,592,884	576,109	116,651
October	4,377,351	4,079,396	42,727	13,379,600	588,233	110,752
November	4,188,083	3,847,556	36,763	11,355,367	553,372	92,898
December	4,031,854	3,721,597	34,485	10,129,846	541,465	100,805
Total	51,932,868	48,344,358	504,575	143,169,682	7,658,332	1,324,428
1933						
January	4,337,546	3,868,951	30,440	9,830,404	548,883	102,600
February	3,904,259	3,556,410	30,298	9,919,976	516,085	117,436
March	4,336,849	3,856,810	30,696	10,120,556	611,362	151,840
April	4,273,394	3,957,263	36,835	10,850,026	590,799	133,715
May	4,463,894	4,228,803	45,061	14,311,801	635,662	159,619
June	4,522,485	4,456,869	55,151	17,903,363	666,133	164,245
July	4,993,433	4,957,868	63,034	20,839,713	667,058	165,772
August	5,024,986	4,919,119	64,147	21,366,935	713,415	169,397
September	4,833,918	4,672,076	60,842	20,375,170	666,465	174,601
October	4,803,648	4,706,806	55,409	19,648,340	688,936	171,857
November	4,348,347	4,009,806	40,643	15,773,854	654,348	179,012
December	4,189,708	3,609,924	33,679	12,755,646	685,500	194,451
Total	54,072,467	50,800,705	546,235	183,695,784	7,644,646	1,884,545

AIRCRAFT APPROPRIATIONS, UNITED STATES

Fiscal Year		*Department Appropriations*	*Total*	*Increase or Decrease*	*Net*
1924–25	Army.....	$14,113,043.80		+$1,687,043.80	
	Navy	15,150,000		+502,826	
	Air Mail.....	2,750,000		+1,250,000	
	N.A.C.A.....	470,000	$32,483,043.80	+187,000	+$3,626,869.80
1925–26	Army.....	14,700,000(1)		+586,956.20	
	Navy	14,790,000(2)		−360,000	
	Air Mail.....	2,810,000(3)		−150,000	
	N.A.C.A.....	534,000	32,624,000	+64,000	+350,956.20
1926–27	Army.....	15,050,000†		+350,000	
	Navy	18,505,288		+3,715,288	
	Air Mail.....	2,650,000(3)		−160,000	
	N.A.C.A	513,000	36,718,288	−21,000	3,844,288
1927–28	Army.....	20,396,300		+5,346,300	
	Navy	20,100,000		+1,594,712	
	Air Mail.....	4,150,000		+1,500,000	
	N.A.C.A.....	513,000			
	Commerce.....	3,791,500	48,950,800	+3,791,500	+12,232,512
1928–29	Army.....	24,848,562(4)		+4,452,262	
	Navy	32,189,560(5)		+12,089,560	
	Air Mail.....	6,430,000		+2,280,000	
	N.A.C.A.....	600,000		+87,000	
	Commerce.....	4,361,850	68,429,972	+570,350	+19,479,172
1929–30	Army.....	34,690,785		+9,842,223	
	Navy	31,430,000(5)		−759,560	
	Air Mail.....	13,300,000		+6,870,000	
	N.A.C.A.....	1,292,200		+692,200	
	Commerce.....	6,416,620	87,129,605	+2,054,770	+18,699,633
1930–31	Army.....	35,823,473		+1,132,688	
	Navy	32,033,211		+603,211	
	Air Mail.....	21,600,000(6)		+8,300,000	
	N.A.C.A.....	1,321,000(7)		+29,000	
	Commerce.....	9,207,430(8)	99,985,114	+2,790,810	+12,855,498
1931–32	Army.....	31,479,635(9)		−4,343,838	
	Navy	31,145,000		−888,211	
	Air Mail.....	27,000,000(10)		+5,400,000	
	N.A.C.A.....	1,051,070(11)		−269,930	
	Commerce.....	10,362,300(12)	101,038,005	+1,154,870	+1,052,891

(1) Plus $2,150,000 "contract authorizations" for additional purchases of aircraft.
(2) Plus $4,100,000 "contract authorizations" for additional purchases of aircraft.
(3) For the contract Air Mail Service $500,000 was appropriated for 1926 and $2,000,000 was allowed for 1927.
(4) And contract authorization of $5,000,000.
(5) And contract authorization of $10,000,000.
(6) Includes $6,600,000 for Foreign Air Mail.
(7) Includes $15,000 for printing.
(8) Includes $7,944,000 for new and improved air navigation facilities.
(9) Not less than $15,296,231 to be spent for the purchase of new airplanes, equipment, spare parts, and accessories.
(10) Includes $7,000,000 for Foreign Air Mail.
(11) Includes $23,000 for printing.
(12) Includes $9,000,000 for new and improved air navigation facilities.
+ Shows amount of increase. − Shows amount of decrease.
† Plus $6,250,000 "contract authorization" for additional purchases of aircraft.

AIRCRAFT APPROPRIATIONS, UNITED STATES (Continued)

Fiscal Year	*Department Appropriations*	*Total*	*Increase or Decrease*	*Net*
1932–33 Army.....	$25,439,131		−$6,040,504	
Navy	25,245,420		−5,899,580	
Air Mail.....	26,460,000(13)		−540,000	
N.A.C.A.....	920,000		−131,070	
Commerce.....	8,553,500(14)	$86,618,051	−1,808,800	−$14,419,954
1933–34 Army.....	23,324,185(16)		−2,114,946	
Navy	21,957,459		−3,287,961	
Air Mail.....	21,000,000(13)		−5,460,000	
N.A.C.A.....	695,000		−225,000	
Commerce.....	7,660,780(15)	74,637,424	−892,720	−11,980,627
1934–35 *Army.....	21,450,253(17)		−1,873,932	
*Navy	18,643,320		−3,314,139	
*Air Mail.....	19,000,000(18)		−2,000,000	
*N.A.C.A.....	726,492(19)		+31,492	
*Commerce.....	5,205,332	65,025,397	−2,455,448	−9,612,027

(13) Includes $7,000,000 for Foreign Air Mail.
(14) Includes $1,000,000 for "Aircraft in Commerce".
(15) Only $5,172,500 of the $7,660,780 appropriated for the fiscal year 1934 was available. It was divided as follows: $700,000 for "Aircraft in Commerce" and $4,472,500 for "Air Navigation Facilities".
(16) Only $11,599,673 of the 23 million was available for the fiscal year 1934, the rest having been impounded. An additional sum of $7,500,000 was made available for the purchase of new airplanes through the P.W.A. (Public Works Administration) fund; plus $3,000,000 'contract authorization" for additional purchases prior to July 1, 1934.
(17) Plus $3,000,000 "contract authorization" for additional purchases of aircraft.
(18) Includes $7,000,000 for Foreign Air Mail.
(19) Includes $18,700 for printing.
— Shows amount of decrease. *Proposed expenditures.

MONTHLY PRODUCTION AND SALES STATISTICS

Military and Salable Commercial Aircraft

PRODUCTION

	1932				1933			
	Military		Commercial		Military		Commercial	
	Units	Value	Units	Value	Units	Value	Units	Value
January	75	$1,051,297	28	$109.001	50	$873,048	31	$109,366
February	90	1,325,713	40	172,557	55	1,309,931	26	85,533
March	43	690,264	67	352,359	44	828,618	36	258,232
April	35	579,386	98	451,648	40	787,212	51	893,843
May	25	555,299	57	181,631	42	1,037,623	60	953,090
June	47	1,013,628	36	141,078	45	1,083,394	73	1,004,950
July	49	831,518	43	120,957	51	932,569	80	1,046,013
August	50	925,150	39	152,055	25	498,021	70	866,398
September	56	1,299,900	34	128,034	32	802,300	51	406,759
October	44	699,719	40	164,822	30	426,423	50	241,380
November	39	706,961	38	242,758	19	365,237	34	195,439
December	40	710,481	29	120,999	33	840,267	29	119,897
Total	593	$10,389,316	549	$2,337,899	466	$9,784,643	591	$6,180,900

DELIVERIES

January	75	$1,051,297	44	$142,999	63	$971,948	41	$120,826
February	90	1,325,713	55	246,999	55	1,309,931	27	85,380
March	44	710,264	84	340,387	44	828,618	39	285,471
April	35	579,386	116	448,053	40	787,212	53	900,091
May	33	680,732	59	160,385	42	1,037,623	58	953,424
June	47	1,013,628	59	186,932	34	670,368	71	987,465
July	45	794,898	61	172,037	51	932,569	81	1,048,545
August	57	979,828	88	382,960	25	498,021	71	871,608
September	56	1,299,900	46	179,513	31	727,300	51	413,482
October	57	938,255	59	209,253	31	501,423	43	227,115
November	39	706,961	43	248,243	19	365,237	39	209,224
December	40	710,481	34	89,414	33	840,267	30	132,788
Total	618	$10,791,343	748	$2,807,775	468	$9,470,517	604	$6,235,419

* All values represent planes less motors.

REVIEW OF ANNUAL MILITARY AND COMMERCIAL PRODUCTION IN THE UNITED STATES

AIRPLANE PRODUCTION

Annual Totals

	Military		Commercial	
Year	Units	Value	Units	Value
1925	447(1)	$ 5,174,025(1)	268(1)	$ 1,499,634(1)
1926	532(1)	6,154,708(1)	604(1)	2,716,319(1)
1927	621(1)	7,528,383(1)	1,565	6,976,616
1928	1,219(1)	19,066,379(1)	3,542	17,194,298
1929	677	10,832,544	5,357	33,624,756
1930	747	10,723,720	1,937	10,746,042
1931	812	12,971,028	1,582	6,655,738
1932	593	10,389,316	549	2,337,899
1933	466	9,784,643	591	6,180,900

(1) Source: Derived from U. S. Census Reports.

AIRPLANE ENGINE PRODUCTION

Annual Totals

Year	Military Units	Military Value	Commercial Units	Commercial Value
1926	842(1)	$ 4,080,571(2)	*	*
1927	1,397(1)	6,550,533(3)	*	*
1928	2,620(2)	12,407,920(2)	632(2)	$ 979,600(2)
1929	1,861	8,600,530	5,317	17,895,300
1930	1,841	10,823,423	1,925	6,255,493
1931	1,800	10,417,718	1,976	4,148,131
1932	1,085	6,370,678	813	2,898,371
1933	860	4,986,181	1,120	4,724,441

(1) This total does not include an indeterminate number of Liberty and OX engines that were reconditioned and put into service.
(2) Department of Commerce.
(3) Derived from U. S. Census Reports.
* Liberty and OX war surplus used.

MONTHLY PRODUCTION AND SALES STATISTICS

Military and Commercial Aircraft Engines

PRODUCTION

	1932 Military Units	1932 Military Value	1932 Commercial Units	1932 Commercial Value	1933 Military Units	1933 Military Value	1933 Commercial Units	1933 Commercial Value
January	168	$1,018,000	48	$162,135	55	$314,710	68	$299,790
February	110	631,150	66	219,610	61	326,101	79	363,234
March	94	515,850	77	241,045	64	353,050	73	361,365
April	133	734,880	52	112,540	91	596,400	74	323,774
May	95	575,370	39	72,940	132	787,800	120	422,920
June	91	620,262	51	114,210	121	700,350	146	636,078
July	66	378,685	84	230,449	69	348,700	102	394,275
August	43	246,844	76	279,390	42	236,700	150	656,575
September	91	558,538	49	175,790	75	419,220	72	276,945
October	85	427,684	83	349,920	55	335,250	65	242,375
November	60	366,848	102	524,117	19	90,300	70	300,360
December	49	296,567	86	416,225	76	477,600	92	446,750
Total	1,085	$6,370,678	813	$2,898,371	860	$4,986,181	1,120	$4,724,441

DELIVERIES

January	134	$867,300	40	$124,940	55	$314,710	103	$459,450
February	126	710,250	51	118,210	67	358,301	81	368,734
March	112	603,100	107	376,200	65	359,050	83	386,135
April	120	666,480	62	115,095	91	596,400	67	282,769
May	90	541,370	42	93,110	132	787,700	109	312,810
June	100	615,962	52	122,075	121	700,350	138	595,473
July	75	425,285	108	288,149	69	348,700	138	524,125
August	45	260,444	99	329,255	42	236,700	105	459,535
September	93	588,538	54	176,725	75	419,220	101	363,060
October	86	434,307	68	260,995	55	335,250	62	236,150
November	60	366,848	84	357,262	19	90,300	74	287,385
December	49	296,567	85	416,860	76	447,600	74	348,940
Total	1,090	$6,376,451	852	$2,778,876	867	$5,024,281	1,135	$4,624,566

EXPORTS OF AIRCRAFT, ENGINES AND PARTS FROM THE UNITED STATES IN 1933

Source—U. S. Bureau of Foreign and Domestic Commerce

AIRPLANES, SEAPLANES AND AMPHIBIONS

Country of Destination	Full Year 1931 Units	Full Year 1931 Value	Full Year 1932 Units	Full Year 1932 Value	Full Year 1933 Units	Full Year 1933 Value
China	38	$ 644,170	16	$ 88,110	86	$1,456,580
Brazil	1	5,050	111	2,282,245	73	1,104,533
Colombia	4	59,700	9	191,500	30	656,593
Hong Kong	5	42,600	6	189,793	36	474,508
Argentina	6	51,199	9	67,210	38	417,962
Mexico	27	374,745	21	133,571	48	249,469
Peru	...	.....	9	176,816	16	188,475
Panama	4	37,000	...	.....	9	146,363
Bolivia	...	.....	15	344,501	7	133,000
Philippine Islands	6	26,472	2	61,657	6	74,603
Honduras	1	15,599	5	22,100	12	70,227
Japan	...	.....	1	20,400	6	61,350
El Salvador	...	.....	...	.....	3	59,641
Chile	1	58,602	...	.....	2	50,000
Hawaii	...	.....	...	.....	1	32,500
Union of South Africa	1	4,489	3	14,470	3	30,300
Greenland	...	.....	...	.....	1	30,000
United Kingdom	7	263,512	1	10,000	1	29,069
Portugal	...	.....	...	.....	5	21,600
Netherlands West Indies	...	.....	2	4,600	3	20,500
Dominican Republic	...	.....	...	.....	1	16,000
Ecuador	...	.....	3	31,201	1	15,200
Nicaragua	...	.....	...	.....	4	13,775
Guatemala	4	11,400	1	4,600	2	12,500
Netherlands	3	8,766	...	.....	2	12,040
Costa Rica	...	.....	...	.....	3	11,500
Canada	16	62,394	19	80,583	2	10,301
France	1	2,500	1	6,097	1	5,915
New Zealand	...	.....	5	5,839	1	5,883
Egypt	...	.....	1	2,500	2	5,400
Spain	4	32,575	2	10,800	1	4,204
Germany	1	1,600	3	55,000	1	4,000
Turkey	...	.....	26	432,459	...	.....
Belgium	...	.....	2	48,850	...	.....
Venezuela	...	.....	3	41,000	...	.....
Australia	1	25,000	1	20,000	...	.....
Palestine	...	.....	1	4,820	...	.....
Uruguay	...	.....	1	4,245	...	.....
Syria	...	.....	1	4,000	...	.....
Siam	2	42,750	...	.....	...	.....
Italy	1	21,000	...	.....	...	.....
Czechoslovakia	1	11,000	...	.....	...	.....
British India	3	7,369	...	.....	...	.....
Rumania	1	1,835	...	.....	...	.....
Greece	1	1,500	...	.....	...	.....
Total	140	$1,812,827	280	$4,358,967	407	$5,423,991

AIRCRAFT ENGINES

Country of Destination	Full Year 1931 Units	Full Year 1931 Value	Full Year 1932 Units	Full Year 1932 Value	Full Year 1933 Units	Full Year 1933 Value
Soviet Russia in Europe	45	$ 322,460	2,010	$ 261,334	2,576	$ 255,400
Netherlands	31	185,192	29	138,802	40	221,750
Germany	7	10,563	23	96,193	41	200,446
Poland and Danzig	10	48,098	...	.....	24	112,980
Siam	...	.....	...	.....	15	102,195
Colombia	3	14,805	12	64,855	20	94,139
China	38	100,120	5	4,195	13	70,084
Argentina	19	81,247	3	12,027	17	57,869
Bolivia	...	.....	4	10,900	9	57,688
Panama	28	110,815	14	28,540	20	37,800

Country of Destination	*Units*	*Value*	*Units*	*Value*	*Units*	*Value*
Trinidad and Tobago	7	24,393	14	49,820	12	31,182
Australia	...	.....	...	.....	9	31,102
Mexico	37	151,419	61	63,500	21	27,546
Sweden	7	38,372	15	98,386	4	25,200
Brazil	6	20,093	4	27,234	8	22,395
Finland	10	71,008	1	300	3	21,003
Peru	2	10,500	10	34,155	3	14,198
Italy	9	35,391	...	.....	2	12,988
Cuba	3	10,050	5	8,052	20	11,047
Philippine Islands	...	.....	36	55,003	3	10,070
United Kingdom	5	13,152	1	5,000	1	9,000
Canada	12	24,904	19	8,361	10	8,255
Hong Kong	6	35,400	4	17,600	2	3,000
Dominican Republic	...	.....	1	5,000	3	2,238
Honduras	1	1,107	3	4,541	6	2,519
Spain	...	.....	7	21,000	1	2,097
Japan	7	35,161	...	.....	2	1,800
Arabia	...	.....	...	.....	1	1,800
Guatemala	1	1,200	2	985	1	1,000
Costa Rica	...	.....	...	.....	1	1,000
Other British West Indies	...	.....	1	5,000	3	950
Union of South Africa	...	.....	...	.....	1	650
Hawaii	...	.....	...	.....	1	520
Nicaragua	1	7,500	...	.....	1	500
Mozambique	...	.....	...	.....	1	450
Belgium	1	3,556	41	357,792	...	.....
Turkey	1	4,753	12	72,400	...	.....
France	1	300	4	26,441	...	.....
Netherland India	...	.....	2	10,996	...	.....
Latvia	...	.....	5	10,400	...	.....
Chile	12	81,450	1	8,000	...	.....
Venezuela	...	.....	2	4,350	...	.....
Haiti	...	.....	2	3,034	...	.....
El Salvador	...	.....	1	1,500	...	.....
Portugal	...	.....	1	1,136	...	.....
Egypt	...	.....	1	850	...	.....
Java and Madura	4	23,141	...	.....	...	.....
Newfoundland and Labrador	1	3,500	...	.....	...	.....
British Honduras	1	3,375	...	.....	...	.....
Switzerland	1	1,278	...	.....	...	.....
New Zealand	1	482	...	.....	...	.....
Total	318	$1,474,785	2,356	$1,517,682	2,895	$1,452,861

AIRCRAFT PARTS AND ACCESSORIES (EXCEPT TIRES)

Country of Destination	*Full Year 1931 Value*	*Full Year 1932 Value*	*Full Year 1933 Value*
Brazil	$ 124,500	$ 286,489	$ 332,839
Japan	116,106	346,495	275,984
China	163,945	58,760	235,583
Argentina	48,413	191,850	201,606
Colombia	5,756	32,035	184,899
Peru	66,002	126,693	161,468
Germany	15,729	41,308	145,093
Soviet Russia in Europe	210,697	40,343	124,822
Netherlands	71,476	40,826	86,011
Bolivia	81	6,645	70,152
Netherland India	796	9,795	51,113
Panama	27,048	14,042	48,463
United Kingdom	60,852	41,556	46,792
Canada	292,712	89,019	45,532
Belgium	8,288	60,320	37,588
Poland and Danzig	5,612	.....	34,191
Rumania	341	5,215	24,726
Sweden	2,433	15,568	20,417
Mexico	60,244	31,563	19,865
Yugoslavia	37	17	15,171
Cuba	32,751	29,802	14,317
Hawaii	.....	.....	13,148
Australia	10,143	4,107	12,522

Country of Destination	Full Year 1931 Value	Full Year 1932 Value	Full Year 1933 Value
Turkey	899	72,674	11,498
France	7,725	21,567	11,037
Czechoslovakia	3,915	16,458	10,876
Philippine Islands	23,958	91,455	10,503
Chile	74,837	13,065	9,284
Italy	26,416	3,696	8,017
Guatemala	5,756	4,317	7,664
Honduras	463	6,611	7,442
Venezuela	655	10,723	6,748
Hong Kong	3,016	3,017	6,607
Siam	1,050	2,135	6,509
El Salvador	1,116	147	5,437
Norway	899	159	4,620
Finland	5,747	1,918	4,482
Dominican Republic	175	2,632	4,107
Kwantung	1,236	.....	3,965
Ecuador	118	107	3,771
Portugal	.....	3,128	3,704
Switzerland	3,388	1,629	2,669
Trinidad and Tobago	2,019	6,889	2,564
French Oceania	.....	.....	2,111
Puerto Rico	.....	.....	1,923
Haiti	240	777	1,392
Mozambique	.....	749	1,247
Bulgaria	.....	.....	1,140
Spain	540	7,772	1,137
New Zealand	706	193	1,043
Other British West Indies	1,580	848	982
Costa Rica	.....	74	892
Other Asia	.....	.....	826
Nicaragua	.....	854	606
Virgin Islands of U. S.	$.....	$ 100	$ 560
British East Africa	.....	62	510
Lithuania	.....	868	490
Jamaica	494	590	439
Union of South Africa	2,797	622	407
Egypt	230	1,059	236
Surinam	.....	986	198
French Guiana	.....	217	164
British Oceania	.....	358	149
Netherlands West Indies	.....	439	134
Denmark	175	431	100
Austria	.....	30	83
British Malaya	.....	450	75
British Guiana	96	1,343	71
Uruguay	.....	1,400	70
Greece	.....	53	65
Iraq	.....	.....	63
Syria	81	.....	50
British India	1,135	466	.....
French West Indies	.....	265	.....
Palestine	.....	262	.....
Barbados	64	165	.....
Newfoundland and Labrador	2,868	60	.....
Canary Islands	.....	56	.....
Algeria and Tunisia	.....	34	.....
Belgian Congo	.....	30	.....
Morocco	.....	15	.....
British Honduras	.....	11	.....
Albania	.....	7	.....
Java and Madura	21,378	.....	.....
Italian Africa	1,730	.....	.....
Latvia	140	.....	.....
Permuda	130	.....	.....
Azores and Madeira Islands	52	.....	.....
Hungary	29	.....	.....
Bulgaria	13	.....	.....
Total	$1,521,828	$1,756,421	$2,350,969

PRODUCTION AND DELIVERIES OF SALABLE AIRCRAFT IN THE UNITED STATES
COMMERCIAL AND MILITARY

Type	*Places*	*Production—1932*		*Deliveries—1932*		*Production—1933*		*Deliveries—1933*	
		Number	*Value**	*Number*	*Value**	*Number*	*Value**	*Number*	*Value**
Biplanes									
Open Cockpit	1	7	$65,735.00	10	$86,235.00	1	$2,000.00	1	$2,000.00
	2	74	231,707.00	141	334,047.00	76	316,807.00	85	330,852.00
	3	86	308,487.00	125	321,971.00	56	190,099.00	58	195,376.00
	Up	8	22,285.00	6	16,024.00	0	.....	0	.....
Sub-total	.....	175	$628,214.00	282	$758,277.00	133	$508,906.00	144	$528,228.00
Cabin Single Engine	All	52	243,270.00	50	232,954.00	87	363,790.00	90	374,585.00
Cabin Multi-Engine	All	0	.....	2	82,500.00	21	1,150,000.00	21	1,150,000.00
Total Biplanes	.....	227	$871,484.00	334	$1,073,731.00	241	$2,022,696.00	255	$2,052,813.00
Monoplanes									
Open Cockpit	1	16	15,003.00	11	11,152.00	2	1,750.00	3	2,500.00
	2	110	163,024.00	120	154,342.00	72	109,375.00	65	102,701.00
	3	0	.....	0	.....	0	.....	0	.....
	Up	0	.....	0	.....	0	.....	1	1,350.00
Sub-total	.....	126	$178,027.00	131	$165,494.00	74	$111,125.00	69	$106,611.00
Cabin Single Engine	1	0	.....	0	.....	0	.....	0	.....
	2	50	107,000.00	46	92,548.00	64	118,048.00	61	105,413.00
	3	3	6,490.00	46	49,720.00	0	.....	0	.....
	4	48	136,510.00	66	144,510.00	96	234,525.00	101	240,270.00
	5	0	.....	2	4,200.00	8	130,800.00	9	143,550.00
	6	11	144,160.00	25	178,565.00	10	110,100.00	11	123,700.00
	7	3	9,000.00	4	24,000.00	1	12,050.00	1	12,050.00
	8 and Up	20	360,159.00	23	395,862.00	2	45,000.00	2	45,000.00
Sub-total	.....	135	$763,319.00	212	$889,405.00	181	$657,423.00	185	$670,883.00
Cabin Multi-Engine	All	8	178,152.00	8	107,749.00	69	3,181,787.00	71	3,211,193.00
Total Monoplanes	.....	269	$1,119,498.00	351	$1,222,648.00	324	$3,050,335.00	325	$3,088,687.00
Seaplanes	All	2	19,100.00	2	19,100.00	2	4,314.00	1	1,314.00
Amphibions	All	12	97,307.00	27	292,450.00	13	139,755.00	13	139,755.00
Autogiros	.....	39	230,510.00	34	190,840.00	11	63,800.00	10	52,850.00

Sub-total	.....	53	$346,917.00	63	$511,396.00	26	$207,869.00	24	$103,010.00
Commercial Total	.....	549	$2,337,899.00	748	$2,807,775.00	591	$6,180,900.00	604	$6,235,410.00
Military Total	.....	593	$10,389,316.00	618	$10,791,343.00	466	$9,784,043.00	468	$9,470,517.00
Grand Total	.....	1,142	$12,727,215.00	1,366	$13,590,118.00	1,057	$15,965,543.00	1,072	$15,705,930.00

*Values represent planes less engines.

PRODUCTION AND DELIVERIES OF COMMERCIAL AND MILITARY AIRPLANE ENGINES IN THE UNITED STATES

H. P.	*1932 Production*		*1932 Deliveries*		*1933 Production*		*1933 Deliveries*	
	Units	*Value*	*Units*	*Value*	*Units*	*Value*	*Units*	*Value*
Under 75	97	$56,410	121	$67,500	67	$43,958	73	$46,038
76–125	58	66,910	88	103,515	102	124,230	99	119,040
126–175	32	59,970	49	82,375	30	56,695	44	83,395
176–225	84	183,160	92	204,700	152	364,135	183	433,070
226–300	123	321,120	114	292,085	95	255,705	104	286,405
301–400	42	182,200	46	197,200	36	145,330	28	112,130
401–500	119	570,700	121	581,500	67	325,788	64	307,788
501–600	228	1,281,700	187	1,043,700	232	1,224,500	249	1,337,700
601–Up	30	176,111	34	206,211	339	2,184,100	291	1,807,800
Commercial Totals	813	$2,808,371	852	$2,778,876	1,120	$4,724,441	1,135	$4,624,566
MILITARY:								
126–175	0	.....	0	.....	0	.....	0	.....
176–225	31	$66,450	32	$69,050	13	$27,234	13	$27,234
226–300	59	196,550	50	196,550	9	27,000	9	27,000
301–400	69	282,850	68	279,100	30	120,000	30	120,000
401–500	114	546,800	114	546,600	181	812,217	181	812,217
501–600	516	2,891,968	522	2,933,591	153	745,400	160	782,500
601–Up	296	2,386,060	295	2,351,560	474	3,254,330	474	3,255,330
Military Totals	1,085	$6,370,678	1,090	$6,376,451	860	$4,986,181	867	$5,024,281
Grand Total	1,898	$9,269,049	1,942	$9,155,327	1,980	$9,710,622	2,002	$9,648,847

DOMESTIC AIR MAIL OPERATIONS BY ROUTES CALENDAR YEAR 1933

A.M. No.	Contractor	Route	Length of Route†	Miles Scheduled	Miles Actually Flown	Pounds of Mail Dispatched	Amount Paid Carriers
1	American Airways	Boston–New York	201	335,849	270,881	89,350	$106,118.85
2	American Airways	Chicago–Memphis	548	611,226	563,413	61,299	225,064.19
20	American Airways	New York-Cleveland-Ft. Worth	1,911	2,885,881	2,628,846	394,165	1,173,175.89
21	American Airways	Ft. Worth–Galveston	300	236,088	224,983	29,239	102,594.14
22	American Airways	Dallas–Brownsville	551	402,751	392,072	85,426	172,902.46
23	American Airways	Atlanta–New Orleans	429	313,716	307,588	64,025	144,586.93
24	American Airways	Chicago–Cincinnati	271	428,882	390,638	66,143	139,236.60
27	American Airways	Buffalo–Chicago	736	1,493,698	1,303,347	132,524	532,667.28
29	American Airways	New Orleans–Houston	337	235,900	234,497	33,852	100,540.87
30*	American Airways	Chicago–Atlanta	802	1,156,119	1,006,757	161,008	456,364.77
33*	American Airways	Atlanta–Ft. Worth–Los Angeles	2,486	3,063,428	2,992,493	345,684	1,388,135.83
Total	American Airways	All American Airways Routes	8,572	11,163,538	10,375,515	1,462,715	4,550,387.81
19	Eastern Air Transport, Inc.	New York–Atlanta–Miami	2,118	3,718,869	3,580,848	793,516	1,518,505.57
9*	Kohler Aviation Corp.	Milwaukee–Detroit	257	298,218	269,187	14,250	93,559.71
26	National Parks Airways	Great Falls–Salt Lake City	517	737,916	723,843	53,491	283,956.56
9*	Northwest Airways	Chicago–St. Paul–Billings	1,363	1,700,081	1,622,603	228,630	738,383.26
11	Pennsylvania Air Lines	Washington–Cleveland	321	950,247	802,757	105,149	312,031.06
34	Transcontinental & Western Air	New York–Kansas City–Los Angeles–San Francisco	3,960	6,511,564	6,180,378	1,114,496	2,743,991.03
3	United Air Lines	Chicago–Dallas	1,031	1,815,734	1,721,742	363,021	781,838.58
5	United Air Lines	Salt Lake City–Portland	875	1,242,887	1,202,654	229,328	555,380.27
8	United Air Lines	Seattle–San Diego	1,243	1,892,902	1,824,918	389,401	828,285.66
17	United Air Lines	New York–Chicago	724	2,795,033	2,537,242	1,062,737	897,672.82
18	United Air Lines	Chicago–Salt Lake City– San Francisco	2,255	5,075,457	4,878,906	1,109,525	2,108,097.99
30*	United Air Lines	Omaha–Kansas City	165	108,648	107,012	20,862	51,884.15
Total	United Air Lines	All United Air Lines Routes	6,293	12,030,661	12,272,474	3,174,874	5,313,159.47

30*	U. S. Airways	Kansas City–Denver	560	401,024	394,231	18,326	132,873.37
4	Western Air Express	Salt Lake City–San Diego	778	1,045,087	1,024,877	191,502	512,728.09
12	Western Air Express	Cheyenne–Albuquerque	509	560,846	547,864	107,298	226,905.81
33*(1)	Western Air Express	Albuquerque–El Paso	222 (1)	109,890 (1)	107,892 (1)	7,033 (1)	41,760.00 (1)
Total	Western Air Express	All Western Air Express Routes	1,509	1,724,823	1,680,633	306,733	781,303.90
GRAND TOTAL			25,470†	40,136,941	37,902,469	7,362,180	$16,468,242.04

* Representing a portion of an entire route.

† Route mileages as of December 1933. These route mileages vary each month; the highest being 28,040 miles in April and May, 1933; the lowest being December.

(1) Discontinued September 4, 1933.

POSTAGE RATES

U. S. Air Mail to Foreign Countries

RATES (postage plus fee for air mail service) for each half ounce or fraction for air dispatch to North, Central and South America and the West Indies, are as follows:

	Each Half Ounce
Argentina	$ .55
Bahamas	.10
Barbados	.20
Bolivia (by ordinary means from Arequipa, Peru)	.40
Brazil	.50
Canada—same as the United States, see footnote	
Canal Zone	.20
Chile	.50
Colombia	.35
Costa Rica	.20
Cuba	.10
Dominican Republic	.10
Dutch West Indies	
Curacao, Bonaire, Aruba	.30
St. Martins, St. Eustatius, Saba	.20
Ecuador	.30
Guadeloupe (including Desirade, Les Saintes, Marie Galante, Petite Terre, St. Bartholomew (Barthelemy) and the French part of St. Martins)	.20
Guatemala	.15
Guianas (British, Dutch, French)	.30
Haiti	.10
Honduras (British)	.15
Honduras (Republic)	.15
Jamaica	.10
Leeward Islands:	
Anguilla, Antigua, Barbuda, Dominica, Montserrat, Nevis, Redonda, St. Christopher (St. Kitts)	.20
British Virgin Islands	.10
Martinique	.20
Mexico	.10
Nicaragua	.15
Panama Republic	.20
Paraguay (by ordinary means from Buenos Aires, Argentina)	.55
Peru	.40
Puerto Rico	.10
Salvador, El	.15
Trinidad	.20
Uruguay	.55
Venezuela (by air to Maracaibo, La Guaira, Caripito)	.30
Venezuela (including dispatch by Venezuelan air mail service from Maracaibo or La Guaira)	.45
Virgin Islands (U. S.)	.10
Windward Islands (Grenada, Grenadines, St. Lucia and St. Vincent)	.20

U. S. DOMESTIC AIR MAIL POSTAGE RATE—8 cents for the first ounce; 13 cents for each additional ounce.

The above rates include dispatch by the United States domestic air routes, where available, as well as by the international routes. The rates to Canada, Colombia, Cuba and Mexico, provide also for dispatch by the domestic air routes of those countries, where available.

STRENGTH OF NAVAL AVIATION

Fiscal years 1923-1933

Officers Attached to Aviation

	June 30, 1923	*June 30, 1924*	*June 30, 1925*	*June 30, 1926*	*June 30, 1927*	*June 30, 1928*	*June 30, 1929*	*June 30, 1930*	*June 30, 1931*	*June 30, 1932*	*June 30, 1933*
Naval aviators	326	328	382	426	472	466	520	614	737	803	826
Student naval aviators	33	47	35	71	28	73	116	184	149	84	45
Line, ground	91	42	17	14	12	24	54*	69	254	230	444
Staff, ground	134	101	99	129	138	128	101*	98	120	111	
Naval observers	6	5	5	11	12	11	11	9	5	7	6
Student naval observers	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....
Officers having flight orders	10	13	16	19	15	33	41	45	48	48	2
Total	600	536	554	670	677	737	843	1,019	1,313	1,283	1,323

* Approximate figures.

Enlisted Men on Duty

	June 30, 1923	*June 30, 1924*	*June 30, 1925*	*June 30, 1926*	*June 30, 1927*	*June 30, 1928*	*June 30, 1929*	*June 30, 1930*	*June 30, 1931*	*June 30, 1932*	*June 30, 1933*
Aviation ratings	1,612	1,788	1,711	1,722	2,092	2,785	3,067	2,895	3,136	3,313	1,033
General service ratings	2,104	1,814	1,597	2,155	2,333	8,636	8,575	7,874	9,503	9,045	10,053
Total	3,716	3,602	3,308	3,877	4,425	11,421	11,642	10,769	12,639	12,358	12,286

Marine Corps Aviation

Fiscal Year	*1931*			*1932*			*1933*		
	Officers	*Enlisted Men*	*Total*	*Officers*	*Enlisted Men*	*Total*	*Officers*	*Enlisted Men*	*Total*
Pilots	98	33	131	101	32	133	103	30	133
Student pilots	10	0	10	12	0	12	0	7	7
Flight orders	7	157	164	7	157	164	5	155	160
Non-flyers	8	842	850	10	760	770	10	758	768
Total	123	1,032	1,155	130	949	1,079	118	950	1,068

COMPARATIVE TABULATIONS OF ACCIDENTS—CIVIL AERONAUTICS FOR THE YEARS, 1930, 1931, 1932 AND THE FIRST SIX MONTHS OF 1933

(Compiled by Aeronautics Branch, Department of Commerce)

Mileage Flown Per Accident

	*January–June 1930**	*July–December 1930*	*January–June 1931**	*July–December 1931*	*January–June 1932**	*July–December 1932*	*January–June 1933**
Miles flown in scheduled transport operations	16,902,728	20,042,475	20,190,925	27,195,062	24,668,414	26,264,553	25,862,120
Miles flown in miscellaneous operations including student instruction and experimental flying	51,767,200	56,502,560	43,282,595	51,060,520	33,722,685	44,456,015	32,748,485
Total	68,669,928	76,545,035	63,473,520	78,255,582	58,391,099	70,720,568	58,610,605
Accidents, all services	961	1,163	1,054	1,277	914	1,152	813
Miles flown per accident, all services	71,457	65,817	60,222	61,281	63,885	61,389	72,091
Accidents, scheduled transport operations	44	47	61	65	67	48	48
Miles flown per accident, scheduled transport operations	384,152	426,436	330,999	418,386	368,185	547,178	538,794
Accidents, miscellaneous operations	917	1,116	993	1,212	847	1,104	765
Miles flown per accident, miscellaneous operations	56,453	50,630	43,676	42,129	39,814	40,268	42,808
Fatal accidents, all services†	148	162	114	153	105	119	85
Miles flown per fatal accident in all services	463,986	472,500	556,785	511,474	556,100	594,290	689,536
Fatal accidents, scheduled transport operations†	6	3	5	9	11	6	5
Miles flown per fatal accident, scheduled operations	2,817,121	6,680,825	4,038,185	3,021,674	2,242,583	4,377,425	5,172,424
Fatal accidents, miscellaneous operations†	142	159	109	144	94	113	80
Miles flown per fatal accident, miscellaneous operations	364,558	355,362	397,088	354,587	358,752	393,416	409,356
Pilot fatalities, all services	119	133	95	125	82	99	72
Miles flown per pilot fatality, all services	577,058	575,527	668,142	626,045	712,086	714,349	814,036
Pilot fatalities, scheduled transport operations	5	3	5	6	10	5	4
Miles flown per pilot fatality, scheduled transport operations	3,380,585	6,680,825	4,038,185	4,532,510	2,466,841	5,252,911	6,465,530
Pilot fatalities, miscellaneous operations	114	130	90	119	72	94	68
Miles flown per pilot fatality, miscellaneous operations	454,098	434,635	480,918	429,080	468,371	472,936	481,595

*It should be borne in mind that weather conditions during the last 6 months of the calendar year are more favorable for flying than during the first 6 months, hence, in making comparisons, figures for corresponding periods should be used in each case.

†A fatal aircraft accident is one in which 1 or more persons (passenger, pilot, or crew) were killed or fatally injured.

Causes of Accidents
Scheduled Air Transport Operations

Causes	Percentages						
	January-June, 1930	*July-December 1930*	*January-June, 1931*	*July-December 1931*	*January-June, 1932*	*July-December, 1932*	*January-June, 1933*
Number of accidents involved....	44	47	61	65	67	48	48
PERSONNEL:							
Pilot:							
Error of judgment.....	12.27	3.19	8.85	6.15	3.73	5.85	1.04
Poor technique.....	8.18	5.21	3.44	4.92	3.88	1.06	3.12
Disobedience of orders.....	0	0	2.29	0	.37	0	0
Carelessness or negligence...	7.84	2.13	6.15	6.15	2.98	6.38	7.29
Miscellaneous.....	1.14	2.13	0	0	0	0	2.08
Total pilot errors.....	29.43	12.66	20.73	17.22	10.96	13.29	13.53
Other personnel:							
Supervisory.....	2.27	.53	1.14	1.15	0	2.66	0
Miscellaneous.....	0	2.13	3.28	0	0	0	2.08
Total personnel errors.....	31.70	15.32	25.15	18.37	10.96	15.95	15.61
MATERIAL:							
Power Plant:							
Fuel system.....	0	1.60	3.85	3.85	6.71	6.39	7.30
Cooling system.....	0	0	0	0	0	0	0
Ignition system.....	1.70	0	1.64	.77	1.49	0	0
Lubrication system.....	0	1.06	0	1.54	0	0	0
Engine structure.....	11.37	11.17	3.28	1.54	7.47	6.38	2.08
Propellers and accessories....	0	2.13	4.92	3.08	2.99	6.38	4.17
Engine-control system.....	0	0	0	0	1.49	0	2.08
Miscellaneous.....	0	0	1.64	5.39	.75	2.13	0
Undetermined.....	2.27	6.38	1.64	3.08	1.49	2.13	6.25
Total power-plant failures..	15.34	22.34	16.97	19.25	22.39	23.41	21.88
Structural:							
Flight-control system.....	0	0	0	1.54	0	1.06	0
Movable surfaces.....	0	0	0	0	0	0	0
Stabilizing surfaces.....	0	0	0	1.54	0	0	0
Wings, struts, and bracings..	0	0	.57	1.54	0	0	0
Undercarriage.....	2.27	7.45	8.20	12.30	7.47	10.64	4.17
Wheels, tires and brakes.....	1.70	4.79	3.69	1.54	5.82	4.26	4.17
Pontoons or boats.....	0	0	0	0	0	0	0
Fuselage, engine mountings and fittings.....	0	0	0	1.54	0	0	0
Tail-skid assembly.....	0	0	0	0	0	3.19	2.18
Miscellaneous.....	0	0	0	0	0	0	0
Undetermined.....	0	0	0	0	0	4.26	0
Total structural failures....	3.97	12.24	12.46	20.00	13.29	23.41	10.42
Handling qualities.....	2.05	2.66	10.65	0	5.97	1.06	2.08
Instruments.....	0	0	0	0	0	0	0
Total airplane failures.....	6.02	14.90	23.11	20.00	19.26	24.47	12.50
MISCELLANEOUS:							
Weather.....	27.16	32.02	21.73	26.00	31.72	25.53	27.09
Darkness.....	.68	.53	0	0	2.24	0	0
Airport and terrain.....	13.98	11.70	10.33	14.84	13.43	6.38	14.59
Other.....	0	3.19	.25	0	0	2.13	8.33
Total miscellaneous causes..	41.82	47.44	32.31	40.84	47.39	34.04	50.01
Undetermined and doubtful.....	5.12	0	2.46	1.54	0	2.13	0
Total percentages.....	100	100	100	100	100	100	100

Causes of Accidents
Non-Scheduled Air Transport Operations

Causes	Percentages						
	January-June, 1930	*July-December, 1930*	*January-June, 1931*	*July-December, 1931*	*January-June, 1932*	*July-December, 1932*	*January-June, 1933*
Number of accidents involved	917	1,116	991	1,212	847	1,104	765
PERSONNEL:							
Pilot:							
Error of judgment	11.17	7.17	9.23	8.04	7.19	6.85	7.00
Poor technique	36.85	38.75	32.98	37.95	35.85	34.25	36.62
Disobedience of orders	2.11	1.77	3.53	2.15	1.64	1.82	1.01
Carelessness or negligence	6.07	5.11	6.26	7.24	7.08	8.75	6.01
Miscellaneous	.52	.20	.55	.27	.12	.18	.36
Total pilot errors	56.72	53.00	52.55	55.65	51.88	51.85	51.00
Other personnel:							
Supervisory	.36	0	.05	.04	0	0	0
Miscellaneous	.85	.33	.86	.06	.74	.32	.39
Total personnel errors	57.93	53.33	53.46	55.75	52.62	52.17	51.39
MATERIAL:							
Power Plant:							
Fuel system	2.88	3.87	4.20	2.87	6.27	6.69	7.90
Cooling system	.54	.23	.84	.17	.55	.14	.59
Ignition system	1.24	1.70	1.79	2.11	2.08	1.83	1.37
Lubrication system	.13	.43	.62	.64	.32	.34	.23
Engine structure	8.49	9.42	3.15	2.80	3.89	2.83	4.09
Propellers and accessories	.23	.07	.60	.25	.12	.59	.52
Engine-control system	.28	.40	.18	.58	.12	.41	.52
Miscellaneous	.41	.67	3.18	4.94	.79	.61	0
Undetermined	.84	1.79	4.81	4.31	2.25	3.77	4.67
Total power-plant failures	15.04	18.58	19.37	18.67	16.39	17.21	19.89
Structural:							
Flight-control system	.53	.72	1.01	.58	.46	.29	.66
Movable surfaces	.11	.02	.25	.12	.03	.36	.13
Stabilizing surfaces	.22	.09	.25	.17	.25	0	0
Wings, struts, and bracings	1.11	.85	1.65	1.07	1.26	.63	1.11
Undercarriage	2.83	4.38	4.06	5.22	4.69	4.86	4.74
Wheels, tires and brakes	1.31	2.76	1.38	1.90	2.27	1.63	.92
Pontoons or boats	.05	.09	0	.17	0	0	0
Fuselage, engine mountings and fittings	.35	.18	.50	.04	.24	.45	.26
Tail-skid assembly	.16	.04	.10	.17	.27	.27	0
Miscellaneous	.33	0	.30	.25	.53	1.65	.26
Undetermined	.27	.13	.23	.33	0	.18	0
Total structural failures	7.27	9.26	9.73	10.02	10.00	10.32	8.08
Handling qualities	1.99	1.96	2.02	2.05	2.73	2.17	2.35
Instruments	0	.07	0	0	0	.09	0
Total airplane failures	9.26	11.29	11.75	12.07	12.73	12.58	10.43
MISCELLANEOUS:							
Weather	5.38	3.90	3.81	3.29	7.64	5.85	7.69
Darkness	.06	.65	.25	.21	.53	.41	.02
Airport and terrain	9.63	9.01	9.96	8.21	8.64	8.56	7.54
Other	1.46	1.72	.75	1.28	.62	1.63	2.39
Total miscellaneous causes	16.53	15.28	14.77	12.99	17.43	16.45	17.64
Undetermined and doubtful	1.24	1.52	.65	.52	.83	1.59	.65
Total percentages	100	100	100	100	100	100	100

INJURIES CLASSIFIED

January to June, 1933, Inclusive

Kind of Flying	Total Persons Involved	Pilots					Co-Pilots or Students				
		Fatal	Severe	Minor	No Injury	Total	Fatal	Severe	Minor	No Injury	Total
Schedule.....	152	4	1	7	36	48	0	1	0	5	6
Student instruction...	223	14	5	17	122	158	5	6	6	5	22
Experimental.	45	5	4	7	19	35	0	0	0	0	0
Commercial .	236	11	7	9	91	118	1	0	0	1	2
Pleasure.....	806	38	29	48	341	456	0	0	0	1	1
Total....	1462	72	46	88	609	815	6	7	6	12	31

Kind of Flying	Total Persons Involved	Passengers					Aircraft Crew				
		Fatal	Severe	Minor	No Injury	Total	Fatal	Severe	Minor	No Injury	Total
Schedule.....	152	2	2	13	80	97	0	0	0	1	1
Student instruction...	223	0	2	3	38	43	0	0	0	0	0
Experimental.	45	3	0	2	4	9	1	0	0	0	1
Commercial .	236	11	10	9	83	113	1	1	0	1	3
Pleasure.....	806	38	26	32	253	349	0	0	0	0	0
Total....	1462	54	40	59	458	611	2	1	0	2	5

AERONAUTICAL PURCHASES BY MILITARY SERVICES FISCAL YEAR 1933

The following is a compilation of major purchases and deliveries of aircraft and engines by the United States Army and Navy aviation services during the fiscal year 1933, prepared with the aid of the Army Air Corps and the Bureau of Aeronautics of the Navy Department.

ARMY AIR CORPS AERONAUTICAL CONTRACTS

Contract No.	Contractor	Article
W 535 ac-5446	Douglas Aircraft Co., Inc., Santa Monica, Calif.	15 O-38E Airplanes
W 535 ac-5450	Douglas Aircraft Co., Inc., Santa Monica, Calif.	1 YO-44 Airplane.
W 535 ac-5609	Bellanca Aircraft Corp., New Castle, Delaware	10 C-27A Airplanes
W 535 ac-5642	Boeing Airplane Company, Seattle, Washington	136 P-26A Airplanes
W 535 ac-5649	The Glenn L. Martin Co., Baltimore, Maryland	1 XB-10 (XB-907A) Airplane
W 535 ac-5665	The Glenn L. Martin Co., Baltimore, Maryland	33 YB-12 Airplanes 15 YB-10 Airplanes
W 535 ac-5711	Curtiss Aeroplane & Motor Co., Inc., Buffalo, N. Y.	1 XP-31 Airplane
W 535 ac-5732	Consolidated Aircraft Corp., Buffalo, New York	4 P-30 Airplanes 4 A-11 Airplanes
W 535 ac-5733	Curtiss Aeroplane & Motor Co., Inc., Buffalo, N. Y.	46 A-12 Airplanes
W 535 ac-5743	Douglas Aircraft Co., Inc., Santa Monica, Calif.	24 O-43A Airplanes
W 535 ac-5745	Douglas Aircraft Co., Inc., Santa Monica, Calif.	4 C-26B Airplanes 2 C-29 Airplanes
W 535 ac-5774	Douglas Aircraft Co., Inc., Santa Monica, Calif.	8 O-38F Airplanes
W 535 ac-5927	Curtiss-Wright Airplane Co., Robertson, Missouri	2 YC-30 Condor Airplanes
W 535 ac-5428	Douglas Aircraft Co., Inc., Santa Monica, Calif.	1 O-38S Airplane
	Total.....	307

Engines and Spares

Type	*Number*	*Contractor*
R-1340-27	121	Pratt & Whitney Aircraft Co.
R-1340-29	4	Pratt & Whitney Aircraft Co.
R-1690-13	8	Pratt & Whitney Aircraft Co.
YR-985-9	8	Pratt & Whitney Aircraft Co.
YR-1690-11	66	Pratt & Whitney Aircraft Co.
YR-1860-19	10	Pratt & Whitney Aircraft Co.
R-1820-17	30	Wright Aeronautical Corp.
YR-1820-21	46	Wright Aeronautical Corp.
V-1570-57	32	Wright Aeronautical Corp.
Cyclone	2	Wright Aeronautical Corp.

AIRPLANES DELIVERED TO ARMY AIR CORPS

Quan.	*Type*	*Contractor*
15	O-38E	Douglas Aircraft Company, Inc., Santa Monica, Calif.
1	XB-10 (XB-907A)	The Glenn L. Martin Co., Baltimore, Maryland.
1	XP-31	Curtiss Aeroplane & Motor Company, Inc., Buffalo, N. Y.
8	O-38F	Douglas Aircraft Company, Inc., Santa Monica, Calif.
2	YC-30 (Condor)	Curtiss Wright Airplane Co., Robertson, Mo.
1	O-38S	Douglas Aircraft Company, Inc., Santa Monica, Calif.
28		

NAVY PURCHASES OF AERONAUTICAL EQUIPMENT FISCAL YEAR 1933

Airplanes

Type	*Make*	*Quantity*
F4B-4	Boeing Fighters with R-1340-16 engines	38
F11C-2	Curtiss Fighters with R-1820-78 engines	27
XF11C-3	Curtiss Fighter with R-1820-80 engine	1
XF13C-1	Curtiss Fighter with R-1510-92 engine	1
XF9C-2	Curtiss Fighter with R-975-22 engine	1
XF2F-1	Grumman Fighter with R-1535-44 engine	1
FF-1	Grumman Fighters with R-1820-78 engines	27
XF7B-1	Boeing Fighter with R-1340-30 engine	1
XFT-1	Northrop Fighter with R-1510-92 engine	1
XO5U-1	Vought Observation with R-1340-12 engine	1
XO2D-1	Douglas Observation with R-1340-12 engine	1
XO3C-1	Curtiss Observation with R-1340-12 engine	1
OJ-2	B/J Observation with R-985-38 engines	9
XSU-4	Vought Scout with R-1690-50 engine	1
SU-2	Vought Scouts with R-1690-40 engines	20
XP3Y-1	Consolidated Long Range Patrol with 2 R-1830-54 engines	1
XP3D-1	Douglas Long Range Patrol with 2 R-1830-54 engines	1
	Note: These airplanes are under option and may not be purchased.	
JF-1	Grumman Utilities with R-1860-62 engines	22
RE-3	Bellanca Transport with R-1340-96 engine	1
RD-2	Douglas Amphibian Transport with R-1340-96 engine	1
Gliders	2 Franklin Glider Corporation	2
	Total	159

Engines

Type	*Make*	*Quantity*
R-760-98	Wright Aeronautical Corporation	3
R-975-22	Wright Aeronautical Corporation	6
R-1510-30	Wright Aeronautical Corporation	1
R-1510-94	Wright Aeronautical Corporation	1
R-1510-98	Wright Aeronautical Corporation	2
R-1820-78	Wright Aeronautical Corporation	96
R-1820-88	Wright Aeronautical Corporation	3
*R-975-22	Curtiss	1
R-985-38	Pratt and Whitney	14
R-1340-12	Pratt and Whitney	36
R-1340-16	Pratt and Whitney	57
SR-1340-28	Pratt and Whitney	2
SR-1340-30	Pratt and Whitney	3
R-1535-44	Pratt and Whitney	1
R-1535-64	Pratt and Whitney	3
R-1690-40	Pratt and Whitney	12
R-1690-42	Pratt and Whitney	30
R-1690-46	Pratt and Whitney	1
R-1830-54	Pratt and Whitney	1
*Menasco	Grover Loening Corporation	1
VG-1710	Allison	3
*R-1690-50	Vought	1
†VL-2	Maybach	9
	Total	290

* These engines furnished with XSL-2, XF9C-2 and SU-2 (modified to SU-4) airplanes, respectively.

† Eight of these engines furnished with U. S. S. MACON.

AIRPLANES DELIVERED TO U. S. NAVY

Type	*Make*	*Quantity Delivered*
CF9C-2	Curtiss Airship Fighter	1
F9C-2	Curtiss Airship Fighter	6
XF11C-1	Curtiss Fighter	1
XF11C-2	Curtiss Fighter	1
F11C-2	Curtiss Fighter	27
XF11C-3	Curtiss Fighter	1
XF6B-1	Boeing Fighter	1
F4B-4	Boeing Fighter	92
FF-1	Grumman Fighter	7
XFA-1	General Aviation Mfg. Corp. Fighter	1
O3U-3	Vought Observation	32
OJ-2	E/J Observation	18
SU-2	Vought Scout	44
SU-3	Vought Scout	20
XSU-4 (SU-2 modified)	Vought Scout	1
XSF-1	Grumman Scout	1
XS2C-1	Curtiss Scout	1
XS2L-1	Loening Scout	1
XBM-1	Martin Dive Bomber	1
BM-1	Martin Dive Bomber	7
BM-2	Martin Dive Bomber	16
XBY-1	Consolidated Dive Bomber	1
PH-1	Hall Twin Engine Patrol	1
XP2H-1	Hall Three Engine Patrol	1
P2D-1	Douglas Twin Engine Patrol	1
XP2Y-1	Consolidated Twin Engine Patrol	1
P2Y-1	Consolidated Twin Engine Patrol	22
RE-3	Bellanca Transport	1
RD-2	Douglas Amphibion Transport	3
XJF-1	Grumman Utility	1
Gliders	Franklin	2
	Total	313

AIRCRAFT ENGINES DELIVERED TO U. S. NAVY

Type	*Make*	*Quantity Delivered*
R-1340-12	Pratt and Whitney	117
R-1340-8	Pratt and Whitney	18
R-1340-16	Pratt and Whitney	57
R-985-38	Pratt and Whitney	17
R-1690-40	Pratt and Whitney	87
R-1690-44	Pratt and Whitney	4
R-1535-44	Pratt and Whitney	5
R-1535-64	Pratt and Whitney	3
R-1535-62	Pratt and Whitney	2
R-975-22	Wright Aeronautical Corporation	7
R-1820-80	Wright Aeronautical Corporation	1
R-1820-78	Wright Aeronautical Corporation	99
R-1820-88	Wright Aeronautical Corporation	3
R-1820-86	Wright Aeronautical Corporation	12
R-1510-26	Wright Aeronautical Corporation	5
R-1510-92	Wright Aeronautical Corporation	5
R-760-98	Wright Aeronautical Corporation	3
R-790-4	Continental Aircraft Engine Co.	1
VL-2	Maybach Motor Co.	9
	Total	455

TREND OF AIRCRAFT ACCIDENT RATES

In the U. S. Army Air Corps

Fiscal Years	*Aircraft Hours*	*Fatal accidents*	*Rate per 1000 hrs.*	*Hours per fatal accidents*	*All accidents*	*Rate per 1000 hrs.*	*Hrs. per accident*	*Ratio accidents to fatal accidents*
1922	65,214	24	.368	2,714	330	5.06	198	1 to 13.8
1923	65,750	33	.502	1,992	283	4.31	232	1 to 8.6
1924	97,834	23	.235	4,250	275	2.81	356	1 to 12.0
1925	150,319	29	.193	5,180	311	2.07	483	1 to 10.7
1926	158,402	27	.171	5,865	334	2.11	474	1 to 12.4
1927	140,402	28	.199	5,030	227	1.61	620	1 to 8.1
1928	182,903	25	.137	7,320	249	1.36	734	1 to 10.0
1929	263,381	42	.230	4,355	390	1.48	675	1 to 9.3
1930	325,224	37	.114	8,785	468	1.44	695	1 to 12.6
1931	396,961	21	.053	18,900	456	1.15	870	1 to 21.7
1932	371,254	33	.086	11,061	423	1.14	877	1 to 12.8
1933	432,966	28	.064	15,463	442	1.02	979	1 to 15.8

AIRPLANE AND PILOT LICENSES JANUARY 1, 1934

Classified by States

AERONAUTICS BRANCH, U. S. DEPARTMENT OF COMMERCE

STATE	AIRCRAFT			PILOTS					
	Licensed	*Unlicensed*	*Total*	*Transport*	*Ltd. Com.*	*Industrial*	*Private*	*Solo*	*Total*
Ala.	32	27	59	59	4	0	37	6	106
Ariz.	36	16	52	25	4	0	33	3	65
Ark.	42	15	57	50	3	0	19	5	77
Calif.	870	160	1,030	1,177	133	6	977	329	2,622
Colo.	34	21	55	44	3	0	20	6	73
Conn.	101	9	110	80	25	0	64	12	181
Del.	47	2	49	15	0	0	15	2	32
D. C.	92	8	100	142	5	0	49	11	207
Fla.	122	57	179	173	22	0	94	33	322
Ga.	100	40	140	76	6	0	49	3	134
Ida.	25	13	38	21	1	0	10	4	36
Ill.	545	78	623	461	61	0	295	63	880
Ind.	143	115	258	125	21	0	111	36	293
Iowa	115	69	184	97	23	0	61	2	183
Kans.	124	123	247	105	12	0	50	12	179
Ky.	40	19	59	38	4	0	28	4	74
La.	93	23	116	78	8	0	41	1	128
Maine	40	20	60	27	5	0	17	8	57
Md.	78	39	117	77	13	0	55	15	160
Mass.	188	43	231	161	32	0	134	38	365
Mich.	281	132	413	280	52	1	177	49	559
Minn.	112	124	236	155	33	0	31	18	237
Miss.	26	15	41	23	5	0	22	1	51
Mo.	196	86	282	257	29	0	86	13	385
Mont.	37	25	62	29	4	0	33	4	70
Neb.	90	66	156	97	12	0	51	22	182
Nev.	11	7	18	10	0	1	4	6	21
N. H.	20	9	29	13	4	0	13	7	37
N. J.	208	51	259	214	36	1	123	41	415
N. M.	20	9	29	12	2	0	12	1	27
N. Y.	817	98	915	579	139	3	500	132	1,353
N. C.	58	56	114	46	9	0	38	6	99
N. D.	54	43	97	40	5	0	18	4	67
Ohio	398	106	504	399	83	0	275	94	851
Okla.	184	55	239	155	18	2	95	20	290
Ore.	82	69	151	74	14	1	50	30	169
Pa.	430	85	515	304	80	0	275	75	734
R. I.	38	3	41	19	4	0	28	16	67
S. C.	14	28	42	17	1	0	8	0	26
S. D.	57	21	78	41	6	0	42	5	94
Tenn.	63	26	89	77	9	0	54	8	148
Tex.	284	144	428	449	35	1	171	37	693
Utah	33	2	35	47	2	0	11	1	61
Vt.	26	5	31	16	4	0	6	3	29
Va.	79	32	111	143	13	0	55	17	228
Wash.	110	61	171	140	27	0	63	24	254
W. Va.	44	17	61	38	5	0	24	14	81
Wis.	149	93	242	122	36	0	41	11	210
Wyo.	54	13	67	39	3	0	11	2	55
Alaska	36	5	41	28	3	0	3	1	35
Canada[1]	0	0	0	3	1	0	0	1	5
Canal Zone	0	2	2	45	1	0	6	0	52
Hawaiian Is.	9	1	10	66	6	0	4	3	79
Mexico[1]	0	0	0	17	0	0	3	0	20
Philippine Is.	1	0	1	21	0	0	1	0	22
Foreign Misc.[1]	8	2	10	57	4	0	12	7	80
Total	6,896	2,388	9,284	7,103[2]	1,070	16	4,505	1,266	13,960[3]

1. Figures for these countries mean pilots and aircraft licensed or identified by the United States.

2. This figure includes 554 pilots who hold scheduled air transport ratings.

3. This figure includes 362 women pilots, 71 Transport, 34 Limited Commercial, 1 Industrial, 178 Private, 77 Solo, and 1 woman autogiro pilot.

AIRPORTS AND LANDING FIELDS JANUARY 1, 1934

Classified by States

Aeronautics Branch, U. S. Dept. of Commerce

	Municipal	*Commercial*	*Intermediate*	*Auxiliary*	*Army*	*Navy*	*Miscellaneous Government, private, and State*	*Total*	*Partially or fully lighted*
Alabama	4	4	7	6	3	0	0	24	11
Arizona	13	5	10	17	1	0	0	46	15
Arkansas	14	3	4	9	0	0	3	33	6
California	51	65	23	61	5	2	4	211	65
Colorado	12	4	2	13	1	0	0	32	7
Connecticut	5	9	1	2	0	0	2	19	8
Delaware	1	1	0	4	1	0	1	8	2
District of Columbia	0	1	0	0	1	1	0	3	3
Florida	28	19	3	13	1	4	3	71	19
Georgia	17	3	12	8	1	0	0	41	18
Idaho	14	0	9	15	0	0	12	50	15
Illinois	9	39	7	7	2	1	1	66	32
Indiana	6	22	9	7	2	0	0	46	17
Iowa	9	16	4	3	0	0	0	32	14
Kansas	18	14	5	11	2	0	0	50	17
Kentucky	4	3	4	5	0	0	0	16	6
Louisiana	9	4	2	13	1	0	1	30	11
Maine	2	9	0	11	0	0	1	23	1
Maryland	1	11	2	3	2	0	1	20	8
Massachusetts	4	27	1	8	0	1	2	43	6
Michigan	28	25	0	15	1	1	13	83	17
Minnesota	8	8	1	10	1	0	0	28	6
Mississippi	10	1	3	8	0	0	0	22	5
Missouri	10	9	7	3	0	0	2	31	13
Montana	18	3	5	10	0	0	6	42	2
Nebraska	8	5	6	2	1	0	0	22	11
Nevada	4	2	10	4	0	0	0	20	13
New Hampshire	4	3	0	11	0	0	1	19	0
New Jersey	4	23	0	2	1	1	1	32	7
New Mexico	6	5	10	13	1	0	0	35	13
New York	19	57	4	8	3	0	8	99	25
North Carolina	10	11	3	7	1	0	0	32	8
North Dakota	15	8	0	2	0	0	1	26	0
Ohio	14	53	9	34	3	0	4	117	22
Oklahoma	23	11	7	8	1	0	0	50	18
Oregon	16	5	9	4	0	0	2	36	20
Pennsylvania	6	70	14	16	3	1	4	114	36
Rhode Island	0	4	0	4	0	1	2	11	2
South Carolina	9	2	3	6	0	2	0	22	9
South Dakota	5	11	0	3	0	0	2	21	1
Tennessee	8	3	6	8	0	0	0	25	9
Texas	52	12	24	44	11	0	1	144	48
Utah	4	0	15	1	0	0	0	20	18
Vermont	3	5	0	2	1	0	1	12	0
Virginia	11	10	5	6	1	2	0	35	11
Washington	14	11	5	7	3	1	3	44	12
West Virginia	2	5	0	9	0	0	1	17	1
Wisconsin	18	26	5	8	0	0	2	59	15
Wyoming	8	3	9	8	0	0	0	28	12
Total	558	650	265	479	55	18	85	2,110	635

AVIATION GASOLINE TAX SUMMARY

State	Tax	Dispositions of Receipts	Applicable to Aircraft Fuel	Exemption or Refund
1. Alabama	5c	Highways	Yes	No
2. Arizona	5c	Highways; R.F.C. Fund	Yes	Refund
3. Arkansas	6c	Highways; Airports	No	Exemption
4. California	3c	Highways	Yes	Refund
5. Colorado	5c (a)	Highways; Relief	Yes	Refund
6. Connecticut	2c	Highways	No	Exemption
7. Delaware	3c	Highways	Yes	Refund
8. Dist. of Columbia	2c	Highways	Yes	Refund
9. Florida	7c	Roads; Schools	Yes	No
10. Georgia	6c	Roads; Schools	Yes	No
11. Idaho	5c (b)	Airfuel tax to Aeronautics Fund	Yes	No
12. Illinois	3c	Highways	Yes	Refund
13. Indiana	4c	Highways	Yes	Refund
14. Iowa	4c	Highways	Yes	Refund
15. Kansas	3c	Highways	Yes	Refund (c)
16. Kentucky	5c	Highways	Yes	No
17. Louisiana	5c	Highways	Yes	Fed. Gov't Only
18. Maine	4c	Highways	Yes	¾ of Tax
19. Maryland	4c	Highways	Yes	Refund
20. Massachusetts	3c	Highways	Yes	Refund
21. Michigan	3c	Highways; Aeronautics	Yes	No
22. Minnesota	3c	Highways	Yes	Refund
23. Mississippi	5½c	Highways	Yes	Refund all but 1c
24. Missouri	2c	Highways	Yes	Refund
25. Montana	5c	Highways	Yes	Refund
26. Nebraska	4c	Highways	Yes	No
27. Nevada	4c	Highways	Yes	Refund
28. New Hampshire	4c	Highways	Yes	Refund
29. New Jersey	3c	Traffic; Waterways	No	Exemption
30. New Mexico	5c	Highways	Yes, unless sold in interstate commerce	Refund (d)
31. New York	3c	Highways	Yes	Refund
32. North Carolina	5c	Highways	Yes	Refund
33. North Dakota	4c	Highways	Yes	Refund
34. Ohio	4c	Highways; Poor relief	Yes	Refund
35. Oklahoma	4c	Highways	Yes, unless inter-state flying	No
36. Oregon	5c	Highways; aeronautics	Yes	Refund all but 1c
37. Pennsylvania	3c	Highways; aeronautics	Yes	No
38. Rhode Island	2c	Highways	Yes	Refund
39. South Carolina	6c	Highways	Yes	No
40. South Dakota	4c	Highways	Yes	Refund of ½ of tax
41. Tennessee	6c (e)	Highways, General Fund except $50,000 to Airways	Yes	No
42. Texas	4c	Highways; Schools	Yes	Refund
43. Utah	3½c	Highways	Yes, unless interstate flying	No
44. Vermont	4c	Highways	Yes	No
45. Virginia	5c	Highways; Bridges	Yes	Refund
46. Washington	5c	Highways	Yes	Refund
47. West Virginia	4c	Highways	Yes	Refund
48. Wisconsin	4c	Highways	Yes	Refund
49. Wyoming	4c	Highways; Airports	Yes	No (f)

(a) Until August 31, 1934; thereafter 4c.

(b) Plus privilege tax of 2½c "on all aircraft engine fuel sold or used in producing power for propelling aircraft in the State of Idaho".

(c) Complete exemption on purchases of forty gallons or more.

(d) Upon purchases of 50 gallons minimum.

(e) Plus ½c per gallon unless inspection held and inspection fees paid.

(f) 2c per gallon refunded on purchases in excess of 10,000 gallons per month at any airport in the State.

STATE LAWS RELATING TO LICENSING OF AIRCRAFT AND AIRMEN

January 1, 1934

The following summary of the status of state licensing laws, classifying them into nine different groups so as to indicate the character of the laws in each state and the year in which the acts were passed, was prepared by the Legal and Legislative Research Service of the Aeronautical Chamber of Commerce especially for The Aircraft Year Book for 1934.

I. States Requiring Federal License for all Aircraft and Airmen:

1.	Alabama	(1931)	(See footnote a)
2.	Arizona	(1929)	
3.	California	(1929)	
4.	Delaware	(1929)	
5.	Florida	(1931)	(See footnotes a and b)
6.	Georgia	(1933)	(Same exceptions as stated in footnotes a and b)
7.	Idaho	(1931)	(State registration also required)
8.	Illinois	(1931)	(Same exceptions as stated in footnotes a and b)
9.	Indiana	(1929)	
10.	Iowa	(1929)	(See footnote c)
11.	Kansas	(1931)	
12.	Kentucky	(1930, 1932)	(State registration also required. See footnote d)
13.	Louisiana	(1932)	(See footnote e)
14.	Michigan	(1933)	(State registration also required. See footnote f)
15.	Minnesota	(1933)	(State registration may be required by Aeronautics Commission)
16.	Mississippi	(1928)	
17.	Missouri	(1929)	(Except solo pleasure. See footnote g)
18.	Montana	(1929)	
19.	Nebraska	(1929)	(Does not apply to non-commercial airmen)
20.	New Jersey	(1931)	
21.	New Mexico	(1929)	
22.	New York	(1928)	(Except airmen in private or pleasure flying) (h)
23.	North Dakota	(1930)	(Covers only civil aircraft flown for hire)
24.	Ohio	(1931)	(See footnote a)
25.	Oklahoma	(1931)	(See footnote a)
26.	Pennsylvania	(1933)	(Same exceptions as stated in footnotes a and b)
27.	Rhode Island	(1929)	
28.	South Carolina	(1930)	
29.	South Dakota	(1929)	
30.	Texas	(1929)	(Except public aircraft of U. S. or Texas)
31.	Utah	(1931)	(See footnote a—1st paragraph only)
32.	Washington	(1929)	
33.	Wisconsin	(1929)	
34.	Wyoming	(1931)	

II. States Requiring Federal License for All Commercial Aircraft and All Airmen in Commercial Flying:

1.	Colorado	(1929)	(See entry under VII, post)
2.	Dist. of Columbia	(1926)	
3.	Nebraska	(1929)	(Applies to airmen of civil aircraft, passenger carrying)
4.	Nevada	(1929)	
5.	North Carolina	(1929)	
6.	Oregon	(1931)	(Does not apply to airmen—see entry under III, post)

III. States Requiring State or Federal License for All Aircraft, Airmen:

1.	Maine	(1929)	(Except public aircraft and pilots thereof)
2.	Maryland	(1930)	
3.	Massachusetts	(1922)	
4.	New Hampshire	(1929)	(State registration required. See footnote j)
5.	Oregon	(1929)	(Does not apply to aircraft—see entry under II, supra)
6.	Tennessee	(1931)	

IV. States Requiring State or Federal License for Aircraft, Airmen in Commercial Flying Only:

None.

V. States Requiring State License for all Aircraft, Airmen:

1. Arkansas (1927)
2. Connecticut (1927)
3. West Virginia (1931)

VI. States Requiring State License for Aircraft, Airmen in Commercial Flying Only:

None

VII. States Requiring State License for Aircraft, Airmen in Non-Commercial Flying:

1. Colorado (1929) (Applies to airmen and not aircraft)

VIII. States Requiring Both State and Federal Licenses for All Aircraft and Airmen:

1. Vermont (1929)
2. Virginia (1930)

IX. States Having No License Requirements:

None.

Footnotes

(*a*) "Provided, however that this restriction shall not apply to military aircraft of the United States, or of a State, Territory, or possession thereof, or to aircraft licensed by a foreign country with which the United States has a reciprocal agreement covering the operation of such licensed aircraft."
"Provided, however, that this restriction shall not apply to pilots operating aircraft of the United States, or of a State, Territory, or possession thereof."

(*b*) ". . . or to persons operating aircraft licensed by a foreign country with which the United States has a reciprocal agreement covering the operation of licensed aircraft."

(*c*) Aircraft, and pilots thereof, used exclusively in the governmental service of the United States or of any of the States are excepted, as are pilots without passengers.

(*d*) Law does not apply to "public aircraft of the Federal Government, or of a State, Territory, or possession, or of a political subdivision thereof, or to aircraft licensed by a foreign country with which the United States has a reciprocal agreement covering the operation of such licensed aircraft."

(*e*) Law applies to all but "public aircraft," defined to mean "an aircraft used exclusively in the governmental service of the United States." "Airmen" includes anyone who engages in the navigation of aircraft while under way and anyone who is in charge of the inspection, overhauling, or repairing of aircraft.

(*f*) Law covers only airmen operating civil aircraft, and exempts from provisions military aircraft of the United States and aircraft licensed by country having reciprocal relations with United States, provided such aircraft is not engaged commercially within the State.

(*g*) Law does not apply to public aircraft owned by, or to pilots in the service of, the U. S. or State of Missouri.

(*h*) Law does not apply to aircraft used exclusively in the governmental service of the U. S., of the National Guard or of one or more of the civil departments of the State. Certain test flights also excepted.

(*j*) State registration required of resident owners and airmen and of non-resident airmen and aircraft operating commercially in State.

Aeronautical Directory and Trade Index

Aeronautical Directory

Trade Index

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22 East Fortieth Street, New York

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(Elected at Annual Meeting of Members, January 25, 1934)

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Fleetwings, Inc., Garden City, L. I., N. Y.
Fort Wayne Board of Aviation Commissioners, Fort Wayne, Ind.
General Aviation Mfg. Corp., Dundalk, Baltimore, Md.
General Electric Co., Schenectady, N. Y.
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Goodyear Zeppelin Corp., Akron, Ohio
Great Lakes Aircraft Corp., Cleveland, Ohio
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Hartford Municipal Airport, Hartford, Conn.
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Hurley-Townsend Corp., New York City
Indianapolis Municipal Airport, Indianapolis, Ind.
Inter-Island Airways, Ltd., Honolulu, T.H.
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Kollsman Instrument Co., Brooklyn, N. Y.
Lawrance Engineering & Research Corp., New York City
The Leece-Neville Co., Cleveland, Ohio
Lockheed Aircraft Corp., Burbank, Calif.
Grover Loening Aircraft Co., Inc., Garden City, L. I., N. Y.
Loomis, Suffern & Fernald, New York City
Luke, Banks & Weeks, New York City
D. A. Luscombe, Kansas City, Mo.
Lycoming Mfg. Co., Williamsport, Pa.
Macwhyte Co., Kenosha, Wisc.
Maryland Casualty Co., Baltimore, Md.
McCann-Erickson, Inc., New York City
Monocoupe Corp., Robertson, Mo.
Municipal Airport, Birmingham, Ala.
National Air Transport, Inc., Chicago, Ill.
National Aviation Corp., New York City
National Credit Office, Inc., New York City
National Parks Airways, Inc., Salt Lake City, Utah
Norma-Hoffman Bearings Corp., Stamford, Conn.
Occidental Publishing Co., Los Angeles, Calif.
Pacific Aeromotive Corp., Ltd., Burbank, Calif.
Pacific Air Transport, Inc., Chicago, Ill.
Pan American Airways System, New York City
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Parks Air College, Inc., East St. Louis, Ill.
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The Pennsylvania Railroad Co., Philadelphia, Pa.
Pioneer Instrument Co., Brooklyn, N. Y.
Pittsburgh Screw & Bolt Corp., Pittsburgh, Pa.
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The Pyle-National Co., Chicago, Ill.
John A. Roebling's Sons Co., Trenton, N. J.
Roosevelt Field, Inc., Mineola, L. I., N. Y.
RCA Victor Co., Camden, N. J.
SKF Industries, Inc., New York City
Sacramento Municipal Airport, Sacramento, Calif.
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Shell Petroleum Corp., St. Louis, Mo.
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Sperry Gyroscope Co., Inc., Brooklyn, N. Y.
Standard Oil Co. (Indiana), Chicago, Ill.
Standard Oil Co. of N. J., New York City
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Stearman Aircraft Co., Wichita, Kans.
The Steel Products Engineering Co., Springfield, Ohio
Stinson Aircraft Corp., Wayne, Mich.
Summerill Tubing Co., Bridgeport, Montgomery Co., Pa.
Tacoma Field, Tacoma, Wash.
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Waco Aircraft Co., Troy, Ohio
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Associate Members

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Los Angeles Chamber of Commerce, Los Angeles, Calif.
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Municipal Airport, Denver, Colo.
Ohio Bureau of Aeronautics, Columbus, Ohio
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Loening, Grover
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Air Corps Posts

Akron, Ohio—(Chief of the Air Corps) Balloon Production and Inspection. Procurement Section. District Office. P. O. Goodyear Tire & Rubber Co., Akron, Ohio.

Albrook Field—(P. C. Dept.) P. O. Quarry Heights, Canal Zone. 44th Obs. Sq.

Barksdale Field—(Fourth Corps Area) P. O. Shreveport, La. Air Corps Detachment.

Benning, Ft., Ga.—Flight E, 16th Obs. Sq.

Biggs Field—(Eighth Corps Area) P. O. Ft. Bliss, Texas. Intermediate Landing Field.

Bolling Field—(Chief of the Air Corps) P. O. Anacostia, D. C. Air Corps Detach. Flying Field.

Boston Airport—(First Corps Area) P. O. Boston, Mass. Air Corps Detach. Intermediate Landing Field. Reserve Flying. Reserve Airdrome.

Bowman Field—(Fifth Corps Area) P. O. Jeffersontown, Ky. Intermediate Landing Field. Reserve Airdrome.

Bragg, Ft.—(Fourth Corps Area) P. O. Ft. Bragg, N. C. 2nd Balloon Co. Flight C, 16th Obs. Sq.

Bristol, Pa.—(Chief of the Air Corps) P. O. Bristol, Pa. Air Corps Representative Keystone Aircraft Corp.

Brooks Field—(Eighth Corps Area) P. O. San Antonio, Texas. 12th Obs. Gp. Hq. 12th, 22d, 88th Obs. Sqs. 1st Photo Section. 62d Service Sq. Border Patrol Station. Airdrome. Intermediate Landing Field.

Buffalo, N. Y.—(Chief of the Air Corps) P. O. 65 Franklin St., Buffalo, N. Y. Procurement Planning Representative. Air Corps Representative. Curtiss Aeroplane & Motor Corp. Air Corps Procurement District.

Burgess Field—(Chief of the Air Corps) P. O. Uniontown, Pa. Intermediate Landing Field.

Candler Field—(Fourth Corps Area) P. O. Atlanta, Ga. Reserve Airdrome.

Chanute Field—(Chief of the Air Corps) P. O. Rantoul, Ill. Technical School. School Troops.

Chapman Field—(Fourth Corps Area) P. O. Miami, Fla. Temporary Machine Gun & Bombing Range.

Chicago, Ill.—(Chief of the Air Corps) P. O. 1819 W. Pershing Road. Municipal

Airport. Reserve Airdrome. Procurement Planning Representative. Air Corps Procurement District at 59 East Van Buren.

CLARK FIELD—(P. Dept.) P. O. Camp Stotsenburg, P. I. 3d Pursuit Sq.

CLARK, FT.—(Eighth Corps Area) P. O. Bracketville, Texas. Airdrome. Intermediate Landing Field.

CRISSY FIELD—(Ninth Corps Area) P. O. Presidio of San Francisco, Calif. 91st Obs. Sq. 15th Photo Section.

CROCKETT, FT.—(Eighth Corps Area) P. O. Galveston, Texas. 3d Attack Wing Hq. Hq. 3d Attack Gp. 8th, 13th, 90th Attack Sqs. 60th Service Sq.

CROOK, FT.—(Seventh Corps Area) P. O. Ft. Crook, Nebr. Corps Area Hq. Flight. Intermediate Landing Field. Reserve Flying.

DETROIT, MICH.—(Chief of the Air Corps) P. O. 802 Farwell Bldg., Detroit, Mich. Procurement Planning Representative. Air Corps Procurement District.

DODD FIELD—(Eighth Corps Area) P. O. Ft. Sam Houston, Texas. Airdrome.

DOUGLAS, ARIZONA—(Eighth Corps Area) P. O. Douglas, Arizona. Airdrome. Intermediate Landing Field.

DRYDEN, TEXAS—(Eighth Corps Area) P. O. Dryden, Texas. Border Patrol Station. Airdrome. Intermediate Landing Field.

DUNCAN FIELD—(Chief of the Air Corps) P. O. San Antonio, Texas. Supply and Repair Depot.

EDGEWOOD ARSENAL—P. O. Edgewood, Md. Air Corps Detachment.

FAIRFIELD AIR DEPOT—(Chief of the Air Corps) P. O. Patterson Field, Fairfield, Ohio. Supply and Repair Depot.

FRANCE FIELD—(P. C. Dept.) P. O. France Field, Canal Zone. 6th Composite Gp. Hq. 7th Obs. Sq. 12th Photo Section. 63d Service Sq. 24th, 78th Pursuit Sqs. 25th Bomb. Sq. Aerial Coast Defense. Panama Air Depot.

GARDEN CITY—(Chief of the Air Corps) P. O. Long Island, N. Y. Air Corps Representative Curtiss Aeroplane & Motor Corp.

HAMILTON FIELD—(Ninth Corps Area) P. O. San Rafael, Calif. 70th Service Sq.

HATBOX FIELD—(Eighth Corps Area) P. O. Muskogee, Okla. Intermediate Landing Field. Reserve Airdrome.

HENSLEY FIELD—(Eighth Corps Area) P. O. Grand Prairie, Texas. Intermediate Landing Field. Reserve Airdrome.

HOUSTON, FT. SAM—(Eighth Corps Area) P. O. Ft. Sam Houston, Texas. Airway Control Officer. Air Corps Detach. 8th Corps Area.

KELLY FIELD—(Chief of of the Air Corps) P. O. Kelly Field, Texas. Advanced Flying School. 39th, 40th, 41st, 42d, 43d School Sqs. 68th Service Sq. 22d Photo Section. Flying Cadet Detach.

LANGLEY FIELD—(Third Corps Area) P. O. Hampton, Va. Hq. 2d Bomb. Wing. 19th Airship Co. Hq. 2d Bomb. Gp. 20th, 49th, 96th Bomb. Sqs. 1st Bomb. Brigade 58th, 59th Service Sqs. 2d Photo Section. Flying Field, Flight A, 16th Obs. Sq. 8th Pursuit Gp. Hq. 33d, 35th, 36th Pursuit Sqs.

LEAVENWORTH, FT.—P. O. Ft. Leavenworth, Kansas. Air Corps Detach. Intermediate Landing Field.

LEWIS, FT., WASH.—(Ninth Corps Area) P. O. Ft. Lewis, Wash., A. C. Detach.

LONG BEACH, CALIF.—(Formerly Clover Field) Municipal Airport. Reserve Airdrome.

LOGAN FIELD—(Third Corps Area) P. O. Dundalk, Md. Intermediate Landing Field. Flying Field for 104th Obs. Sq., Md. National Guard.

LORDSBURG—(Eighth Corps Area) P. O. Lordsburg, N. M. Airdrome. Intermediate Landing Field.

LUKE FIELD—(H. Dept.) P. O. Honolulu, T. H. Hq. 5th Composite Gp. 4th, 50th Obs. Sqs. 23d, 72d Bomb. Sqs. 65th Service Sq. 11th Photo Section. Aerial Coast Defense. Air Depot.

LUNKEN AIRPORT—(Fifth Corps Area) P. O. Cincinnati, Ohio. (Station (C)). Airdrome. Intermediate Landing Field. Reserve Airdrome.

MCINTOSH, FT.—(Eighth Corps Area) P. O. Ft. McIntosh, Texas. Intermediate Landing Field.

MARCH FIELD—(Ninth Corps Area) P. O. Riverside, Calif. 1st Bomb. Wing Hq. 7th Bomb. Gp. Hq. 9th, 11th, 31st Bomb. Sqs. 17th Pursuit Gp. Hq. 34th, 73d, 95th Pursuit Sqs. 64th, 70th Service Sqs. 23d Photo Section.

MARSHALL FIELD—(Seventh Corps Area) P. O. Ft. Riley, Kans. Flight D, 16th Obs. Sq.

MATHER FIELD—(Ninth Corps Area) P. O. Mills, Calif. 20th Pursuit Gp. Hq. 55th, 77th Pursuit Sqs. 80th Service Sq.

MAXWELL FIELD—(Chief of the Air Corps) P. O. Montgomery, Ala. 4th Photo Section. Hq. Tactical School. 51st, 54th School Sqs.

MIDDLETOWN AIR DEPOT—(Chief of the Air Corps) P. O. Middletown, Pa. Repair & Supply Depot. Flying Field.

MITCHEL FIELD—(Second Corps Area) P. O. Mitchel Field, L. I., N. Y. Hq. 9th Obs. Gp. 1st, 5th, 99th Obs. Sqs. 8th, 14th Photo Sections. 61st Service Sq. 19th Composite Wing Hq.

NEW YORK—(Chief of the Air Corps) P. O. 39 Whitehall St., New York, N. Y. District Office Procurement Section (Material Division) Procurement Planning Representative. Air Corps Procurement District.

NICHOLS FIELD—(P. Dept.) P. O. Maricaban, Rizal, P. I. Hq. 4th Composite Gp. 66th Service Sq. 6th Photo Section. 28th Bomb. Sq. 2d Obs. Sq. Philippine Air Depot.

OFFUTT FIELD—(Seventh Corps Area) P. O. Ft. Crook, Nebr. Corps Area Hq. Flight Intermediate Landing Field. Reserve Flying.

PATTERSON FIELD—(Chief of the Air Corps) P. O. Fairfield, Ohio. Fairfield Air Depot. Supply & Repair.

PEARSON FIELD—(Ninth Corps Area) P. O. Vancouver, Wash. Intermediate Landing Field Reserve Airdrome.

PHILLIPS FIELD—P. O. Aberdeen Proving Ground, Md. Air Corps Detach.

PITTSBURGH AIRPORT—(Third Corps Area) R. D. No. 2, Sharpsburg, Pa. Airport. Intermediate Landing Field. Reserve Airdrome.

POPE FIELD—(Fourth Corps Area) P. O. Ft. Bragg, N. C. Flying Field. See Ft. Bragg for troops.

PORT COLUMBUS—(Fifth Corps Area) P. O. Columbus, Ohio. Air Corps Detach. Intermediate Landing Field. Reserve Airdrome.

POST FIELD—P. O. Ft. Sill, Okla. Flight E, 16th Obs. Sq. 1st Balloon Co. Flying Field.

RANDOLPH FIELD—(Chief of the Air Corps) P. O. Randolph Field, Texas. Primary Flying School. Hq. A. C. Training Center. Hq. & Hq. Sq. 46th, 47th, 52d & 53d School Sqs. 67th Service Sq. 20th Photo Section. Flying Cadet Detach. School of Aviation Medicine.

RICHARDS FIELD—(Seventh Corps Area) P. O. Kansas City, Mo. Intermediate Landing Field. Reserve Airdrome. (Part of Kansas City Municipal Airport.)

ROCKWELL FIELD—(Chief of the Air Corps) P. O. Rockwell Field, Coronado, Calif. Supply & Repair Depot. Flying Field. 19th Bomb. Gp. Hq. 30th, 32d Bomb. Sqs. 76th Service Sq.

ROSS FIELD—(Ninth Corps Area) P. O. Arcadia, Calif. Detach 91st Obs. Sq. Intermediate Landing Field.

RUSSELL, FT. D. A.—(Eighth Corps Area) P. O. Marfa, Texas. Airdrome. Intermediate Landing Field.

SALT LAKE CITY—Municipal Airport. P. O. Salt Lake City, Utah. (Formerly Woodward Field.) Reserve Airdrome.

SAN ANTONIO AIR DEPOT—(Chief of the Air Corps) P. O. Duncan Field, Texas. Supply & Repair Depot.

SAN FRANCISCO—(Chief of the Air Corps) P. O. Room 624, Exchange Block, 369 Pine St., San Francisco, Calif. Procurement Planning Representative. Air Corps Procurement District.

SANTA MONICA—(Chief of the Air Corps) P. O. 3000 Ocean Park Blvd., Santa Monica, Calif. District Procurement Office. Production Manager, Air Corps Representative, Douglas Aircraft Co.

SCHOEN FIELD—(Fifth Corps Area) P. O. Ft. Benjamin Harrison, Ind. Intermediate Landing Field. Reserve Airdrome.

SCOTT FIELD—(Chief of the Air Corps) P. O. Scott Field, Belleville, Ill. 9th Airship Co. 21st Airship Gp. Hq. 5th, 21st Photo Sections. 15th Obs. Sq. 24th Airship Service Co. Balloon & Airship School. Air Depot. Flying Field.

SEATTLE—(Chief of the Air Corps) P. O. c/o Boeing Airplane Co., Georgetown Station, Seattle, Wash. District Procurement Office. Air Corps Representative, Boeing Airplane Co. Municipal Airport. Reserve Airdrome.

SELFRIDGE FIELD—(Sixth Corps Area) P. O. Mt. Clemens, Mich. Hq. 1st Pursuit Gp. 17th, 27th, 94th Pursuit Sqs. 57th Service Sq. Flying Field.

SHAFTER, FT.—(H. Dept.) P. O. Address, Ft. Shafter, T. H. 18th Composite Wing Hq.

SHERIDAN, FT.—(Sixth Corps Area) P. O. Ft. Sheridan, Ill. Corps Area Hq. Flight Intermediate Landing Field.

TUCSON—(Eighth Corps Area) P. O. Tucson, Arizona. Airdrome. Intermediate Landing Field.

U. S. M. A., WEST POINT, N. Y. A. C. Detachment.

WHEELER FIELD—(H. Dept.) P. O. Schofield Barracks, Honolulu, T. H. 18th Pursuit Gp. 6th, 19th Pursuit Sqs. 26th Attack Sq. 75th Service Sq. Flying Field.

WRIGHT FIELD—(Chief of the Air Corps) P. O. Dayton, Ohio. Material Division. Engineering School. Experimental Engineering Section. Procurement Planning Representative. Repair & Maintenance Section. Industrial War Plans. Field Service Section. Procurement Section. A. C. Procurement District.

Corps Area and Department Air Officers

First Corps Area	Army Base, Boston 9, Mass.
Second Corps Area	Governors Island, N. Y.
Third Corps Area	United States Post Office & Court House, Baltimore, Md.
Fourth Corps Area	Hq. Ft. McPherson, Ga. Mail Address: Oakland City Sta., Atlanta, Ga.
Fifth Corps Area	Ft. Hayes, Columbus, Ohio
Sixth Corps Area	1819 W. Pershing Road, Chicago, Ill.
Seventh Corps Area	Baird Bldg., Omaha, Nebr.
Eighth Corps Area	Ft. Sam Houston, San Antonio, Texas
Ninth Corps Area	Presidio of San Francisco, Calif.
The Philippine Department	Manila, P. I.
The Hawaiian Department	Ft. Shafter, T. H.
The Panama Canal Department	Quarry Heights, C. Z.

Organized Reserve Airdromes and Stations for Reserve Flying.—Boston Airport, Bowman Field, Candler Field, Hatbox Field, Hensley Field, Kansas City Airport, Lunken Airport, Pearson Field, Pittsburgh Airport, Port Columbus, Schoen Field. Also municipal airports—Chicago, Ill.; Long Beach, Calif.; Salt Lake City, Utah; Seattle, Wash.

Note: Reserve flying also conducted at Air Corps Stations at which one or more Air Corps units are operating.

Air Depots.—Fairfield, Hawaii, Middletown, Panama, Philippines, Rockwell, San Antonio, Scott Field.

Special Service Schools.—Advanced Flying School, Kelly Field, Texas; Primary Flying School, Randolph Field, Texas; Tactical School, Maxwell Field, Montgomery, Ala.; Technical School, Chanute Field, Rantoul, Ill.; Engineering School, Wright Field, Dayton, Ohio; School of Aviation Medicine, Randolph Field, Texas; Balloon & Airship School, Belleville, Ill.

Air Corps National Guard Units

Organization		*P. O. Address*
101st Obs. Sq. & Photo Sec.,	Mass.	Nat. Guard, Boston Airport, Boston, Mass.
102nd Obs. Sq. & Photo Sec.,	N. Y.	Nat. Guard, Miller Field, Staten Island, N. Y.
103rd Obs. Sq.....	Penn.	Nat. Guard, The Armory, Philadelphia Airport, Paschall Post Office, Philadelphia, Pa.
104th Obs. Sq. & Photo Sec.,	Md.	Nat. Guard, Logan Field, Baltimore, Md.
105th Obs. Sq. & Photo Sec.,	Tenn.	Nat. Guard, Sky Harbor Airport, Nashville, Tenn.
106th Obs. Sq. & Photo Sec.,	Ala.	Nat. Guard, Roberts Field, P. O. Box No. 570, Birmingham, Ala.
107th Obs. Sq. & Photo Sec.,	Mich.	Nat. Guard, Wayne Co. Airport, Route No. 1, Romulus, Mich.
108th Obs. Sq.	Ill.	Nat. Guard, Municipal Airport, Chicago, Ill.
109th Obs. Sq. & Photo Sec.,	Minn.	Nat. Guard, Municipal Airport, St. Paul, Minn.
110th Obs. Sq. & Photo Sec.,	Mo.	Nat. Guard, Lambert-St. Louis Municipal Airport, Robertson, Mo.
111th Obs. Sq. & Photo Sec.,	Tex.	Nat. Guard, Route 1, Box No. 655, Houston, Texas
112th Obs. Sq.	Ohio	Nat. Guard, Cleveland Airport, Cleveland, Ohio
113th Obs. Sq. & Photo Sec.,	Ind.	Nat. Guard, RR 3, Box No. 28, Indianapolis, Ind.
115th Obs. Sq. & Photo Sec.,	Cal.	Nat. Guard, Los Angeles Airport, Griffith Park, Cal.
116th Obs. Sq. & Photo Sec.,	Wash.	Nat. Guard, Felts Field, Parkwater, Wash.
118th Obs. Sq. & Photo Sec.,	Conn.	Nat. Guard, P. O. Box No. 931, Hartford, Conn.
119th Obs. Sq. & Photo Sec.,	N. J.	Nat. Guard, Newark Airport, Newark, N. J.
120th Obs. Sq. & Photo Sec.,	Colo.	Nat. Guard, Lowry Field, Denver, Colo.
154 Obs. Sq.	Ark.	Nat. Guard, Little Rock Airport, Little Rock, Ark.

Air Corps Procurement Districts

Buffalo, N. Y.	65 Franklin St.
Chicago, Ill.	919 New Post Office
Cleveland, Ohio	Wright Field, Dayton, Ohio
Detroit, Mich.	802 Farwell Bldg.
New York, N. Y.	39 Whitehall St.
San Francisco, Calif.	369 Pine St.

Materiel Division

Wright Field, Dayton, Ohio

Brig. Gen. Henry C. Pratt, Chief of the Division

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Assistant Executive	Capt. Aaron E. Jones
Adjutant	Capt. Dudley B. Howard
Supply Officer	Capt. Fred S. Borum
Acting Chief, Engineering Section	Capt. A. J. Lyon
Chief, Procurement Section	Major Harold A. Strouse
Chief, Field Service Section	Major Hugh J. Knerr
Chief, Industrial War Plans Section	Capt. R. B. Hough, Jr.
Finance Officer	Capt. Louis H. Price
Asst. Commandant A. C. Engineering School	Capt. F. M. Hopkins, Jr.
Quartermaster	Captain S. W. McIlwain
Signal Officer	Captain Tom C. Rives
Engineer Corps Representative	Captain Bruce C. Hill
Ordinance Corps Representative	Major J. L. Hatcher
Navy Representative	Lieut. Comdr. R. P. McConnel

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Lieutenants H. P. Becker, W. C. Lemly.
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Name	*Commanding Officer*
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Anacostia, D. C.	Lt. Comdr. W. K. Harrill, (acting)
Norfolk, Va.	Capt. A. W. Fitch
San Diego, Calif.	Comdr. J. H. Hoover
Seattle, Wash.	Lt. Comdr. G. D. Price
Pensacola, Fla.	Capt. F. R. McCrary
Pearl Harbor, T. H.	Comdr. E. W. Tod
Coco Solo, C. Z.	Comdr. R. P. Molten
Sunnyvale, Calif.	Capt. H. E. Shoemaker

Marine Corps Flying Fields

Quantico, Va. ..... Lieut. Col. Ross E. Rowell
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George W. Johnson	(D-W. Va.)	John T. Buckbee	(R-Ill.)
Elmer E. Studley	(D-N. Y.)	William D. Thomas	(R-N. Y.)
George B. Terrell	(D-Tex.)	Lincoln L. McCandless	(D-Hawaii)
Harry W. Musselwhite	(D-Mich.)		
John C. Taylor	(D-S. C.)		
D. C. Dobbins	(D-Ill.)		

House Subcommittee of Military Affairs Committee
(Investigation into military aircraft contracts)

Wm. N. Rogers (chairman) (D-N. H.)

Lister Hill	(D-Ala.)	Edward W. Goss	(R-Conn.)
Numa F. Montet	(D-La.)	Paul J. Kvale	(F-L-Minn.)
D. W. Hartar	(D-Ohio)	Charles A. Plumley	(R-Vt.)
Frank W. James	(R-Mich.)		

DIPLOMATIC SERVICE TO THE UNITED STATES

The following foreign aeronautical representatives may be addressed at their respective embassies in Washington, D. C.

Argentina ..... Lieutenant Commander S. J. Leporaze, Air Attache
Belgium ..... Viscount Eric de Spoelberch, Air Attache
Bulgaria ..... Mr. Vladimir S. Manoloff, Secretary of Legation
Canada ..... Mr. E. D'Arch McGreer, Second Secretary
Chile ..... Senor Don Carlos de la Barra, Commercial Secretary
China ..... Mr. Yung Kwai, Counselor of Embassy
Colombia ..... Senor Jose Saenz, Commercial Attache
Costa Rica ..... Senor Don Manuel Gonzalez-Zeledon, Counselor of Legation
Cuba ..... Captain Enrique A. Prieto, Military Attache
Czechoslovakia ..... Mr. Otakar Kabelac, First Secretary of Legation
Denmark ..... Mr. Hubert de Wichfield, Counselor of Legation
Ecuador ..... Senor Don Luis Alberto Carbo, First Secretary of Legation
Egypt ..... Mr. Nicholas Khalil Bey, Charge d'Affaires
El Salvador ..... Senor Don Roberto D. Melendez, Charge d'Affaires
France ..... Major Norbert Champsaur, Air Attache
Germany ..... Lieutenant General Friederich von Botticher, Military Attache
Great Britain ..... Group Captain G. R. M. Reid, Air Attache
Greece ..... Mr. Nicholas G. Lely, First Secretary of Legation
Hungary ..... Baron Paul Schell, Secretary of Legation
Italy ..... Lieutenant Colonel Paolo Sbernadori, Air Attache
Japan ..... Colonel Y. Kanoto, Air Attache
Mexico ..... Brigadier General Juan F. Azcarate Pino, Military Attache
Netherlands ..... Jonkheer H. M. van der Wyck, Secretary
Nicaragua ..... Senor Dr. Don Henri De Bayle, Charge d'Affaires
Peru ..... Lieutenant Colonel Ricardo Gusman Marquina, Military Attache
Poland ..... Mr. Janus Zoltowski, Commercial Counselor
41 Broad Street, New York, N. Y.
Portugal ..... Dr. Joas Antonio de Bianchi, Minister
Rumania ..... Mr. George Boncesco, Financial Counselor
South Africa ..... Mr. Eugene Kevin Scallan, Secretary of Legation
Spain ..... Major Ramon Franko, Commercial Counselor
Turkey ..... Mr. Ibrahim Seyfullah, Secretary of Embassy
Uruguay ..... Mr. J. Richling, Charge d'Affaires
Venezuela ..... Senor Claudio Urrutia, Attache
Yugoslavia ..... Capt. Gordon Gordon-Smith, Attache

DIPLOMATIC SERVICE OF THE UNITED STATES

Army

Berlin, Germany ..... Lieut. Colonel Jacob W. S. Wuest, U. S. A., Military Attaché, Germany; Assistant Military Attaché for Air, Austria, Czechoslovakia, The Netherlands.
Paris, France ..... Colonel Frank P. Lahm, Air Corps, Military Attaché, France; Assistant Military Attaché for Air, Spain.
London, England ..... Captain John W. Monahan, Air Corps, Assistant Military Attaché for Air, Great Britain and Irish Free State.
Rome, Italy ..... Captain Francis M. Brady, Air Corps, Assistant Military Attaché for Air, Italy and Greece.
Moscow, Russia ..... 1st Lieut. Thomas D. White, Air Corps, Assistant Military Attaché for Air, U. S. S. R.

Navy

London, England ..... Captain A. L. Bristol, U. S. N. Naval Attaché.
Rome, Italy ..... Lieut. Comdr. F. W. Pennoyer, U. S. N. Assistant Naval Attaché.
Paris, France ..... Lieut. Comdr. B. H. Wyatt, U. S. N., Paris, Berlin, The Hague; Assistant Naval Attaché, London, England.

DOMESTIC AIR MAIL CONTRACTS, JAN. 1, 1934

DATE OF AWARDS AND OTHER INFORMATION

A. M. 1—Boston to New York.
Awarded Oct. 7, 1925—To Colonial Air Lines, Inc.
May 5, 1930—Contract surrendered and exchanged for route certificate.
July 1, 1932—Sublet to American Airways, Inc.

A. M. 2—Chicago to St. Louis.
Awarded Oct. 7, 1925—To Robertson Aircraft Corp.
May 5, 1930—Contract surrendered and exchanged for route certificate.
May 1, 1931—Sublet to American Airways, Inc.

A. M. 20—Albany to Cleveland.
Awarded July 27, 1927—To Colonial Western Airways, Inc.
Nov. 1, 1930—Contract surrendered and exchanged for route certificate.
May 15, 1931—Sublet to American Airways, Inc.

A. M. 21—Dallas to Galveston.
Awarded August 17, 1927—To Seth W. Barwise.
Feb. 6, 1928—Sublet to Texas Air Transport, Inc.
Dec. 1, 1930—Contract surrendered and exchanged for route certificate.
July 1, 1932—Sublet to American Airways, Inc.

A. M. 22—Dallas to Laredo.
Awarded August 17, 1927—To Seth W. Barwise.
Feb. 6, 1928—Sublet to Texas Air Transport, Inc.
Dec. 1, 1930—Contract surrendered and exchanged for route certificate.
July 1, 1932—Sublet to American Airways, Inc.

A. M. 23—Atlanta to New Orleans.
Awarded August 19, 1927—To St. Tammany Gulf Coast Airways, Inc.
Sept. 23, 1929—Name changed to Gulf Coast Airways, Inc.
Dec. 1, 1930—Contract surrendered and exchanged for route certificate.
Oct. 1, 1931—Sublet to American Airways, Inc.

A. M. 24—Chicago to Cincinnati.
Awarded Nov. 17, 1927—To Embry Riddle Co.
Dec. 1, 1930—Contract surrendered and exchanged for route certificate.
May 1, 1932—Sublet to American Airways, Inc.

A. M. 27—Bay City, Michigan to Chicago.
Awarded May 5, 1928—To Thompson Aeronautical Corp.
Aug. 1, 1930—Contract surrendered and exchanged for route certificate.
Jan. 1, 1931—Sublet to Transamerican Air Lines Corp.
Apr. 1, 1933—Sublet to American Airways, Inc.

A. M. 29—New Orleans, La. to Laredo, Tex.
Awarded July 13, 1928—To St. Tammany Gulf Coast Airways, Inc.
Sept. 23, 1929—Name of contractor changed to Gulf Coast Airways.
Apr. 1, 1931—Contract surrendered and exchanged for route certificate.
Oct. 1, 1931—Sublet to American Airways, Inc.

A. M. 30—Chicago to Atlanta.
Awarded Aug. 9, 1928—To Interstate Air Lines, Inc.
Dec. 1, 1930—Contract surrendered and exchanged for route certificate.
May 15, 1931—Sublet to American Airways, Inc.

A. M. 33—Atlanta to Los Angeles.
Awarded Sept. 16, 1930—To Robertson Aircraft Corp.
Oct. 15, 1930—Sublet to Southern Air Fast Express, Inc.
Name of Sub-contractor changed to Southern Transcontinental Airways, Inc. Jan. 8, 1931.
July 1, 1931—Sublet to American Airways, Inc.
Feb. 10, 1933—Contract surrendered and exchanged for route certificate.

A. M. 19—New York to Atlanta.
Awarded Feb. 28, 1927—To Pitcairn Aviation Corp.
Jan. 18, 1930—Name of contractor changed to Eastern Air Transport, Inc.
Dec. 1, 1930—Contract surrendered and exchanged for route certificate.

A. M. 9—Chicago by way of Milwaukee and LaCrosse, Wis., and St. Paul to Minneapolis.
Awarded Sept. 7, 1926—To Northwest Airways, Inc.
Sept. 1, 1930—Contract surrendered and exchanged for route certificate.
Sept. 1, 1930—Sublet to Northwest Airways, Inc.
(An earlier A. M. 9 was awarded Jan. 11, 1926 to Charles Dickinson but was cancelled Sept. 30, 1926.)

A. M. 26—Great Falls to Salt Lake.
Awarded Dec. 30, 1927—To Alfred Frank.
June 30, 1928—Sublet to National Parks Airways, Inc.
Aug. 1, 1930—Contract surrendered and exchanged for route certificate.

A. M. 11—Cleveland to Pittsburgh.
Awarded March 27, 1926—To Clifford Ball.
Oct. 26, 1930—Contract surrendered and exchanged for route certificate.
Oct. 26, 1930—Sublet to Pennsylvania Air Lines.

A. M. 34—New York to Los Angeles.
Awarded Sept. 30, 1930—To Western Air Express and Transcontinental Air Transport.
Oct. 25, 1930—Sublet to Transcontinental and Western Air, Inc.
Feb. 1, 1933—Contract surrendered and exchanged for route certificate.

A. M. 3—Chicago to Fort Worth.
Awarded Oct. 7, 1925—To National Air Transport.
May 5, 1930—Contract surrendered and exchanged for route certificate.

A. M. 5—Elko, Nev. to Pasco, Wash.
Awarded Oct. 7, 1925—To Walter Varney.

A. M. 8—Seattle, Wash. to Los Angeles and return.
Awarded Dec. 31, 1925—To Verne Gorst.

A. M. 17—New York to Chicago.
Awarded Apr. 2, 1927—To National Air Transport.

A. M. 18—Chicago to San Francisco.
Awarded Jan. 29, 1927—To Boeing Airplane Co.

A. M. 4—Salt Lake City to Los Angeles.
Awarded Oct. 7, 1925—To Western Air Express.

FOREIGN AIR MAIL ROUTES

U. S. Post Office Department

Route No.		*Contractor*	*One Way Distance*
		Canadian Colonial Airways, Inc.	
		45 Vanderbilt Ave., New York.	
F. A. M.	1	New York, N. Y., via Albany, N. Y., to Montreal, Canada	334 Miles
		Seattle Victoria Air Mail, Inc.	
		56 Roanoke Street, Seattle Wash.	
F. A. M.	2	Seattle, Wash., to Victoria, B. C., and return	74 Miles
		John A. Hunter & Arthur O. Johnson	
		1506 Abundance, New Orleans, La.	
F. A. M.	3	New Orleans to Pilottown, La., and return	75 Miles
		Pan American Airways, Inc.	
		135 East 42nd Street, New York, N. Y.	
F. A. M.	5	*Long Flight*: Miami, Florida, via Havana, Cuba; Cozumel and Merida, Mexico; Belize, British Honduras; Puerto Barrios, Guatemala; San Salvador, El Salvador; San Lorenzo, Republic of Honduras; Managua, Nicaragua; San Jose, Costa Rica; David and Panama City, Panama; to Cristobal, Canal Zone, and return	2,228.5 Miles
		Short Flight: Miami, Florida, via Cuba; Kingston, Jamaica; and Barranquilla, Colombia; to Cristobal, Canal Zone, and return	1,810 Miles
F. A. M. (as of Aug. 5, 1932)	5	*Extended* Barranquilla, Colombia, via Maracaibo, La Guaira, and Caripito, Venezuela, to Port-of-Spain, Trinidad, and return	1,021 Miles
		Pan American Airways, Inc.	
		135 East 42nd Street, New York, N. Y.	
F. A. M.	6	Miami, Florida, via Nuevitas, Cuba; Port-au-Prince, Haiti; San Pedro de Macoris, Dominican Republic; San Juan, Puerto Rico; St. Thomas, U. S. V. I.; St. Johns, Antigua; Castires, St. Lucia; Port-of-Spain, Trinidad; Georgetown, British Guiana, to Paramaribo, Dutch Guiana, and return	2,558.5 Miles
		Pan American Airways, Inc.	
		135 East 42nd Street, New York, N. Y.	
F. A. M.	7	Miami, Florida, to Nassau, Bahama Islands. (Bahamas mail carried on return trip)	188 Miles
		Pan American Airways, Inc.	
		135 East 42nd Street, New York, N. Y.	
F. A. M.	8	Brownsville, Texas, via Tampico, Mexico City, Vera Cruz, San Geronimo and Tapachula, Mexico; and Guatemala City, Guatemala; to San Salvador, and return	1,336.5 Miles

Pan American-Grace Airways, Inc.

135 East 42nd Street, New York, N. Y.

F. A. M. 9 Cristobal, Canal Zone, via Buenaventura and Tumaco, Colombia; St. Elena and Guayaquil, Ecuador; Talara, Trujillo, Lima, Arequipa and Tacna, Peru; Arica, Antofagasta, Ovalle and Santiago, Chile; Mendoza and Buenos Aires, Argentina; to Montevideo, Uruguay, and return ..... 4,551.5 Miles

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Pan American Airways, Inc.

135 East 42nd Street, New York, N. Y.

F. A. M. 10 Paramaribo, Dutch Guiana, via Cayenne, French Guiana; Para Maranhao, Fortaleza, Natal, Pernambuco, Maceio, Bahia, Victoria, Rio de Janeiro, Santos, Florianopolis, Porto Alegre and Rio Grande do Sul, Brazil; Montevideo, Uruguay, to Buenos Aires, Argentina, and return ..... 4,840.5 Miles

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Pan American Airways Co.

135 East 42nd Street, New York, N. Y.

F. A. M. 12 (Suspended until further notice)
Bangor, Maine, via St. Johns, New Brunswick to Halifax, Nova Scotia ..... 281 Miles

FOREIGN AIR MAIL ROUTES

Dates of Contract Awards, Terminals, and Contractors.

F. A. M. 1 From New York to Montreal, Canada, via Albany, N. Y., and return.
Contract awarded July 9, 1928 to Canadian Colonial Airways, Inc. (American Airways), for a period of 10 years beginning with date of inauguration of service on October 1, 1928.

F. A. M. 2 From Seattle to Victoria, B. C., and return.
Contracts have been let as follows:
October 15, 1920 to June 30, 1923 to Edward Hubbard
July 1, 1923 to June 30, 1924 to Alaska Airways Co.
July 1, 1924 to June 30, 1925 to Edward Hubbard
July 1, 1925 to June 30, 1926 to Edward Hubbard
July 1, 1926 to June 30, 1927 to Edward Hubbard
July 1, 1927 to June 30, 1928 to Northwest Air Service, Inc.
July 1, 1928 to June 30, 1929 to P. F. Barnes and Vern C. Gorst
On May 10, 1929, a 4 year contract beginning July 1, 1929 was awarded to Seattle-Victoria Air Mail, Inc.
On July 1, 1933, a 4 year contract was awarded to Seattle-Victoria Air Mail, Inc.

F. A. M. 3 From New Orleans to Pilottown or Port Eads, La. and return.
Contracts have been let as follows:
April 9 to June 30, 1923, a temporary contract to M. K. Riddick
July 1, 1923 to June 30, 1924 to Gulf Coast Airline (Inc.)
July 1, 1924 to June 30, 1932, successive annual contracts to Arthur E. Cambas.
July 1, 1932—awarded to Johnson Airways (Inc.) for 1 year
Contract extended for 6 months July 1, 1933 to December 31, 1933.
January 1, 1934 to June 30, 1934 awarded to Tropical Airways, (Inc.).

F. A. M. 4 From Miami to Habana, Cuba and return.
Discontinued on February 1, 1933, and superseded by daily service, on F. A. M. 5 on the same date.
Contracts have been let as follows:
October 15, 1920 to October 14, 1921 to Florida West Indies Airways, Inc. (Key West to Habana, Cuba). This contract was terminated in June, 1921.
Contract authorized January 11, 1923 to June 30, 1923, with Aeromarine Airways, Inc. (Key West to Habana).
October 19, 1927—June 30, 1928 to Pan American Airways, Inc.
Contract made May 29, 1928 for a period of 5 years effective from July 1, 1928 with Pan American Airways, Inc. Contract amended to cover service both ways, effective December 1, 1930.

F. A. M. 5 From Miami, Florida to Cristobal, C. Z., with an extension to Port-of-Spain, Trinidad and return, including stops in Cuba, Mexico, British Honduras, Guatemala, El Salvador, Republic of Honduras, Nicaragua, Costa Rica, Panama, Jamaica, Colombia and Venezuela.
Contract was made July 13, 1928 with Pan American Airways, Inc. for a 10 year term to begin with the inauguration of service on February 4, 1929.

F. A. M. 6 From Miami, Florida to Paramaribo, Dutch Guiana and return, including stops in Cuba, Haiti, Dominican Republic, Puerto Rico, U. S. Virgin Islands, Antigua, St. Lucia, Trinidad and British Guiana.
Contract was made July 13, 1928 with Pan American Airways, Inc. for a term of 10 years beginning with the inauguration of service on January 9, 1929.

F. A. M. 7 From Miami, Florida to Nassau, Bahama Islands. Bahaman mail carried on return trip.
Contract made on October 28, 1928 with Pan American Airways, Inc. for a 10 year term beginning with the inauguration of service on January 2, 1929.

F. A. M. 8 From Brownsville, Texas to San Salvador, El Salvador and return, including stops in Mexico and Guatemala.
Contract made February 16, 1929 with Pan American Airways, Inc. for a 10 year term beginning March 9, 1929.

F. A. M. 9 From Cristobal, C. Z. to Montevideo, Uruguay and return, including stops in Colombia, Ecuador, Peru, Chile and Argentina.
Contract made March 2, 1929 with Pan American Airways, Inc. for a 10 year term beginning with the date of inauguration April 1, 1929.

F. A. M. 10 From Paramaribo, Dutch Guiana to Buenos Aires, Argentina and return, with stops in French Guiana and Brazil.
Contract made September 24, 1930 with Pan American Airways, Inc. for the period between October 20, 1930 and January 8, 1939.

F. A. M. 12 From Bangor, Maine to Halifax, Nova Scotia via St. Johns, N. B. Service suspended until further notice in October 1931.
Contract made July 31, 1931 with Pan American Airways, Inc. for a 10 year term beginning with inauguration of service on August 1, 1931.

FLYING SCHOOLS GRANTED APPROVED CERTIFICATES BY DEPARTMENT OF COMMERCE

January 1, 1934

	Courses Offered	*License Qualifications*	*Certificate Issued*
Parks Air College, Inc. Parks Airport East St. Louis, Ill.	Ground and Flying	Transport Ltd. Com. Private	7–15–29
D. W. Flying Service LeRoy Airport LeRoy, N. Y.	Ground and Flying	Ltd. Com.	7–15–29
Boeing School of Aeronautics Oakland Municipal Airport Oakland, Calif.	Ground and Flying	Transport Ltd. Com. Private	10–17–29
Spartan School of Aeronautics Apache Blvd. & Chamberlain Drive Tulsa, Okla.	Ground and Flying	Transport Ltd. Com. Private Amateur	10–18–29
Roosevelt Aviation School, Inc. Roosevelt Field No. 1 Mineola, L. I., N. Y.	Ground and Flying	Transport Ltd. Com. Private Amateur	10–25–29
Penn School of Aviation Pittsburgh-Butler Airport Butler, Penna.	Ground and Flying	Transport Ltd. Com. Private	12–12–29

Lincoln Airplane & Flying School 2415 O Street—(Ground) Municipal Airport—(Flying) Lincoln, Nebr.	Ground and Flying	Transport Ltd. Com. Private	3-31-30
Furniture Capital Air Service Grand Rapids Airport Grand Rapids, Mich.	Ground and Flying	Transport Ltd. Com.	8-21-30
Dallas Aviation School and Air College Love Field Dallas, Texas	Ground and Flying	Transport Ltd. Com. Private	12-22-30
Penn School of Aviation Bettis Airport—(Flying) In combination with Pittsburgh Auto & Aviation School 405 Penn Ave.—(Ground) Pittsburgh, Pa.	Ground and Flying	Ltd. Com. Private	9-28-31
Aereco Flying Service, Inc. Municipal Airport Fort Wayne, Ind.	Ground and Flying	Ltd. Com. Private	1-22-32
Los Angeles Aircraft, Ltd. Los Angeles Municipal Airport Inglewood, Calif.	Ground and Flying	Private	7-30-32
Ryan School of Aeronautics, Ltd. Lindbergh Field San Diego, Calif.	Ground and Flying	Transport Ltd. Com. Private	9-1-32
Erickson & Remmert Floyd Bennett Field Brooklyn, N. Y. In combination with New York University	Ground and Flying	Private	10-22-32
United Air Services, Inc. Floyd Bennett Field Brooklyn, N. Y.	Ground and Flying	Private	12-7-32
Safair, Inc. Roosevelt Field, Mineola, L. I. In combination with New York University 51 West Fourth St., N. Y. C.	Ground and Flying	Transport Ltd. Com. Private	12-27-32
North Shore Airways, Inc. Curtiss-Reynolds Airport, Glenview, Ill. In combination with Aeronautical University, Inc. 1338 So. Michigan Ave. Chicago, Ill.	Ground and Flying	Transport Ltd. Com. Private	1-25-33
Northland Aviation Co. Wold-Chamberlain Airport Minneapolis, Minn.	Ground and Flying	Transport Ltd. Com. Private	5-4-33
Grand Central Flying School Grand Central Air Terminal—(Flying) Glendale, Calif. In combination with Curtiss-Wright Technical Institute of Aeronautics 1224 Airway, Glendale—(Ground)	Ground and Flying	Ltd. Com. Private	12-18-33

AIRPORTS AND AIRPORT MANAGERS IN THE UNITED STATES

January 1, 1934

The following is a selected list of leading American airports and their managers compiled by the Airport Section of the Aeronautical Chamber of Commerce of America, Inc., especially for The Aircraft Year Book for 1934. All airports listed have sufficient landing area for normal landings and take-offs. Intermediate and auxiliary fields are not included. Municipally owned fields are indicated by (*m*) preceding the name of the airport.

Location	*Name of Port*	*Manager*
ALABAMA		
Birmingham (*m*)	Birmingham Airport	Steadham Acker
Birmingham	Messer Field	Glenn E. Messer
Mobile (*m*)	Bates Field	O. N. Barney
Montgomery (*m*)	Montgomery Airport	Lion G. Mason
Selma (*m*)	Legion Field	
ARIZONA		
Ajo (*m*)	Ajo Airport	W. R. Devison
Chandler (*m*)	Chandler Airport	Marg. K. Stewart
Douglas (*m*)	Douglas International Airport	L. Fyfe Peters
Flagstaff (*m*)	Koch Field	Ross Sampson
Grand Canyon	South Rim Airport	
Jerome	Clemenceau Airport	
Kingman	Port Kingman	
Marana (*m*)	Marana Landing Field	
Phoenix	Sky Harbor Airport	
Prescott (*m*)	Ernest A. Love Airport	S. A. Spear
St. Johns (*m*)	Harry A. Saunders Airport	
Springerville (*m*)	Springerville Landing Field	Melvin Brown
Tucson (*m*)	Davis Monthan Field	R. L. Andrick, S. S.
Willcox (*m*)	Willcox Airport	
Winslow	TWA Airport	C. W. Helm, C. A. C.
Yuma (*m*)	Fly Field	Johnnie Redondo
ARKANSAS		
Conway	Conway Airport	
Ft. Smith	Alexander Airport	
Little Rock (*m*)	Little Rock Airport	Joseph A. Young
Monticello (*m*)	Monticello Airport	Frank Horsfall
Paragould (*m*)	Paragould Airport	M. A. West
Pine Bluff (*m*)	Toney Field	Kenneth Garrett
Texarkana (*m*)	Texarkana Airport	J. B. Newbauer, Op.
CALIFORNIA		
Alameda	Alameda Airport	F. Buchanan
Alameda	San Francisco Bay Airdrome	R. U. St. John
Alhambra	Alhambra Airdrome	Homer T. Seale
Avalon	Catalina Seaplane Airport	E. McFarlan Moore
Bakersfield	Kern County Airport	H. P. Griffis, Supt.
Barstow (*m*)	20-30 Airport	Russell E. Riley
Berkeley (*m*)	Berkeley Airport	
Blythe (*m*)	Blythe Airport	
Brawley (*m*)	Brawley Airport	M. H. Carberry
Burbank	United Airport	Fred Denslow
Calexico (*m*)	Calexico Airport	Roy E. Saddler
Chico	Chico Airport	
Colusa (*m*)	Colusa Airport	
Compton	Compton Airport	
Delano (*m*)	Delano-Kern County Airport	
Desert Center (Mecca)	Desert Center Airport	
Elsinore (*m*)	Lake Elsinore Airport	O. W. Graham
Eureka	Murray Field	
Fillmore	Fillmore Airport	Chamber of Commerce, E. C. Fuller, Sec'y.
Fresno (*m*)	Fresno Chandler Airport	Geo. T. Johnson, Supt.
Fullerton (*m*)	Fullerton Airport	Claude L. Long
Glendale (*m*)	Grand Central Air Terminal	Major C. C. Moseley
Grass Valley	Gilmore Flying Field	Lyman Gilmore
Hanford (*m*)	Hanford Airport	A. C. Hanford
Imperial (*m*)	Imperial County Airport	Chas. M. Sproule

Location	*Name of Port*	*Manager*
Inglewood ..... (*m*)	Los Angeles Airport	R. B. Barnitz, Dir.
Lancaster	Lancaster Airport	
Long Beach ..... (*m*)	Daugherty Field	Wm. J. Putnam, Supt.
Los Angeles	Dycer Airport	Edw. A. Dycer
Los Banos ..... (*m*)	Los Banos Airport	
Marysville ..... (*m*)	Cheim Airport	F. H. Bartlett
Merced ..... (*m*)	Merced Airport	Geo. G. Vought
Modesto	Modesto Airport	J. C. Cuneo
Mojave	Kern County Airport	
Monrovia	Foothill Flying Field	
Montague ..... (*m*)	Montague Airport	Chas. C. Shock
Needles ..... (*m*)	Needles Airport	George Morden
Oakland (Grove St. Pier) ..... (*m*)	Oakland Airport	A. H. Abel
Ontario ..... (*m*)	Ontario Airport	
Palo Alto	Goddard Airport	A. W. Gorman
Paso Robles ..... (*m*)	Paso Robles Airport	
Petaluma	Petaluma Airport	
Porterville	Porterville Airport	Maj. LeRoy Miller
Red Bluff ..... (*m*)	Bidwell Field	Raines F. Griffin
Redding ..... (*m*)	Benton Field	L. D. Sarvis, C. A. C.
Redwood City	Sanders Field	
Riverside	Riverside Airport	Roman C. Warren
Sacramento ..... (*m*)	Sacramento Airport	Donald B. Smith
Salinas ..... (*m*)	American Legion Airport	Wm. T. Swain
San Bernardino	Big Bear City Airport	Calif. Peter Pan Woodland Club
San Bruno ..... (*m*)	San Francisco Airport	B. M. Doolin
San Diego ..... (*m*)	Lindbergh Field	John Van Horn, Supt.
San Jose ..... (*m*)	San Jose Airport	
San Luis Obispo ..	Clark Field	Union Oil Co.
San Mateo	Curtiss-Wright Airport	Capt. F. M. Bartlett
Santa Ana (P. O. Box 986)	Eddie Martin's Airport	Floyd R. Martin
Santa Barbara	Goleta Airport	Louis F. Vremsak
Santa Cruz ..... (*m*)	Santa Cruz Airport	
Santa Monica ..... (*m*)	Clover Field	James E. Grainger
Santa Paula	Santa Paula Airport	R. E. Dickenson
Santa Rosa ..... (*m*)	Santa Rosa Municipal Airport.	L. E. Newton
Sebastopol ..... (*m*)	Sebastopol Airport	L. C. Cnoplus
Stockton	Oranges Brothers Airport	
Stockton ..... (*m*)	Stockton Airport	Henry Nordwick
Strathmore ..... (*m*)	Strathmore Airport	C. W. Bouldin
Taft ..... (*m*)	Taft Airport	
Vallejo ..... (*m*)	Knight Field	
Van Nuys	Metropolitan Airport	N. R. Wells, Jr.
Visalia ..... (*m*)	Visalia Airport	L. E. Crowder
Watsonville	Watsonville Airport	Jack Irwin
Willows ..... (*m*)	Willows Airport	F. H. Nolta
Yreka ..... (*m*)	Yreka Airport	Irving L. Eddy
COLORADO		
Colorado Springs ..	Alexander Airport	Pikes Peak Air Com. Inc.
Colorado Springs (R. 1, Box 7) ..... (*m*)	Colorado Springs Airport	Max Piele
Denver	Curtiss-Wright Field	
Denver (32d & Ulster St.) ..... (*m*)	Denver Airport	Irvin F. Lowry
Durango ..... (*m*)	Durango Airport	
Grand Junction ... (*m*)	Grand Junction Airport	D. P. Bullock
Greeley ..... (*m*)	Greeley Airport	James Starkey
Holyoke ..... (*m*)	Holyoke Airport	H C Hill
Montrose ..... (*m*)	Montrose Airport	
Pueblo ..... (*m*)	Pueblo Airport	H. F. Hershey
CONNECTICUT		
Danbury ..... (*m*)	Danbury Airport	Henry Taylor
Groton ..... (*m*)	Trumbull Field	
Hartford ..... (*m*)	Brainard Field	Herbert H. Mills
Hartford	Rentschler Field	Bernard L. Whalen
Meriden ..... (*m*)	Meriden Airport	E. L. Markham
New Haven ..... (*m*)	New Haven Airport	
Stratford	Mollison	F. D. Moller
Wallingford ..... (*m*)	Wallingford Airport	

Location		Name of Port	Manager
DELAWARE			
New Castle		Bellanca Field	Andrew Bellanca
Wilmington		Dupont Field	Joe P. Manning
DISTRICT OF COLUMBIA			
Washington (S. Wash., Va. Bx. 101)		Washington-Hoover Airport	C. E. Fauntleroy
FLORIDA			
Arcadia		Seward Airport	
Auburndale	(m)	Auburndale Airport	H. M. Frazer
Bradenton	(m)	Wallace Field	Harry L. Land, Mgr.
Clearwater	(m)	Springtime Airport	Tropical Airways, Inc.
Daytona Beach	(m)	Daytona Beach Airport	
DeLeon Springs		DeLeon Springs Aviation Field	F. N. Burt
Ft. Lauderdale	(m)	Merle Fogg Airport	
Ft. Myers	(m)	Ft. Myers Airport	C. Franklin Wheeler
Jacksonville	(m)	Jacksonville Airport	J. R. Griffis, Mgr.
Key West		Meacham Airport	
Lakeland	(m)	Haldeman-Elder Field	
Miami		All-American Airport	Karl Voelter
Miami		Curtiss-Wright Seaplane Base	
Miami		Dinner Key, Seaplane Base	Pan American Airways, N. Y. C.
Miami	(m)	Miami Municipal Airport	Aviation Dept., Miami
Miami		Pan American Airport	
Ocala	(m)	Taylor Field	
Orlando	(m)	Orlando Airport	Lt. E. C. Nilson
St. Augustine	(m)	St. Augustine Airport	L. G. Rees
St. Petersburg	(m)	Albert Whitted Airport	Dan J. Sullivan
St. Petersburg		Grand Central Airport	
Sanford	(m)	Sanford Airport	J. A. Speer
Sarasota	(m)	Sarasota Airport	Dr. J. R. Scully, G. P. W.
Tallahassee	(m)	Dale Mabry Field	Wm. R. Gault, C. M.
Tampa	(m)	Drew Field	H. D. DeNegre
Vero Beach	(m)	Vero Beach Airport	B. L. Holman
W. Palm Beach	(m)	Currie Seaplane Base	John A. Gross
W. Palm Beach		Belvedere Airport	
GEORGIA			
Albany	(m)	Albany Field	
Athens	(m)	Epps Field	Benn Epps, Mgr.
Atlanta	(m)	Atlanta Airport	J. H. Gray, Mgr.
Augusta	(m)	Daniel Field	Fred L. Dorset
Cedartown		Adamson Field	
Columbus	(m)	Columbus Airport	H. B. Crawford, C. M.
Douglas	(m)	State College Airport	J. M. Thrash, Pres.
Fitzgerald		Lynnwood Airport	C. A. Newcomer
Macon	(m)	Miller Field	R. J. Litteen
Moultrie	(m)	Clark Field	
Rome	(m)	Rome Airport	Rome Airport Assn.
St. Simons Island	(m)	Redfern Field	
Savannah	(m)	Savannah Airport	
Thomasville	(m)	Thomasville Airport	H. Wimpy
Valdosta	(m)	Valdosta Airport	P. W. Robertson, Chrm.
Waycross	(m)	Ware County Airport	
IDAHO			
Boise	(m)	Boise Airport	A. H. Hanley
Burley	(m)	Burley Airport	
Cascade	(m)	Cascade Airport	
Idaho Falls	(m)	Idaho Falls Airport	L. A. Dean
Kellogg	(m)	Shoshone County Airport	Kermit Paul
Pocatello	(m)	McDougall Field	E. L. Anderson, Mgr.
Priest River	(m)	Priest River Airport	A. C. Valkenberg
Twin Falls	(m)	Twin Falls Airport	Nowell Wight
ILLINOIS			
Bloomington		Bloomington Airport	
Champaign		Chamber of Commerce Airport	
Chicago (6200 South Cicero Ave.)	(m)	Chicago Airport	John Allen Casey
Chicago (Glenview)		Curtiss-Reynolds Airport	R. J. Hall
Danville	(m)	Chamber of Commerce Airport	
East St. Louis		Curtiss-Steinberg Airport	C. Ray Wassell.
East St. Louis		Parks Airport	Oliver L. Parks
Elgin	(m)	Elgin Airport	Herbert Byrne

Location	*Name of Port*	*Manager*
Elmhurst	Greer Lake St. Airport	
Galesburg	Galesburg Airport	
Joliet (m)	Joliet Municipal Airport	Harry E. Ohlhaver
Joliet	Joliet Airport	
Kewanee (m)	Kewanee Airport	W. E. Gerber
Lansing	Ford Airport	
LaSalle	LaSalle-Peru Airport	
Lombard	Lombard Airport	
Marion	Marion Airport	
Moline	Moline Airport	Bernard Sewerkrup
Monmouth	Monmouth Airport	G. Craig
Mt. Prospect	Pal-Waukee Airport	Duncan Hodges
Peoria	Mt. Hawley Airport	Alex Varney
Peoria	Peoria Airport	John A. Pullen
Quincy	Monroe Airport	Lester E. Webener
Quincy	Quincy Airport	
Rockford	Machesney Airport	F. E. Machesney
Springfield	Commercial Air Port	Craig Isabel, Mgr.
St. Elmo	Smith Aviation Field	Reginald Pattison
Sterling (m)	Sterling Airport	
Waterman (m)	De Kalb County Airport	
West Chicago	Air Activities Airport	John F. Jaenicke
INDIANA		
Angola	Tri-State Airport	Paul D. Eyster
Auburn	Cord Airport	John H. Springer
Elkhart	Arisman Airport	A. E. Arisman
Evansville (m)	Evansville Airport	W. R. Genot
Ft. Wayne (m)	Baer Field	R. S. Bartel
Ft. Wayne	Means Airport	E. W. Campbell
Frankfort (m)	Frankfort Airport	
Gary	Gary Airport	
Indianapolis	Capitol Airport	
Indianapolis (R. R. 18, Bx. 300R)	Hoosier Airport	Bob Shank, Mgr.
Indianapolis (m)	Indianapolis Airport	Major C. E. Cox, Jr.
Kokomo (m)	Kokomo Airport	Mike Murphy
LaFayette	Shambaugh Airport	L. I. Aretz
Madison	Crozier Airport	
Michigan City	Michigan City Airport	
Muncie	Muncie Airport	Clyde E. Shockley
Richmond	Richmond Airport	Claud Berry
South Bend (m)	South Bend Airport	Glen W. Borror
Terre Haute (m)	Dresser Field	J. H. Haxton
Vincennes	O'Neal Field	
Wabash (485 W. Canal)	Rettig Airport	Geo. O. Rettig
IOWA		
Ames	Ames Airport	
Boone	Boone Airport	
Burlington (m)	Burlington Airport	A. J. Hartman
Cedar Rapids	Cedar Rapids Airport	
Centerville (m)	Centerville Airport	V. C. Price
Clarinda	Ray Schenck Airport	
Columbus Junction	Pine Brothers Airport	
Council Bluffs (m)	Council Bluffs Airport	
Davenport	Cram Field	O. R. Hansen
Denison	Chamberlin Field	
Des Moines (m)	Des Moines Airport	A. E. Thomas
Dewitt	Dewitt Airport	A. H. Wheeler
Estherville (m)	Estherville Airport	Dr. G. G. Griffith
Ft. Dodge	Ft. Dodge Airport	E. Ellis Eno
Iowa City (m)	Iowa City Airport	Jack Curtis
Milford	Donaldson Bros. Aviation Field	
Monticello	Monticello Airport	R. L. McCaffree
Muscatine	Muscatine Airport	Wm. Groves
Sioux City	Rickenbacker Airport	A. S. Hanford, Jr.
Waterloo	Waterloo Airport	A. B. Livingston, Mgr.
KANSAS		
Beloit	Barker's Airport	
Bird City (m)	Bird City Airport	John Kite
Caney	Truskett Airport	
Chanute (Box 514) (m)	Chanute Airport	O. E. Dickerhoff
Clay Center (m)	Clay Center Airport	E. T. Starkweather

Location		*Name of Port*	*Manager*
Coffeyville	(m)	Coffeyville Airport	Lynn Berentz
Concordia	(m)	Blosser Airport	Chas. H. Blosser
Dodge City		McCoy Airport	
Garden City		Garden City Airport	Charles B. Eggen
Goodland	(m)	Goodland Airport	Vernon Dorney
Great Bend	(m)	Great Bend Airport	Bd. of Commissioners
Hutchinson	(m)	Hutchinson Airport	Grant Markle
Kansas City		Fairfax Airport	W. A. Barrett
Larned	(m)	Larned Airport	Sec. C. of C.
Lawrence	(m)	Lawrence Airport	
Newton	(m)	Newton Airport	K. L. Brode
Norton	(m)	Norton Airport	
Pittsburg		Pittsburg Airport	Mayor
Pratt		Pratt Airport	F. F. Swinson
Salina	(m)	Salina Airport	
Topeka		Topeka Airport	Paul W. Pugh
Wichita		Central Ave. Flying Field	R. W. Edwards
Wichita		Kellogg Airport	
Wichita		Wichita Airport	H. L. Mellor, Supt.
KENTUCKY			
Corbin	(m)	Corbin Airport	
Louisville	(m)	Bowman Field	Lt. Col. H. W. Rogers, Supt.
Owensboro		Sheehan Field	
Williamstown		Williamstown Airport	
LOUISIANA			
Alexandria	(m)	Alexandria Airport	R. W. Bringhunt
Baton Rouge	(m)	Baton Rouge Airport	Ed. W. Kleinpeter
Baton Rouge		Ronaldson Airport	
Eunice	(m)	Legion Airport	
Hammond	(m)	Port Hammond Airport	N. S. Chollette
Monroe	(m)	Selman Field	C. E. Woolman
New Orleans (P. O. Bx. 783)		Menafee Airport	W. J. Fry
New Orleans	(m)	New Orleans Airport	Geo. A. Hero, Jr.
New Orleans		Shushan Airport	E. E. Elam
New Orleans		Weddell-Williams Airport	
Patterson		Patterson Airport	
Shreveport	(m)	Shreveport Airport	R. C. Berry
MAINE			
Bangor		Godfrey Field	E. Godfrey
Farmington		Farmington Airport	
W. Scarboro		Portland Airport	E. C. Bessey
Portland		Stroudwater Field	Portland Flying Service
Presque Isle		Presque Isle Airport	M. S. W. Dingwall
Rockland (Bx. 280)		Curtiss-Wright Airport	W. H. Wincapaw
Sanford		Sanford Airport	Winfield Young & Co.
Skowhegan		Whittemore Field	
Waterville		Waterville Airport	
MARYLAND			
Baltimore		Martin Airport	The Glenn L. Martin Co.
Baltimore (Dundalk)	(m)	Logan Field	L. M. Rawlins, Jr.
Baltimore		Curtiss-Wright Airport	W. D. Tipton, Mgr.
Cumberland		Cumberland Airport	
Easton		Tred Avon Airport	M. L. Hathaway
Hagerstown		Hagerstown Airport	R. A. Henson
Rockville		Congressional Airport	
MASSACHUSETTS			
Athol		Orange & Athol Airport	
Beverly	(m)	Beverly Airport	
Boston	(m)	Boston Airport	Albert L. Edson
Boston (North Quincy)		Dennison Airport	H. E. Martin
Boston (Norwood)		Boston Metropolitan Airport, Inc.	John G. Rizzo
Brockton		Brockton Airport	
Falmouth		Falmouth Airport	
Framingham	(m)	Framingham Airport	R. C. Codman
Gardner		Gardner Airport	
Haverhill		Haverhill Airport	
Hyannis		Hyannis Airport	Alton B. Sherman
Lowell		Lowell Airport	

Location		*Name of Port*	*Manager*
Natick		Natick Wellesley Airport	E. Fletcher Ingals
Northampton		LaFleur Airport	
Pittsfield		Pittsfield Airport	
Revere		Muller Field	Al Zewink
Springfield		Springfield Airport	Edmund Fischer
Taunton		King Field	
Westfield-Holyoke	(m)	Barnes Airport	Chas. O'Connor
MICHIGAN			
Alma		Sharrar Airport	
Ann Arbor	(m)	Ann Arbor Airport	D. E. Richardson
Baldwin	(m)	Hulbertcrest Airport	H. W. Davis, Mgr.
Battle Creek	(m)	Kellogg Airport	Randolph Russell
Bay City	(m)	James Clements Airport	Henry Dora
Caro	(m)	Caro Airport	Glenn W. Owen
Crystal Falls	(m)	Crystal Falls Airport	I. H. Sanders
Detroit (Dearborn)		Ford Airport	H. L. Russell
Detroit (400 City Hall)	(m)	Detroit City Airport	R. W. Snoke
Detroit (3800 Barlum Tower)		Wayne County Airport	L. C. Smith
Ewen		Ewen Airport	A. M. Anderson
Flint		Bishop Airport	
Grand Rapids		Grand Rapids Airport	Thomas Walsh
Harbor Springs	(m)	Emmet County Airport	Norman W. Wells
Hartford		Leach Aero Service Field	Ronald Leach
Houghton		Isle Royale Sands Airport	
Howell	(m)	Howell Airport	
Ironwood	(m)	Gogebic County Airport	Geo. Koronski
Jackson	(m)	Reynolds Fields	Ross Beckner
Kalamazoo	(m)	Lindbergh Field	C. T. Tolpo
Lansing	(m)	Capitol City Airport	Charles Davis
Manistique	(m)	Schoolcraft County Airport	
Marysville	(m)	Marysville Airport	R. Stuart Weeks
Menominee	(m)	Menominee County Airport	M. B. Jensen
Midland	(m)	Midland Airport	Merle Newkirk
Muskegon	(m)	Muskegon County Airport	
Owosso		Owosso Airport	
Plymouth		Triangle Flying Service Field	
Pontiac	(m)	Pontiac Airport	Neil C. Brackstone
Saginaw	(m)	Saginaw Municipal Airport	Walter J. Carr
Sault Ste Marie	(m)	Sault Ste. Marie Airport	H. A. Sherman
Traverse City	(m)	Traverse City Airport	Don Clothier
Wayne		Detroit Wayne Ind. Airport	E. J. Smith
Ypsilanti (R. R. 4)		Ypsilanti Airport	M. E. Oliphant, Mgr.
MINNESOTA			
Coleraine	(m)	Coleraine Airport	C. M. Murphy
Duluth	(m)	Williamson-Johnson Airport	Harry T. Peterson
Fergus Falls		Fergus Falls Airport	Gustav O. Imm
Hibbing	(m)	Hibbing Airport	
Jackson	(m)	Jackson Airport	
Mankato		Mankato Airport	L. J. Sohler
Minneapolis	(m)	Minneapolis Municipal Airport	L. D. Hammond, Dir.
Rochester		Rochester Airport	G. T. Trenholm
St. Paul	(m)	Holman Municipal Airport	F. J. Geng, Master
Virginia	(m)	Virginia Airport	Clinton H. Sigel
Walker		Walker Airport	Ernie Beard
MISSISSIPPI			
Brookhaven	(m)	Brookhaven Airport	J. R. Ulmer
Clarksdale	(m)	Clarksdale Airport	H. B. Mitchell
Corinth		Corinth Airport	
Greenwood	(m)	Greenwood Airport	L. D. Pepper, Jr.
Greenville	(m)	Greenville Airport	T. White
Gulfport	(m)	Gulfport Airport	W. R. Hostetter
Hattiesburg	(m)	Hattiesburg Airport	
Jackson	(m)	Jackson Airport	
Laurel	(m)	Laurel Airport	
Meridian	(m)	Meridian Airport	
MISSOURI			
Bucklin		Vanosdel Field	
Carthage		Carrothers Airport	
Columbia		Allton Airport	
Jefferson City	(m)	Jefferson City Airport	Victor E. Raithel

Location		*Name of Port*	*Manager*
Kansas City	(m)	Kansas City Airport	Roy C. Farrell
Kansas City		Old Richards Field	
Marshall		Nicholas-Beazley Field	R. B. Nicholas
Springfield	(m)	Springfield Airport	Carl McClure
St. Joseph	(m)	Rosecrans Field	H. C. Brasfield
St. Louis (Robertson)	(m)	Lambert-St. Louis Airport	Milton D. Girton
MONTANA			
Belgrade	(m)	Belgrade Airport	E. A. Stiefel, C. A. Comm.
Billings	(m)	Billings Airport	Dick Logan
Butte	(m)	Butte Airport	I. K. Heslet
Dillon		Dillon Airport	Fred Woodside
Glasgow	(m)	Glasgow Airport	H. K. Near
Great Falls	(m)	Great Falls Airport	
Havre	(m)	Havre Airport	E. Sandquist
Helena	(m)	Helena Airport	Fred B. Sheriff, Chrm.
Kalispell	(m)	Kalispell Aviation Park	C. E. Trekell, Clerk
Miles City	(m)	Miles City Airport	Airport Commission
Missoula	(m)	Missoula Airport	
Stevensville	(m)	Stevensville Airport	Lester A. Meisner
Terry	(m)	Terry Airport	F. L. Patterson
NEBRASKA			
Alliance	(m)	Alliance Airport	
Columbus		Columbus Airport	
Grand Island	(m)	Grand Island Airport	Stover Deats, Mgr.
Holdrege	(m)	Holdrege Airport	
Lincoln		Arrow Airport	
Lincoln	(m)	Lindbergh Field	D. L. Erickson, C. E.
Lincoln		Union Airport	Harry B. Sidles
McCook	(m)	Chamber of Commerce Airport	
Norfolk		Norfolk Airport	
North Platte	(m)	North Platte Airport	C. H. Sluder
Omaha	(m)	Omaha Airport	Jay Dudley, Mgr.
Scottsbluff	(m)	Schafer Field	
NEVADA			
Caliente	(m)	American Legion Airport	Willard W. Smith
Elko	(m)	Keddie Field	Wm. H. Wunderlich
Las Vegas		Las Vegas Airport	Taylor & Bible
Reno	(m)	Blanchfield Airport	Robert E. Overman
Reno		Hubbard Field	
NEW HAMPSHIRE			
Claremont	(m)	Claremont Airport	Claremont Aero. Service
Concord	(m)	Concord Airport	C. J. Marston
Keene		Keene Airport	Edw. C. Sweeney
Manchester	(m)	Manchester Airport	
Newport	(m)	Albert N. Parlin Field	Edwin Acker
Portsmouth	(m)	Portsmouth Airport	John H. Wever
Twin Mountain		Twin Mountain Airport	Wiley Apte
NEW JERSEY			
Atlantic City	(m)	Atlantic City Airport	H. B. Baldwin, Supt.
Caldwell		Curtiss-Wright Airport	Frank LeMan
Camden		Central Airport	J. W. Markeim
Cape May	(m)	Cape May Airport	
Hasbrouck Heights		Teterboro Airport	L. F. Mitten
Newark	(m)	Newark Metropolitan Airport	R. Aldworth
New Brunswick		Hadley Airport	Thos. W. Robertson
Paterson		Murchio Field	
Red Bank		Red Bank Airport	J. F. Casey, Pres.
Trenton	(m)	Mercer Airport	William S. Borden, Dir.
NEW MEXICO			
Albuquerque		Albuquerque Airport	D. E. Dalby
Albuquerque		T. & W. A. Airport	Fred B. McLeod
Farmington	(m)	Farmington Airport	
Las Vegas		Las Vegas Airport	H. B. Taylor
Roswell	(m)	Roswell Airport	J. C. Barrett
Santa Fe		Santa Fe Airport	
Silver City	(m)	Whitehill Airport	F. J. Vesely
Socorro	(m)	Socorro Airport	W. E. West, Sec. S. B. M. C.

Location		*Name of Port*	*Manager*
NEW YORK			
Albany	(m)	Albany Airport	J. F. Fitzgerald, Jr.
Armonk		Westchester Airport	J. Edwin Jones
Binghamton		Binghamton Airport	C. A. Rowe
Binghamton		Bennett Field	C. W. Woodworth
Buffalo		Becker Airport	E. J. Becker
Buffalo	(m)	Buffalo Airport	N. E. Duffy
Cortland	(m)	Cortland County Airport	E. A. Link, Jr.
Dansville	(m)	Dansville Airport	L. E. Pickard
Endicott		Endicott Airport	Alfred MacLatchie
Farmingdale		American Airport	
Flushing		Flushing-New York Airport	W. W. Lewis
Glens Falls	(m)	Floyd Bennett Field	
Gloversville		Gloversville Airport	Guy W. Wilmot
Hammondsport		Mercury Field	H. C. Mummert
Hemlock		Hemlock Airport	Dr. Harold Nott
Islip		Islip Airport	A. I. Theis
Ithaca	(m)	Ithaca Airport	H. M. Peters
Jamestown		Jamestown Airport	
LeRoy		Donald Woodward Airport	Capt. Russell Holderman
Massapequa	(m)	Fitzmaurice Field	Daniel Hogan
Mineola		Roosevelt Field	George W. Orr
Montgomery		Tri-States Airways Airport	
New York City	(m)	Floyd Bennett Field, B'klyn	J. N. Kelly
New York City (Greenridge)		Donovan Hughes Airport	George Scharf
New York City (Jackson Heights)		Glenn Curtiss Airport	Peyton Gibson
Niagara Falls	(m)	Niagara Falls Airport	P. N. Pattison
Norwich		Norwich Airport	Harold J. Bowen
Oneonta		Keys Field	Charles A. Georgia
Pittsford		Brizee Aviation Field	R. G. Hottman
Poughkeepsie		Poughkeepsie Airport	John M. Miller
Rochester	(m)	Rochester Airport	Howard M. Shafer
Saratoga Springs		Saratoga Springs Airport	
Schenectady		Schenectady Airport	J. H. Alrutz
Syracuse		Empire Airport	
Syracuse	(m)	Syracuse Airport	R. L. Kincaid
Utica	(m)	Utica Airport	Reginald J. Heath
Valley Stream		Curtiss-Wright Airport	Bruce Johnson
Watertown	(m)	Watertown Airport	F. H. Taylor
Wellsville	(m)	Wellsville Aviation Club Field	
Westport	(m)	Westport Airport	H. P. Smith
NORTH CAROLINA			
Asheville	(m)	Asheville-Hendersonville Airport	
Charlotte (Box 735)		Charlotte Airport	J. R. Farrow
Fayetteville		Fayetteville Airport	
Greensboro	(m)	Lindley Field	Henry W. Rafus
Hickory		Longview Field	B. F. Seagle, Jr.
High Point		Chas. Kenner Flying Service Airport	
Kinston	(m)	Kinston Airport	
Marion	(m)	Francis Marion Field	W. F. Shiflett
New Bern	(m)	New Bern Airport	
N. Wilkesboro		N. Wilkesboro Airport	C. S. Coffey
Pinehurst	(m)	Knollwood Airport	Lloyd O. Yost
Raleigh		Curtiss-Wright Airport	Elmer A. Myers
Rockingham		Fox's Rockingham Airport	V. Ratliff
Rocky Mount		Eagle Airport	J. D. Winstead, Owner
Salisbury	(m)	Salisbury Airport	
Wilmington		Wilmington Airport	
NORTH DAKOTA			
Bismarck	(m)	Bismarck Airport	M. H. Atkinson, G. M.
Devils Lake	(m)	Devils Lake Airport	
Dickinson	(m)	Dickinson Municipal Airport	
Fargo	(m)	Hector Field	Titus Richards
Grand Forks	(m)	Grand Forks Airport	E. L. Lium, Act. Mgr.
Hettinger	(m)	Hettinger Airport	Dr. W. D. Odou
Jamestown	(m)	Jamestown Airport	C. A. Henderson, Sec.
Lakota		Lakota Airport	A. E. Thompson
Minot	(m)	Port O Minot	C. O. Shupe
Pembina	(m)	Ft. Pembina Airport	Mun. Airport Comm.

Location	*Name of Port*	*Manager*
Towner	Jake's Airport	J. J. Bertram
Valley City (m)	Valley City Airport	C. E. Clarke
Williston (m)	Williston Airport	E. M. Canfield
OHIO		
Akron (m)	Akron Airport	B. E. Fulton
Alliance	Alliance Airport	
Ashland	Ashland Airport	
Ashtabula (m)	Ashtabula Airport	
Bucyrus (m)	Port Bucyrus	M. H. Foltz
Canton	McKinley Airport	
Cincinnati (m)	Lunken Airport	Albert B. Wunder, Supt.
Cincinnati	Watson Airport	
Cleveland (m)	Cleveland Airport	John Berry
Cleveland	Great Lakes Aircraft Corp. Fld.	
Columbus (m)	Port Columbus	Maj. Wm. F. Centner, Supt.
Coshocton	Coshocton Airport	Russell C. Jacobs
Dayton (m)	Dayton Municipal Airport	E. A. Johnson
Dayton	East Dayton Airport	
Edison	Ireland Airport	
Findlay	Rummell Airport	Harry B. Rummell
Gallipolis (m)	Twin City Airport	Stanley B. Huntington, Mgr.
Hamilton	Hamilton Airport	Joseph Hogan
Lancaster (m)	Lancaster Airport	
Madison	Madison-on-the-Lake Airport	
Marietta (m)	Ohio Valley Airport	Chris Matthews
Marion (m)	Marion Airport	
Middletown	Middletown Airport	Geo. J. Wedekind
Montpelier	Montpelier Airport	
Sandusky	Parker Field	
Springfield (m)	Springfield Mun. Airport	W. B. Little
Toledo (Box 167)	Transcontinental Airport	C. J. Fenton
Willoughby	Lake County Airport	Harry R. Playford
Willoughby	Euclid Ave. Airport	W. W. Francis
Youngstown	Bernard Airport	
Youngstown (m)	Youngstown Airport	C. S. Hanson
Yorkville (Belmont Co.)	Scott Field	
OKLAHOMA		
Ada	Ada Airport	Lt. Paul Hinds
Bartlesville	Phillips Aviation Field	Wm. Parker
Blackwell (m)	Blackwell Airport	C. A. Bradfield
Bristow	Bristow Airport	G. C. Kittelsen
Chickasha (m)	Chickasha Airport	Paul Rider
Claremore (m)	Will Rogers Airport	
Duncan (m)	Halliburton Field	J. H. Bender, C. M.
Durant (m)	Eaker Airport	
Elk City (m)	Elk City Airport	Walter D. Mauk
El Reno (m)	Reno Airport	H. M. Woods, C. A. C.
Enid (m)	Woodring Field	Capt. Hugh Askew
Mangum (m)	Ponder Field	Ray Shiffett
McAlester	Claud Eures Airport	
Miami (m)	Miami Airport	H. G. Freehauf
Muskogee (m)	Hatbox Field	L. L. Rupert
Oklahoma City	Curtiss-Wright Airport	
Oklahoma City (m)	Oklahoma City Airport	William E. Fletcher
Pauls Valley	Pauls Valley Airport	Earl Witten
Ponca City (m)	Ponca City Airport	T. D. Harris
Stillwater (m)	Stillwater Airport	L. M. McGoodwin
Tulsa	McIntyre Airport	D. A. McIntyre
Tulsa (Box 3156) (m)	Tulsa Airport	C. W. Short, Jr.
Waynoka	Waynoka Airport	
Woodward (m)	Woodward Airport	
OREGON		
Albany (m)	Albany Airport	F. E. Bloom
Ashland (m)	Ashland Airport	
Baker (m)	American Legion Airport	
Beaverton	Watts Airport	R. J. Danis
Bend	Bend Airport	C. G. Reiter
Corvallis	Lyndon Airport	P. W. Lyndon
The Dalles	The Dalles	Dr. A. B. Stone

Location		*Name of Port*	*Manager*
Eastside	(m)	Coos Bay Airport	
Eugene (Box 328)	(m)	Eugene Airport	H. H. Hobi
Grants Pass	(m)	Josephine County Airport	Josephine County A. C.
Lakeview	(m)	Lakeview Airport	Harry Ballard
Medford (Box 1016)	(m)	Medford Airport	T. A. Culbertson, Jr.
North Bend	(m)	North Bend Airport	Frank L. Black
Pendleton	(m)	Pendleton Airport	City of Pendleton
Portland	(m)	Portland Airport	James H. Polhemus
Roseburg	(m)	Roseburg Airport	A. I. Geddes
Salem	(m)	Salem Airport	Lee Everly
Springfield	(m)	Springfield Airport	

PENNSYLVANIA

Allentown		Allentown Airport	J. S. Christman
Altoona-Tyrone		Stultz Field	
Berwick		Berwick Airport	
Bethlehem		Bethlehem Airport	Stanley W. Keck
Bradford		Harri Emery Airport	John J. Moore
Coatesville		Coatesville Airport	Philip Harman, Jr.
Dubois	(m)	Dubois Airport	R. O. Howard
Easton		Easton Airport	Chas. A. Benckert
Ebensburg		Keystone Airport	
Erie		Port Erie Airport	
Fairview		Erie County Airport	N. R. McCray
Gettysburg		Gettysburg Airport	M. S. Kleinfelter
Harrisburg		Harrisburg Airport	
Harrisburg		Susquehanna Airport	J. P. Walmer
Indiana		Hamilton Field	
Johnsonburg	(m)	Johnsonburg Legion Airport	
Jones Mills		Pike Run Airport	
Johnstown	(m)	Johnstown Airport	J. H. Ritter
Kylertown		Ames Airport	
Lancaster		Lancaster Airport	
Latrobe		J. D. Hill Airport	
Leechburg		Leechburg Airport	
Lehighton		Lehighton Airport	
Meadville		Port Meadville Airport	R. P. Boynton
New Castle		Bradford Airport	
Nicholson		Mount View Airport	
Norristown		Patco Field	
Philadelphia	(m)	Philadelphia Airport	LeRoy Hauser
Pittsburgh (Dravosburg)		Curtiss-Bettis Airport	W. C. McConnell, Jr.
Pittsburgh	(m)	Pittsburgh-Allegheny County Airport	H. R. Bazley
Pittsburgh		Pittsburgh-Butler Airport	J. T. Rinker
Scranton		Scranton Airport	
Somerset		Rhoads Field	
Sunbury	(m)	City of Sunbury Airport	
Towanda	(m)	Towanda Legion Airport	
Waynesboro		Waynesboro Airport	
Wilkes-Barre		Wilkes-Barre Wyoming Valley Airport	Geo. S. Eckman
Williamsport		Williamsport Airport	T. H. Kinkade
Willow Grove (Phila.)		Pitcairn Field	Geo. E. Chambliss
York		York Airport	Lester J. Sipe

RHODE ISLAND

Newport		Newport Airport	Guerdon Brockso
Pawtucket		What Cheer Airport	Joshua Crane, Jr.
Providence		Providence Airport	W. M. Fletcher
Woonsocket		Woonsocket Airport	

SOUTH CAROLINA

Anderson	(m)	Anderson Airport	
Camden	(m)	Woodward Aviation Field	
Charleston	(m)	Charleston Airport	
Columbia	(m)	Columbia Airport	
Florence	(m)	Florence Airport	D. L. Husband
Greenville	(m)	Greenville Airport	
Myrtle Beach		Myrtle Beach Airport	
Rock Hill		Roddey Airport	
Spartanburg	(m)	Spartanburg Airport	J. E. Simkins

Location	Name of Port	Manager
SOUTH DAKOTA		
Aberdeen ..... (m)	Aberdeen Airport	R. G. Barstow
Belle Fourche	Belle Fourche Airport	George E. Hight
Lemmon ..... (m)	Lemmon Airport	C. of C.
Mobridge	Mobridge Flying Service Field.	I. L. Hagen
Pierre ..... (m)	Walter J. Smith Airport	G. M. Roberts
Rapid City	Rapid Air Lines Corporation Airport	
Sioux Falls	Renner Field	E. H. McCord
Volga	Midway Airport	
Wagner ..... (m)	Wagner Airport	C. W. Knight
Watertown	Watertown Airport	R. C. Hubbard
TENNESSEE		
Chattanooga	Brainerd Airport	
Chattanooga ..... (m)	Chattanooga Airport	W. Deland Dyke
Knoxville ..... (m)	McGhee-Tyson Airport	W. I. Self
Memphis ..... (m)	Memphis Airport	B. B. Holmes
Nashville ..... (m)	McConnell Field	W. L. Hethcote
Union City ..... (m)	Union City Airport	J. R. Meck
TEXAS		
Abilene ..... (m)	Abilene Air Terminal	
Albany ..... (m)	Plane Haven Airport	J. P. Alexander
Amarillo	English Field	Harold W. English
Austin ..... (m)	Robert Mueller Airport	
Austin	University Airport	
Beaumont ..... (m)	Beaumont Airport	Frank L. Bertschler
Big Spring ..... (m)	Big Spring Airport	Wm. L. Hagman, Jr.
Bonham ..... (m)	Jones Field	L. K. Crawford
Breckenridge ..... (m)	Breckenridge Airport	C. H. Clark
Brownsville ..... (m)	Brownsville Pan-American Airport	T. E. Gilmore
Corpus Christi ..... (m)	Corpus Christi Airport	W. C. Maus
Corsicana ..... (m)	Corsicana Airport	
Dallas ..... (m)	Love Field	W. E. Fly
Del Rio ..... (m)	Del Rio Airport	John Y. Long, Mayor
El Paso	Air Mail Field	J. G. Welker
El Paso ..... (m)	El Paso Airport	A. E. Johnson
Fort Worth ..... (m)	Meacham Field	William G. Fuller
Grand Prairie	Curtiss-Wright Airport	
Harlingen ..... (m)	Harlingen Airport	
Houston ..... (m)	Houston Airport	C. P. Neuhaus
Houston ..... (m)	Houston Main Street Airport.	
Kerrville	Louis Schreiner Airport	C. L. Mason C. A. Comm.
Lubbock ..... (m)	Lubbock Airport	Wm. C. Breedlove
McCamey ..... (m)	McCamey Field	W. E. Pittman
Marfa ..... (m)	Marfa Airport	
Marlin ..... (m)	Chamber of Commerce Airport	
Marshall ..... (m)	Marshall Airport	
Pecos ..... (m)	Pecos Airport	Ralph Sparke
Port Arthur (Box 712)	Texaco Airport	E. P. Dodge
Ranger (Box 902) .. (m)	Ranger Airport	C. J. Moore, Mgr.
San Angelo ..... (m)	San Angelo Airport	Autrey Monsey
San Antonio ..... (m)	Winburn Field	J. Wayne Parks
Sherman ..... (m)	Sherman Airport	
Sweetwater ..... (m)	Sweetwater Municipal Airport	
Tyler ..... (m)	Tyler Airport	
Waco ..... (m)	Rich Field	J. C. Estes
Wichita Falls ..... (m)	Kell Field	F. Armstrong
UTAH		
Ogden ..... (m)	Ogden Airport	Harold R. Tripp
Salt Lake City ..... (m)	Salt Lake Airport	Gilbert R. Rich
VERMONT		
Burlington ..... (m)	Burlington Airport	James Beckwith
Manchester	Equinox Airport	F. W. Orvis
Montpelier	Barre-Montpelier Airport	Chas. McKenna
Rutland	Rutland City Airport	
Springfield ..... (m)	Hartness Airport	R. M. Wilcomb
White River Junction	Twin State Airport	A. W. Stone, Pres.
VIRGINIA		
Alexandria	Alexandria Airport	E. W. Robertson

Location	*Name of Port*	*Manager*
Bristol ..... (m)	Bristol Airport	Louis Hilbert
Danville ..... (m)	Danville Airport	
Fredericksburg ..... (m)	Shannon Field	
Hopewell ..... (m)	Hopewell Airport	Lamar Johnson
Lynchburg (Box 782) (m)	Preston Glenn Airport	R. D. Apperson
Norfolk	Norfolk Airport	
Port Richmond ..... (m)	Thompson Field	Grosby Thompson, Mayor
Richmond ..... (m)	Richard E. Byrd Flying Field.	C. H. Schutte
Roanoke ..... (m)	Roanoke Airport	Clayton Lemon
Waynesboro	Valley Airport	C. C. Loth
Williamsburg ..... (m)	Williamsburg Airport	O. Z. Johnson
Winchester ..... (m)	Admiral Byrd Airport	Roy W. Richards
WASHINGTON		
Bellingham	Graham Field	R. C. Graham
Centralia ..... (m)	Centralia Airport	T. R. Patton
Chehalis ..... (m)	Chehalis Airport	A. C. St. John, Pres.
Ellensburg	Ellensburg Airport	
Olympia ..... (m)	Olympia Airport	E. N. Steele
Pasco ..... (m)	Franklin County Airport	A. E. Wehe
Port Angeles	Port Angeles Air Transport Field	John Blum
Seattle ..... (m)	Boeing Field	Douglas Miller
Seattle	Renton (Bryn Mawr) Field ..	George Whaley
South Bend	South Bend-Raymond Airport..	B. C. Kremmel
Spokane ..... (m)	Felts Field	Andrew J. Fabian
Tacoma	Mueller-Harkins Airport	
Tacoma ..... (m)	Tacoma Field	J. D. Crichton
Vancouver ..... (m)	Vancouver Airport	
Walla Walla ..... (m)	Walla Walla Airport	K. E. Baumeisten
Wenatchee	Wenatchee Chamber of Commerce Airport	
White Bluffs ..... (m)	White Bluffs Landing Field	
Yakima ..... (m)	Yakima County Airport	County Comm.
WEST VIRGINIA		
Bluefield	Bluefield Airport	
Charleston ..... (m)	Wertz Field	C. H. Hetzel, Mgr.
Huntington	Huntington Airport	Howard G. Mayes
White Sulphur Springs	Greenbrier Airport	L. R. Johnston
WISCONSIN		
Appleton	George A. Whiting Airport	
Athlestane	Schaf Airport	R. H. Schaf
Eagle River	Keystone Park Airport	
Eagle River	McCullough-Otter Rapids Field.	
Fond du Lac	Fond du Lac Airport	F. F. Manor
Janesville	Janesville County Airport	
Janesville	Janesville Airport	
Kohler ..... (m)	Kohler Airport	Anton F. Brotz
LaCrosse ..... (m)	LaCrosse Airport	Board Pub. Works
Land O'Lakes ..... (m)	Land O'Lakes Airport	J. F. Handhos
Madison	Madison Airport	O. G. Corben
Madison	Royal Airport	Howard A. Marey
Manitowoc ..... (m)	Manitowoc Airport	F. Shoblaska
Marshfield	Miners Airport	W. Miner
Milwaukee (Bx 1036)	Curtiss-Milwaukee Airport	Douglas Harris
Milwaukee ..... (m)	Milwaukee County Airport	Major S. E. Piasecki
Mosinee	Mosinee Airport	
Oshkosh	Oshkosh Airport	R. A. Mensing, Jr.
Princeton ..... (m)	Princeton Airport	G. V. Kelly
Rhinelander ..... (m)	Legion Field	Steve Shadbreck
Sheboygan ..... (m)	Sheboygan Airport	
Stevens Point	Stevens Point Airport	
Three Lakes ..... (m)	Three Lakes Airport	H. L. Grandy
Washington Island .	Washington Island Airport ..	Wm. Jess
Wausau	Alexander Airport	M. Johnson
WYOMING		
Casper ..... (m)	Wardwell Field	R. Leferink
Cheyenne ..... (m)	Cheyenne Airport	Boeing Air Transport
Cody ..... (m)	Cody Airport	
Greybull	Greybull Airport	
Lander ..... (m)	Lander Airport	Hugh D. Spangler
Parco ..... (m)	Parco Airport	
Rock Springs ..... (m)	Rock Springs Airport	E. S. Maroney
Sheridan ..... (m)	Sheridan Airport	Hanley G. Cohn
Thermopolis ..... (m)	Thermopolis Airport	

SEAPLANE ANCHORAGES IN THE UNITED STATES

List Supplied by Hydrographic Office, Washington, D. C.

CLASS I. ANCHORAGES WITH RAMPS, ETC.

Atlantic Coast

Maine

Bar Harbor (Hadley Point)
Rockland

Massachusetts

*Gloucester (Coast Guard Air Station)
*Boston (municipal airport)
*Squantum (Naval Reserve air station)
*South Dartmouth (Round Hill Airport)

Rhode Island

*Newport (Gould Island naval torpedo station)

Connecticut

*Bridgeport
Groton
*New Haven

New York

Brooklyn (Floyd Bennett Field)
College Point, Long Island
Croton-on-Hudson
Lake George
*Port Washington, L. I.
*North Beach, L. I.
Amityville, L. I.
*New Dorp, S. I.

New Jersey

Atlantic City
*Cape May (Coast Guard air station)
Jersey City

Pennsylvania

*Philadelphia (naval aircraft factory)
Essington

Virginia

*Hampton (Langley Field)
*Hampton Roads (naval air station)
Hopewell
Quantico (Marine barracks)
Dahlgren (naval proving ground)

Maryland

Baltimore (2) (Middle River: Martin Airport) (Municipal Airport)

District of Columbia

Washington (naval air station, Anacostia)

North Carolina

Beaufort

Florida

West Palm Beach
*Miami (5)
*Key West (naval station)

Gulf Coast

Florida

*St. Petersburg
Pensacola (naval air station)
Tampa

Louisiana

New Orleans

Pacific Coast

California

San Diego (naval air station)
Catalina Island
Oakland (Oakland Municipal Airport)

Oregon

Portland

Washington

Seattle (5) (Sand Point Naval Reserve Air Station); (Renton Airport); (Elliott Bay); (Lake Union (2))
Port Townsend (floating hangar)

Great Lakes

Illinois

Chicago
Great Lakes (naval training station)

Michigan

Detroit (2)
Grosse Ile (Naval Reserve aviation base)
Mount Clemens (Selfridge Field)

Minnesota

Duluth

Ohio

Cleveland

Wisconsin

Delafield
Milwaukee
Racine

Alaska

Anchorage (floating ramp)
Cordova
Juneau (floating hangar)
Ketchikan (2) (ramp and floating hangar)
Petersburg
Wrangell

II. ANCHORAGES WITH ORDINARY HARBOR FACILITIES

Atlantic Coast

Maine

Calais
*Eastport
*Boothbay
Bath
*Portland

New Hampshire

*Portsmouth

Massachusetts

Salem
Provincetown
West Barnstable
*New Bedford
Fall River
Nantucket
Edgartown

Rhode Island

Providence

Connecticut

*New London

New York

*Port Jefferson, L. I.
Amityville, L. I.
Great Pond (Lake Montauk L. I.)
Brooklyn

New Jersey

*Keyport

Maryland

*Aberdeen
Annapolis
Baltimore

North Carolina

Elizabeth City
*Edenton
Morehead City
New Bern
Wilmington

South Carolina

*Georgetown
*Charleston
*Beaufort

Georgia

Savannah
*Brunswick

Florida

*Fernandina
*Jacksonville
*St. Augustine
*Daytona Beach
*Titusville
*Fort Pierce

Gulf Coast

Florida

*Fort Myers
*Sarasota
*Cedar Keys
Panama City

Alabama

Mobile

Mississippi

Pascagoula
Biloxi
Gulfport
Bay St. Louis

Louisiana

Weeks

Texas

Port Arthur
Houston
Corpus Christi
Rockport
Point Isabel

Pacific Coast

California

Los Angeles
Port San Luis
Monterey
Santa Cruz
San Francisco
Sausalito
Alameda
Eureka
Crescent City

Oregon

Port Orford
Marshfield
Reedsport
Astoria

Washington

Grays Harbor
Port Angeles
Blaine
Bellingham
Anacortes
New Dungeness
Everett
Bremerton (Navy Yard)

*Description of anchorages published in the Naval Air Pilot East and Gulf Coasts of the United States.

H. O. Publication 190.

SEAPLANE ANCHORAGES OUTSIDE THE UNITED STATES

CLASS I. ANCHORAGES WITH RAMPS, ETC.

Canada

British Columbia

Nanaimo
Swanson Bay
Vancouver (2)
Victoria

New Brunswick

Fredericton
St. John

Ontario

Sault Ste. Marie

Central America

Canal Zone

Coco Solo (United States Naval Air Station)
France Field (United States Army Air Corps)

British Honduras

Belize

South America

Argentina

Puerto Belgrano

Brazil

Fortaleza (Cera)
Ilheios
Para
Porto Alegre
Rio de Janeiro

British Guiana

Georgetown

Chile

Quintero

Columbia

Barranquilla
Buenaventura

Dutch Guiana

Paramaribo

Ecuador

Guayaquil
Santa Elena

Peru

Ancon

Venezuela

Maracaibo

West Indies

Bahama Islands

New Providence Island (Nassau)

Cuba

Guantanamo (Hicacal Beach)

Curacao

Willemstad

Haiti

Port au Prince (2) (United States Marine Corps) (floating ramp)

Jamaica

Kingston

Puerto Rico

San Juan (Isla Grande Airport)

St. Lucia

Port Castries

Trinidad

Port of Spain

STATE AIRPORT ADVISORS

Appointed by the Aeronautics Branch, U. S. Department of Commerce, to cooperate in the municipal airports development program of the Civil Works Administration.

Alabama	Col. Sumpter Smith	830 Brown Marx Bldg., Birmingham
Arizona	Lynn Lockhart	P. O. Box 1328, Phoenix
Arkansas	Chas. M. Taylor	406 Louisiana St., Little Rock
California	B. M. Doolin	c/o CWA, 49 Fourth St., San Francisco
Colorado	Danny Kearns	1375 Lincoln St., Denver
Connecticut	Charles W. Morris	State Capitol, Hartford
Delaware	Leon Thompson	c/o CWA, Delaware Trust Bldg., Wilmington
Florida	A. B. McMullin	State Capitol, Tallahassee
Georgia	William F. Cummings	61 Mitchell St., Atlanta
Idaho	Arthur Blomgren	State Capitol, Boise
Illinois	L. P. Bonfoey	State Capitol, Springfield
Indiana	Charles V. Cox	217 N. Senate Ave., Indianapolis
Iowa	Ralph W. Cram	c/o "Davenport Democrat," Davenport
Kansas	Earl Schaeffer	c/o CWA, Topeka
Kentucky	John C. Bennett	Louisville Flying Service, Louisville
Louisiana	W. S. Young	Sinclair Bldg., Shreveport
Maine	Harry M. Jones	State House, Portland
Maryland	W. D. Tipton	306 Stewart Bldg., Baltimore

Massachusetts	Francis P. Kendall	c/o National Guard Hangar, Municipal Airport, East Boston
Michigan	Col. Floyd Evans	Department of Aeronautics, Lansing
Minnesota	Col. L. H. Brittin	Northwest Airways, St. Paul
Mississippi	John O'Keefe	Biloxi
Missouri	Roy C. Farrell	Kansas City Airport, Kansas City
Montana	Fred B. Sheriff	State Capitol, Helena
Nebraska	Dr. W. W. Arrasmith	Grand Island Clinic, Grand Island
Nevada	Robert E. Overman	Reno
New Jersey	Maj. Robert L. Copsey	Newark Metropolitan Airport, Newark
N. Hampshire	W. N. Cogswell	State Capitol, Concord
New Mexico	R. L. Harrison	Albuquerque
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Oregon	Lt. Basil B. Smith	1117 Spalding Bldg., Portland
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Rhode Island	Dan W. Jones	26 Washington Square, Newport
S. Carolina	Dr. L. B. Owens	Columbia
S. Dakota	R. T. McKinnon	Pierre
Tennessee	Col. Herbert Fox	American Natl. Bank, Nashville
Texas	M. J. Norrell	Dallas
Utah	D. R. Brimhall	c/o R. H. Hinckley, State Capitol, Salt Lake City
Vermont	Porter Adams	c/o Motor Vehicles, Montpelier
Virginia	A. H. Pettigrew	State Capitol, Richmond
Washington	Elsworth French	Civic Bldg., Spokane
W. Virginia	David M. Giltinan	State Capitol, Charleston
Wisconsin	A. D. Murphy	c/o CWA, Casper
Wyoming	I. Kirk Baldwin	c/o Association of Commerce, Green Bay

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JOURNAL OF AIR LAW	357 East Chicago Avenue, Chicago, Ill.
JOURNAL OF THE AERONAUTICAL SCIENCES	5431 R.C.A. Building, Rockefeller Center, New York, N. Y.
NATIONAL AERONAUTIC MAGAZINE	Dupont Circle, Washington, D. C.
OFFICIAL AVIATION GUIDE OF THE AIRWAYS	608 South Dearborn Street, Chicago, Ill.
POPULAR AVIATION	608 South Dearborn Street, Chicago, Ill.
SKY LINES	540 North Michigan Avenue, Chicago, Ill.
SPORTSMAN PILOT	515 Madison Avenue, New York, N. Y.
U. S. AIR SERVICES	Transportation Building, Wash., D. C.
UNIVERSAL MODEL AIRPLANE NEWS	551 Fifth Avenue, New York, N. Y.
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· DIVISION I ·

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· DIVISION II :
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Aeronautical Representative
Catalog A-636

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