The AIRCRAFT YEAR BOOK

For 1932

HARRISON BRAND, JR.

AIRCRAFT YEAR BOOK, 1932

The AIRCRAFT YEAR BOOK

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For 1932

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PART I

The Year in the Air

CHAPTER I

THE OUTLOOK FOR 1932

Military Aviation Important Factor—Continued Growth of Air Line Traffic Foreseen—Airship Programs Move Forward Steadily—President Receives Recommendations of Aviation Industry

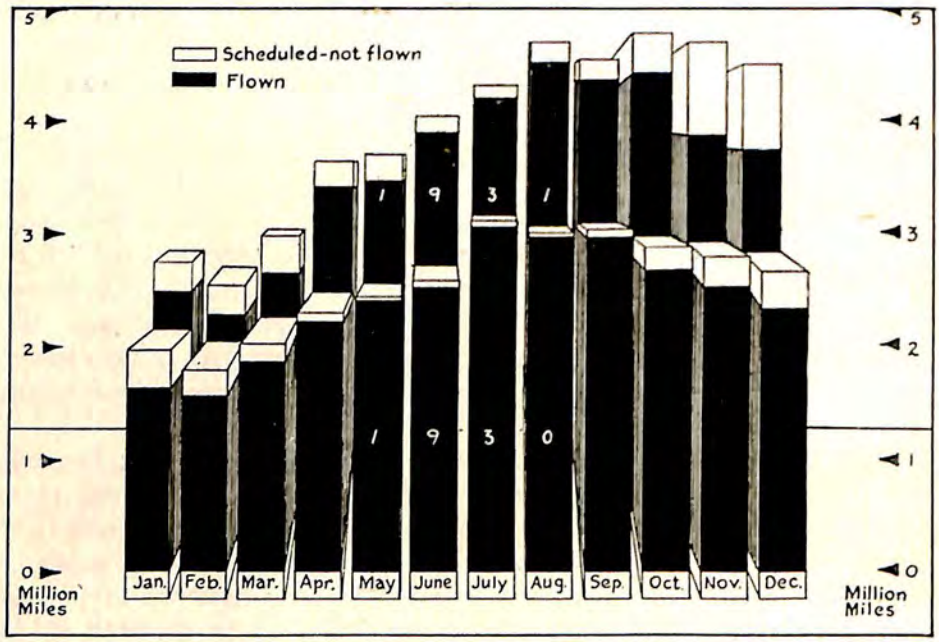
THE aviation industry weathered two of the most critical years in its history in 1930 and 1931, and entered 1932 considerably stronger as a result of the achievements and readjustments of the preceding two year period. As will be seen later, the year 1931 measured up well to the forecasts made for it in the last volume of THE AIRCRAFT YEAR BOOK. Only lack of courage and foresight on the part of those in whose hands the national aviation program is entrusted can keep aviation from being a leader among industries in the slow but steady march toward general business recovery in 1932.

This, the fourteenth successive edition of THE AIRCRAFT YEAR BOOK, is a record of aeronautic development throughout the world during 1931. It owes its comprehensive character to the close cooperation of hundreds of persons and organizations allied with the American industry, the far-flung corps of American consular officials and trade commissioners in foreign countries, and the several departments of the federal government, all of whom contributed in some way to the fund of information at the editor's disposal in finally portraying the year's progress in word and picture. Just as past editions provided reviews of the preceding year's activity in every phase of the industry and made possible a forecast for the new year, so it is felt that this 1932 edition presents a picture of 1931 which can be projected into the new year and a forecast of the trends made with a fair degree of accuracy.

Fulfilling the forecast made for it at the beginning of the year, air transport experienced the greatest year in its history in 1931 with substantial gains in the number of plane-miles and passenger-miles flown, the total passengers carried, the volume of mail transported, and the amount of air express flown. The major transport operators plowed their receipts back into new development, with the result that nearly $5,000,000 worth of new transport aircraft, faster and more luxurious than any previously in service,

was purchased during 1931, old lines were extended and new routes added to bring the benefits of air transport to new sections of the nation's population. This phenomenal growth of air transport, during a period when older forms of transportation were showing sharp decreases in their volume of business, should continue in 1932 if the air transport operators are assured of the steady development of the federal airway program by the Department of Commerce and a continuation of the Post Office Department's support through adequate air mail appropriations.

Keeping pace with the example of the domestic air transport operators,



MILES SCHEDULED AND FLOWN BY AMERICAN AIR LINES

American endeavor in the international field of air line operation was redoubled during 1931 with the result that American-owned lines extended throughout the Western Hemisphere from Alaska to Argentina and Chile. As will be seen in a later chapter, the operation of this vast system of international lines under the American flag is playing an increasingly important part in the opening up of new markets for American products in nearly two score countries served. Continued support of these lines through foreign air mail appropriations is considered vital by business houses seeking new outlets for their goods during a depressed period at home.

Military aviation, for years an important factor in the progress of American aeronautics, stood out as particularly significant during 1931 and promised to be a major factor in 1932. The Army Air Corps flew 44,000,000

miles during 1931, while the Navy and Marine Corps logs totaled nearly 29,000,000 miles. Both constituted new operating records. The Navy completed its Five Year Program a year ahead of schedule, while the Army's Five Year Program still lacked the necessary appropriations to make possible its completion on time. The lack of a continuing program for procurement upon which aircraft constructors, charged with the duties of maintaining production forces intact and pursuing new engineering research to meet the demands of a national emergency, might build their plans left a sharp corner to be turned during 1932.

PRESIDENT RECEIVES CHAMBER OFFICIALS

Delegation from the Aeronautical Chamber of Commerce received by President Hoover, photographed on the lawn of the White House.

It was evident that if American aviation is to meet the commercial demands being made upon it as a means of high speed transportation and communication, and if it is to continue as an effective and progressive medium of national defense, the industry must have assurance of support along several lines. Military and naval aviation appropriations must be increased from their low 1933 scale so as to provide a balancing of Air Corps equipment to personnel authorized by the Five Year Program, and tying the Naval aircraft procurement program in with the carrier and deck cruiser construction plan which grew out of the London Naval Limitation Treaty. Commercial air transport must receive continued support under the McNary-Watres Act, administered by the Post Office Department, and

under the Air Commerce Act, administered by the Department of Commerce, through sympathetic regulation and the establishment and maintenance of aids to air navigation. Private and industrial flying must obtain recognition by the several states of their responsibilities as well as their privileges in developing commercial aviation, by adopting rules and regulations uniform in principle with the Department of Commerce, by imposing no unnecessary burden of taxation or fees, and by supplying such intrastate aids to air navigation as will complement the national airway system under construction by the federal government.

Just as the motor car industry—then a new force in speeding the tempo of transportation—led the way to business recovery in an earlier period of widespread depression, so the aviation industry entered 1932 with the product and the energy to aid modern business in stepping-up its sales and distribution organizations and to lead the way to new business levels. How great a part the aviation industry might play in this leadership during 1932 depended in a large measure on the support afforded it by such agencies as the federal and state governments, which recognized the value of the motor car as a stimulant to general business by investing billions of dollars in good roads at the opportune time.

With calls for economy in government expenditures on every side, the national and state legislatures faced the dilemma of encouraging methods for speeding the tempo of modern business and stimulating recovery from the world-wide depression on one hand, while catch-penny economy programs—which threatened to break down the industrial structure built at a cost of years of effort and millions of dollars invested—were being presented as panaceas on the other hand.

The federal aviation appropriations picture from 1922 to 1933 is presented in a carefully prepared table which will be found in Part IV, "Flying Facts and Figures," of this volume. It should be remembered in considering this table that a large portion of the funds appropriated by the federal government for aviation is necessary for personnel salaries, the construction of living quarters for personnel and other items, so that the total amount appropriated in no way represents the amount of money paid to the aircraft industry for equipment or services.

Leaders in the aircraft industry have maintained that the primary purpose of aviation should be considered as commercial. The industry, therefore, supports any wise effort to divert the world's attention from unproductive armaments to those means of national security which contribute most to economic welfare and at the same time fulfill a military service. Such means are to be found in aviation, and most notably in the nation-wide air mail and air transport system, maintained over a network of interstate airways developed by the federal government. Because commercial airways, with their auxiliary aids to air navigation, are regarded in some foreign

INAUGURATING NEW SERVICE

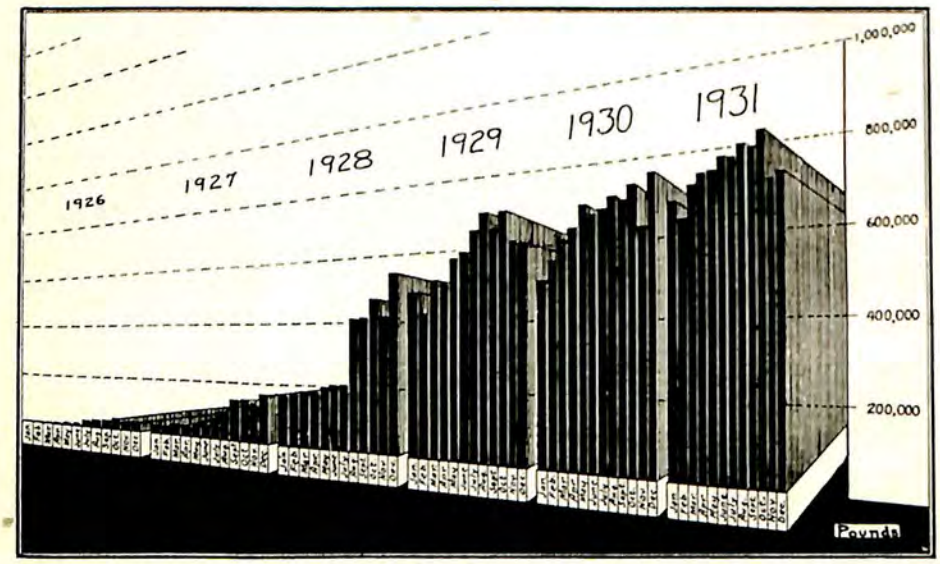
Ancient stage coach in striking contrast to Boeing (3 Pratt and Whitney Hornets) transport during ceremonies opening 28 hour coast-to-coast service.

NEW LOW-WING METAL TRANSPORT

Boeing Monomail (Pratt and Whitney Hornet) monoplane in service of United Air Lines as a combination mail-passenger high speed plane.

countries as convenient lines of military communication in time of peace, and of taking their place actively in the military scheme in time of war, the United States cannot wisely overlook the relationship between national security and the work which the Post Office Department and the Department of Commerce are doing for commercial aviation.

Any plan for the reduction of American air defenses in agreement with foreign powers, if it contemplates a retarding influence on American commercial aviation, must, out of justice to the United States, recognize the fact that the fundamental concept of aviation held in this country is different from that held in some other countries. Because of their proximity to each other and due to their prime considerations of national security



DOMESTIC AIR MAIL POUNDAGE 1926–31

most foreign countries look upon aircraft chiefly as instruments of war. The United States, because of its geographic location and great need for speed in transportation, considers the airplane primarily as a commercial vehicle. When the American industry asks support from the Post Office, Commerce, War and Navy departments, it is in order that it may eventually be established upon a permanent commercial basis; other nations subsidize commercial operations to achieve an immediate and permanent military end.

It was with a view toward establishment of a self-sustaining commercial industry in the lighter-than-air field that American airship interests sought and obtained the support of the Navy's airship program as a forerunner to the construction and operation of a fleet of super-airships on regular schedule across the Atlantic and Pacific oceans. This program

moved a step closer to completion in 1931 with the commissioning of the U.S.S. "Akron" and the inauguration of construction on a sistership, the ZRS-5. The passage of legislation by Congress to give trans-oceanic airships legal status and the same privileges as mail carriers as surface merchant ships is considered the next important step toward the realization of

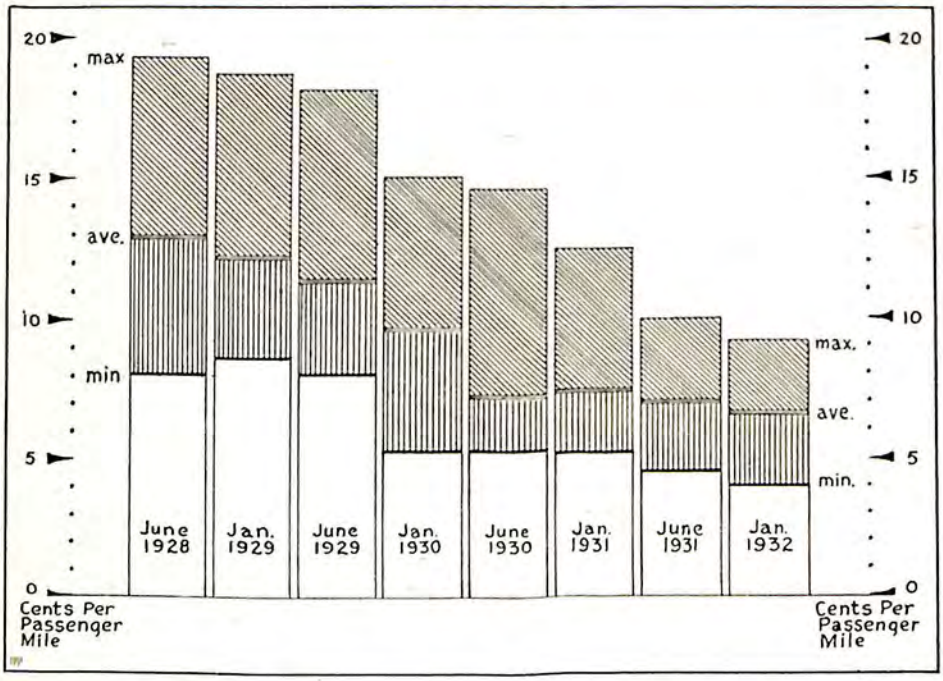
CHAMBER HONORS WORLD FLIERS

Wiley Post and Harold Gatty holding plaques presented to them by the Aeronautical Chamber of Commerce during dinner in their honor.

regular trans-oceanic transport on schedule. As will be seen in a later chapter, Germany made considerable progress in this field during 1931 with the three round trips of the "Graf Zeppelin" between Germany and South America on commercial schedules and is proceeding with the construction of a still larger airship to be launched in 1932.

It is easy to see how military aircraft production formed the backbone of activity in American airplane factories during 1931 from the information given in the next chapter on the volume of aircraft production and sales. Despite the aid obtained from military contracts and in the construction of transports for the scheduled air lines, production in 1931 slipped below the figures of 1930, which were less than half of those reached in the peak year 1929.

Like most other industries, aviation usually depends upon foreign markets to absorb about one-tenth of its total production of aircraft, engines and



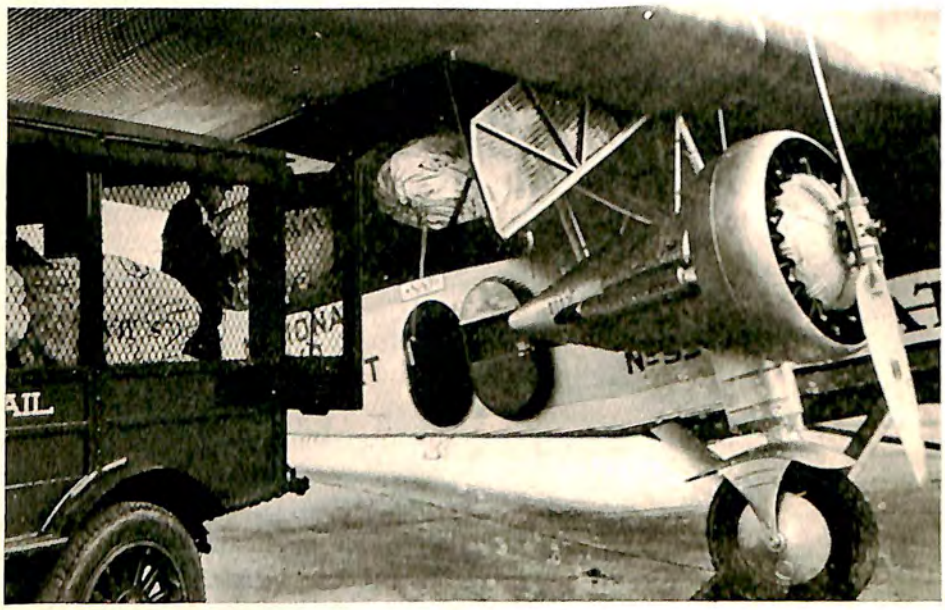
PASSENGER RATE TRENDS ON AMERICAN AIR LINES

equipment. The effects of the world-wide depression and the uncertainty of the political situation in many foreign countries cut American aircraft exports in 1931 to nearly half the volume for the previous year. It seemed uncertain that this market would improve during 1932 unless there should be an unexpected upturn in the financial position of those nations which make their principal aircraft purchases in the United States.

It is interesting to note that history-making flights of 1931 overshadowed those of 1930 and rivaled the series of brilliant achievements which fired the world with enthusiasm for aviation in 1927. World records for speed, duration, distance and altitude were shattered with America regaining several important world titles. The globe was girdled in eight days and

the first non-stop crossing of the Pacific achieved. Eighteen planes carrying 79 persons crossed the Atlantic successfully during 1931 in by far the most brilliant performances of a single year's history. These history-making flights of the year, which brought the names of many new aviation heroes to the front pages of the nation's newspapers, will be reviewed at length in a later chapter.

This edition of THE AIRCRAFT YEAR BOOK is far more comprehensive than any previous volume which has been presented in the series since the first book was written in 1919. It is really five books in one, so compiled that the reader will find it easy to use for future reference on any subject connected with aviation. Part I is devoted to a review of the year in the air, not only in the United States, but throughout the world. Part II embraces a complete work in itself on every phase of aircraft engineering and manufacturing. Part III is a handy aviation chronology for 1931, with complete world and American aviation records, and the results of all important air contests during the year. Part IV is a statistical handbook containing accurate and up-to-date facts and figures in comparative tables on every phase of aviation. Part V is an aeronautical directory and trade index, with up-to-date lists of major aeronautical association officials, government officers, diplomatic and foreign officials, domestic and foreign publications, airports and airport managers, approved flying schools, aviation editors of newspapers and similar information. Every effort has been made to obtain the best photographs of the year to provide a vivid picture of developments throughout the world, and to develop sufficient maps and drawings to fulfill every requirement of the reader, whether he is a layman or technician.



MAIL TUCKED INTO WING

Ford (3 Pratt and Whitney Wasps) transport on the National Air Transport division of United Air Lines being loaded with westbound mail.

AIR MAIL FROM THE SOUTH

Postoffice employees helping to unload southern air mail from one of the huge Curtiss Condors (2 Conquerors) of Eastern Air Transport, Inc.

CHAPTER II

AVIATION'S BAROMETERS OF BUSINESS

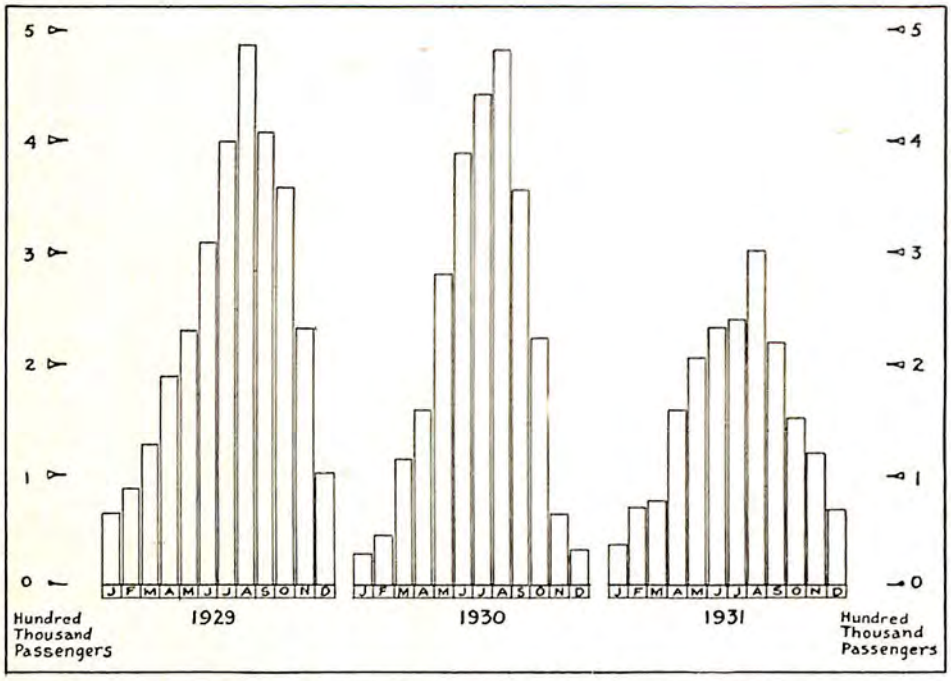
Air Transport Shows Greatest Growth—Depression Cuts Private Flying and Aerial Service—Aircraft and Engine Production Drops—Army and Navy Record Good—Other Statistics

AVIATION'S best business barometers are to be found in the industry's statistics. Accurately compiled and properly interpreted they speak volumes on the progress of the industry and provide an index to its most likely future trends. It is with the importance of this function in view that the Aeronautical Chamber of Commerce of America, as the national trade association of the aircraft industry to which all branches of the business turn for information, maintains an active department for the collection, compilation and distribution of statistical information. The Chamber, therefore, is in a unique position to keep its finger on the pulse of the industry at all times and to make frequent reports for the guidance of its members. The results of the efforts of its statistician are to be found in the detailed statistical tables and analytical graphs in this volume, not only in this chapter, but in Part IV, "Flying Facts and Figures," a new feature of this edition to which the reader's attention is invited.

All aircraft under the American flag, including planes in civilian, commercial and government operation, flew a grand total of 218,890,503 miles in 1931, which was about 6,500,000 miles less than in 1930, but 20,000,000 miles more than in the boom year 1929. The grand total for 1930 was 225,266,967 miles and that for 1929 was 197,546,590 miles. Civilian and commercial planes flew 144,978,228 miles in 1931 as compared with 164,793,612 miles in 1930 and 149,579,451 miles in 1929. Government planes, including those of the Army, Navy, Marine Corps, Coast Guard and Department of Commerce, flew a total of 73,912,275 miles in 1931 as compared with 60,473,355 miles in 1930. As will be seen later, the chief declines in the volume of miles flown during 1931 were in private and industrial flying, aerial service operations, and in the departments of the government outside the Army and Navy.

American air transport lines showed gains in every department of traffic and operations during 1931. With 720 planes in service, the major American lines reporting to the Aeronautical Chamber of Commerce carried

457,753 passengers, 9,351,195 pounds of mail, and 885,164 pounds of express in 1931 as compared with 385,910 passengers, 8,513,675 pounds of mail, and 286,798 pounds of express in 1930. Comparison with earlier years can be made at a glance from the graphs in this chapter or the statistical tables in Part IV. The American lines flew 43,395,478 miles out of a total of 47,463,673 miles scheduled in 1931. This could be compared with a record of 28,833,967 miles flown out of a total of 30,703,119 miles scheduled in 1930. Passenger-miles increased from 94,545,784 in 1930 to 116,232,153 in 1931.



PASSENGERS CARRIED ON SHORT HOPS OR CHARTER

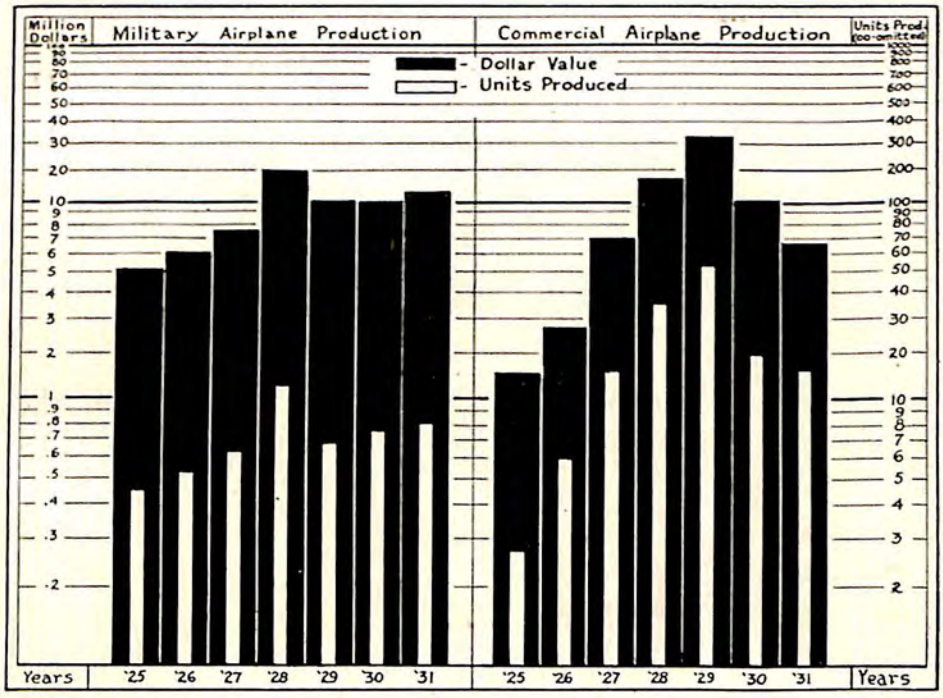
Interpreted in percentages, American air lines increased their passenger traffic 18.6 per cent., their mail volume 10 per cent., and their express business 208 per cent. in 1931 over 1930 levels. Miles flown increased 50.5 per cent. and passenger-miles rose 22.9 per cent. This was particularly significant, as will be seen in the next chapter, at a time when railroad and steamship traffic had shown sharp declines during the year.

Aerial Service Operations

The Aeronautical Chamber of Commerce made its sixth annual statistical study of operations in the aerial service field at the close of 1931, which showed a sharp drop in the number of operators carrying on this type of

work during the year. Statistical estimates based on typical reports and computed to include 352 aerial service operators in business in 1931 showed that 3,238 planes in service flew 71,582,750 miles during the year on missions which ran the gamut of diversification from crop dusting and aerial photography to short passenger hops. These operators carried 1,875,992 passengers during 1931 on short hops or charter flights.

This survey showed a sharp falling off of activity in this field during 1931 as compared with 1930 when 95,959,645 miles were flown and 2,621,769 passengers were carried. Complete tables covering the six years in



AMERICAN AIRCRAFT PRODUCTION 1925–31

which the surveys of this field were made are included in Part IV and more detailed information on the character of the year's activity will be found in a later chapter, "Airplanes: Versatile Machines of Work."

Private and Industrial Flying

The general business depression also cut sharply into the volume of private and industrial flying logged during 1931. Because of the very character of this activity, it was practically impossible to obtain exact statistics on the miles flown by private individuals and corporations for business or pleasure. However, the Aeronautical Chamber of Commerce estimated

that the 6,057 planes in the hands of individuals or corporations for their private use flew approximately 30,000,000 miles during 1931. This was 10,000,000 miles below the estimate for 1930, and 5,000,000 miles above the estimated total for 1929.

The United States led the world in private flying, and this market promised to offer a growing outlet for commercial airplanes of American manufacture. The development of a social program to interest the private flier and the increased opportunities for the employment of planes in modern business were the chief stimulants to this market, as will be seen in a later chapter, "Flying For Sport and Business."

Government Operations

The total miles flown by government planes in 1931 increased principally because of the activities of the Army, Navy and Marine Corps. The Coast Guard and Department of Commerce both reported declines in their mileage logged as compared with 1930. The United States Army Air Corps flew 44,000,000 miles in 1931 as compared with 32,500,000 miles in 1930 and 27,405,790 miles in 1929. The United States Navy, including the Marine Corps and Naval Reserve, showed a similar increase, with 28,889,835 miles flown in 1931 as compared with 26,478,700 miles in 1930 and 19,513,095 miles in 1929.

The United States Coast Guard showed a decrease in its total miles flown, with 53,440 miles logged in 1931 as compared with 67,655 miles in 1930 and 48,254 miles in 1929. The Department of Commerce likewise reported a decrease in its mileage flown, with 969,000 miles in 1931 as compared with 1,427,000 miles in 1930 and approximately 1,000,000 miles in 1929. Complete statistics for the six years, 1926 to 1931, on government flying operations will be found in Part IV.

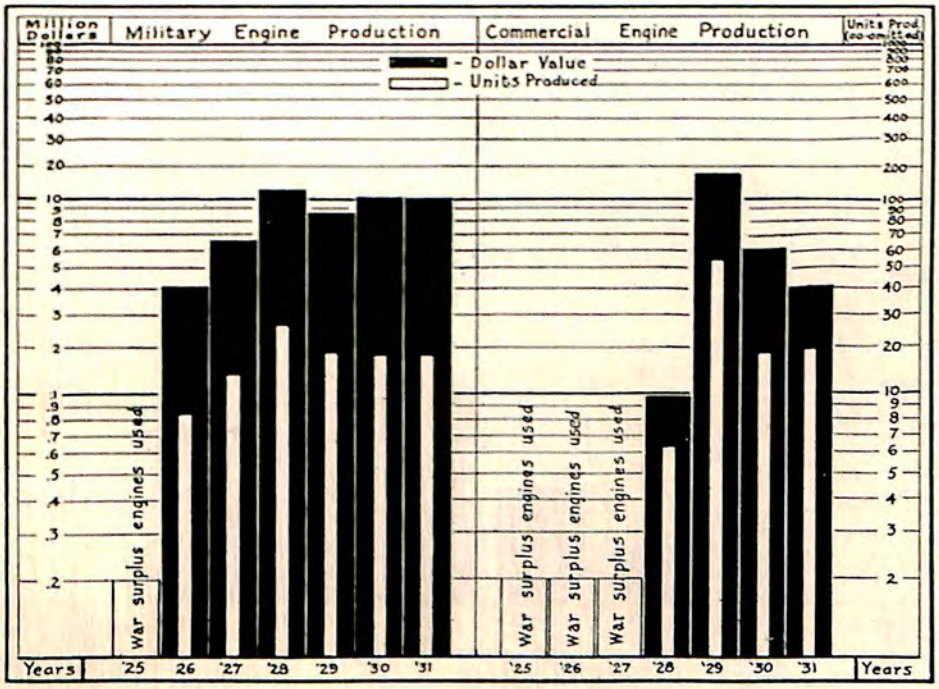
Aircraft Production and Sales

The Aeronautical Chamber of Commerce collected and compiled monthly statistics on aircraft production and sales to give manufacturers an active key to the trends in the market. The results of these monthly statistical reports are illustrated in the graphs on production and sales.

Aircraft production, considering military and commercial planes together, fell off about 300 units during 1931 from 1930 levels, with a consequent reduction of about $2,000,000 in the value of aircraft produced. The steep decline of 1929-30, when production was cut in half within a year, had been checked and it was expected that 1932 might witness a rise in production figures if general business conditions improved and military purchases were continued at the same level.

American aircraft manufacturers produced 2,394 commercial and mili-

tary airplanes during 1931 as compared with 2,684 units in 1930 and 6,034 units in 1929. Planes sold during 1931 totaled 2,469 as compared with 3,125 units in 1930, the first year in which sales statistics were collected. In the commercial field, 1,582 airplanes were built and 1,658 were sold during 1931. In the military field, 812 planes were manufactured and 811 were delivered to the government on contract. The number of military planes produced during 1931 represented an increase of 65 over the 747 manufactured in 1930, and an increase of 135 over the 677 produced in 1929. The commercial field showed a further curtailment of production



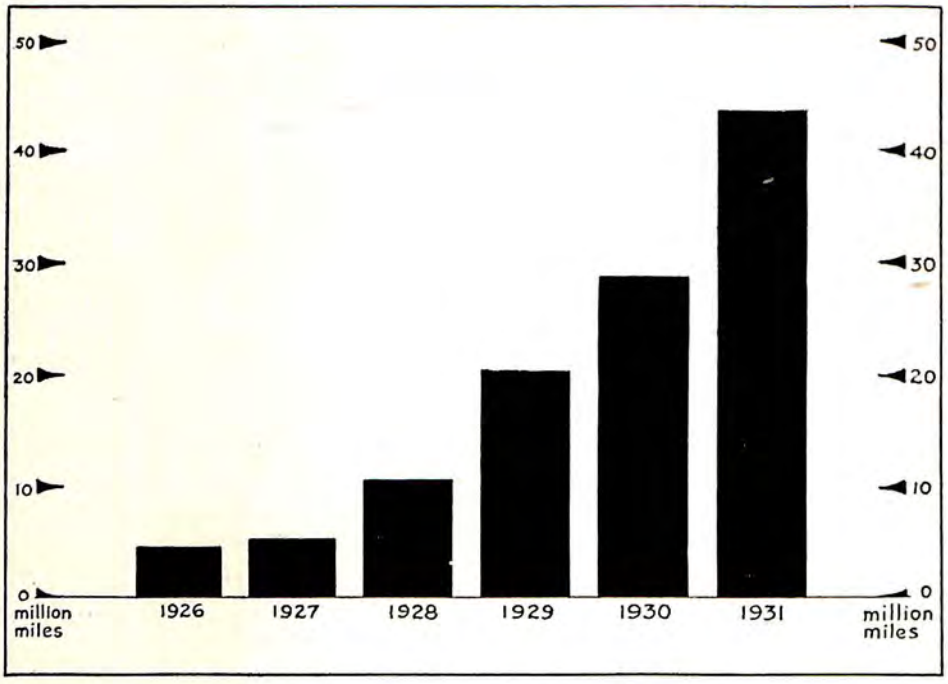
AMERICAN AIRCRAFT ENGINE PRODUCTION 1925–31

when the 1,582 planes manufactured in 1931 were compared with 1,937 in 1930 and 5,357 made in 1929.

While commercial production in 1931 was almost twice as large as military production in number of units manufactured, the importance of the military market is seen in the fact that the value of military aircraft produced was almost twice that of commercial production. The manufacture of a large number of low-powered light airplanes during the year to sell at less than $1,800 accounted for commercial production even reaching the 1,582 unit figure.

The total value of aircraft produced by American manufacturers during

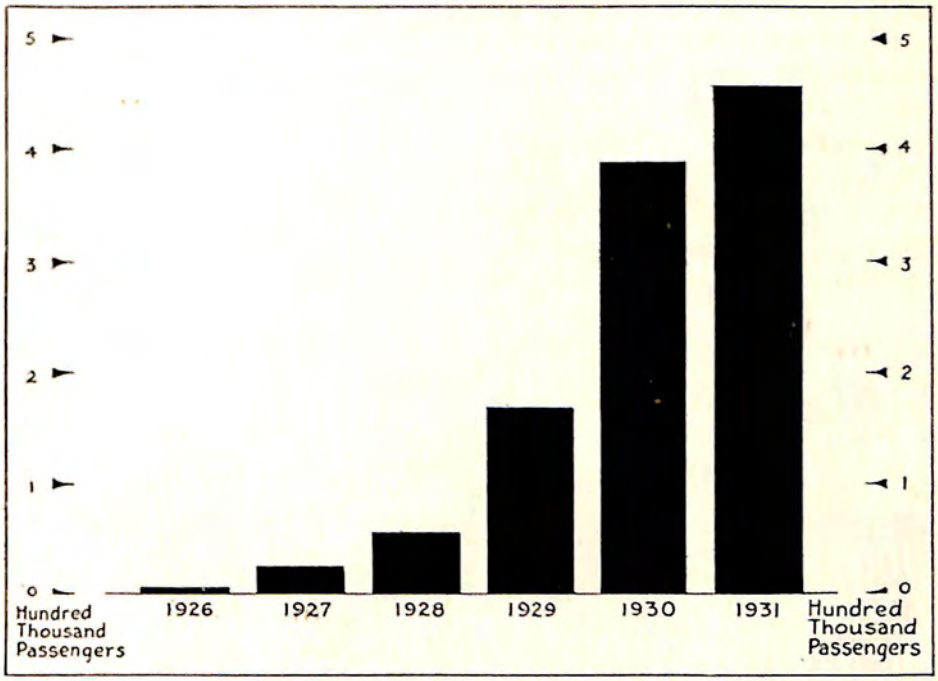
1931 was $19,626,766 as compared with $21,469,763 in 1930 and $44,457,300 in 1929. Sales in 1931 totaled $20,873,588 as compared with $22,938,552 in 1930, the first year in which sales statistics were compiled. Commercial airplanes produced during 1931 were valued at $6,655,738 as compared with $10,746,043 in 1930. Military airplanes manufactured in 1931 were valued at $12,971,028 as compared with $10,723,720 in 1930, indicating the importance of the military market in 1931. Commercial sales in 1931 were reported at $7,656,827 as compared with $11,666,209 in 1930. It was considered significant that sales more than kept pace with production through-



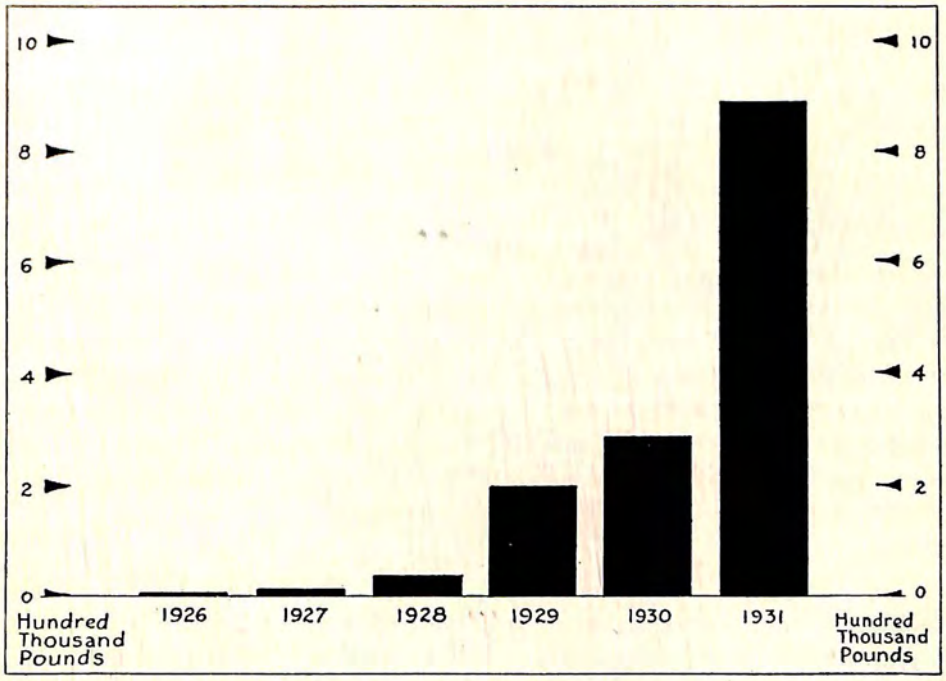
MILES FLOWN ANNUALLY BY AMERICAN AIR LINES

out 1930 and 1931, making it possible for manufacturers to deplete their stocks built up through over-production in 1929. Military sales in 1931 totaled $13,216,761 as compared with $11,272,343 in 1930. All figures given here for aircraft are for units without engines. Detailed analyses of these statistics on production and sales with comparisons for previous years are provided in Part IV.

It is interesting to note from an analysis of the production and sales figures by types that for the first time in history the open cockpit monoplane, and particularly the two-place open cockpit monoplane, dominated the field of commercial production in 1931. This position was previously



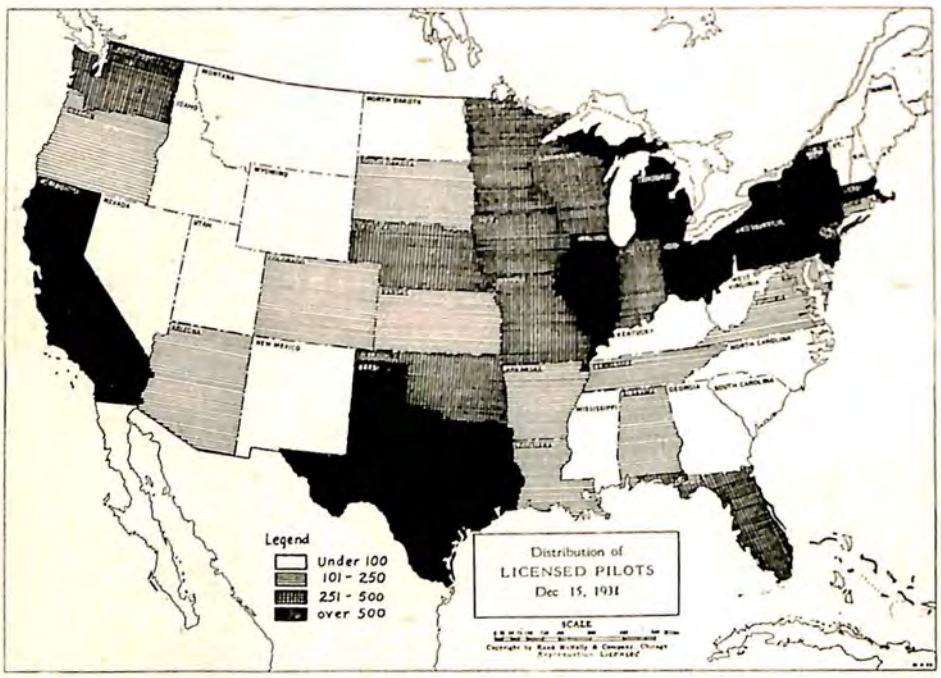
PASSENGERS CARRIED ANNUALLY ON AMERICAN AIR LINES



AIR EXPRESS POUNDAGE ON AMERICAN AIR LINES

held by the open cockpit biplane and particularly the three-place open cockpit biplane. The introduction of two-place open cockpit monoplanes to sell at very low prices during 1931 accounted for the marked trend toward this type. Almost half the year's production could be accounted for by planes in this low-horsepower field.

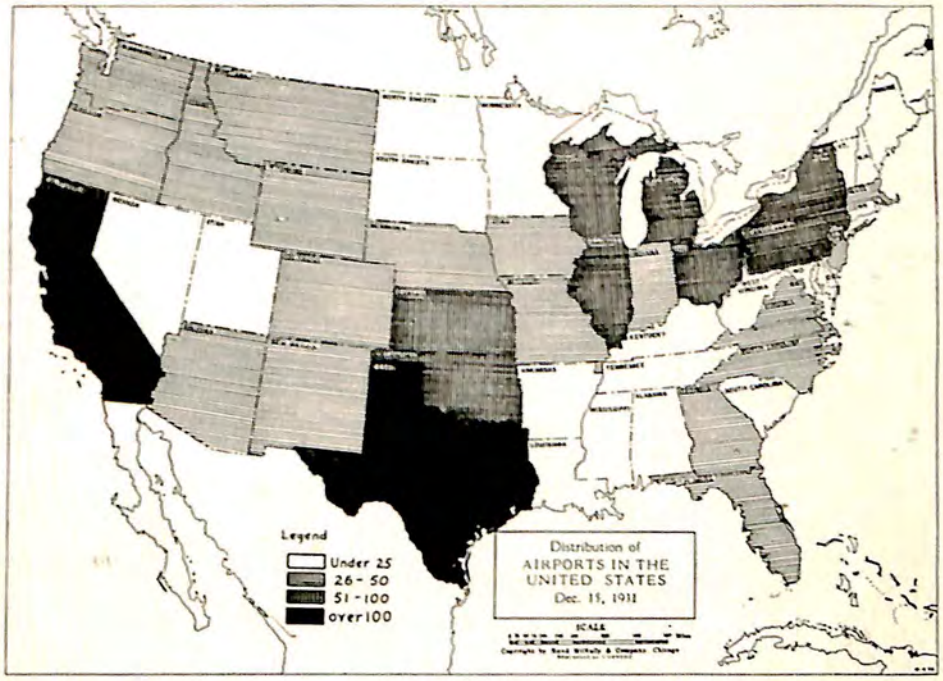
The monoplane also outnumbered the biplane for the first time, with 1,021 commercial monoplanes produced as compared with 471 biplanes. The seaplane and amphibian market remained to be developed on a scale commensurate with its importance. Only two commercial seaplanes were

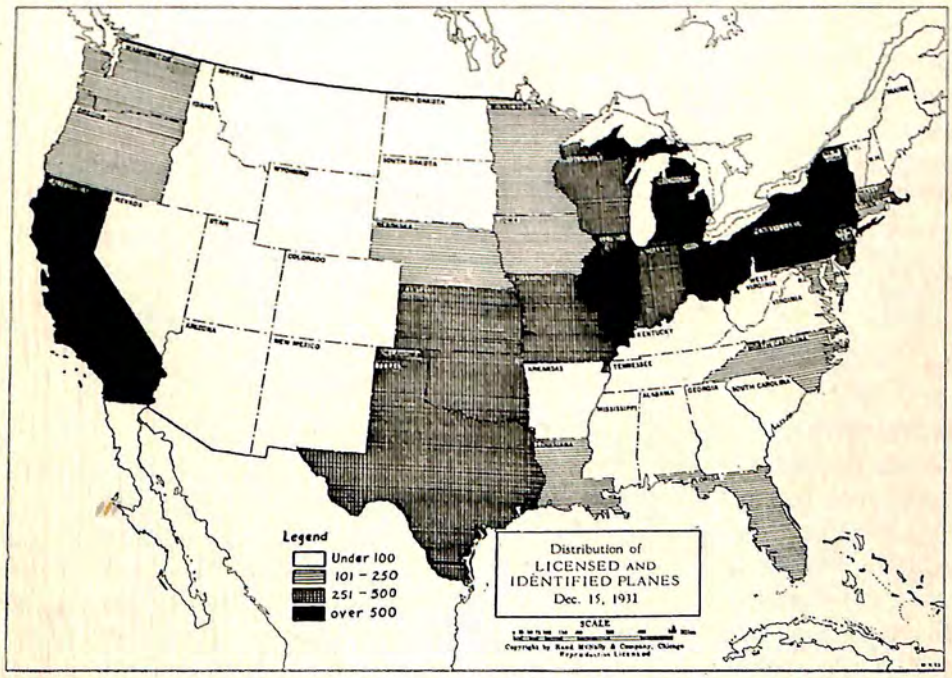


listed by manufacturers in their reports during the year, although statistics on float production showed that 24 pairs of floats were sold for use on convertible land planes. Thirty-seven amphibians were manufactured during 1931, an increase of 20 over the previous year. The first year of the autogiro on the commercial market witnessed 51 of the "windmill" machines produced with a total value of $408,681, while 46 were sold with a value of $377,086.

Engine Production and Sales

Aircraft engine production in 1931 showed a slight increase over 1930 in the number of units manufactured, but experienced a sharp decrease in total value. The increased number of low-powered and low-priced engines


Legend
Under 25
26 - 50
51 - 100
over 100
Distribution of
AIRPORTS IN THE
UNITED STATES
Dec. 15, 1931
SCALE


Legend
Under 100
101 - 250
251 - 500
over 500
Distribution of
LICENSED AND
IDENTIFIED PLANES
Dec. 15, 1931
SCALE

built for light airplanes in the commercial field during 1931 accounted for keeping the number of units at the 1930 level, while the total value of engines produced declined sharply. Engine sales during 1931 more than kept pace with production to indicate a healthy inventory condition.

Commercial and military engines manufactured during 1931 totaled 3,776 units valued at $14,609,949 as compared with 3,766 units valued at $17,078,916 in 1930. Aircraft engine sales in both commercial and military fields for 1931 totaled 3,836 units valued at $15,263,553 as compared with 3,846 units valued at $17,268,219 in 1930. The graphs indicate the month-to-month production and sales trends in the engine field during 1931 as compared with the previous year.

Commercial and military production was fairly evenly divided in 1931 if units alone were considered, but the military market represented more than twice the value of the commercial market. Commercial production totaled 1,976 units valued at $4,192,231 as compared with commercial sales of 2,009 units valued at $4,576,012. Military production totaled 1,800 engines with a value of $10,417,718 as compared with military sales of 1,827 units valued at $10,687,541. The detailed analysis of engine production and sales broken down according to horsepower is worthy of further study by sales engineers. It will be found in Part IV.

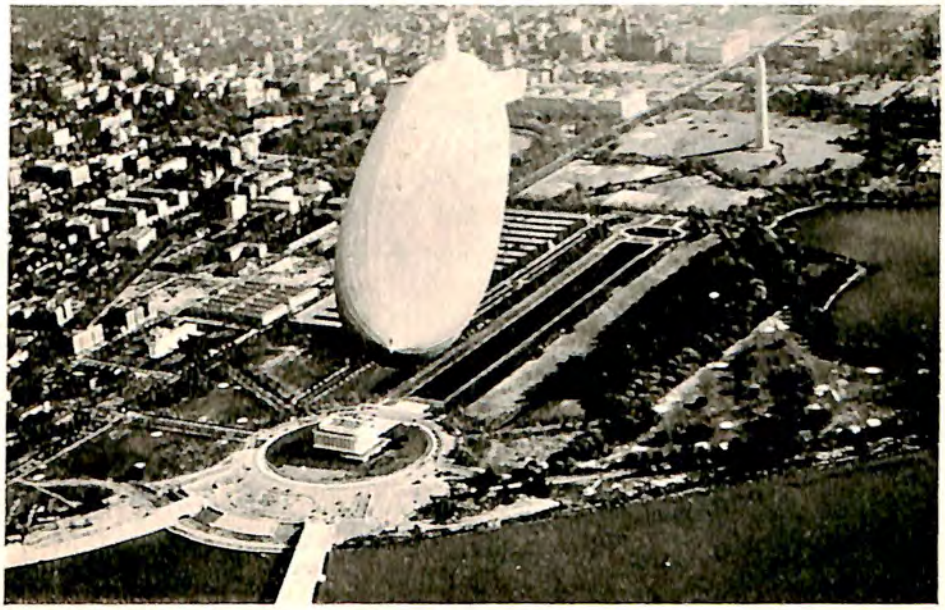
American Aeronautic Exports

In common with other countries, the United States experienced a sharp reduction in the volume of its aeronautic exports during 1931. The total value of airplanes, engines and parts exported from the United States in 1931 declined 45 per cent. below the 1930 level, which had shown a five per cent. decrease from the peak year 1929. Exports of aircraft engines held fairly close to the 1929 and 1930 levels, but parts dropped more than 25 per cent. and exports of airplanes fell off more than 50 per cent.

Aeronautic exports in 1931 had a total value of $4,810,531 as compared with $8,806,396 in 1930 and $9,202,385 in 1929. Only 140 airplanes valued at $1,812,827 were exported in 1931 as compared with 321 planes valued at $4,819,669 in 1930 and 354 units with a value of $5,574,480 in 1929. Engines held fairly steady with 317 valued at $1,474,489 exported in 1931 as compared with 377 valued at $1,635,076 in 1930 and 321 valued at $1,375,697 in 1929. The value of parts exported in 1931 was $1,523,215 as compared with $2,351,651 in 1930 and $2,252,208 in 1929.

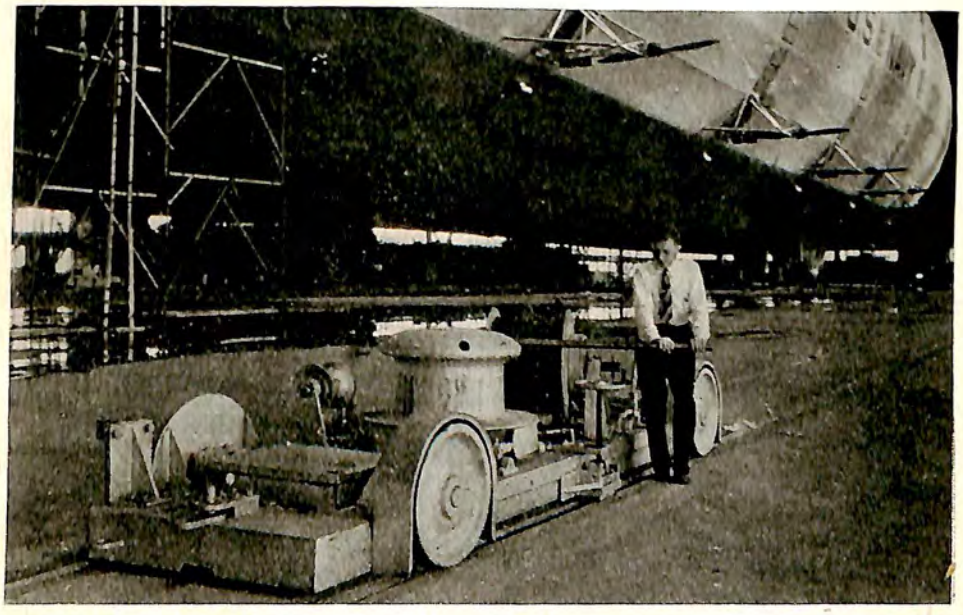
China and Mexico were the principal foreign markets for American aircraft in 1931, while Soviet Russia, China, Mexico, and the Netherlands were the chief outlets for aircraft engines exported. Detailed analyses of the export market in 1931 as compared with 1930 will be found in Part IV.

The Aeronautics Branch of the Department of Commerce maintains an



CAPITAL SEES NEW GIANT

President Hoover saw the U.S.S. "Akron" in flight for the first time as it flew from the Capitol to the Lincoln Memorial, in foreground.



AIDS UNDOCKING OPERATIONS

One of the handling cars devised to aid in walking the U.S.S. "Akron" out of the Goodyear-Zeppelin dock near Akron, O.

elaborate organization for the compilation and interpretation of aircraft accident statistics. Unfortunately, accident statistics for the last half of the year are never completed in time to be included in this volume. However, detailed tables analyzing aircraft accidents in air transport and miscellaneous flying are provided in Part IV to provide comparisons of previous years by six month periods. Complete statistics for the first six months of 1931 are included. Attention is also directed to the interesting analysis of aircraft accident rates in the United States Army Air Corps from 1921 to 1931. It shows that the hours flown per fatal accident has increased steadily in the Army Air Corps from 1,718 hours in 1921 to 18,900 hours in 1931.

Analyses of License Lists

Licenses issued by the Department of Commerce for aircraft, pilots and mechanics continued to be an important source of statistical information for the manufacturers and distributor-dealer alike. Consequently the Aeronautical Chamber of Commerce distributed these lists to its members at frequent intervals and kept up-to-date analyses of the trends in the industry as shown by the lists.

Detailed analyses of airplane licenses and identifications by states to show the number in each state, the date of manufacture of the plane, and in whose name the plane has been licensed, whether manufacturer, transport operator, school, aerial service operator or other, are provided in Part IV of this volume. They have been prepared especially for THE AIRCRAFT YEAR BOOK by the Aeronautical Chamber of Commerce.

With this rather weighty statistical background, the following chapters are designed to provide the reader with a running story of the year's developments in every phase of aviation. Statistics will be used sparingly and only when they seem necessary to the discussion.

CHAPTER III

AMERICA'S GROWING AIR LINE NETWORK

Vast Expansion Programs Add New Services, More Frequent and Faster Schedules—Effect Closer Coordination of Units in Major Systems —Inaugurate New Air Express Services

CARRYING out an elaborate expansion program, adding more frequent schedules, buying faster and more comfortable planes, and employing more men in operations and traffic departments during a period when most industries were marking time or were making drastic cuts in their operations, the American air transport network presented one of the few bright spots in the nation's industrial picture for 1931.

As was seen from the statistical studies presented in the foregoing chapter, the air lines showed an increase in mileage flown, passenger-miles, passengers carried, mail transported and express flown over any preceding year in their history. This was particularly significant when it was considered that the older systems of transportation—also mail carriers—experienced drastic cuts in their business volume. Inter-city passenger traffic on Class I railroads showed a decrease of 20.5 per cent. Eastbound trans-Atlantic steamship passenger traffic in ships of all nationalities operating from American ports was off 18.8 per cent., while westbound trans-Atlantic passenger volume showed a decrease of 43.9 per cent. The total volume of first class mail fell off 4.2 per cent. in the United States, but the air mail poundage jumped up 1,000,000 pounds.

The air transport lines were fulfilling a trust placed in them by the general public which demanded the advantages of faster and more convenient schedules, better interline traffic facilities, and rates that were economically commensurate with the speed and service offered. The air mail lines were fulfilling their promises to the Post Office Department by expediting the service and extending the advantages of air mail and passenger routes into every corner of the country. The result was an increased volume of mail and passenger business. The increase was not the result of any patriotic gesture to aid a new industry. Business men were not spending an extra three-cent stamp nor an extra dollar for transportation in 1931. They got value received for every cent spent. The general depres-

sion placed an added burden on all businesses and industries to investigate, select and utilize every instrument which would speed up the tempo of their activity, and the air mail, air express and air passenger lines provided an indispensable aid in injecting force and power behind a naturally laggard buyer's market.

It would have been easy for the air transport lines to have halted new expenditures for planes and equipment, airports, communication facilities, and other operating improvements during a period when pessimism held the center of the industrial stage. New enterprises contemplated might have been abandoned or postponed until business conditions improved. A policy of watchful waiting might have been pursued, with more attention concentrated on showing an immediate profit to stockholders without regard for service to the public, operating conditions, or the possibilities of future business. Had this policy been injected into air transport in 1931, the development of the growing air line network would have been stifled. Another decade or more might have been necessary to reconstruct the structure that had been erected and to restore public confidence in air transport.

New Development Encouraged

Instead, the major air lines encouraged the design of faster and better adapted planes through purchases of nearly $5,000,000 worth of new aircraft during the year, carried out carefully planned development programs, and expanded their services through extensions of existing lines, the creation of new routes, or the adding of additional schedules providing more frequent service between principal centers. It was significant, too, that new enterprises, backed by the kind of initiative that has characterized the progress of the aviation industry, made their appearance in the passenger air line field during this period when most purse strings were drawn a little tighter and programs of expansion stored away to become yellowed on dusty shelves.

Strict economy was the order of the day in every air line operating organization to make possible this vast expansion. Not the kind of catch-penny economy that lops off necessary funds for adequate operating personnel and equipment, but a detailed study of all expenditures to make certain that value was received for every cent spent.

The opening of 1932 found passengers, mail and express being flown 148,509 miles daily within the continental limits of the United States. An additional 12,371 miles daily were being flown by American lines into nearly two score countries of the Western Hemisphere. Taken as a unit, the American air transport network was by far the greatest in the world under the flag of a single nation. More than 40 per cent. of the daily scheduled mileage was flown during the hours between dusk and dawn

NEW YORK-ATLANTA IN EIGHT HOURS

Eighteen-passenger Curtiss Condor (2 Conquerors) transport flying over Atlanta, Ga., carrying Eastern Air Transport passengers from New York.

LUXURY TRAVEL BY AIR

Hostess aboard huge Curtiss Condor transport of Eastern Air Transport, Inc., serving passengers in the luxuriously fitted cabin lounge.

on the lighted airways, which became increasingly popular for passenger travel as well as for the over-night dispatch of mail and express.

Continual Federal Support Necessary

Air mail lines under contract with the Post Office Department, carrying passengers and express in addition to mail loads on practically all of their schedules, were flying 108,011 miles daily in the United States and on foreign air mail routes. The development of this system was a result of the foresighted policy of the Post Office Department in meeting the demands of the public for adequate service, a demand which dominated the administration of the postal system since the days of the pony express. The McNary-Watres Act, passed by Congress in 1930, was the major factor in the stimulation of the growth of the air mail lines and their development of passenger business. They looked to continued support of the federal government in the form of air mail contracts and airways construction and maintenance to insure their development until passenger and freight volume could reach a point which would make possible a fair profit to the lines and reduced rates to the government for the transportation of mail.

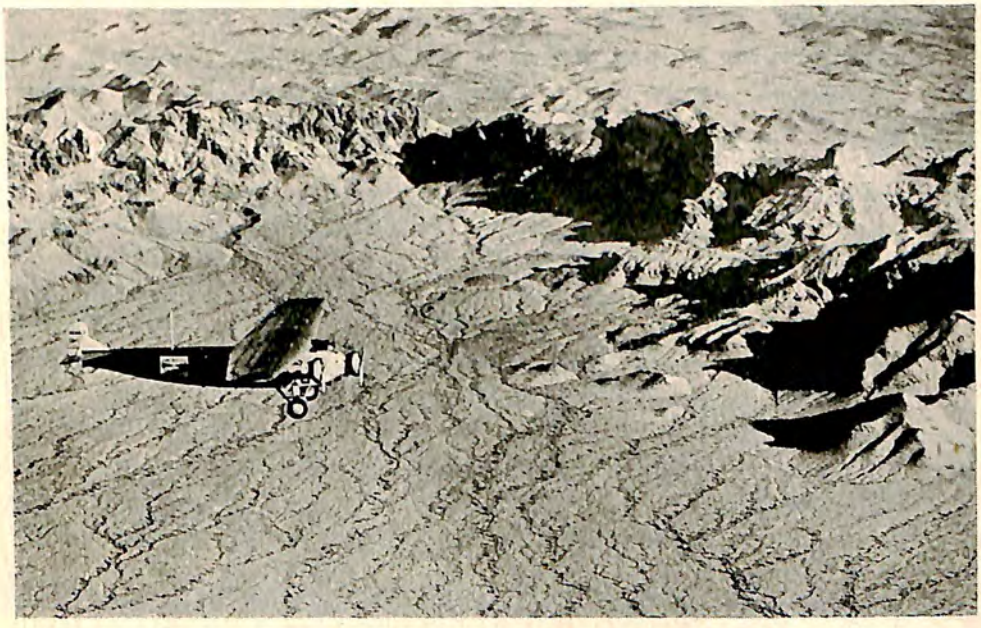
An analysis of federal expenditures in assisting the development of railroad and highway transportation as compared with those for air transport indicated that the government had already realized a bargain in the development of its airway network. Lumping the total amount spent by the Post Office Department during the 14 years of the air mail's history with that expended by the Department of Commerce on its civil airway development program, it was found that the total amount spent per mile of air mail routes developed was less than one-third that spent by the government for every mile of motor road constructed under provisions of the Highway Act of 1921, and only 2.94 per cent. of the investment represented in a single mile of railway. Furthermore, the capacity of the airways was unlimited, required no periodic rebuilding program, and only low-cost maintenance.

Traffic Interchange Facilitated

The year 1931 witnessed a successful movement toward the coordination of the activities of both mail and non-mail lines to facilitate interchange of traffic between all lines, to permit an exchange of operating experiences looking toward the reduction of maintenance expenses, and to standardize the business practices of the various lines on such matters as accounting, depreciation, and insurance. The Aeronautical Chamber of Commerce of America, embracing within its membership lines flying more than 90 per cent. of the total daily mileage, provided the facilities for carrying on this work through committees on traffic, operations, maintenance, business prac-

LINKS SOUTHWEST BY AIR

American Airways passengers speeding along Southern Transcontinental airway over the Arizona mountains in a Wasp-powered Fokker.



NEAR INTERNATIONAL BORDER

Fokker (3 Pratt and Whitney Wasps) transport of American Airways, Inc., approaching Douglas, Ariz., near the United States-Mexican border.

tices and insurance. The principal executive of each member transport line concerned with the problem before each of the committees served as his company's representative on that committee. The Executive Committee of the Air Transport Section headed up the whole activity, keeping a definite check on the work of each group but permitting a considerable degree of latitude in the authority of each committee.

The problem of coordination of traffic practices to permit facile interchange of passengers and goods from one line to another, thereby strengthening the connecting links in the nation's air line network, was one of the most important facing the Transport Section at the opening of 1931. With the approval of the Executive Committee, the Air Traffic Conference of the Aeronautical Chamber of Commerce was formed with the general traffic managers of all member lines authorized to represent their companies in deliberations of the Conference on traffic matters. Meetings at Chicago in February and at Detroit in April brought about agreements among the lines on such important matters as standardized excess baggage charges, uniform free baggage weights, standard system of handling interline baggage, requirements for agents, agent's commissions, elimination of free or reduced transportation rates to specialized groups, and recommendations on traffic practices for the guidance of all lines based on their collective experience. Through the Section Manager, the work of the Conference was carried on throughout the year after the groundwork for the season's peak traffic had been laid at the two general sessions.

In the operating and maintenance field, the Operations Committee with a Sub-Committee on Maintenance was organized early in the year. Meetings at Detroit in April and at Cleveland in September made possible a free exchange of information on experiences of the operations heads of the member lines represented on the committee, resulting in recommendations to aircraft and engine manufacturers from the operator's viewpoint and in the promulgation of a Code of Safety Practices for the guidance of the entire industry. The Sub-Committee on Maintenance was particularly active, making a detailed study of the life, inventory and service methods of equipment based on an analysis of the maintenance practices of the various lines. Discussion of the results of this study served to standardize the practices of the lines and made possible adoption of the best methods and service equipment developed. The committee adopted a system for the interchange of information between meetings through reports, photographs and drawings sent to the Section Manager for distribution to all members contributing to the pool.

The Business Practices Committee was formed with the comptrollers and treasurers of the air lines as its members. The committee made a study of depreciation and obsolescence rates used by the various lines for aircraft, engines, and equipment, the discussion of which brought about

HOURLY SERVICE ATTRACTS CROWDS

Ludington Air Lines' frequent service between New York and Washington in Stinson Airliners attracts crowds to Washington-Hoover Airport.

NATIONAL CAPITAL'S AIR LINE CENTER

Passenger waiting room of the Washington-Hoover Airport through which pass the great and near-great of the nation to travel by air.

a standardization of the rates used by all lines. A sub-committee, concerned with air mail accounting problems, cooperated closely with representatives of the Post Office Department in working out details of the uniform accounting system which all air mail operators were required to follow in their reports to the government.

New Regulations Approved

The Air Transport Section Committee, composed of the presidents of member lines, met in Washington late in July and drew up a program of recommendations and suggestions for consideration of the Department of Commerce at its joint meeting with the operators on the government regulations affecting interstate air passenger lines. The program aided in crystallizing the opinions of all operators at the conference and made possible the adoption of all salient points which were mutually agreeable to the operators and officials of the Department of Commerce. With the approval of the Section Executive Committee, the Chamber undertook a campaign to lay the facts and problems of air transport before editors and publishers of newspapers throughout the country in an effort to obtain a better understanding of mutual problems concerned with accurate reporting of accident news. The result, explained in more detail in a later chapter on "Aviation and the Press," was an immediate response from newspapers throughout the country commending the campaign and expressing their willingness to cooperate.

Through its statistical department, the Aeronautical Chamber of Commerce kept the traffic and operating departments constantly informed on the pertinent facts of traffic volume throughout the country. Several special studies, including one on the trends in passenger rates on American lines, were kept up to date for the information of member operators.

Rates Reduced

With the opening of 1932, rates for passengers were at the lowest in the history of the lines. The Chamber's study showed that the maximum passenger rate per mile was 9.13 cents, while the minimum was 3.94 cents. The average passenger rate per mile was 6.53 cents. This was lower than the June, 1931, rates of 10 cents per mile maximum, 4.53 cents minimum, and 7.01 cents as the average. It was a marked cut under the figures for January, 1931, when 12.5 cents was the maximum, 5.2 cents the minimum, and 7.4 cents the average. It seemed an unbelievable reduction below the prevailing rates of June, 1928, when the first study was made. The maximum rate at that time was 19.3 cents; the minimum, 8 cents; and the average, 12.87 cents. It was evident from this that the 1932 rates were less than half those of June, 1928.

As a result of the agreement between the lines on baggage weights and rates, baggage carried free was standardized at 30 pounds as contrasted with weights which varied from 15 to 35 in previous years. Charges on baggage in excess of 30 pounds were standardized in 1931 at one-half of one per cent. of the total fare per pound, although one line charged a flat 10 cents per pound excess baggage rate. In previous years, excess baggage charges ranged from 10 cents per pound to $1.00 per pound, making the easy exchange of interline baggage almost impossible.

All major air transport operators were members of the Air Transport Section and of the Air Traffic Conference, the roster at the end of 1931 including: American Airways, Inc., with its Colonial, Universal, Interstate, Embry-Riddle, Southern and Alaskan divisions; Bowen Air Lines, Inc.; Century Air Lines, Inc., with its subsidiary, Century Pacific Lines, Ltd.; Eastern Air Transport, Inc.; Ludington Air Lines, Inc.; National Parks Airways, Inc.; Northwest, Airways, Inc.; Pan American Airways System; Pennsylvania Airlines, Inc.; Rapid Air Transport, Inc.; Transamerican Airlines Corp.; Transcontinental and Western Air, Inc.; United Air Lines, Inc., with its National Air Transport, Boeing Air Transport, Pacific Air Transport, and Varney Air Lines divisions; and Western Air Express, Inc.

Trend Toward Consolidation

There was a definite trend during 1931 in the major financial groups which maintained control of the principal mail, passenger and express lines to consolidate the activities of their subsidiaries and eliminate duplication of effort by coordinating all holdings into a single system. One of the outstanding examples of this trend was the formation of United Air Lines, Inc., as the operating company of the United Aircraft and Transport Corp. group, consolidating its four air line subsidiaries: National Air Transport (New York-Chicago and Chicago-Dallas); Boeing Air Transport (Chicago-San Francisco); Varney Air Lines (Salt Lake City-Seattle) and Pacific Air Transport (San Diego-Seattle). The names of the subsidiaries were maintained only as divisions, emphasis being placed on the operation of all four as a single system under the name of United Air Lines, Inc., which P. G. Johnson, president of the Boeing aviation interests, was chosen to head as president with Frederick B. Rentschler, president of United Aircraft and Transport Corp., as chairman of the board.

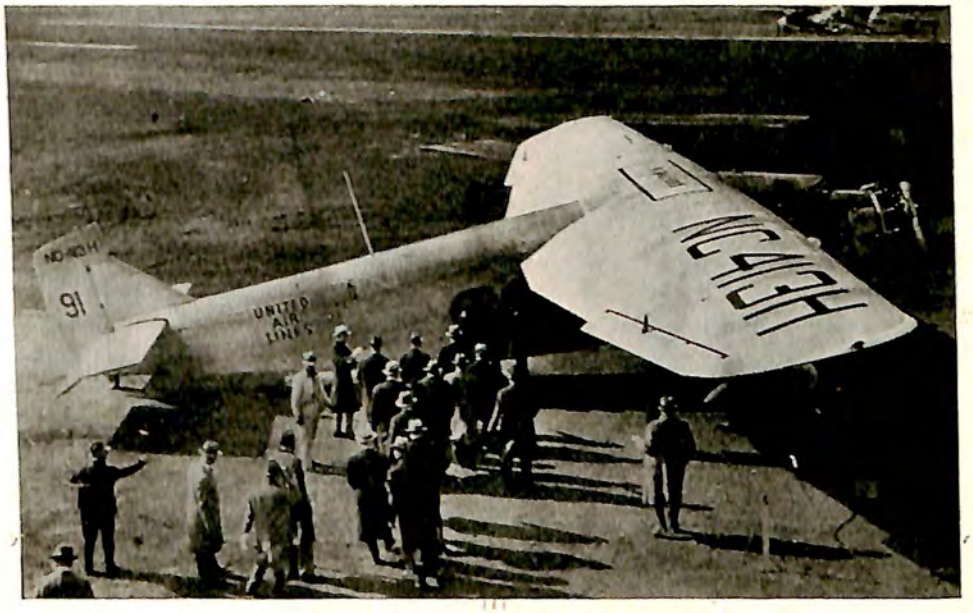
The Aviation Corporation of Delaware continued the process of consolidating and coordinating the activities of its various air line properties under the flag of the American Airways, Inc., its operating company, tying into one vast system the Colonial, Universal, Interstate, Southern, Embry-Riddle and Alaskan divisions. The coordination program was undertaken in 1930 under the leadership of Frederick G. Coburn as president and continued throughout 1931.

Transcontinental and Western Air, Inc., formed by TAT-Maddux Air Lines, Inc., and Western Air Express, Inc., to operate the transcontinental mail and passenger route between New York and Los Angeles, inaugurated a branch line to Chicago during 1931 and concentrated on the coordination of the western and eastern sections of its 2,626 mile cost-to-coast route with operating headquarters at Kansas City. General Motors Corp., through its aviation subsidiary, General Aviation Corp., became a stockholder in Transcontinental and Western in March when it purchased 50,000 shares of stock in Western Air Express, Inc. In July, Harris M. Hanshue, who had been ill for some months, resigned as president of Transcontinental and Western Air and Richard W. Robbins was later elected to succeed him. C. M. Keys continued as chairman of the board with D. M. Sheaffer, who represented the Pennsylvania Railroad, one of the largest stockholders in TAT-Maddux Air Lines, as chairman of the executive committee. J. M. Schoonmaker, jr., president of General Aviation Corp., was elected vice-chairman of the board and of the executive committee.

Transcontinental and Western Air closely coordinated its activities with those of financially affilated lines, including Pennsylvania Airlines, Inc., the operating company of Pittsburgh Aviation Industries Corp. which held a stock interest in TWA; and Eastern Air Transport, Inc., a subsidiary of North American Aviation Corp. with Mr. Keys as its president. North American Aviation, as an investor, held a substantial interest in TAT-Maddux Air Lines, and completely controlled Eastern Air Transport, Inc. (New York-Atlanta-Miami), and Compañia Nacional Cubana de Aviacion Curtiss, operating domestic mail and passenger lines in Cuba.

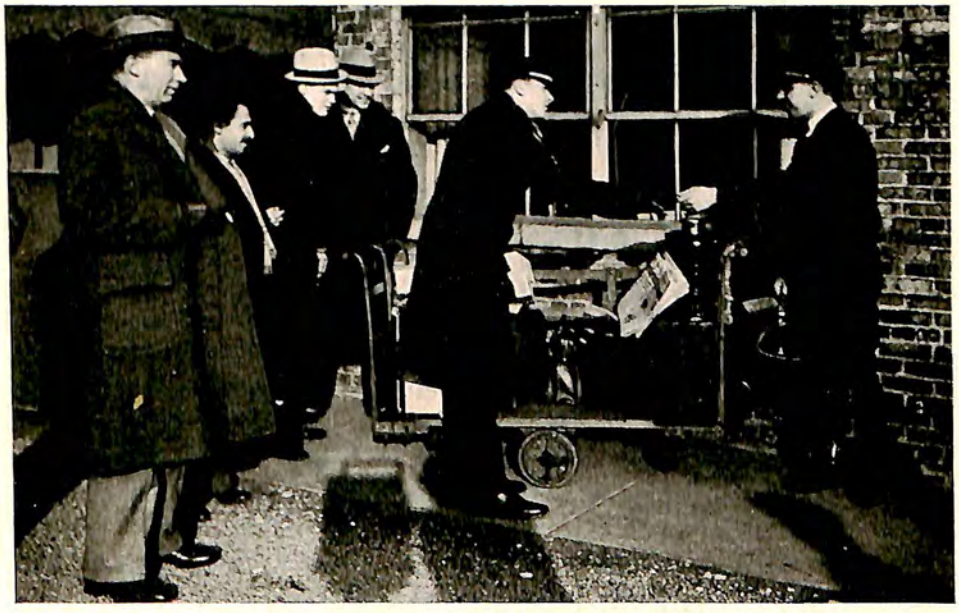
Western Air Express, Inc., continuing under the leadership of Mr. Hanshue as president, operated its San Diego-Los Angeles-Salt Lake City and Cheyenne-Denver-Pueblo mail lines—not included in the consolidation with TAT-Maddux—and leased equipment in August from Midcontinent Air Express to operate new mail extensions from Pueblo to Amarillo and Pueblo-Albuquerque-El Paso. Western Air Express owned 52 per cent. of the stock of Midcontinent and as soon as earnings were established, plans were made to acquire the remainder and effect a complete consolidation under the name of Western Air. Equipment of West Coast Air Transport Corp., which operated passenger service along the Pacific Coast in 1930, was purchased in 1931 by the Pacific Air Transport division of United Air Lines, which expanded the coastal service.

The Cord Corporation, already in the aeronautical field through its ownership of Stinson Aircraft Corp. and Lycoming Manufacturing Company, entered the operating field in 1931 with the organization of Century Air Lines, Inc., which began operation of a system of exclusive passenger and express lines radiating from Chicago, and through a subsidiary, Century Pacific Lines, Ltd., opened passenger lines on the Pacific Coast. E. L. Cord,



"ALL ABOARD" FOR NEW YORK

Passengers boarding United Air Lines' Ford (3 Pratt and Whitney Wasps) transport at Chicago for six and one-half hour flight to New York.



BAGGAGE WORRIES ELIMINATED

United Air Lines' passengers at Chicago receiving baggage which is carefully checked before and after the fast flight from New York.

also president of the Auburn and Cord motor car companies, became president of Century Air Lines, Inc. and chairman of the board of Century Pacific Lines, Ltd.

With the extension of its lines to Norfolk and Atlantic City, the New York, Philadelphia and Washington Airways Corp., financed principally by C. T. Ludington and N. S. Ludington, brothers, became Ludington Airlines, Inc. James M. Eaton, erstwhile general traffic manager of Pan American Airways, Inc., became president and general manager of the lines late in the year; Gene Vidal and Paul Collins, originators of the every hour-on-the-hour service, continuing as executive vice-president and vice-president in charge of operations respectively.

Thompson Aeronautical Corp. also established an operating division during 1931, named Transamerican Airlines Corp. to coordinate the mail, passenger and express line of the company with R. C. Marshall as president and E. G. Thompson as chairman of the board. Mr. Marshall, a veteran in aviation, had been vice-president and general manager of the company before becoming president.

Telegraph Companies Sell Tickets

The entrance of the two great telegraph systems into the field of marketing air transportation through their thousands of telegraph offices throughout the country was an important step taken during 1931. The end of the year found practically every American air transport line in the United States under contract with the Postal Telegraph Cable Company or Western Union for the sale of air line tickets. Negotiations leading to the development of this merchandising plan were carried on through the Air Traffic Conference of the Aeronautical Chamber of Commerce. The lines also entered into cooperative arrangements, where their interests were in common, for the operation of Consolidated Air Ticket Offices in principal traffic centers.

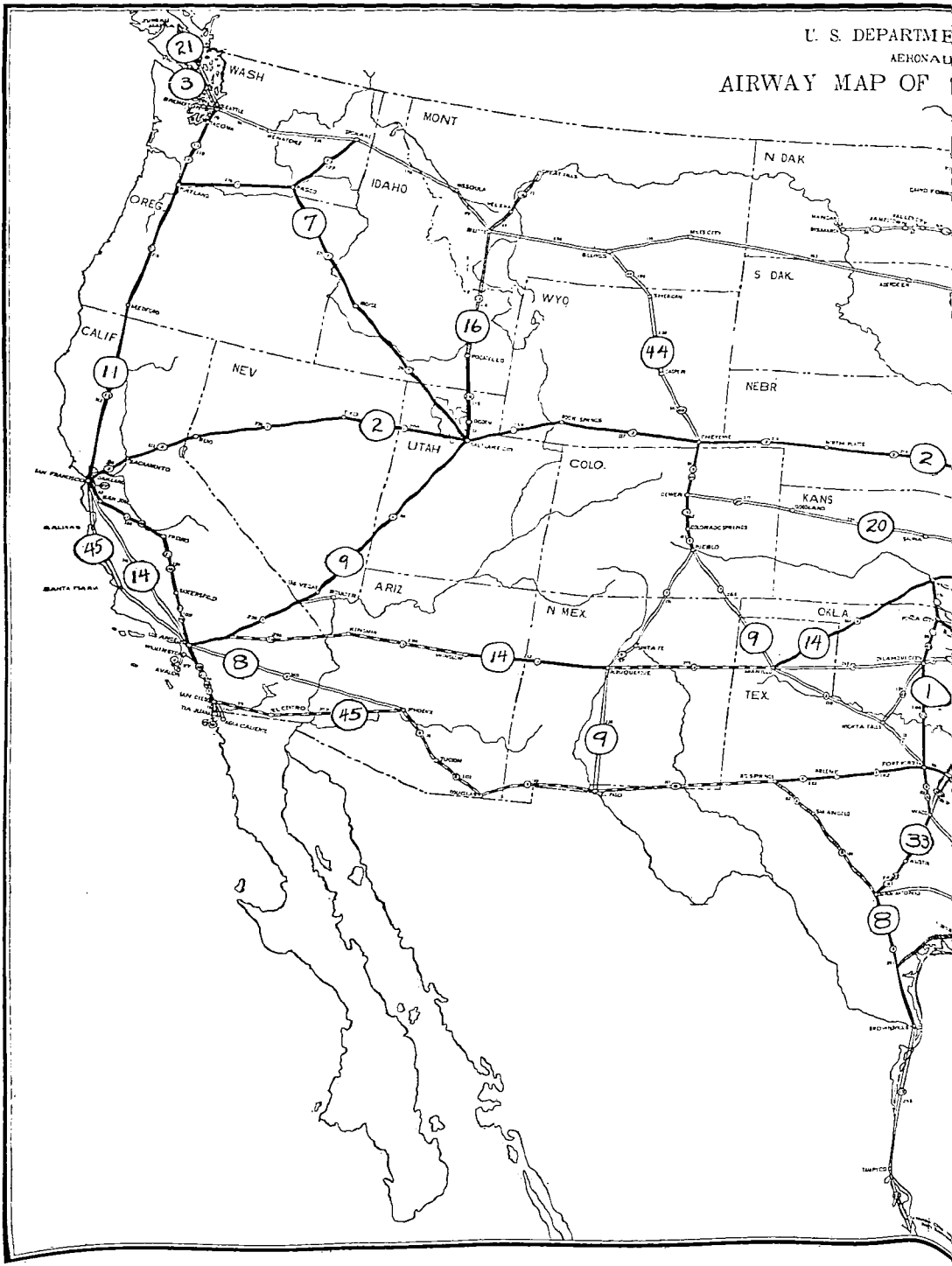
The development of air express, also aided by door-to-door delivery arrangements with the telegraph companies, was the object of concentrated attention by practically all lines during 1931. In August, Transcontinental and Western Air inaugurated the first overnight air freight service between New York and Kansas City. In November, the company entered into an interline air express arrangement with Pennsylvania Airlines, Bowen Air Lines and United States Airways, Postal Telegraph handling pick-up and delivery at all points on the combined system. Similar efforts to develop air express and freight resulted in an increase of more than 200 per cent. in the volume of goods handled in 1931 over 1930.

The transport lines employed an unusually high type of personnel, both in their operating and traffic departments. First pilots or captains were men with thousands of hours of experience; co-pilots or assistant-pilots were

SCHEDULED AIRWAY OPERATORS

Route No.	Operator	Routes Operated	Route Mileage	Class of Service
1	National Air Trans. Co. Inc. (United Air Lines)	Chicago to New York	717	MPE
		Chicago to Dallas (via Wichita)	973	MPE
		Chicago to Dallas (via Tulsa)	952	MPE
		Tulsa to Ponce City	72	ME
2	Boeing Air Transport, Inc. (United Air Lines)	San Francisco to Chicago	1930	MPE
3	Seattle-Victoria Air Mail, Inc.	Seattle to Victoria	74	MP
4	Wilmington-Catalina Air Line	Wilmington to Avalon	27	PE
5	New Orleans Air Lines	Pilottown to New Orleans	74	M
6	Ford Airways	Detroit to Buffalo (via Cleveland)	270	E
		Detroit to Chicago	262	E
7	Varney Airlines (United Air Lines)	Salt Lake to Seattle (via Pasco and Portland)	847	MPE
		Pasco to Spokane	127	MPE
8	American Airways, Inc.	St. Louis to Chicago	257	MPE
		St. Louis to Omaha	406	MPE
		Nashville to Cleveland	501	M
		Fort Worth to Cincinnati	902	MPE
		New Orleans to St. Louis	599	MPE
		Brownsville to Dallas	532	MPE
		Galveston to Dallas	318	MPE
		New Orleans to Atlanta	480	M
		Houston to New Orleans	319	M
		Atlanta to Los Angeles (via Dallas)	2065	MPE
		San Antonio to Big Springs	266	M
		Atlanta to Chicago	623	M
		St. Louis to Evansville	145	M
		Atlanta to Nashville	222	MPE
		Cincinnati to Chicago	261	MPE
		New York to Boston	192	MPE
		Boston to Bangor	206	MP
		Cleveland to Albany	446	ME
		New York to Montreal	332	MPE
		St. Louis to Memphis	240	MP
		Dallas to Amarillo	345	MP
9	Western Air Express	San Diego to Salt Lake City	702	MPE
		Pueblo to Cheyenne	199	MPE
		Amarillo to Pueblo	261	MP
		El Paso to Pueblo	478	MP
10	Northwest Airways, Inc.	Milwaukee to Green Bay	120	MPE
		Chicago to St. Paul (via Milwaukee & Minneapolis)	391	MPE
		Chicago to St. Paul (via Rochester & Minneapolis)	359	MPE
		Omaha to Twin Cities	320	PE
		Chicago to Madison	140	MPE
		St. Paul to Pembina, N. D.	369	MPE
		St. Paul to Duluth	146	MPE
		Fargo to Mandan, N. D.	194	MPE
11	Pacific Air Transport, Inc. (United Air Lines)	San Diego to Seattle	1161	MPE
		Oakland to San Jose	42	MPE
12	Pennsylvania Air Lines	Washington to Cleveland	317	MPE
13	Pan American Airways, Inc.	Miami to Havana (via Florida Keys)	251	MPE
		Miami to San Juan	1253	MPE
		San Juan to Paramaribo, Dutch Guiana	1378	MPE
		Santos, Brazil to Paramaribo	3619	MP
		Miami to Nassau	193	MPE
		Miami to Cristobal (via San Salvador)	2141	MP
		Cristobal to Miami (via Kingston and Barranquilla)	1587	MP
		Barranquilla to Port Spain	1028	MP
		Maracaibo to Curacao	208	MP
		Brownsville to Mexico City (via Tampico)	501	MP
		Brownsville to San Salvador	1250	MP
14	Transcontinental and Western Air, Inc.	Los Angeles to New York (via Kansas City)	2567	MPE
		Amarillo to Columbus (via Tulsa)	1098	MPE
		Columbus to Chicago	283	P
		Los Angeles to San Francisco	348	P
15	Eastern Air Transport, Inc.	Atlanta to New York	786	MP
		Miami to Atlanta	620	MP
		St. Petersburg to Daytona Beach	147	MP
		Jacksonville to Richmond (via Charleston)	571	MP
		Atlantic City to New York	97	MP
		Savannah to Atlanta	250	P
		Charleston to Atlanta	268	P
16	National Parks Airways, Inc.	Salt Lake to Great Falls, Mon.	483	MPE
17	Transamerican Air Lines	Chicago to Muskegon to Bay City to Pontiac	517	MPE
		Cleveland to Bay City	251	MPE
		Pontiac to Muskegon	157	MPE
		Fort Wayne to South Bend	71	ME
		Chicago to Detroit (direct)	242	MPE
18	Pan American Grace-Airways, Inc.	Cristobal, C. Z. to Montevideo, Uruguay (via Santiago, Chile)	4522	MP
19	Gorst Air Transport, Inc.	Seattle to Bremerton	15	P
20	United States Airways, Inc.	Kansas City to Denver (via Salina)	577	MP
21	Alaska-Washington Air Lines	Seattle to Juneau	934	P
22	Kohler Aviation Corp.	Milwaukee to Grand Rapids	119	PE
		Detroit to Grand Rapids	140	PE
27	Air Ferries, Ltd.	San Francisco to Alameda	7	PE
28	Rapid Air Transport, Inc.	St. Louis to Omaha (via Kansas City)	406	P
29	Robertson Airplane Service Co.	New Orleans to St. Louis	599	P
30	Frank Martz Coach Co., Inc.	New York to Buffalo (via Elmira)	323	P
31	New York, Philadelphia & Washington Airway Corp.	Washington to New York	209	PE
		Norfolk to Washington	146	P
33	Bowen Air Lines, Inc.	Dallas-Fort Worth to Oklahoma City	218	P
		Fort Worth-Dallas to Tulsa	269	P
		San Antonio to Fort Worth	281	P
		Houston to Fort Worth	255	P
36	Dixie Flying Service, Inc.	White Sulphur Springs to Washington	201	P
37	Braniff Airways, Inc.	Oklahoma City to Chicago (via Kansas City)	724	P
		Tulsa to St. Louis to Kansas City	596	P
38	Gilpin Airlines	Agua Caliente to Los Angeles (via San Diego)	130	P
40	Trump Airways	Little Rock to Tulsa	233	P
41	Century Airlines, Inc.	St. Louis to Chicago	257	P
		Chicago to Toledo	216	P
		Cleveland to Detroit (via Toledo)	152	P
		Chicago to Detroit	242	P
42	Hunter Airways	Hot Springs to Memphis	178	P
43	Reed Airline	Wichita Falls to Ponca City	213	P
44	Wyoming-Montana Air Lines	Denver to Billings	476	P
45	Century Pacific Lines, Ltd.	Los Angeles to San Francisco	372	P
		Tucson to Los Angeles	520	P
		Sacramento to San Francisco	80	P
46	Continental Airways, Inc.	Washington to Chicago	510	P

M—Mail P—Passenger E—Express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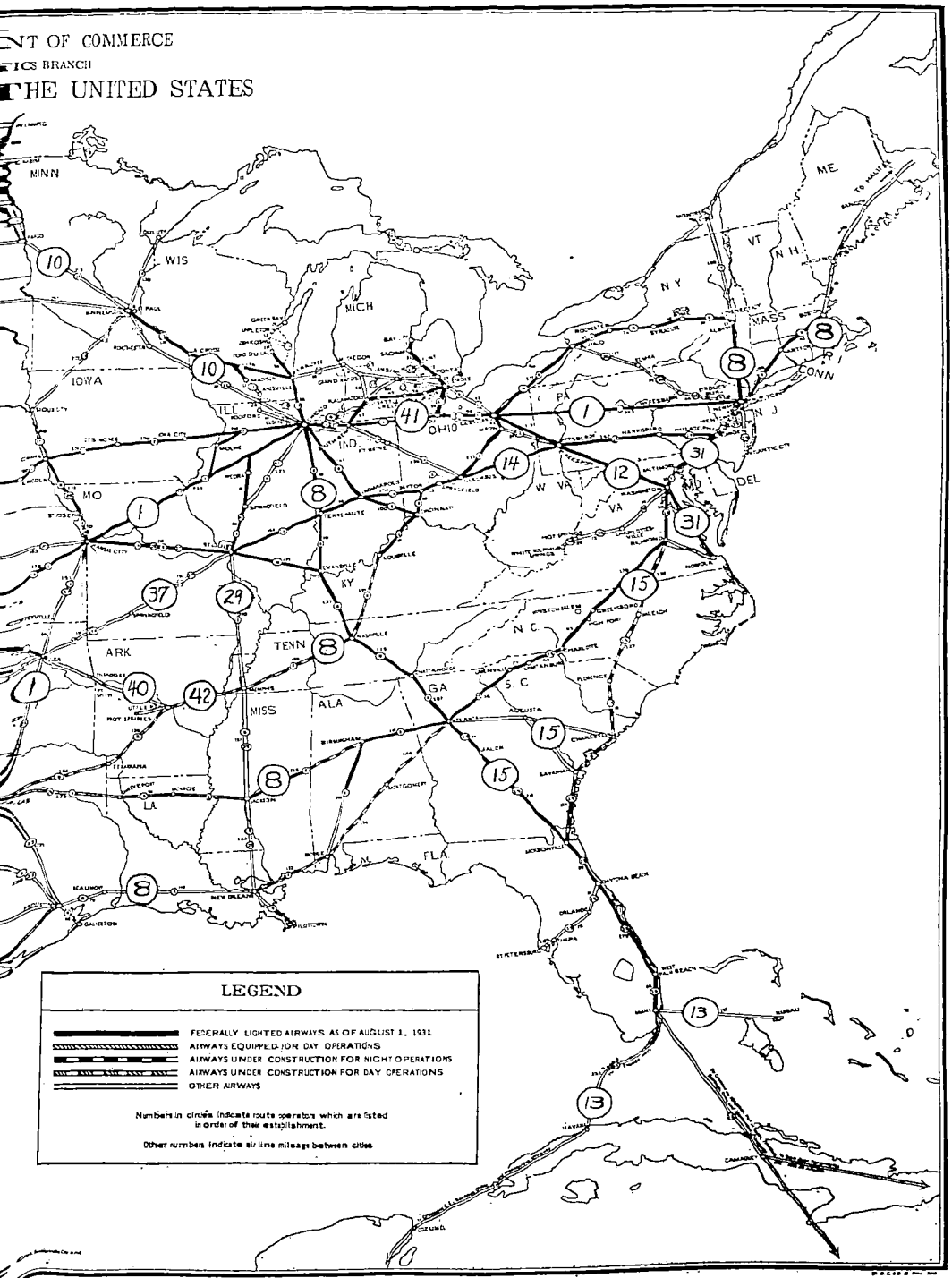
ICS BRANCH

THE UNITED STATES



LEGEND

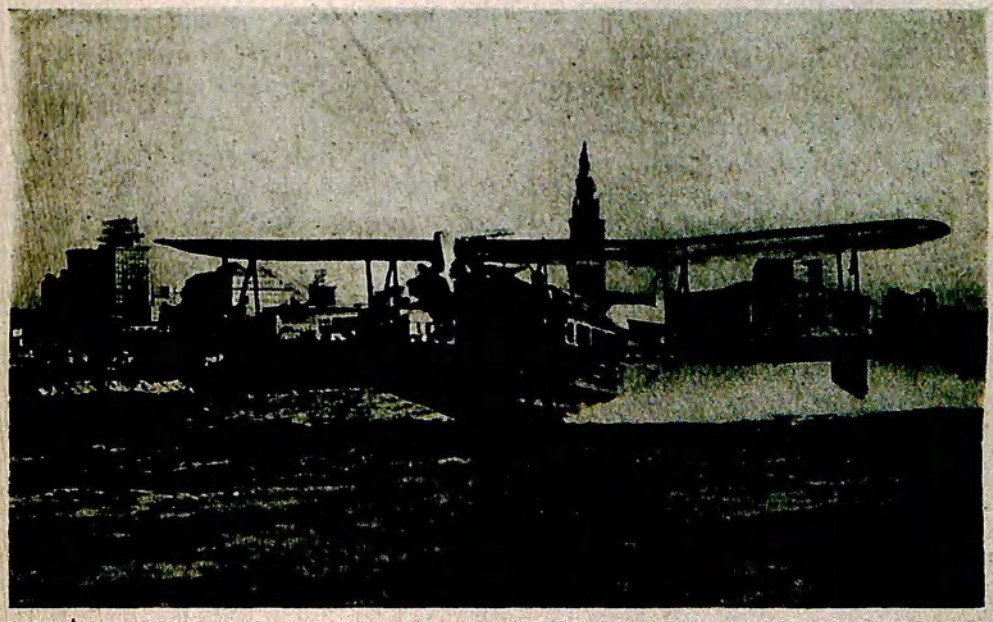
- FEDERALLY LIGHTED AIRWAYS AS OF AUGUST 1, 1931
- AIRWAYS EQUIPPED FOR DAY OPERATIONS
- AIRWAYS UNDER CONSTRUCTION FOR NIGHT OPERATIONS
- AIRWAYS UNDER CONSTRUCTION FOR DAY OPERATIONS
- OTHER AIRWAYS

Numbers in circles indicate route operators which are listed in order of their establishment.

Other numbers indicate airline mileage between cities

FREQUENT SERVICE ITS MISSION

Providing frequent service between midwest cities, one of the Century Air Lines' fleet of Stinson (3 Lycomings) Airliners is seen near Detroit.



DETROIT IN 55 MINUTES

Keystone-Loening (Wright Cyclone) amphibian of Transamerican Airlines Corp. in its "Duck" service between Cleveland and Detroit.

well trained men; and stewards, hostesses or couriers, employed on the longer lines, were college men or women with special qualifications. Reports to the Aeronautical Chamber of Commerce for 1931 indicated that the air transport lines' employees rosters were the largest in the history of the lines, despite the general depression. There were 6,978 employed by the lines in 1931 as compared with 6,350 in 1930. On the 1931 payrolls were 782 pilots, 3,091 mechanics and ground personnel. The remainder were traffic solicitors or administrative executives.

A fleet of 720 planes was employed by American air lines in 1931 as compared with 685 planes in 1930. The 1931 equipment lists included 655 land planes, 27 seaplanes and flying boats and 38 amphibians. Single-engined planes outnumbered all other classes with 463, principally because of the large number of efficient mail and express or mail-passenger planes so equipped. Tri-motors numbered 173, and twin-engined planes accounted for 19. Of the seaplanes, 20 were single-engined and 7 were twin-engined. Seventeen of the amphibians were twin-engined, 2 were four-engined, and 19 were single-engined. Air-cooled engines predominated by types with 832, as compared with 38 water-cooled, totaling 870 engines in use. Three air-cooled Diesel engines were reported in use during 1931.

New Lines Opened; Others Extended Or Improved

The stories of the development of each air transport line composed a picture unprecedented in the history of transportation. While necessarily brief, reviews of the activities of each company offer an insight into the magnitude of the year's developments. They are arranged in alphabetical order for easy future reference.

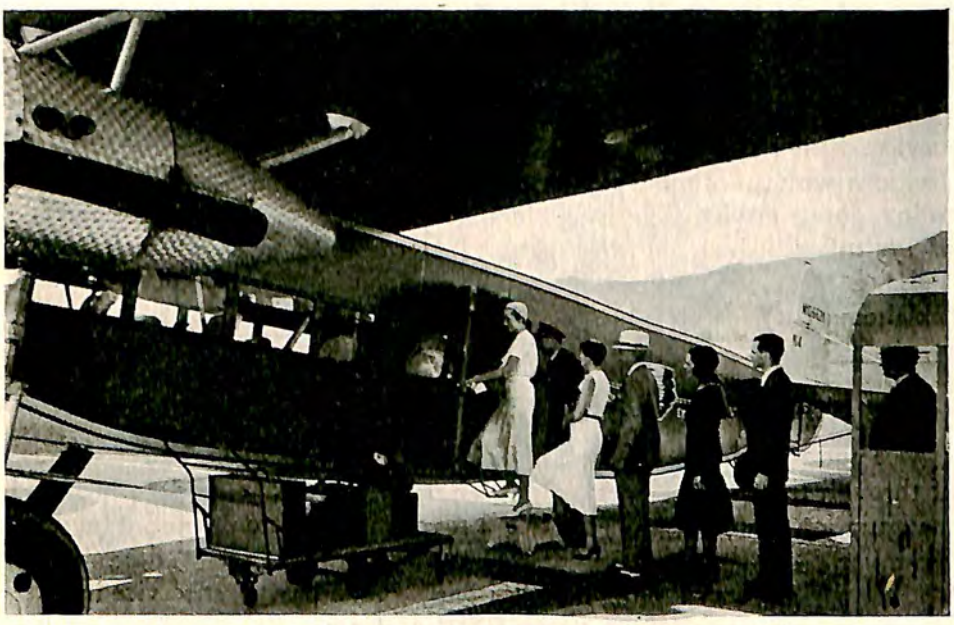
Air Ferries, Ltd., the "world's shortest air line" operating over the seven-mile route across San Francisco Bay from San Francisco to Alameda, carried 20,000 passengers during 1931 on its unique ferry service. Traffic volume was steadier throughout 1931 than in 1930, when the line's novelty attracted 60,000 passengers.

Alaska Washington Airways, Inc., linked Alaska with the American air transport network with bi-weekly service from Seattle to Juneau, Alaska, carrying more than 1,300 passengers during 1931 over the 1,030 mile route. The operations of this line, together with other American lines radiating outside the continental limits of the United States, are discussed in the next chapter, "Alaska to Argentina by Air".

American Airways, Inc., as the operating company of the Aviation Corporation of Delaware, coordinated a vast system of air lines extending from New England, through the middle-west and south, to California, inaugurating 1,821 miles of new lines in 1931: Louisville-Fort Worth, 837 miles; St. Louis-New Orleans, 639 miles and Dallas-Amarillo, 345 miles. Three additional round trip schedules were inaugurated between New York

OVER HOOVER DAM SITE

Fokker (3 Pratt and Whitney Wasps) transport of Western Air Express, Inc., flying directly over Hoover Dam site on Los Angeles-Salt Lake route.



NEW YORK BOUND PASSENGERS

Boarding Western Air Express plane at Los Angeles for six hour flight to Salt Lake City where direct connections are made for New York.

and Boston, making a total of six round trips a day. New daily round trip services were opened between New York and Cleveland, St. Louis and New Orleans, Louisville and Fort Worth, Dallas-San Antonio and Dallas-Amarillo. Additional round trip schedules daily were inaugurated to supplement service between Chicago and Cincinnati, Cleveland and Nashville, and Chicago-St. Louis. Sixty cities were served daily on American Airways' great network of lines with scheduled mail, passenger and express services over Air Mail routes 1, 2, 20, 21, 22, 23, 24, 30, 33 and Foreign Air Mail route 1, which linked New York with Montreal. The company operated one of the three main transcontinental routes, linking Atlanta with Los Angeles, as well as a network of lines in Alaska, which will be described in the next chapter. Nearly 100 planes were required by American Airways to maintain its service during 1931, flying more than 7,500,000 miles with nearly 60,000 passengers, 15,000 pounds of express and 1,500,000 pounds of mail. The company carried out an extensive development program during 1931, surveying, establishing and operating 610 miles of privately lighted airways for night flying and 972 miles of day airways. Three completely lighted, five partially lighted, and eight unlighted intermediate fields were established privately on its southern division. Two-way radio communication between planes and ground stations was installed over 6,000 miles of airways; 13 radio telegraph stations, 44 teletype stations, and 56 weather stations were established throughout the system. The Chicago base was improved with the erection of a 200 by 120 foot hangar designed for shops and offices.

Bowen Air Lines, Inc., starting operations October 1, 1930, with one round trip daily between Fort Worth, Dallas and Houston, expanded its services during 1931 to operate 16 passenger and express schedules over four divisions with 4,114 miles scheduled daily. It was the first line in the world to inaugurate service exclusively for passengers in high speed planes capable of 175 miles an hour cruising speed. Its four divisions, Ft. Worth-Dallas-Tulsa, 267 miles; Ft. Worth-Dallas-Houston, 272 miles; Dallas-Ft. Worth-Oklahoma City, 216 miles; and Dallas-Ft. Worth-San Antonio, 301 miles, were closely coordinated with other lines for direct service from as far south as Houston and San Antonio to Kansas City, St. Louis, Chicago and New York. Arrangements were made with Postal Telegraph to establish express service and with practically all railroads in Texas and Oklahoma for the sale of through tickets to points on Bowen Air Lines. Plans for 1932 included inauguration of 75 minute service between San Antonio and Houston, 180 miles.

Braniff Airways, Inc., inaugurated exclusive passenger service in 1931 over the 1,360 mile airway between Chicago, Kansas City, St. Louis, Tulsa and Oklahoma City. Low rates and fast service were maintained.

Century Air Lines, Inc., the new division of the Cord Corporation

LINK UTAH, IDAHO AND MONTANA

In flight near Butte, Mont., two Boeing 40-B-4 (Pratt and Whitney Hornet) biplanes of National Parks Airways are seen in the tri-state service.

OVER "RICHEST HILLS IN THE WORLD"

National Parks Airways' Fokker Super-Universal (Pratt and Whitney Wasp) monoplane in flight over the rich mines at Butte, Mont.

organized early in 1931, began operations March 23 between Chicago, Detroit, Toledo, Cleveland and St. Louis, featuring frequent schedules and low rates over the 886 miles of routes. Exclusive passenger service was maintained, with a special express department created separate from the traffic department late in the year to develop new business. South Bend, Ind., was added during the first month of operation and Bloomington, Ill., became a stop late in September. Operating a fleet of 14 Stinson (Lycoming) Airliners, supplemented by 16 Auburn limousines for ground transportation, Century Air Lines carried 40,213 revenue passengers over 1,223,828 miles without injury to passengers or pilots during the first six months of operation. In mid-September, maintenance and operations headquarters and general offices were located in a gigantic new hangar on the Chicago Municipal Airport.

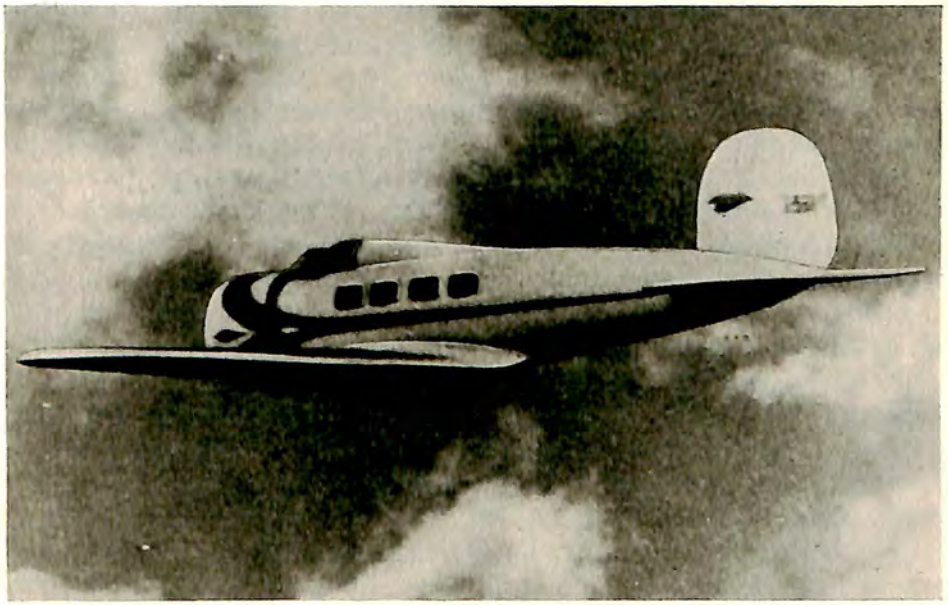
Century Pacific Lines, Ltd., a subsidiary of Century Air Lines, Inc., started passenger operations July 3 between San Diego, Los Angeles, Bakersfield, Fresno, Oakland and San Francisco, but extended the route to approximately 900 miles of routes with Sacramento the northern terminus and Phoenix, Ariz., the southern terminal. New stops were added at San Jose, Salinas, Santa Maria, Long Beach, Yuma and El Centro. With fares below those of the railroads, it operated a fleet of Stinson (Lycoming) Airliners on 26 daily schedules radiating from Los Angeles on its routes, carrying 16,000 passengers, 15,000 pounds of newspapers and 11,500 pounds of express during the first four months of operation.

Continental Airways, Inc., inaugurated a high speed round trip daily between Chicago and Washington with stops at Canton, O., and Pittsburgh. The schedule called for linking the two cities in three hours and fifteen minutes. It was exclusively a passenger service.

Corporación Aeronáutica de Transportes, S.A., an American-owned line in Mexico connecting with the American domestic system at El Paso and Brownsville in Texas, is described in the next chapter, "Alaska to Argentina by Air".

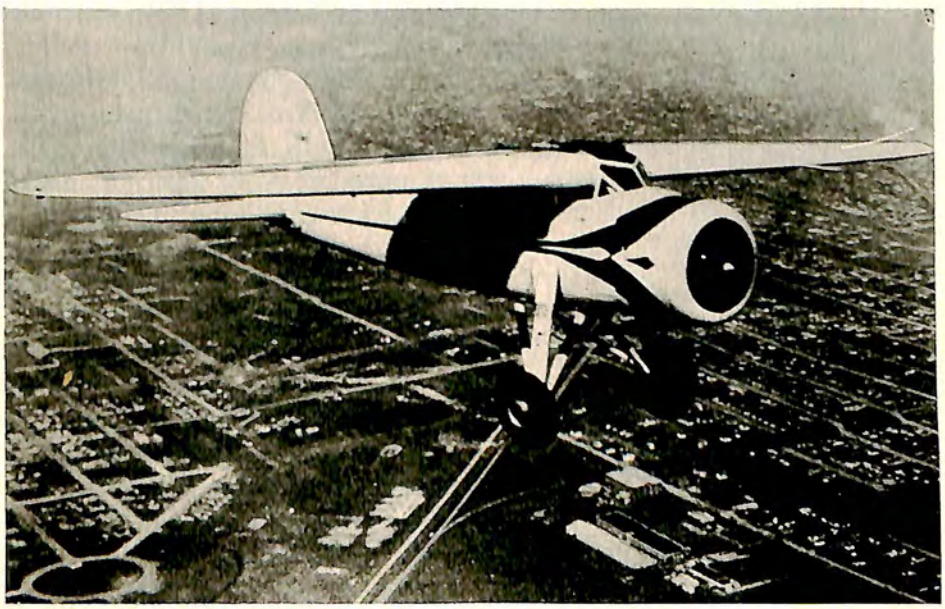
Dixie Flying Service, Inc., operated an exclusive passenger service between White Sulphur Springs, Hot Springs, Charlottesville and Washington with one round trip daily, connecting with the Ludington Air Lines, Inc., at the national capitol.

Eastern Air Transport, Inc., a division of North American Aviation, carried on an extensive expansion program during 1931, adding mail, passenger and express services over 1,324 miles of new routes and new passenger facilities over its mail airway to provide a total of 2,101 miles of routes extending from New York to Miami. The most important extension of the year was the opening of a new coastal passenger and mail route from Richmond to Raleigh, Florence, Charleston, Savannah and Jacksonville, April 1. Other services inaugurated during the year were those to Atlantic



"THREE MILE A MINUTE" SERVICE

With high speeds above 200 miles an hour, Wasp-powered Lockheed Orions with retractable landing gears are used by Bowen Air Lines.



BOWEN SERVES SOUTHWEST

Fast Lockheed Vega (Pratt and Whitney Wasp) monoplanes are in service on some routes of Bowen Air Lines serving the southwest.

City from New York, Philadelphia, Baltimore and Washington; to Norfolk from Richmond; and to Augusta, Charleston and Savannah from Atlanta. The company purchased the rights of New York Airways, a subsidiary of Pan American Airways operating between New York and Atlantic City, and merged it with the Eastern Air Transport organization. New terminal facilities were completed at Newark Airport, 14 new radio stations established at strategic points along the route, and two-way radio apparatus installed on all planes. Reduced round trip rates and a reduction of one-way fares to all points, amounting to 14 per cent,. were inaugurated. The company experienced an increase of a quarter million pounds of air mail on its Air Mail contract 19. Plans for an elaborate express service were under consideration at the close of the year.

Gorst Air Transport, Inc., operated an hourly passenger-express ferry service between Seattle and Bremerton, Wash., transporting 12,000 passengers and 30,000 pounds of express during the year over the short 15 mile route.

Kohler Aviation Corp. operated three round trips daily with passengers and express across Lake Michigan from Milwaukee to Grand Rapids, 119 miles, and two round trips daily with passengers from Detroit to Grand Rapids, 140 miles.

Ludington Airlines, Inc., which inaugurated hourly passenger and express service in September, 1930, between New York, Philadelphia and Washington under the name of the New York, Philadelphia and Washington Airways Corp., extended its service in 1931 from Washington to Norfolk, Va., and from Philadelphia to Atlantic City. Trenton, Wilmington, and Baltimore were added as stops on the New York-Washington route, and a "Three-Mile-A-Minute" express service with four schedules daily inaugurated. During the first full year of operation, 8,300 trips were made with 66,000 passengers. New tri-motored Stinson (Lycoming) Airliners were added to the lines' equipment to provide 30 schedules daily over the 405 miles of routes. The line was designed to illustrate the possibilities of highly frequent, low fare, air transport between important population centers. Air express service was provided with door-to-door delivery through an arrangement with Western Union.

Main Flying Service, Inc., discontinued operations October 1, 1931, after operating 11 months over the 327 mile route between Cincinnati and Pittsburgh with passengers exclusively. It announced plans to reopen the service in the spring of 1932.

Mamer Air Transport, Inc., extended its Spokane-Wenatchee-Seattle passenger line to Tacoma in April, 1931, operating round trip service over the 256 mile route daily during the year. An arrangement with Western Union made possible the collection and distribution of air express.

Martz Air Lines, Inc., a subsidiary of Frank Martz Coach Company,

Inc., operated daily passenger service with two round trips between New York and Buffalo, 323 miles, with stops at Stroudsburg, Wilkes-Barre, Elmira and Dansville.

Metropolitan Air Ferry Service, inaugurated by the Curtiss-Wright Flying Service September 4, 1931, linked the three principal airports in the New York metropolitan area with hourly ferry service in tri-motored planes at low rates, making stops at Newark Airport, Floyd Bennett Field, and Glenn H. Curtiss Airport. The service was discontinued in December for the winter months. It was to be reopened in the spring with amphibian service direct to Manhattan.

National Parks Airways, Inc., operating mail, passenger and express service on Air Mail contract 26, experienced a steady growth of its mail and passenger business during 1931 over 1930 figures for the route between Salt Lake City, Ogden, Pocatello, Butte, Helena and Great Falls. The number of miles flown daily by the company was increased to 718 on May 15 when a round trip flight between Pocatello and Great Falls was added to provide two round trips daily over the entire system. The lighted portion of the line was extended as far north as Spencer, Idaho, from Salt Lake City, increasing the efficiency of the mail service. Two-way radio was installed on three planes used for night flying, with plans for extending the two-way service to all planes.

Northwest Airways, Inc., inaugurated three new daily mail, passenger and express services in 1931: St. Paul to Pembina, N.D.; St. Paul to Duluth; and Fargo to Mandan, N.D., supplementing its older services from the Twin Cities to Chicago via Milwaukee, to Chicago via Rochester, to Omaha, and from Milwaukee to Green Bay, Wis., and Chicago to Madison, Wis. All schedules carried mail, passengers and express daily with the exception of the Twin Cities-Omaha service which was weekly with passengers exclusively and the Chicago-Twin Cities route via Milwaukee which carried passengers, mail and express on two round trips daily. Ford and Hamilton planes were used on Air Mail route 9.

Pan American Airways Company inaugurated, August 1, the first international air mail and passenger service between Boston and Halifax, N.S., and operated a joint air mail and passenger service between Boston, Portland, Rockland, and Bangor with the Boston and Maine Central Railroads. In addition, Pan American Airways System linked a vast system of international lines with those of the domestic system, radiating from Miami, Fla., and Brownsville, Tex. These extensive operations are discussed fully in the next chapter, "Alaska to Argentina By Air."

Pennsylvania Airlines, Inc., a division of Pittsburgh Aviation Industries Corp., operated Air Mail contract 11 between Cleveland and Washington. Two additional round trips daily were added during 1931, making three round trips daily between Cleveland and Washington, with stops at

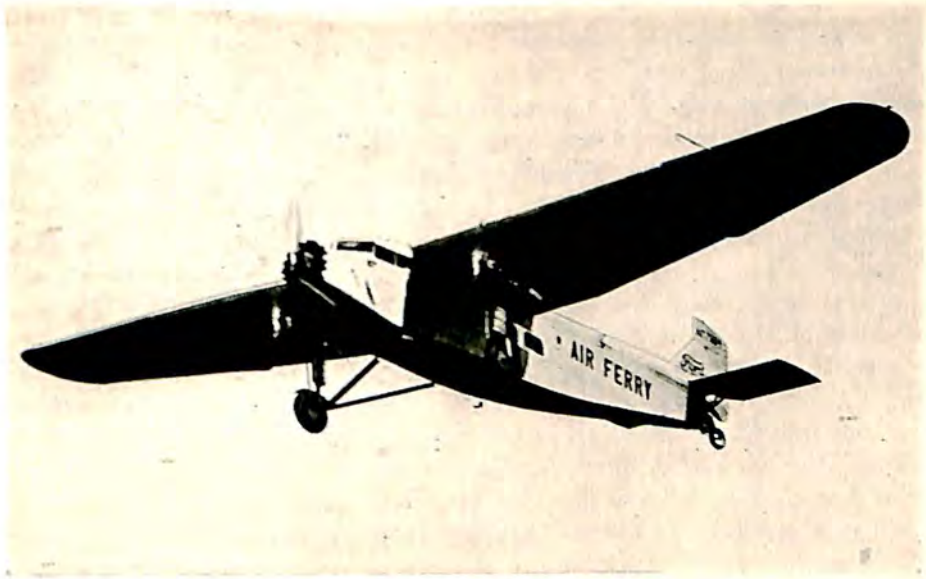
Akron and Pittsburgh. A mail extension was authorized June 8 over the Pittsburgh-Washington division, previously operated as an exclusive passenger service. Stinson (Lycoming) Airliners were added to replace Fairchilds in service to care for the new services. Late in 1931, passenger rates were reduced approximately 25 per cent. and a new interline express arrangement with Transcontinental and Western Air, Inc., Bowen Air Lines, Inc., and United States Airways, Inc., was announced, with the cooperation of Postal Telegraph for door-to-door delivery at rates ranging from 11 cents per pound. Radio was installed on all passenger planes, an elaborate private teletype system established, and new weather stations added along the route.

Rapid Air Transport, Inc., a wholly owned subsidiary of Rapid Air Lines Corp., continued the operation of a passenger and express line from Omaha to Kansas City and St. Louis with flag stops at St. Joseph and Columbia. Two Bellanca (Wright Whirlwind) Pacemakers and a Ryan (Wright Whirlwind) Brougham were used in the service. The line was completing its second year of operation over the 406 mile airway at the end of 1931. The route was lighted for night flying, but the late afternoon schedule was advanced during the winter months to permit daylight arrivals.

Robertson Air Lines, Inc., continued the operation of a passenger and express service with one round trip daily between St. Louis and New Orleans, 599 miles. Stops were made at Memphis, Tenn., and Jackson, Miss. The line had an arrangement with Western Union to provide door-to-door delivery for air express.

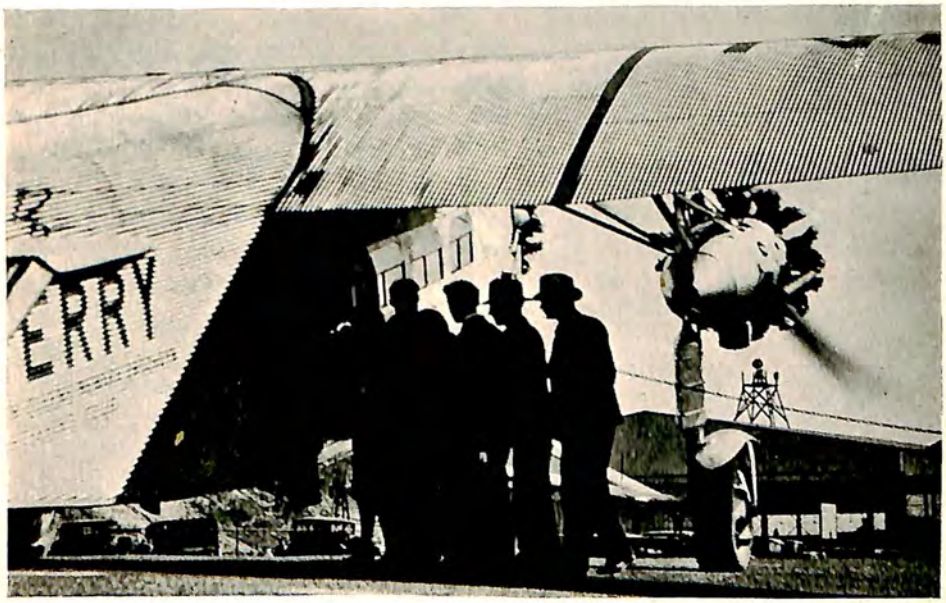
Transamerican Airlines Corp., which became the operating division of Thompson Aeronautical Corp. in 1931, maintained its service over Air Mail route 27 serving 18 cities in Ohio, Michigan, Indiana and Illinois. Its mileage was increased during 1931 from approximately 60,000 to more than 150,000 miles monthly, traversing its original routes with fast, frequent service between Detroit-South Bend-Chicago and Detroit-Toledo-Cleveland, the latter service succeeding its direct 55-minute Detroit-Cleveland amphibian service, suspended for the winter. This unique service, the world's first inland amphibian line, enjoyed the greatest traffic record in its history during 1931 with 12 flights daily between April 1 and November 8, flying 243,700 miles with 9,075 passengers, 6,529 pounds of mail and 11,462 pounds of express. The 222 day operation showed an increase of 62 per cent. in passenger volume with 97.6 per cent. of the scheduled flights carried out. The winter land service between Cleveland and Detroit was on an 80-minute schedule. While primarily concerned with the operation of mail, passenger and express lines, Transamerican undertook the surveying of an Arctic route from the United States to Europe which is more fully described in a later chapter on "History Making Flights for 1931."

Transcontinental and Western Air, Inc., continued operation of



NEW YORK'S AIR FERRY

Ford transport with three Wright Whirlwinds seen on triangular course flown hourly by Curtiss-Wright between metropolitan airports.



DIRECT CONNECTIONS FOR NEWARK

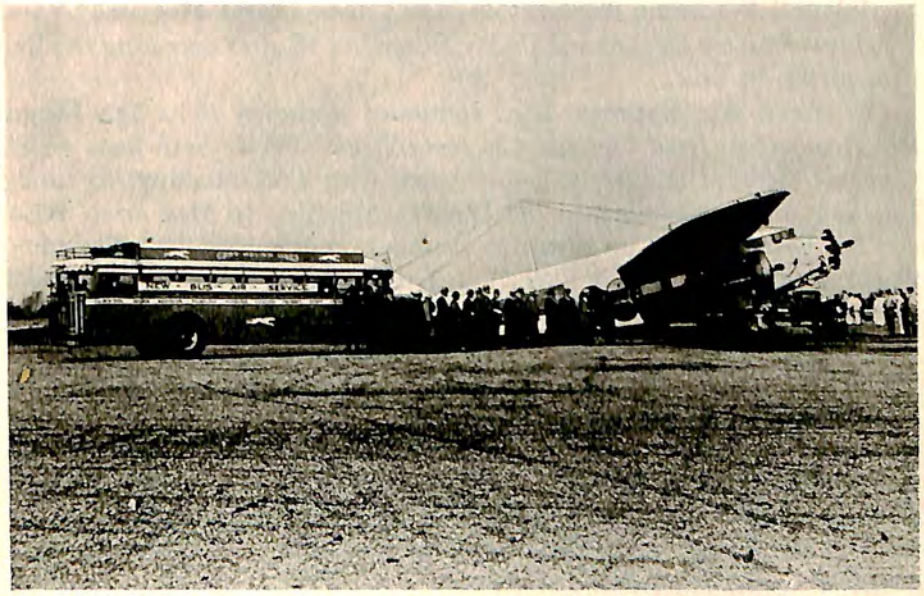
Passengers boarding Curtiss-Wright Air Ferry at North Beach in Queens to make connections with regular air lines at Newark Airport.

its coast-to-coast New York-Los Angeles all-air service in 36 hours and air-rail service in 48 hours, in addition to two round trip flights between Los Angeles and San Francisco daily with mail, passengers and express. Local service between Tulsa and Oklahoma City was discontinued in April, and a new direct all-air service was inaugurated May 1 between New York and Chicago on an eight-hour schedule with stops at Philadelphia, Harrisburg, Pittsburgh and Fort Wayne. In August, two additional round trips for passengers and express were inaugurated between New York and Pittsburgh, which in combination with the transcontinental and Chicago services provided four round trips daily between New York and Pittsburgh on a schedule of little more than two hours for the flight. In August, the first overnight air freight service in the country was opened between New York and Kansas City; and, in November, an interline air express arrangement was put into effect which assured fast service to any point on the lines of TWA, Pennsylvania Airlines, Bowen Air Lines, or United States Airways, with door-to-door delivery provided by Postal Telegraph. In October, co-ordinated service was offered through an arrangement with Greyhound Bus Lines for through ticketing of passengers and express. The company carried mail under provisions of Air Mail contract 34. In April, TWA inaugurated the first "24-hour" coast-to-coast service for mail and express only with two round trips daily between New York and Los Angeles. Elapsed time on the westbound schedule was actually 22 hours and 17 minutes; and eastbound, against the sun, 25 hours and 45 minutes. New buildings of gigantic proportions on the Kansas City Municipal Airport were completed in 1931 to house the central operating base of the company.

United Air Lines, Inc., formed during 1931 as the transport operating subsidiary of United Aircraft and Transport Corp., maintained four closely coordinated divisions: National Air Transport, Boeing Air Transport, Pacific Air Transport and Varney Air Lines. The consolidation gave United Air Lines service to 42 cities in 18 states, with direct air and rail connections to scores of other points. It linked the Atlantic and Pacific, the Great Lakes and the Southwest, the Pacific Northwest and the Rocky Mountain region, and provided the only through service on the Pacific Coast. The system operated a fleet of more than 100 single-engined and tri-motored transports, adding substantially to its investment during the year in modern hangar depots, servicing plants and extensive ground facilities. The company employed 150 pilots and a ground staff of 600. Sixty per cent. of the equipment was manufactured by an allied subsidiary, Boeing Airplane Company, with Ford tri-motors being used on several passenger routes. Carrying 50 per cent. of the air mail in the United States, United also expanded its passenger facilities during 1931, carrying 7,000 passengers in peak months. It flew a total of 10,811,428 miles during 1931—the largest single air line operation in the world—and carried 2,292 tons of mail,

COAST-TO-COAST SERVICE

Transcontinental and Western Air, Inc., serves cities from coast-to-coast with Ford (3 Pratt and Whitney Wasps) passenger transports.



INAUGURATE AIR-BUS SERVICE

Greyhound bus transferring passengers directly to Transcontinental and Western Air plane at Los Angeles under new air and bus hookup.

exclusive of passengers and express business. It completed 97 per cent. of its scheduled mileage. With the opening of 1932, United was flying 18,000 miles every night and 17,000 miles each day. During 1931, it inaugurated 28-hour service from San Francisco to New York and 31-hour westbound schedules, providing the only day and night transcontinental passenger, mail and express service. The Pacific Air Transport division extended its Seattle-Los Angeles route from Los Angeles to San Diego, and, in May, inaugurated daylight tri-motored passenger service along the coast, doubling its mileage record during 1931. The Boeing Air Transport division added a third schedule daily on its San Francisco-Chicago route. The National Air Transport division added a fourth daily round trip between Chicago and New York, providing a twilight service, and inaugurated a tri-motored passenger service between Chicago and Dallas. The Varney Air Lines division changed one of its two daylight round trips between Seattle and Salt Lake City to a night schedule in both directions, when the lighted airway through the Columbia River gorge was completed. United Air Lines through its divisions operated Air Mail contracts 5, 8, 18 and 20.

United States Airways, Inc., added mail and express service to its passenger route between Kansas City and Denver, with a stop at Salina, Kan., when it became a sub-contractor on Air Mail contract 30 which was awarded American Airways in 1931. It joined three other lines in an interline express agreement described above.

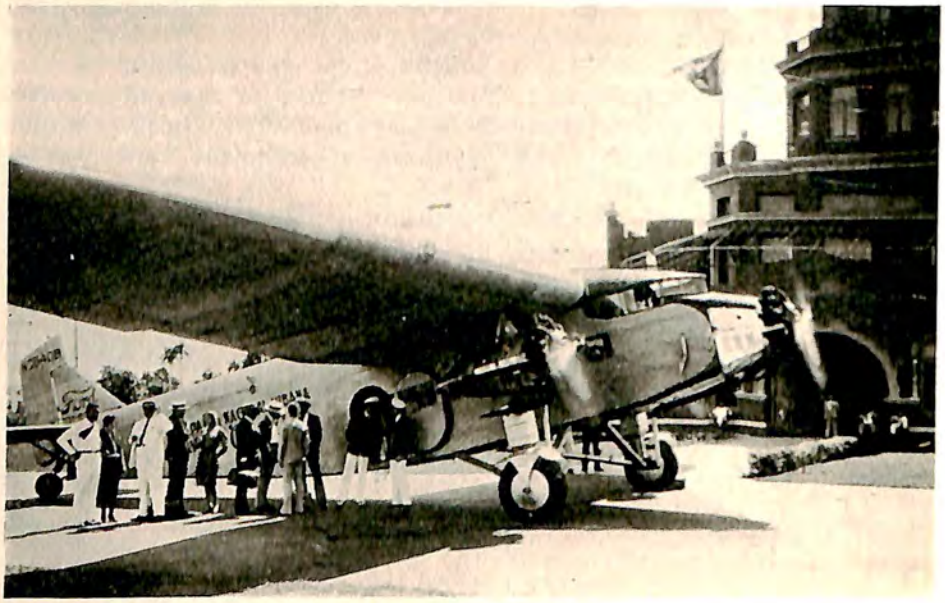
Wedell-Williams Air Service, Inc., discontinued its passenger service between New Orleans and Dallas November 18 after operating the line throughout the year.

Western Air Express, Inc., continued operation of its San Diego-Los Angeles-Salt Lake City and Cheyenne-Denver-Pueblo mail lines which were not included in the 1930 consolidation with TAT-Maddux Air Lines, Inc., to form Transcontinental and Western Air, Inc. In May, 1931, Western Air Express began an extensive overhaul program for the tri-motored planes of the San Diego-Salt Lake City division and, in September, a similar program was undertaken for the single-engined planes of the Denver division. Two air mail extensions were awarded the company by the Post Office Department August 1: Pueblo to Albuquerque and Pueblo to Amarillo. In addition, the company leased from American Airways the portion of the extension granted it from Albuquerque to El Paso. Planes and equipment of Midcontinental Air Express, which had been operating passenger service over the routes awarded mail contracts, were leased by Western Air to care for the additional service. Plans were completed to obtain the remaining stock of Midcontinent Air Express, in which Western Air already had a 52 per cent. controlling interest. A complete company-owned weather service was installed over 990 miles of routes during 1931, and extensive radio equipment added for planes and ground stations. At

the opening of 1932, Western Air Express was flying 5,106 miles daily and operating Air Mail routes 4, 12 and part of 33.

Western Air Service Corp., which had operated an exclusive passenger service between Omaha and Oklahoma City in 1930, changed its routes in 1931 to provide a round trip daily between Sioux City, Omaha, Lincoln, Salina, Wichita, Ponca City and Tulsa, and an additional round trip between Wichita and Tulsa.

There were several other small air line operations inaugurated in 1931, but their traffic volume and daily mileage had not increased sufficiently to include them here. An examination of the United States air transport folding map inserted in this chapter will reveal the nation-wide character of this fast growing air line network, which was serving more than 100,000,000 persons in the United States alone.



LINKS CUBAN CITIES

Ford (3 Pratt and Whitney Wasps) transport of the Compañia Nacional Cubana de Aviacion Curtiss, an American-controlled line, ready to leave Havana.

MACHADO AT HAVANA PORT

President Gerardo Machado of Cuba (tallest man in group) inaugurates Curtiss airport named for him at Havana as base for Cuban line.

CHAPTER IV

ALASKA TO ARGENTINA BY AIR

Vast International Network Under Many Flags Links All Nations of Western Hemisphere—Pan American Extends Routes—American Airways in Alaska—Annual Latin American Reviews

AMERICAN enterprise on a dozen frontiers continued to lead the way during 1931 in the development of a vast network of international air lines in the Western Hemisphere from northernmost Alaska to the far southern capitals of Chile and Argentina. Lines extending across the Canadian boundary linked the system of air lines in the United States with that of Canada at Halifax for the maritime provinces, at Montreal for the rich eastern centers in Ontario and Quebec, at Winnepeg for the great western prairie provinces, and at Victoria, Vancouver, and Manaimo for British Columbia points, extending northward to Ketchikan and Juneau in Alaska. Planes of an American-owned line in Alaska were supplanting the dog teams of former days with a far northern air system.

From air line termini along the southern border radiated another system of American-owned lines which extended from Miami to islands in the Caribbean and on down the east coast of South America to Buenos Aires in the Argentine, from El Paso, Laredo and Matamoros to all parts of Mexico, and from Brownsville to Mexico City, through Central America to Panama and on down the west coast of South America to Santiago in Chile, where a line spanned the Andes to Buenos Aires—completing a circle of air lines around South America. But even more, passengers and mail carried from the United States to centers in 32 countries of Central and South America under the American flag found a dozen other air networks, under the national flags of Latin American republics or those of enterprising European nations, ready to serve in extending the journey to interior points. In Guatemala, a national line flew in two hours to a city formerly reached only after a day by rail, a day by sea and eleven days on muleback over tortuous trails. Similarly, other lines in Latin America—many of them closely linked with the American system—saved days and weeks of the traveller's time.

Even Patagonia in southern Argentina, always thought of as the farthest outpost of the civilized world, was linked by a direct air line from Buenos

Aires, the Argentine terminus of the American line, to Rio Gallegos. American holdings in air lines of Cuba, Peru, Colombia, Mexico, and the Canal Zone were a further tribute to the initiative and enterprise of the United States in aiding to develop this international network. What was even more, German, French, Dutch and British interests were closely allied with those of America in building a great system of lines linking all parts of the Western Hemisphere. The courage and initiative of Latin American republics in backing national air lines under their own flags were also to be commended.

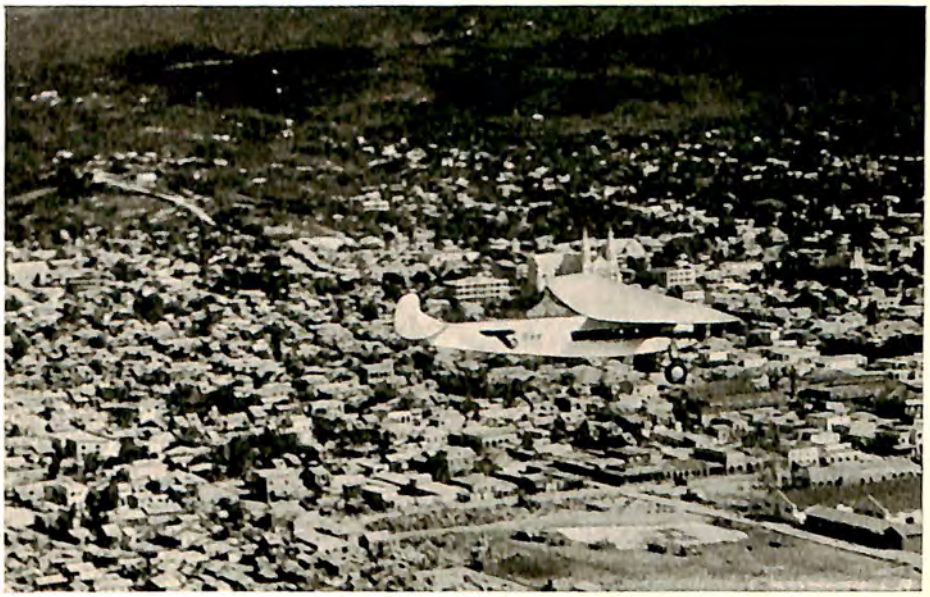
Lines Extending into Canada

On August 1, the Pan American Airways Company inaugurated the first international air mail and passenger service between Boston and Halifax, N. S., and operated a joint air mail and passenger service between Boston, Portland, Rockland and Bangor with the Boston and Maine Central Railroads. While the services were of an experimental nature, possibly leading to future routes across the North Atlantic from Canada to Europe, the first few months of operation set a record for pioneer air line operation with passenger traffic averaging 80 per cent. of the capacity of the planes.

The Colonial Division of American Airways, Inc., continued to link New York, where connections were made for all parts of the United States, with Montreal and the Canadian air line system serving the eastern provinces of Canada. Northwest Airways, Inc., flying northward from Chicago, St. Paul and Minneapolis, carried passengers to Winnepeg, where lines of the Canadian system extended westward into the mountains and northward toward Alaska. Mails from the Orient landing at Victoria, B. C., were speeded to Seattle by flying boat to connect with the domestic air network. Alaska Washington Airways linked Seattle with Victoria, Vancouver and Manaimo in British Columbia with a passenger and express service.

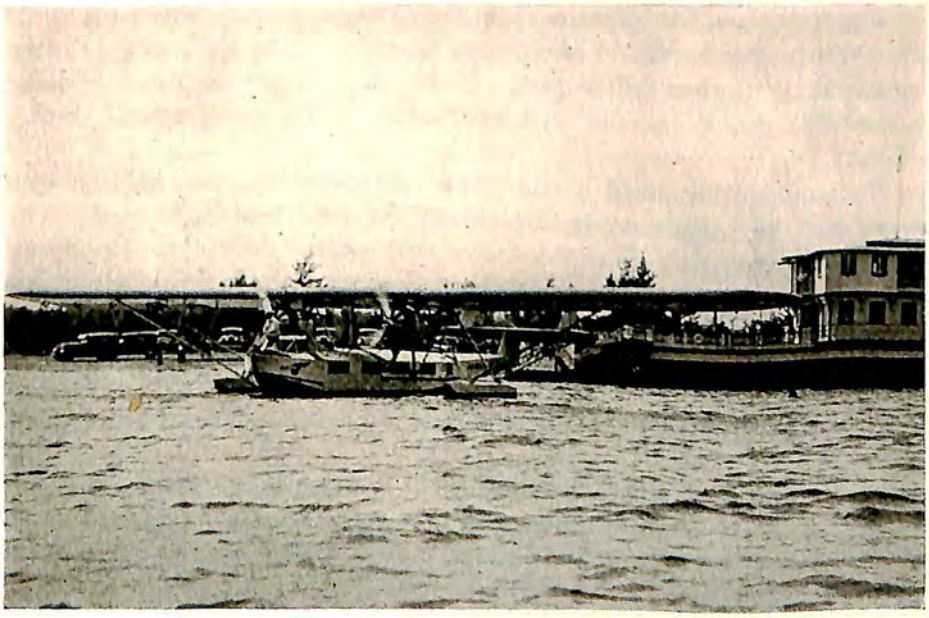
Canadian Airways, Ltd., operated the largest single air transport enterprise in Canada, cooperating closely with the United States air line system. Because of the concentration of Canada's populace in widely scattered sections of the country, a transcontinental service in Canada was considered unwise. In its place was an efficient system of what might be called "local airways" connecting the centers of population in Canada and meeting the American lines at border points.

Daily service was maintained during 1931 between Detroit and Toronto, 200 miles; weekly service was afforded points along the North Shore of the St. Lawrence River; and a bi-monthly service was operated to Anticosti Islands and Magdalen Islands in the maritime provinces. This service was



SIX HOURS FROM MIAMI

Called the "most unusual city in the world," Port au Prince is reached by Wasp-powered Fokkers of Pan American Airways system.



FLYING BOATS TO JAMAICA

Giant Consolidated Commodore (2 Pratt and Whitney Hornets) flying boat of Pan American Airways preparing to take-off from Miami for Kingston.

operated during the winter when other means of transportation were subject to tie-up due to snow and ice.

Passenger and freight service was maintained on a daily schedule between Montreal, Quebec, Moncton and Charlottetown. From Pembina, N. D., at the United States border, passenger, mail and express service was operated northward to Winnepeg, Regina, Moosejaw, Lethbridge, Calgary and Edmonton. Occasional service was offered from Edmonton to Aklavik on the Arctic Ocean, well within the Arctic Circle.

American Lines in Alaska

Alaska Washington Airways, an American line, maintained a service with fast planes for passengers and express from Seattle through British Columbia to Juneau, Alaska, 1,060 miles, on a twice weekly service during the summer months.

The Alaskan Division of American Airways operated on an extensive system of lines farther north in the territory of Alaska, supplanting the dog team with the airplane in the life of the inhabitants.

Its system covered a territory about 1,000 square miles. The planes flew to Siberia on the west, to White Horse, Canada, on the east; as far south as Skagway and north to Point Barrow, in the Arctic Zone.

Due to the low temperatures encountered in the district, many problems arose which were not found in ordinary operation. The thermometer often registered 70 degrees below zero. The frozen banks of snow and ice necessitated equipping ships with skis instead of the usual wheels during winter.

The company accepted anything for transportation provided the ship would lift the load, and pigs and husky dogs were often carried. The most important item of express was gold dust. Although the planes operated over regular routes, many concessions were made from regulations to serve the people of the various communities. It was not at all out of the ordinary for a ship to carry a miner to the place where his claim was producing or where he wished to prospect, with a six months' supply of food, and to arrange to pick him up at the same place at the end of that time.

Use of the planes practically dispensed with dog team travel. A plane was able to cover as much territory in an hour as a good team of huskies could make in a week and the more rapid form of transportation was naturally preferred.

Alaskan Airways' regular schedules were as follows: Anchorage to Flat, weekly; Anchorage to Bethel, every other week; Anchorage to Bristol Bay, monthly; Fairbanks to Nome, weekly; Fairbanks to Fort Yukon, weekly;

Fairbanks to Eagle, every other week; Fairbanks to Wiseman, monthly. All of these routes included stops at towns and villages along the courses.

Pan American Airways Vast System

The opening of 1932 marked the end of a pioneering era for the Pan American Airways System and placed the company in a position to carry out the principal tasks which confront the United States in international air transport. The year was a period of readjustment in which routes and schedules were changed, new extensions inaugurated, and revisions made in the company's operating policy to speed up international air mail and passenger services and insure their efficient operation without interruption.

The most significant change came with the announcement December 1 that the company was laying the groundwork for the largest marine air transport operation in the world. This called for giant flying boats to make scheduled runs out of Miami over the 7,500 mile eastern trunk line to Rio de Janeiro and Buenos Aires by way of the West Indies; across the direct trans-Carribean route to Barranquilla, Colombia, and the Canal Zone; and over the shuttle routes by way of Cuba, Mexico and Salvador and along the north coast of South America.

Installing this flying boat operation was one of the most sweeping readjustments ever instituted by an air transport company. It called for the construction of a gigantic seaplane base, which was designed to be the largest in the world. The Pan American International Airport at Miami, one of the finest landing fields in the country and formerly used by the company in its land plane operation between Miami, Cuba and Porto Rico, was being transformed into an aircraft repair base for the system where all major overhaul work was to be handled. Land plane equipment, which for four years had operated from this port, was transferred to Brownsville, Texas, the western terminus of the company, to be used on the Mexican and Central American routes.

Under the new program the system was broken up into three main routes. From Brownsville, Tex., the western trunk air line covered Mexico and Central America to Panama and the Canal Zone, where it continued through an affiliated company, Pan American-Grace Airways, down the west coast to Chile and over the Andes to Argentina and Uruguay. Ten passenger tri-motored Fokker and Ford land planes were to be used on this route with the exception of the flight between Panama and Peru, where eight passenger twin-motored Sikorsky amphibions were to be used.

The eastern trunk line stretched from Miami to Rio de Janeiro, Montevideo, and Buenos Aires, by way of the West Indies. Twin-motored 24 passenger Commodore flying boats were used on this run. Direct flights were made to Nassau and Havana from Miami, and the shuttle formerly

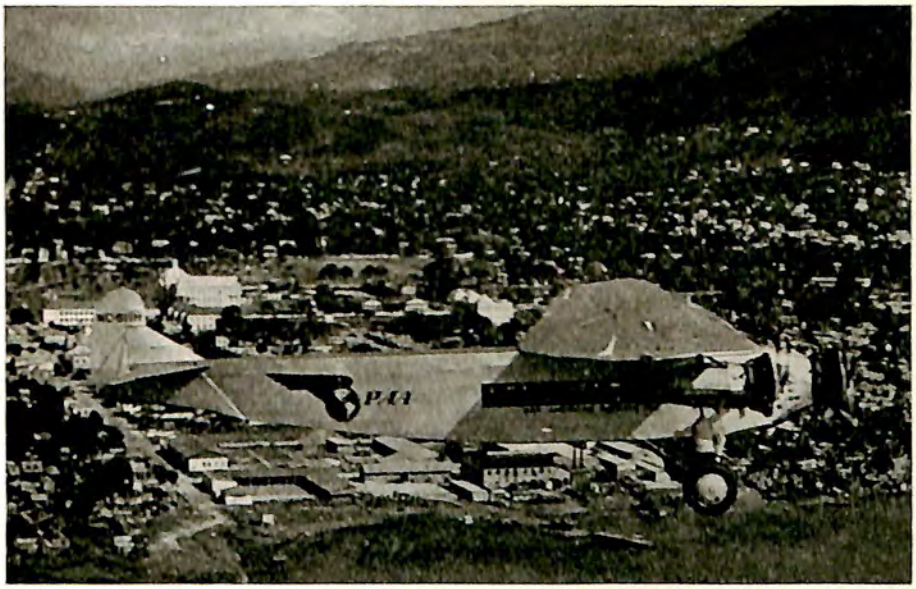
operated across the Caribbean to Cozumel was rerouted to Merida, Mexico, and on to Belize, British Honduras, Puerto Barrios, Guatemala and Salvador, where the eastern and western trunk lines met.

Flying boats making the run across the Caribbean to Colombia and Venezuela also were to be based at Miami. Arriving at Barranquilla, Colombia, these planes connected with shuttle services west to the Canal Zone, meeting the western trunk line, and east to Trinidad, where the air passenger could transfer to the eastern trunk line operated from Miami to Rio de Janeiro and Buenos Aires. These various changes removed the slightest possibility of having mail and passenger service delayed due to any local interference which might occur from time to time.

Throughout 1931, important extensions were inaugurated which led to the feasibility of the program of reorganization launched late in the year. The gap between Santos, Brazil, and Buenos Aires, Argentina, which stood as the only break in the system around the South American continent, was closed October 26 when the United States Post Office Department let contracts for the carriage of mail between these and intermediate points to and from the United States. Along the north coast of South America, mail and passenger services were facilitated when Pan American Airways secured a stock interest in the Sociedad Colombo-Alemana de Transportes Aereos, the Colombian national air line system generally known as "Scadta," and gained a membership on the board of directors. This facilitated development of a highly coordinated mail, passenger and express service to Bogota, capital of Colombia, and interior cities of that country on the air route. Early in May, the southern base of the longest over water hop in the world was shifted from the Canal Zone to Barranquilla, Colombia, cutting off more than 170 miles and offering better connections to the eastern and western trade routes.

During the spring of 1931, air express was inaugurated throughout the West Indies and the east coast of South America as far as Rio de Janeiro, Brazil. The service was launched on an experimental basis and three months later was approved and instituted throughout the remainder of the system. Drastic fare reductions were made in March, passenger rates being slashed from eight to forty-two per cent. over the entire system. This action was followed in December by an announcement of a ten per cent. reduction for round-trip tickets.

The most significant development of the company's equipment during the year came with the introduction of two giant 50 place Sikorsky S-40 (4 Pratt and Whitney Hornets) amphibions, the "American Clipper" and her sister-ship the "Caribbean Clipper." These mammoth planes were constructed as the first of a fleet of super-airliners which Pan American Airways contemplated building. In a measure, they were also introduced to offset European competitors who for six years had been working on the



HAITI PASSES THE WINDOW

Port au Prince, Haiti, passes beneath a Fokker (3 Pratt and Whitney Wasps) transport of Pan American Airways linking the West Indies.

NICARAGUA PROVIDES CONTRAST

Old and new meet at Managua where ox carts receive mail cargoes of Pan American Airways' planes arriving from the United States.

development of huge marine craft with a view to capturing important world trade routes by air. Unlike the development of the American equipment which was financed by private capital, the European flying boats were built with the aid of generous cash subsidies from the government. Mrs. Herbert Hoover acted as sponsor of the first ship, christening it "American Clipper." Col. Charles A. Lindbergh flew it on the inaugural two-day trip from Miami to Colombia and forecast even faster service with his record return flight of 12 hours in one day from Colombia to Florida.

American-Owned Line in Mexico

Next to the vast Pan American system in the number of miles scheduled to be flown weekly by the various lines in Latin America stood another American-owned line, the Corporación Aeronáutica de Transportes, S. A., in Mexico. C.A.T., as as the line was popularly known, operated three routes all within the borders of Mexico but making connections with the United States domestic system at points along the border. Using American-built planes, it operated daily service on a Mexican transcontinental route from Mazatlan on the Pacific coast to Matamoros-Brownsville on the Atlantic, 638 miles and a central route from Juárez-El Paso to Mexico City, 1,104 miles, carrying passengers and Mexican mail. In 1930, 4,000,531 kilometers were flown in Mexico with 20,920 passengers, 74,930 kilograms of mail, 72,930 kilograms of express, and 196,583 kilograms of baggage, according to official reports of the Mexican government. The line experienced a 100 per cent. increase in passenger traffic and 1,000 per cent. increase in freight volume during 1931.

Cuban Curtiss Line Expands

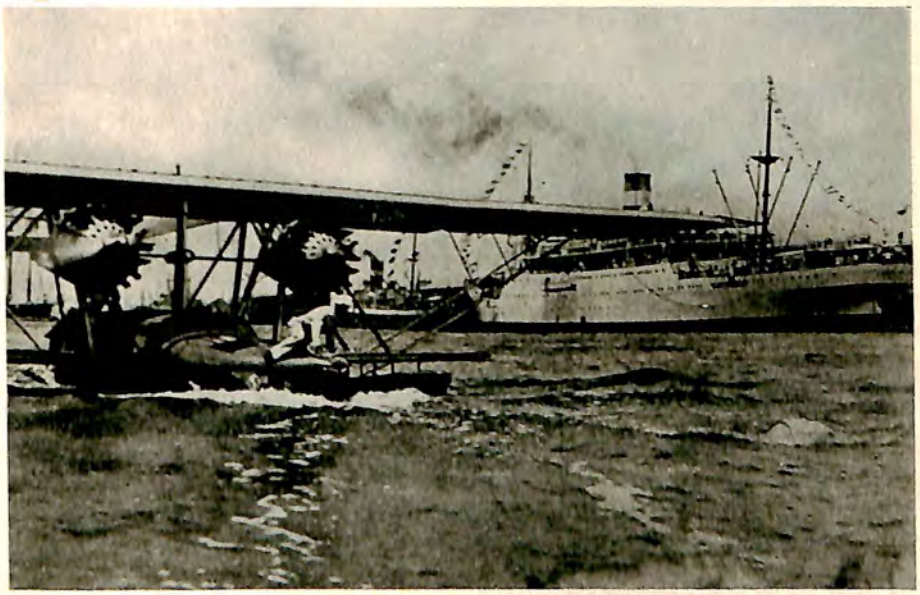
Compañia Nacional Cubana de Aviacion Curtiss, controlled by North American Aviation Corporation, extended its service April 1 from Santiago to Baracoa, using Sikorsky amphibions, with stops at Antilla and Cayo Mambi on a daily service. On July 1, a stop at Cienfuegos was added to the trunk route operated daily with tri-motored Fords from Havana to Santiago, by way of Santa Clara, Morón, Camaguey, Victoria de las Tunas and Holguĭn.

The company, operating under an exclusive contract with the Cuban government for transportation of domestic mail and air parcel post, operated 1,340 miles daily, adding passenger, express and freight service to its mail loads. In 1930, the Cuban Curtiss line flew 103,500 miles, carrying 1,214 passengers and 3,229 pounds of mail. Traffic increased rapidly so that the line carried 2,442 passengers and 63,995 pounds of mail over 215,360

miles in the first six months of 1931. New stations were under construction at Santa Clara Morón and Holguĭn.

American Line in Peru Loses Contracts

The American-owned and operated Faucett Aviation Company, one of the pioneers in Latin American air transport, continued operation of its local services to Peruvian cities despite the fact that the Peruvian government rescinded its mail contract, June 19, and instituted a mail service



MOORING IN PANAMA HARBOR

Sikorsky S-38 (2 Pratt and Whitney Hornets) amphibion of Pan American Airways about to moor at Panama alongside other ocean-going craft.

with military planes and pilots. The change was made to furnish military pilots with experience and at the same time derive some revenue for the government. Several crashes and delays of the mail caused Peruvian business men to protest the change and urge the restoration of the efficient system they formerly enjoyed.

The Faucett Company, using four Stinson Detroiter monoplanes flown by three American pilots, flew 221,894 miles in 1930 and 116,006 miles in the first six months of 1931, carrying 2,306 passengers, 3,113 pounds of mail and 1,726 pounds of express in 1930; and 1,232 passengers, 2,552 pounds of mail, and 2,866 pounds of express in the first six months of

1931. The line had no accidents in either year, operating 1,264 miles of routes between Arequipa and Talara in Peru.

Thirty-Minute Transcontinental Flights

Isthmian Airways, Inc., using Hamilton metal seaplanes, continued its unique 30-minute service three times a day between the Atlantic and Pacific and return over the 47-mile route from Cristobal to Balboa in the Canal Zone. The company reported an increased volume of business during 1931 as the popularity of the service, inaugurated in the spring of 1929, increased.

Another unique foreign air service operated by an American line was that which sped the mails from New Orleans to Pilottown in Louisiana. Because it carried mail bound for foreign countries or received mail for the United States from foreign countries it was classed by the Post Office Department as a foreign air mail route. The Seattle-Victoria shuttle service in the northwest was in a similar category.

Scadta Expands in Colombia

The Scadta line of Colombia, in which Pan American Airways obtained a stock interest in 1931, operated the Magdalena River Line from Barranquilla to Bogota, 630 miles; the Transandien Line from Bogota to Ibagué, 125 miles; the Interocean Line from Barranquilla to Buenaventura and Tumaco, 840 miles; and lines from Barranquilla to Ciénaga, 40 miles; and to Cartagena, 75 miles. Service to Guayaquil, Ecuador, was suspended, the last flight being made northward December 28, 1930.

In May, Scadta obtained approval of a contract from the Venezuelan National Congress for passenger, mail and express routes from Barranquilla to Maracaibo; from El Banco to Encontrados and Maracaibo; from Cucutá to Maracaibo; and from Maracaibo to Curacao, but service was not established over the new lines in 1931. Scadta also had mail contracts with Colombia, Panama, Ecuador and most European countries. In February, the company was commissioned by Presidential decree with the administration of Colombian air mail.

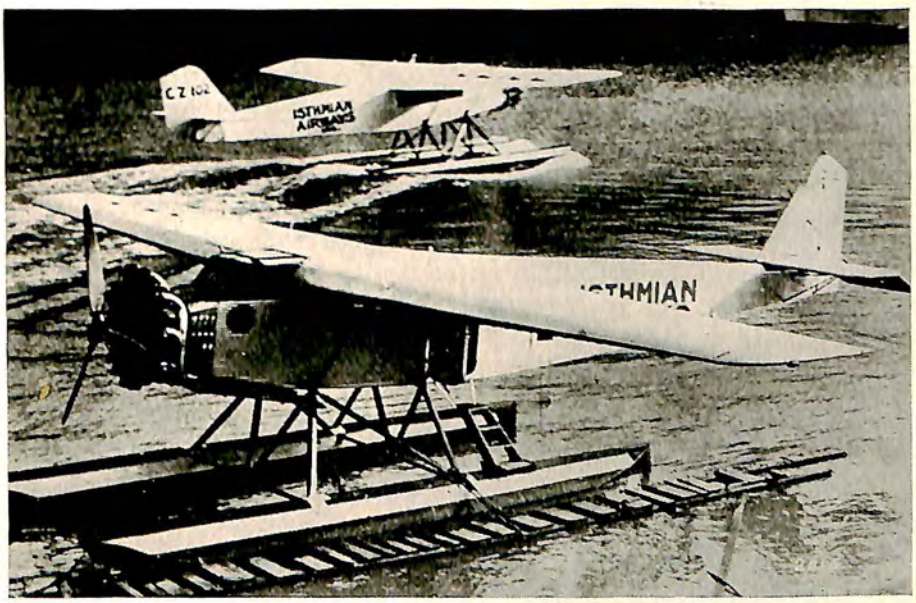
Twenty-one seaplanes, land planes and amphibians were used on the routes over which 743,702 miles were flown in 1930 with 5,083 passengers, 90,607 pounds of mail and 144,236 pounds of express. In the first six months of 1931, 332,050 miles were flown with 3,109 passengers, 41,915 pounds of mail and 67,990 pounds of express. Through the operating agreement with Pan American Airways, Scadta provided two-day service from Colombia to the United States for its passengers.

French Lines Experience Difficulties

The Compagnie Générale Aéropostale, one of the earliest air transport pioneers in South America under the name of Latécoère Air Lines, ex-

BOLIVIAN LINE USES SEAPLANES

Amid a picturesque setting, a Junker seaplane of Lloyd Aereo Boliviano makes a landing at Riberalto after flying from Todos Santos.



IN TRANS-ISTHMIAN SERVICE

Hornet-powered Hamilton metal planes of Isthmian Airways, Inc., an American enterprise, seen at Balboa in service across Canal Zone.

perienced serious financial difficulties in 1931 when the French Chamber of Deputies, which had supported the operation for years, refused to grant the annual $3,000,000 cash subsidy to the line. Impressed, however, with the importance of this company as a link between France and South America as an aid to French trade, the Chamber later altered its view to permit the French government to take an interest in the company.

On January 9, 1931, Aéropostale inaugurated weekly passenger and mail service between Venezuela and Trinidad, but this line was suspended in May when the company ran into financial difficulties. Air mail and passenger service between Arica, Chile, and La Paz, Bolivia, started in September, 1930, was discontinued in April, 1931.

The route from Santiago, Chile, to Buenos Aires, Argentina, was continued in operation, along with the main route up the east coast of South America through Montevideo, Uruguay, and Rio de Janeiro to Natal, Brazil, where connections were made with fast French warships to bear the mail to Africa and on to Paris by air. The weekly services between Maracay, Coro and Maracaibo, Maracay and Ciudad Bolivar, and Bolivar, Guasipati and Tumeremo—all in Venezuela—were continued during 1931.

Paraguay was without air service of any kind as a result of Aéropostale discontinuing its route from Asuncion to Buenos Aires April 17, 1931. The company announced its plans to serve Lima, Peru, and advertised through mail service from Europe by way of Dakar, Africa, and Natal, Brazil, early in 1931, but after a short period of operation, the service was discontinued.

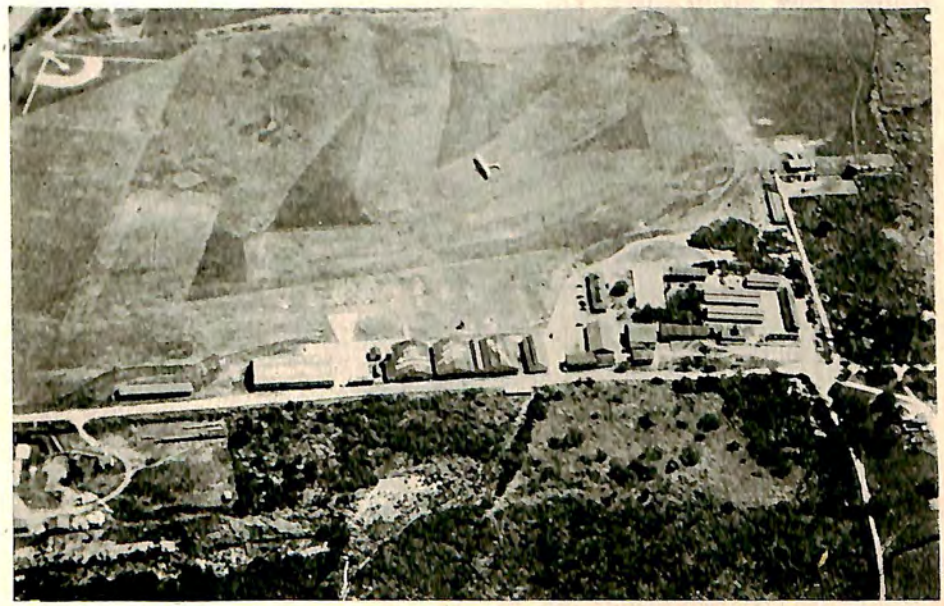
A subsidiary of Aéropostale, Aeroposta Argentina, S. A., discontinued its services from Buenos Aires through many Argentine cities to Rio Gallegos, 1,650 miles, in Patagonia. The Argentine government, however, indicated that it valued the importance of this service sufficiently to organize a line under the direct supervision of the Argentine civil air ministry and reopened the line to Patagonia October 2, 1931, on a bi-weekly schedule. Service to this "far corner of the Western Hemisphere" was thus preserved, making possible a complete chain of international air lines from Alaska to the southernmost part of Argentina. Pilots of the Aeroposta Company were employed and planes and airports of the company used.

Germans Back Condor Syndicate

German capital and governmental support continued to back operations of the Condor Syndicate, Ltd., a company closely affiliated with the Deutsche Luft Hansa, on the east coast of South America and in Brazil. The syndicate operated 2,301 miles of air routes in its own name between Rio de Janeiro and Rio Grande do Sul and from Rio de Janeiro to Natal, with many intermediate stops at Brazilian points. A closely affiliated line, the Empreza de Viacao Aerea Rio Grandense, S. A., carried passengers,

PAN AMERICAN AT MONTEVIDEO

Keystone-Loening (Wright Cyclone) amphibian of Pan American Airways at Montevideo, Uruguay, showing new custom house in background.



HAITIAN AIRPORT FOR LEATHERNECKS

United States Marine Corps airport at Port au Prince, Haiti, also used for a base by Pan American Airways System.

mail and express from Rio Grande do Sul to Porto Alegre and from Porto Alegre to Santa Maria over 320 miles of routes.

Mail was flown to Natal, where fast steamers carried it across the Atlantic to the Canary Islands to connect with planes of the German Luft Hansa for the trip northward to Berlin and other European points. It was planned to use planes for the Atlantic hop as soon as practicable. The "Graf Zeppelin" on its six trips during 1931 to South America made use of these connecting air lines to speed mail it had carried across the Atlantic to its destination.

New Brazilian Military Line

The Military Aviation Corps of Brazil, under the direction of the Ministry of Communication and Public Works, inaugurated a commercial air line June 24, 1931, between Rio de Janeiro and São Paulo on a thrice weekly basis. The Ministry planned the extension of this 225-mile line to other sections of the country, using military planes and pilots.

Seven air lines operating in Brazil, including Pan American, the Condor lines, and the Aéropostale lines, operated over 13,218 miles of routes with 47 planes and 22 pilots during the first three months of 1931, making 509 flights over 440,033 kilometers with 903 passengers, 10,504,091 kilograms of mail, 5,582 kilograms of baggage, and 4,185 kilograms of freight. In 1930, five routes stretching 13,643 miles and using 62 planes and 39 pilots made 1,767 flights over 1,617,977 kilometers with 4,667 passengers, 31,956,271 kilograms of mail, 23,864 kilograms of baggage and 9,508 kilograms of freight.

Chilean National Line Contracts

The Chilean National Air Line, aided by the Chilean government in the purchase of equipment and holders of a monopoly on mail contracts in Chile, discontinued its service south of Santiago August 1, and reduced its service between Santiago and Arica, Chile, and intermediate points to two round trips a week with single-engined planes. Tri-motors formerly used were withdrawn.

In 1930, the Chilean National Air Line made 2,583 flights lasting 6,156 hours and covering 621,785 kilometers with 5,106 passengers, 3,386 kilograms of mail and 80,328 kilograms of baggage.

Bolivian Line Continues Operations

Lloyd Aereo Boliviano, operating air lines wholly within Bolivia, discontinued service from Santa Cruz to Yacuiba during 1931, but continued the operation of six other lines: Cochabamba to Santa Cruz, 274 miles; Santa Cruz to Puerto Suarez, 469 miles; Sucre to Cochabamba, 150 miles;

WHERE AIR TRAVEL COUNTS

Flores, Peten, Guatemala, now only two hours by plane from Guatemala City, formerly requiring 15 days of travel, mostly on muleback.

MAIL FOR GUATEMALAN INTERIOR

Mail stacked in front of Kreutzer (3 Kinners) transport of Guatemalan Aviation Company to be flown into interior of country.

Cochabamba to Todos Santos, 135 miles; Riberalta to Todos Santos, 625 miles; and Cochabamba to La Paz, 236 miles.

From August 1, 1925, when the company began operations, until September 30, 1931, the Bolivian line flew 881,446 kilometers carrying 15,651 passengers, 20,535 kilograms of mail, and 1,386,221 kilograms of express. In 1931, 13,640 kilometers were being flown monthly. The company owned two Junkers W-34 (Pratt and Whitney Hornet), four Junkers F-13 (B.M.V.), one Junkers A-50 (Genet) and one Aerosport (Junkers). It was aided by a subsidy from the Bolivian government.

Peruvian and Honduran Lines

The Peruvian Naval Air Line continued operation of its lines between San Ramon and Iquitos, 800 miles, and Moyobamba and Iquitos, 360 miles, into the interior of Peru; and took over the added responsibility of carrying the Peruvian domestic mails formerly carried by the Faucett Aviation Company. The mail line served Talara, Paita, Piura, Chiclayo, Pacasmayo, Trujillo, Chimbote, Lima, Arequipa and Tacna twice weekly. Military planes and pilots were used.

The Compañia Aereo Hondureño, a line operated for the public by the United Fruit Company in Honduras, discontinued all public service in 1931. Part of the company's equipment was sold to Gordon and Scholes, a transportation company in Tegucigalpa, which planned to replace it in public service.

Two Hours Instead of 13 Days

The Compañia Nacional de Aviación of Guatemala operated a domestic mail, passenger and express service into the interior of Guatemala. In the year ending June 30, 1931, the line flew 157,315 miles with 2,989 passengers, 59,742 pounds of mail and 17,707 pounds of express.

An example of the time saved through use of the service was seen in the two-hour flight from Guatemala City to Flores, the island capital of the Department of Peten, which formerly required a day's railroad journey to Puerto Barrios, a day's ocean travel to Belize, British Honduras, and about 11 days on mule-back over a tortuous trail to Flores. The company's equipment consisted of a Fleet (Kinner) biplane; Kreutzer (3 Kinners) monoplane; Ogden Osprey (3 Menascos); and one Hodkinson (3 Curtiss Challengers). Two pilots flew the line.

No attempt has been made here to give detailed information on the time-saving value of the various lines radiating from the United States to 32 countries and colonies of Latin America. It should be sufficient to say that New York business houses may send their mail or their executives to Buenos Aires in eight days, a journey requiring 18 days by the fastest steamships, and to Santiago, Chile, in seven days, a 16-day steamship

journey. Buenos Aires is farther from New York than Moscow, yet little farther away in point of travel time than Los Angeles was by rail. European nations realized the importance of this time advantage in reaching Latin American trade centers, and now London's mail is in Buenos Aires by air and fast steamship in nine days. It placed an added burden on the ingenuity of the American enterprise to preserve a time advantage for American business.

Aircraft Exports and Production

Just as Latin America proved an important market for all American goods, so it was a rich field for American aircraft and engines. A major part of the planes and engines in the Western Hemisphere outside the United States was of American manufacture, even in Canada where British competition was great.

In only three countries of the Western Hemisphere outside the United States were airplanes or engines produced: Canada, Chile and Mexico. In Canada, branch factories of American and British firms predominated. In Chile, the Curtiss-Wright Corporation operated a factory for airplanes under concession of the Chilean government, manufacturing eleven planes during the first six months valued at $330,000. Manufacturing was concentrated on Curtiss Hawks and Falcons for the Chilean government. In Mexico, the Azcarrate Aircraft Company continued the manufacture of a training plane by that name. Curtiss-Wright obtained a contract during 1931 with the Argentine government for the manufacture of the Whirlwind and Cyclone series of engines in a factory at Cordoba, Argentina. Engines of French design were previously manufactured in Argentina.

Private Flying and Commercial Schools

The year saw some increase in private flying and student instruction outside the United States and Canada in the Western Hemisphere. In Bolivia, Lloyd Aereo Boliviano operated an aviation school with a four-year course and had 18 students under instruction during 1931. Chile had ten privately owned airplanes and 20 licensed private pilots; the Chilean National Air Line stimulated interest in flying through frequent sightseeing trips at Santiago; and the Aero Club of Chile instructed civilian members of its club, graduating ten students during the year and having as many under instruction. Cuba entertained many private fliers from the United States; and the Curtiss Flying School at General Machedo Airport at Havana offered complete courses to students.

In Santo Domingo, the one privately owned plane in the country was pressed into service during 1931 on a tri-weekly schedule between Santo Domingo and Santiago, 80 miles, carrying 275 passengers in four months

on the 40-minute trip. In Haiti, a United States Marine Corps officer had the only privately owned plane in the country. In Mexico, there were 40 privately owned planes and an aviation school at Mexico City as well as four other schools in the country. In Trinidad, a privately owned plane was bought during the year. Peru entertained the Shippee-Johnson Expedition, a privately financed American group, flying two Bellanca planes on photographic and exploration missions. There was a privately owned Heath Parasol in Peru, and in El Salvador the aviation club owned a plane.

Uruguay had seven privately owned planes. A club, known as the Centro Nacional de Aviación and operating under government subsidy, maintained an airport at Melilla, a suburb of Montevideo, and trained seven pilots in 1930 and five in the first six months of 1931 on one plane. None of the other countries of Latin America were known to have privately owned planes or commercial schools.

Military Aviation Advances

Military air forces, corps or departments were maintained in Argentina, Brazil, Bolivia, Canada, Chile, Colombia, Cuba, Ecuador, Guatemala, Panama, Paraguay, Peru, Uruguay, and El Salvador, during 1931.

The Chilean air force, equipped with 100 planes including training ships and manned by 150 pilots and 50 ground officers, was consolidated during the year under one department headed by the Sub-Secretary for Aviation. The military and naval services objected to the air force consolidation when it was effected, but subsequent events, including the mutiny of the Chilean Navy which was broken by a bombing attack made by the aviation force, greatly improved the position of the aviation service as a separate force. The attack of the aviation forces on the mutinous Chilean naval vessels, September 6, was one of the first actions since the World War in which aviation was used against armed naval vessels. The attack was made with 12 planes using 25 to 600 pound bombs. No direct hits were made as the aviation force was instructed to prevent damage to the ships, if possible, during the first attack. A second skirmish was unnecessary when the mutinous forces capitulated as a result of the preliminary bombing. American-designed planes were used by the air force, being manufactured in Chile in 1931 under concession granted the Curtiss-Wright Corporation. A military school at El Bosque airdrome was maintained, graduating 20 students during the year.

Three Curtiss Hawk pursuit planes with Pratt and Whitney Wasp engines were added to the Cuban Army Air Service early in 1931, supplementing 19 other American planes in the Cuban force. The Colombian Air Force, small but efficient, had a Curtiss-Wright Falcon, Fledgling and Air Yacht among its equipment. Military aviation in the Dominican

AIRPORT IN COLOMBIA

Buenaventura, Colombia, base of the Sociedad Colombo Alemena de Transportes Aereos in which Pan American Airways holds a stock interest.

FLYING TO MEXICO CITY

Lockheed Vega (Pratt and Whitney Wasp) monoplane of the Corporación Aeronáutica de Transportes, an American line in Mexico.

Republic was completely wiped out with the cyclone of 1930 and was not restored in 1931.

The Ecuadorian Aviation Corps had seven officers and 25 enlisted men, but only one serviceable observation plane, a Travel-Air. Ecuador was negotiating with an American concern for new equipment at the close of the year. Eight planes were in the Guatemalan Air Corps and two new Waco biplanes were on order. The Republic of Panama purchased a Keystone Commuter and two Travel-Air Speedwing Sportsman planes from the Curtiss-Wright Export Corporation during 1931 to be used for transport of mail, freight, government officials and emergency ambulance work.

Argentina and Brazil both maintained aviation units in their armies. Paraguay had 33 planes used for military purposes, eight of which were for training. El Salvador had three Waco biplanes in its air corps. Uruguay had 30 planes in its military aviation service, none of which were of recent models, used chiefly to train pilots. The United States Marine Corps in Haiti, under the treaty of 1915, maintained six or more planes in that country and provided a field at Port au Prince which was used by Pan American Airways as well as for the Marines' base. The Haitian treaty was to expire in 1936.

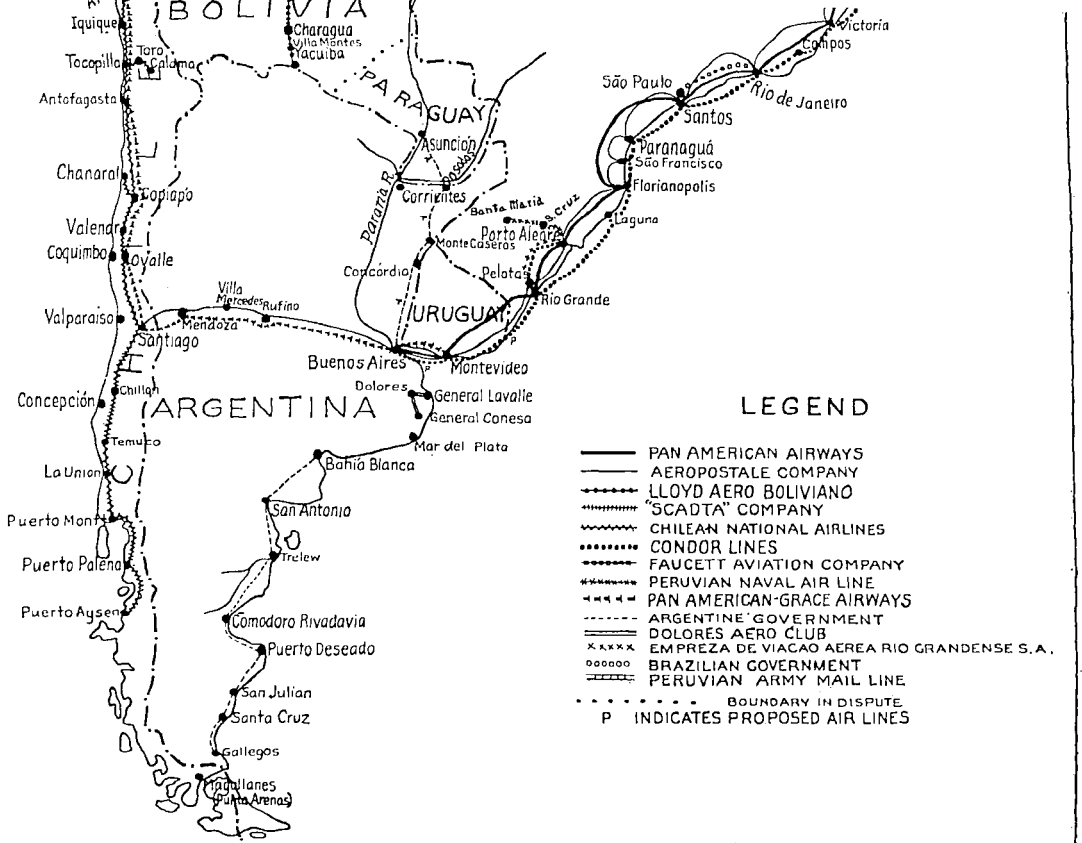
Planes on Errands of Mercy

Aviation's far-flung system of air lines in the Western Hemisphere carried out many errands of mercy during the year, from carrying serum and supplies into remote corners of Alaska to aiding the victims of disaster in Central America and the Carribean.

In March, Managua, Nicaragua, was stricken with a devastating earthquake. When news of the disaster was received in the New York offices of Pan American Airways, a radio was sent to one of its planes bound for San Salvador, instructing the pilots to drop his passengers and proceed to Nicaragua to turn over communication facilities to the government. Two hours later the plane landed on Lake Managua and the radio started broadcasts for aid. In the meantime, relief forces were being organized by the company in Miami, Cristobal and Mexico City. The next morning found seven company planes Managua-bound with doctors, nurses, medical supplies, food and water. The part played by the squadrons from the Navy aircraft carrier in the Carribean is described in the chapter, "Wings for the Fleet."

Seven months later a Pan American Airways radio again tapped out news of an impending disaster. This time it was from Belize, British Honduras. For the first time in the memory of the inhabitants, the city was struck by a hurricane and destroyed. Shortly before the big wind struck the city, the radio operator at the Pan American station was alarmed by barometric readings he was taking. He issued a warning to the popu-


AIRWAYS IN
SOUTH AMERICA
SCALE
0 200 400 MILES
TO MIAMI
Barranquilla
Curaçao
La Guaira
Port of Spain
Cienega
Coro
Maracaibo
Caracas
Maturin
Maracay
Cartagena
Calamar
Cristobal
Lorica
Magangue
El Banco
Gamarra
Nicodi
Sautata
Panama
La Palma
Barranca
Bermeja
Puerta Wilches
Quibdo
Puerto Berrio
La Dorada
Honda
Girardot
Ismina
Buenaventura
Cali
Ibague
Bogota
Neiva
Tumaco
COLOMBIA
VENEZUELA
Orinoco R.
Ciudad Bolivar
Guasipati
Tumeremo
Georgetown
Paramaribo
Surinam
(NETH.)
BR.
FR.
GUIANA
Cayenne
Bahia de
Caraquez
Quito
Manta
St Elena
ECUADOR
Guayaquil
Pto Pizarro
Talara
Paita
Bura
Yurimaguas
Pimentel
Moyobamba
Chiclayo
Pacasmayo
Trujillo
Chimbote
Iquitos
Contamana
Masisea
Puerto Leguia
Puerto Bermúdez
San Ramon
PERU
Lima
Cañete
Pisco
Arequipa
Camana
Mollendo
Tacna
La Paz
Todos Santos
Trinidad
Cochabamba
Santa Cruz
San Jose
Vallegrande
Robore
Oruro
Sucre
Puerto Suarez
Manaos
Amazon River
Belem
(Para)
São Luis
(Maranhão)
Fortaleza
(Ceara)
TO FERNANDO DE
NORONHA ISLAND,
DAKAR AND EUROPE
Natal
Parahyba
Recife
Pernambuco
Maceio
River
Aracajú
Bahia
(São Salvador)
Ilheos
Belmonte
Caravellas
São Matheus
BRAZIL



U.S BUREAU OF FOREIGN AND DOMESTIC COMMERCE

lace and was busy transmitting information to his base station at Miami when the wind carried away his apparatus.

All night long the operator and the station's crew worked in rigging up emergency equipment. The first news of the havoc wrought reached a waiting world the next morning by radio. Again, a Pan American Airways plane was the first to reach the scene and, although unable to land, dropped food and medical supplies.

In July, a Pan American Airways pilot on his regular run from Tampico, Mexico, to Brownsville, Tex., discovered the American good-will fliers, Seth Yerrington and Edward Maloney, forced down on an isolated Mexican beach on a non-stop attempt to reach Mexico City. C. K. Travis and his family were picked up by a Pan American Airways plane after being forced down in an isolated section of Mexico.

The most spectacular rescue event of the year found Pilot Frank Ormsbee of Pan American Airways flying a giant 22-passenger "Commodore" flying boat from Cristobal to Barranquilla across the Caribbean when he sighted ten men in a lifeboat and one on a raft about 40 miles at sea. Radio messages were sent from the plane to shore, calling for aid and giving the position of the helpless shipwrecked band. On the second day, after bad weather held up an immediate rescue by steamships, the United States Navy minesweeper "Swan" picked up the survivors. The old rotor ship "Baden Baden" had sunk.

Radio in each case played a spectacular part. But it was merely an outstanding example of the excellent communication necessary to weld together all parts of the great system. During 1931, Pan American Airways maintained an average efficiency of more than 99 per cent. a record which the 53 radio stations of the company aided in making. With the completion of the extensive plans for marine operations and development of other American-controlled lines in the Western Hemisphere, America seemed assured of a firmly entrenched place in the international sky.

RAKING FIRE ON BOMBERS

Wasp-powered Boeing pursuits diving on Curtiss Condor (2 Conquerors) bombers, snapped by Warren Colby of the Boston Transcript during critical moment in Army Air Corps maneuvers over Boston.

CHAPTER V

ARMY AIR CORPS FLIES ON

First Air Division In Maneuvers—Speeds of Tactical Planes Increased—
Five-Year Program Still Incomplete—General Foulois Becomes Chief—
"West Point of the Air" Opened

ARMY aviation reached new high watermarks in tactical and technical perfection during 1931, but lacked the fulfillment of its procurement plan under the five-year program authorized by Congress in 1926. The Army Air Corps maneuvers in May, involving 4,000,000 miles of flying by the world's first air division, and the progress made in developing new types of tactical planes with greater speed and efficiency attested to Army Air Corps' advances during the year. Failure of Congress to appropriate the necessary funds caused the Army Air Corps to fall behind its five-year program schedule for new aircraft and additional personnel.

From a technical standpoint, the year's greatest progress was made quietly in the research and engineering sections of the Materiel Division at Wright Field with the aid of prominent aircraft manufacturers who built new pursuit, attack, bombardment and observation planes for test. As a result of tests made in 1931, it was indicated that pursuit planes with tactical squadrons would soon have speeds in excess of 225 miles an hour; attack and observation planes, speeds of 200 miles an hour; while bombardment, the slowest member of the military air family, would push forward to speeds of more than 180 miles an hour.

Initial procurements were made of pursuit types having a high speed of 214 miles an hour, as compared with 175 miles an hour for standard types in service. New observation planes were developed with speeds as high as 182 miles an hour, an increase of about 40 miles an hour over types generally in service. The most marked improvement was made in the performance of bombardment and attack types. A new bombardment plane passed its experimental tests with a high speed of 188 miles an hour. This represented an increase of 60 miles an hour over types in service and marked an advance greater than that made during the entire period from the close of the World War to 1932. A new attack airplane, which passed

its experimental tests and was being procured in sufficient numbers to equip one attack squadron attained a high speed of 196 miles an hour, an increase of 55 miles an hour over types operated by the attack group.

In obtaining these improved performances, none of the other essential characteristics required of military planes by the United States was sacrificed. In aircraft engine development, the attainment of more horsepower per pound of engine weight, by means of higher operating speeds and compression ratios, supercharging, improved fuels, and fuel metering, was achieved. These engineering advances in aircraft and engine design are discussed more fully in Part II of this volume, where an extensive section of three-view drawings of new military aircraft types will be found.

The most spectacular demonstration of the Army Air Corps' efficiency was staged in May when the First Provisional Air Division was organized near Dayton, O., under the command of Major General Benjamin D. Foulois, who on January 1, 1932 succeeded Major General James E. Fechet as Chief of Air Corps. The division, composed of one pursuit wing, one bombardment wing, two observation wings, one attack group, and a transport group, was the first to be organized in the history of world aviation. The personnel and equipment consisted of 692 officers, 69 flying cadets, 643 enlisted men, 14 civilian mechanics, and 663 airplanes. All Regular Army and National Guard Air Corps units, except one observation squadron, were assembled in the division, which added eight squadrons of officers and cadets from the Advanced Flying School at Kelly Field, Texas. It was the greatest concentration of military planes flying in formation as a unit in the history of world aviation, although eclipsed in size later in the year by the maneuvers of 894 planes in Italy's Air Force sham battles.

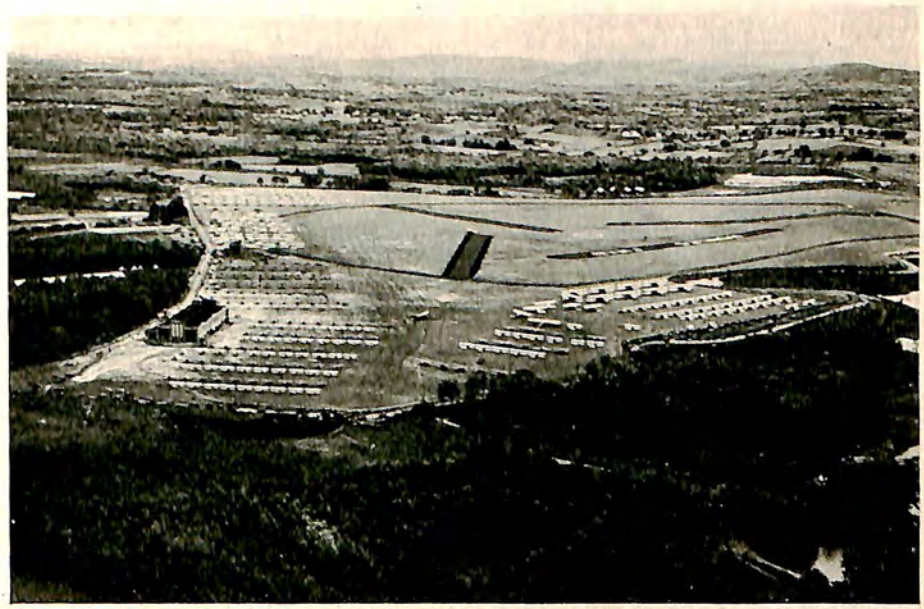
Wing and division practice formations were staged in Ohio from May 15 to May 19, when the division moved on in formation for a demonstration and review along Chicago's lakefront, then proceeded to New York, Hartford, Springfield, Boston, Atlantic City, Trenton, Jersey City, Philadelphia and Washington. President Hoover watched the final review and demonstration on Memorial Day from the lawn of the White House. During the mobilization, demobilization and operation of the First Air Division, every state in the union was flown over, and 4,000,000 miles were flown—more than American fliers in the World War flew during the entire conflict; yet without a single person killed or seriously injured.

Wide newspaper publicity given the spectacular reviews and demonstrations of the First Air Division resulted in an erroneous conclusion by the general public that America's Army air defenses were equal, or even superior, in strength to those of other leading powers. This was clarified in the annual report of the Assistant Secretary of War for Aeronautics, F. Trubee Davison, who pointed out that the conclusion was wrong.

"In the first place, only 449 of the 663 planes which took part were

PREPARING TO "BOMB" NEW YORK

Twenty Keystone (2 Pratt and Whitney Wasps) bombers of the Army Air Corps flying down Hudson River during maneuvers.



TESTING AIRPORT FACILITIES

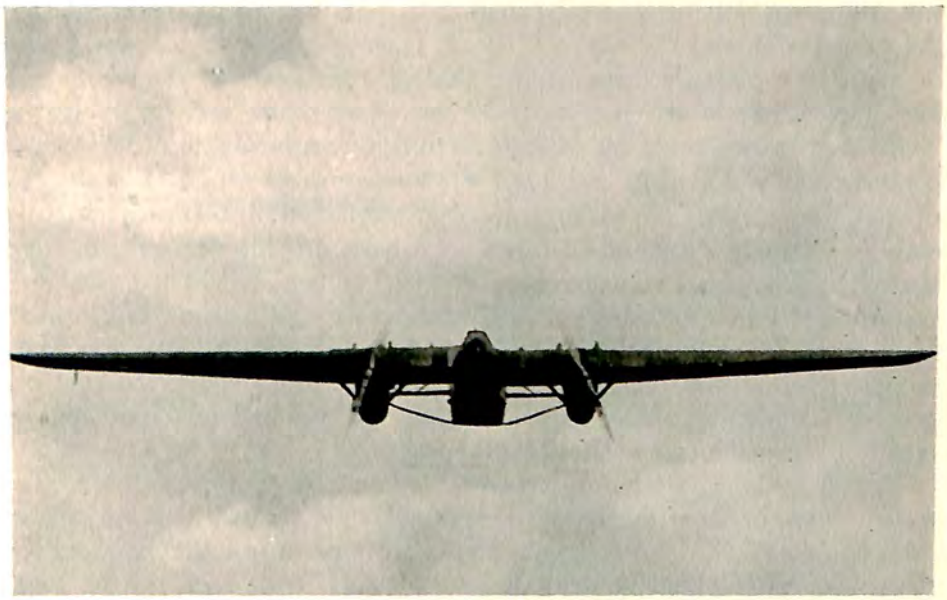
Bowles-Agawam Airport at Springfield, Mass., showing largest concentration of Army planes on a single field during maneuvers.

fighting types that could be used against an enemy," Mr. Davison wrote. "Of these first-line planes there were 133 pursuit, 39 bombardment, 51 attack, and 238 observation craft, including 97 planes from National Guard observation units. The 449 tactical planes represented the maximum combat strength of Army Aviation in the continental limits of the United States. The remaining 214 planes were training types and transports which, while essential to military aviation, have no value in actual combat operations.

"There exists a vast amount of confusion regarding air strengths here and abroad because such figures as are published by the various countries are computed on a basis different from that used in the United States. Without attempting to draw any conclusions, let me state that the United States stands fourth in actual tactical strength; that is, the number of airplanes which could be used in operations against an enemy at the beginning of hostilities. This includes both the Army Air Corps and the Naval Air Service. As a matter of fact, in an emergency the Naval Air Service would be with the fleet and so should not be counted with land forces. With the naval airplanes out of the picture and considering our land air forces alone in comparison with those of other powers, the United States stands fifth."

While the May maneuvers did not involve any tactical problems, valuable information was obtained about the handling of large units, both on the ground and in the air, about the supply and logistics of a large mobile air force, and about the staff requirements of an air division. The maneuvers also illustrated the value of commercial airports to military aviation in case of an emergency, and tested the efficiency of both military and commercial airports when called upon to facilitate the rapid movement and proper servicing of large numbers of military aircraft under simulated emergency conditions. Owing to the manner in which Army Air Corps stations were scattered throughout the country and the inability of any one airdrome to provide space and care for the mass of planes which would be concentrated in case of war, it was evident that non-military airports would be called upon to play important roles in the nation's air defenses in case of an emergency.

The opening of 1932 found the Army Air Corps still struggling to obtain its full strength in planes and personnel under terms of the five-year program adopted in 1926. In personnel, there was a shortage of 190 regular Army officers in the Air Corps and 187 reserve officers on extended active duty. The program was substantially met in the number of enlisted men since such personnel was always subject to minor variations. In planes, there was a shortage of 183 aircraft at the close of the fourth increment in the five-year program. The end of the 1931 fiscal year found the Army with 1,476 serviceable airplanes. The end of the fourth increment called for 1,659 planes. Because of the quality of the serviceable planes on hand,



TUCKING UP ITS WHEELS

General Aviation's YO-27 (2 Curtiss Conquerors) observation plane for the Army Air Corps in flight with landing gear retracted.

NEW ANTI-DRAG RING

Curtiss anti-drag ring installed on a Curtiss Hawk (Wright Cyclone) for the Army Corps to increase the plane's speed.

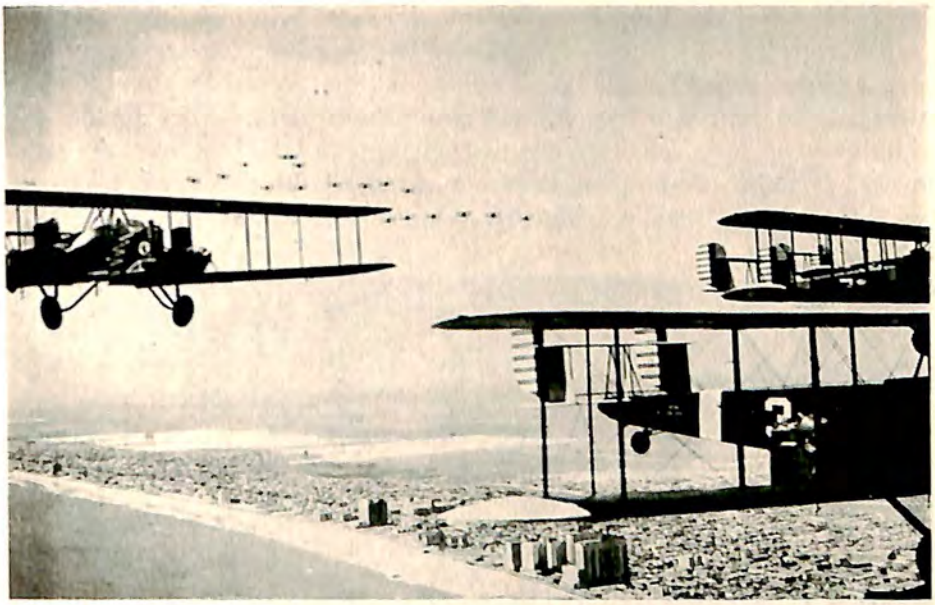
the Air Corps was better equipped than at any time in its history despite the program shortage.

Because experience demonstrated that 12.5 per cent. of the total number of planes were at repair bases for major overhaul, and might just as well be in museums so far as their tactical value during that period was concerned, it was evident that 2,058 airplanes must be on hand at the end of the five-year program in 1932, if 1,800 serviceable airplanes were to be maintained in readiness at all times. To keep up this strength, past experience showed that annual replacements of 25 per cent. or 515 airplanes would be required. Since the Air Corps Act of 1926 limited the number of replacements annually to 400, the Assistant Secretary of War for Aeronautics recommended that legislation be prepared and submitted to Congress to remove this limitation and permit the required increased annual replacement at the end of the five-year program.

It was evident from military and commercial production and sales statistics for 1931 that the aircraft industry was not yet in a position to produce equipment of the type required and in sufficient numbers to meet the demands which would be made in case of war. It was necessary, therefore, that the legislation recommended by the War Department be enacted by the Seventy-Second Congress in session in 1932, if the industry was to be insured sufficient support to permit it to hold its engineering and production organizations intact. The recommended legislation would insure a continuing program necessary to inspire constant technical advances. It was doubly important that Congress provide sufficient funds to enable the fulfillment of the five-year program, which was lagging, as well as to back up the recommended replacement legislation.

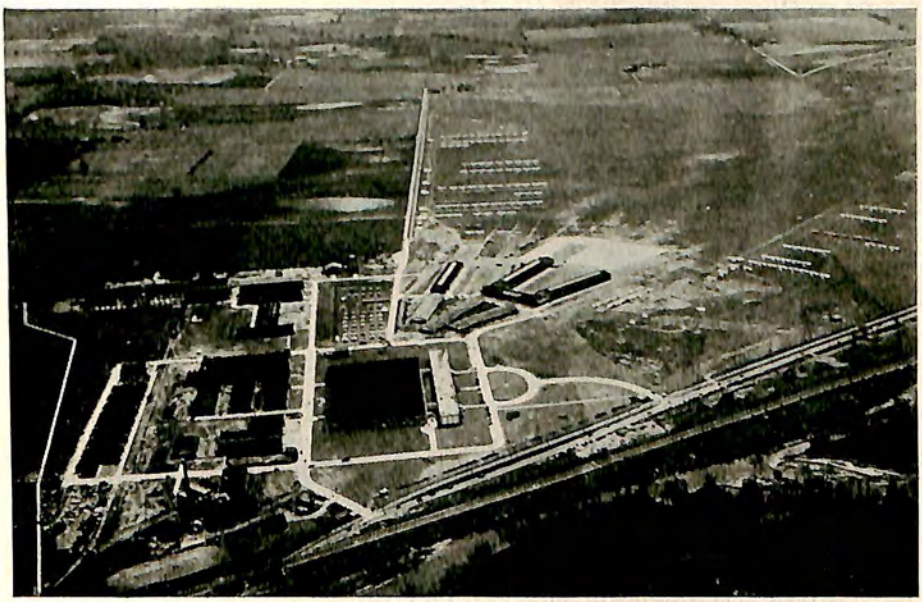
During 1931, the Air Corps expended $11,999,000 toward the completion of its housing program. Finished construction, and the amounts expended, were divided as follows: hangars, shops and warehouses, $2,389,000; administration, photos, radio and operations, $75,000; airdrome improvement including night lighting, paved aprons and gas tanks, $1,757,000; officers' and non-commissioned officers' quarters and mess, $3,034,000; enlisted men's barracks, $4,088,000; service and recreational units, $105,000; quartermaster activities, $110,000; and miscellaneous items such as hospitals, sanitation, fire and police, $441,000.

The most outstanding building project of the year was the completion of the "West Point of the Air," Randolph Field, which received its first training class November 1, after several years of construction at a cost of $10,000,000. Randolph Field, near San Antonio, Tex., was not only the largest airdrome in the world, covering more than 2,000 acres of landing area surrounding a self-sustaining city with a population of more than 3,500, but also the first "air city" ever built. It was constructed with an eye to beauty as well as utility.



"BATTLE OF ATLANTIC CITY"

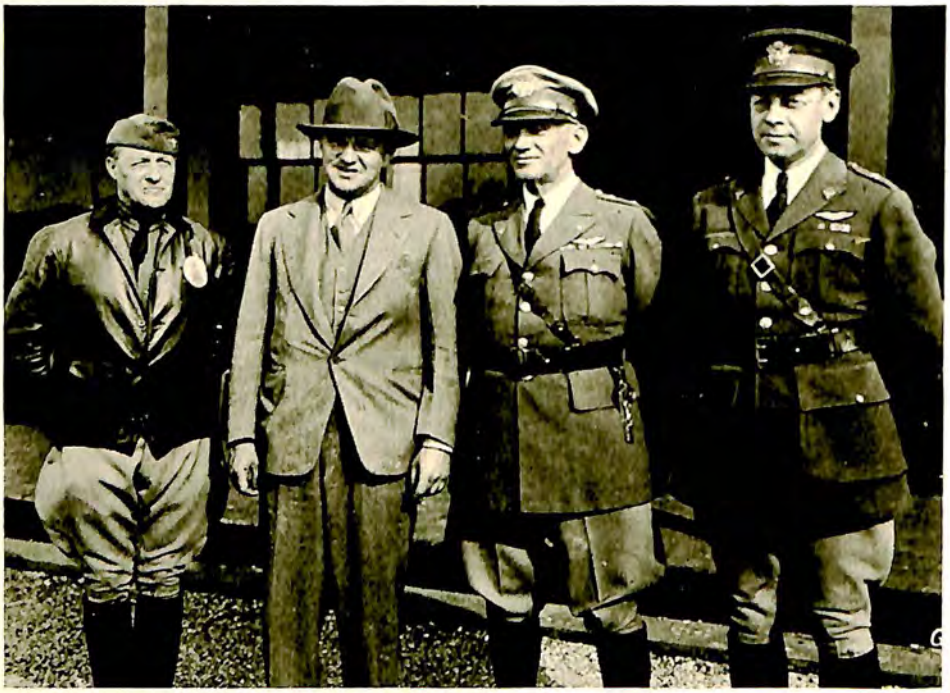
Curtiss Condor (2 Conquerors) bombers being attacked by Wasp-powered Boeing pursuits during Army maneuvers over resort city.



CONCENTRATE AT WRIGHT FIELD

Squadrons parked row on row near Army Air Corps research plant at Wright Field during 1931 maneuvers' concentration near Dayton.

Aside from the hangars and shops, the 400 buildings in the "city," which were placed in the center of the huge airdrome, were in mission style and dominated by an administration building, topped by a magnificent tower. The spire was the only tall object built on Randolph Field. All light and telephone cables were buried underground. There were no radio masts, as radio communication was maintained through remote control with the wireless station at Fort Sam Houston, 20 miles away. The field



WATCHING ARMY AIR MANEUVERS

Maj. Gen. B. D. Foulois, new chief of Air Corps, Secretary Davison, Maj. Gen. James E. Fechet, retiring chief, and Brig. Gen. H. C. Pratt at Dayton.

was equipped with the latest in landing, hangar and shop facilities, capable of giving instruction to 500 cadets.

Other major construction projects started during the year covered the expansion of March Field at Riverside, Cal., which was to be turned into a station for Pacific coast pursuit squadrons; the construction of Barksdale Field near Shreveport, La., the future home of the Third Attack Group stationed at Fort Crockett near Galveston, Tex.; the grading of the new site for Bolling Field south of the old station at Anacostia; and, as soon as titles were cleared for the Marin County tract near San Francisco, the construction of the new Hamilton Field as the station for Pacific Coast

ON WINTER FLYING MISSION

Formation of Boeing (Pratt and Whitney Wasp) pursuit planes over Selfridge Field, Mich., in tests of equipment for winter flying.

PRESENTING MACKAY TROPHY

Assistant Secretary of War for Aeronautics Davison awarding trophy to Maj. Ralph Royce for long mid-winter flight of First Pursuit Group.

bombardment squadrons. Construction of new quarters and buildings at Duncan Field, Tex.; Maxwell Field, Ala.; Mitchel Field, N. Y.; Selfridge Field, Mich.; and the Air Corps stations in Panama and Hawaii were under way at the close of the year.

The Army Air Corps established a new record for miles flown during 1931, with 44,000,000 miles logged during the fiscal year—an increase of nearly 10,000,000 miles over 1930. Much of this flying activity was contributed by movements incidental to the May Maneuvers. It was safe to say that flight operations for the last half of 1931 would in no way compare with those for the first six months. The Air Corps safety record showed a marked decrease in the number of fatal accidents. In 1930, there was one death for every 900,000 miles flown and in 1931, one death for every 2,079,000 miles flown—a total death roster of 21 in 1931 and 37 in 1930. Complete operations statistics of the Army Air Corps, and its accident record for a decade, are given in Part IV of this volume, devoted to Flying Facts and Figures for 1931.

The increased efficiency of the Army Air Corps was due in no small degree to the high quality of personnel and the inspiration afforded the Corps through the activities of its flying chiefs, Assistant Secretary of War F. Trubee Davison and Major General Benjamin D. Foulois, Chief of Air Corps. Both made frequent trips by air to posts throughout the country, keeping abreast of the latest developments in every branch of the service. General Foulois, personally, commanded the First Air Division during maneuvers and flew at the head of the formation. He held the distinction of being the Army's oldest pilot in point of service, having learned to fly under the tutelage of the Wright brothers.

The sphere of activities of the Army Air Corps and the Naval Air Service was clarified during 1931 with an agreement consummated by the Chief of Naval Operations and the Chief of Staff of the Army early in January, whereby the Army Air Corps was assigned the task of defending the coasts, both at home and in foreign possessions of the United States. The Navy was thus relieved of responsibility for coast defense to devote its attention entirely to operations with the fleet at sea. The magnitude of the Army's task could be realized from the fact that the Atlantic, Gulf and Pacific coasts are 7,314 miles in length; the Canadian boundary is 3,986 miles long; and the Mexican, 2,013.

CHAPTER VI

WINGS FOR THE FLEET

Five-Year Aircraft Program Completed—New Carriers and Flight Deck Cruisers Urged—Excellent Operations Record Maintained—Aid Nicaraguans in Earthquake Relief

CARRYING out, a year ahead of schedule, its five-year program of building 1,000 serviceable airplanes, the Navy experienced a crowded year of activity in providing wings for the fleet. Future plans pointed to the necessity of constructing new aircraft carriers and flight deck cruisers, with their appropriate complements of planes, if the United States was to be provided with an adequate naval air arm. Construction was begun on the new 13,800 ton aircraft carrier "Ranger" scheduled for completion in 1934, but authorization of three additional aircraft carriers of this class and 70,000 tons of flight deck cruisers was recommended as an immediate necessity to a continuing naval aviation program.

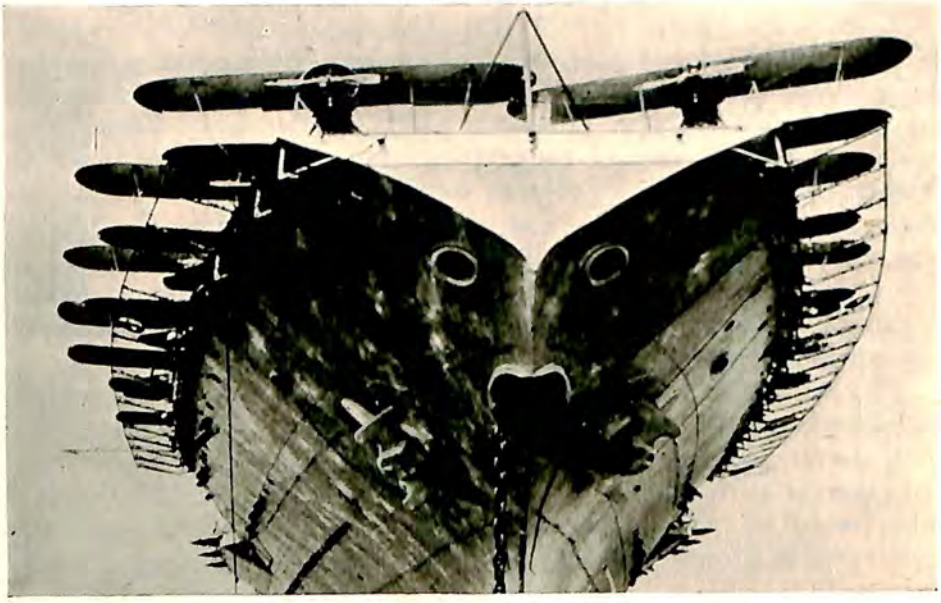
The Bureau of Aeronautics carried out its five-year building program, authorized by an Act of Congress in 1926, with a saving of $23,307,150 from the original estimates. Lower aircraft prices, careful economy and reduction in attrition, due to improvement in material and the splendid safety record of Navy pilots, made possible completion of the program in four years at a cost of $61,771,600, instead of the $85,078,750 originally estimated.

Scouting, torpedo and bombing, observation and fighting planes were carried on the aircraft carriers "Lexington," "Saratoga," and "Langley," while catapults on battleships and cruisers permitted the operation of scouting and observation planes. The five-year program made possible the complete equipment of the present fleet, but did not provide necessary aircraft equipment for the new carrier, "Ranger," and two new cruisers under construction, nor sufficient types for the training station at Pensacola and the United States Naval Academy. On July 1, 1931, the Navy had 958 useful, serviceable airplanes on hand and 216 on order.

Under the arms limitations treaties, the United States and Great Britain might build 135,000 tons of aircraft carriers. At the opening of 1932, Great Britain had six of these ships, totaling 115,350 tons, and the United States had three with a total tonnage considerably under that of Great Britain. This lack of parity was even more acute when it was realized that four of the British carriers were classed as experimental and could

be replaced within the tonnage limits, while only the "Langley" was considered "experimental" among the three American carriers. Therefore, Great Britain had used but 45,000 of the 135,000 tons allotted her under the treaties, while the United States had used 66,000 tons in the "Lexington" and "Saratoga" which, despite their having greater striking power than any other ships afloat, were considered too large and too vulnerable to be employed on scouting missions, an important function.

Experience with the "Lexington," "Saratoga" and "Langley" convinced the chiefs of naval aviation that the most efficient carrier should be one



GIVING WINGS TO THE FLEET

An unusual view from the bow of the U.S.S. "Lexington" at the water line, showing the wings of Wasp-powered Boeing fighters on deck.

of about 13,800 tons, the size of the "Ranger," which was the first ship to be designed and constructed by the United States strictly as an aircraft carrier. The Chief of the Bureau of Aeronautics, Rear Admiral William A. Moffett, recommended in his annual report for 1931 that the United States immediately undertake to fill the remaining 55,200 tons of its carrier allottment with ships of the "Ranger" class.

In the cruiser class, the London treaty permitted the United States to build 180,000 tons of 8-inch and 143,000 tons of 6-inch gun cruisers. Naval experts agreed that the 6-inch gun cruiser was not adaptable to the United States' requirements because of its short cruising radius and limited power, but students of naval aviation pointed out that cruisers of this class could be made very effective by equipping them with landing platforms to per-

mit the operation of 20 to 30 planes, each capable of carrying a 500 pound bomb. Rear Admiral Moffett contended that such a platform cruiser could defeat any 8-inch gun cruiser afloat.

The United States had 10 light cruisers in the fleet of 7,050 tons each, making it possible to utilize 70,000 additional tonnage for flight deck cruisers which would conform to the specifications of the category in which the United States was allowed a total of 143,000 tons. The Assistant Secretary of the Navy for Aeronautics and the Chief of the Bureau of Aeronautics both advocated the building of 70,000 tons of platform cruisers to

PRESIDENT HOOVER LOOKS ON

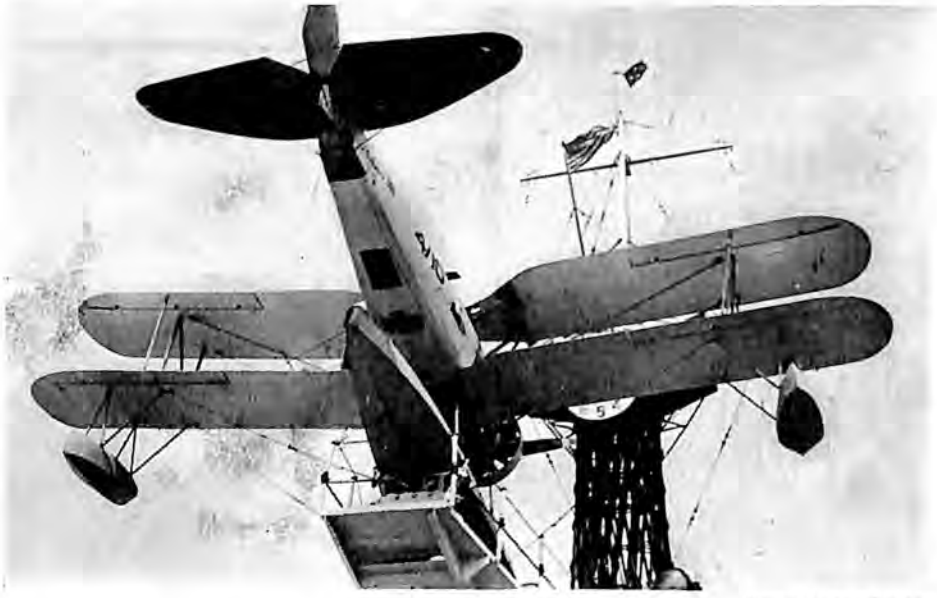
Wasp-powered Vought Corsair being catapulted from the deck of a battleship as the President notes the airplane's versatility.

provide the Navy with additional bases from which to operate aircraft at sea.

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 the most active period of aeronautical experimentation in its history during 1931. The flight test section at Anacostia carried out extensive performance trials of 42 different types of planes built under contract for the Navy to determine the types best suited to naval aviation. The aircraft ranged from giant flying boats to a tiny submarine plane and from an autogiro to high performance fighting

planes, including nine fighters, ten observation planes, six transports, six patrol boats, two torpedo or bombing planes, four training ships, an autogiro and three special types. Some of the most interesting types introduced are discussed in Part II of this volume, where a discussion of engineering and manufacturing advances and a section devoted to drawings of military planes will be found.

The splendid performance of the Navy's planes was evident from the records made by naval aviation during the maneuvers off Panama and in the Caribbean as well as in the year-around operation of 330 planes on



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WAR BIRD BACKS UP COLORS

Wasp-powered Vought Corsair poised on the catapult of the U.S.S. "California," with the colors and Admiral's flag in background.

the backs of the fleet. There was an increase of approximately 50 per cent. in the number of flying hours per forced landing due to power plant failure, while power output per unit of displacement was augmented to a marked degree in current types of service engines. Operations were so successful that the Navy Department decided to purchase only 50 per cent. spare engines for future planes. This was made possible by the marked increase in reliability and length of life 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 one death in tens of thousands of landings on the restricted platforms of the aircraft carriers.

NAVY'S HELLDIVER

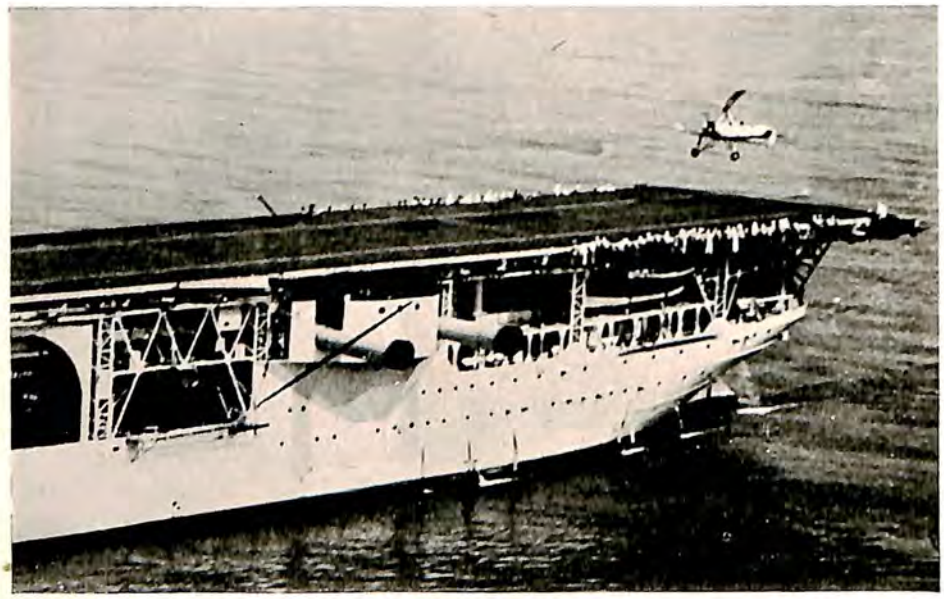
Curtiss F8C-4 (Pratt and Whitney Wasp) observation plane known as the Curtiss "Helldiver" being flown by Lieut. J. R. Tate with fleet.

BIRD-EYE VIEW OF FLEET

Eleven battleships caught in a single shot with a large formation of bombing planes seen on attacking mission.

The extended operations of aircraft during unusually poor visibility and weather conditions at the annual United States Fleet concentration off Panama, the employment of patrol planes in long-range operations across the Caribbean, the increasing service given by aircraft aboard battleships, and the successful operations of the naval airship "Los Angeles" were among the highlights of the year. The part the "Los Angeles" played in the maneuvers and the promising future of its big sister, the U.S.S. "Akron," the world's largest airship, which was commissioned during the year, will be discussed in the next chapter.

Two squadrons of patrol planes flew from Hampton Roads, Va., to



AUTOGIRO ON CARRIER

Pitcairn autogiro delivered to United States Navy makes first landing on the aircraft carrier, U.S.S. "Langley."

Guantanamo, Cuba, then to Kingston, Jamaica, and across the Caribbean to the maneuvers with the fleet off Panama and back over the same route early in the year.

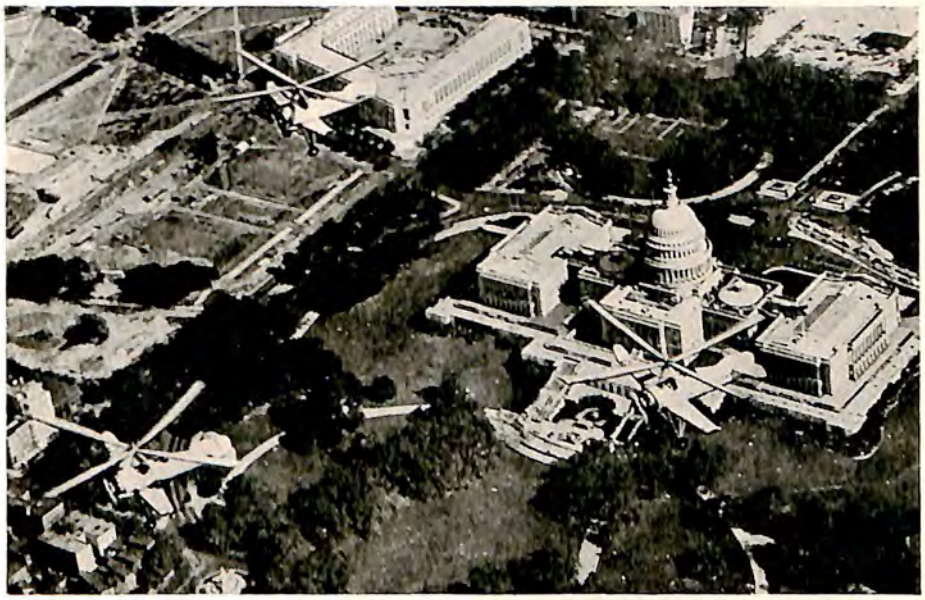
After the fleet concentration, the Scouting Force, reinforced by the "Saratoga" and "Lexington," conducted specialized operations in the Caribbean. To participate, the patrol planes of the Scouting Force flew directly from Colon to Kingston, then to Guantanamo, accompanied by six patrol planes from the Fleet Air Base at Coco Solo, C. Z. It inaugurated actual operations with the fleet of patrol planes from a fleet air base at a long distance from their home base.

The patrol planes at the Fleet Air Base, Pearl Harbor, Hawaii, also

were very active throughout the year, culminating their training by making a non-stop flight in formation around the Hawaiian Islands, a distance of 856 miles.

The Navy, with many successful air survey projects to its credit, undertook early in 1931 a Porto Rican-Nicaraguan Aerial Survey, flying from Hampton Roads to Porto Rico, the Gulf of Paria, Colombia, Venezuela, and Nicaragua, making maps and taking thousands of photographs. The planes returned from their mission through Central America, Mexico and Cuba to the United States.

The Marines and the aviation units of the "Lexington" undertook ex-



Acme Newsphotos

NAVY'S THREE AUTOGIROS

Three Pitcairn autogiros built for the Navy seen flying in formation over the national Capitol during show to honor French general.

tensive relief operations immediately after word was received of the earthquake in Nicaragua in March. Within an hour after the quake hit Managua, marines stationed in Nicaragua succeeded in sending a message to the Navy Department informing it that Managua had been destroyed and that thousands were dead or suffering. The far-flung naval organization sprang into action. Two planes were dispatched with naval medical officers and hospital corpsmen from the Naval Air Station at Coco Solo, C. Z. The aircraft carrier "Lexington," on maneuvers in the Caribbean, proceeded at 30 knots—the fastest vessel afloat— to Bluefields, Nicaragua, sending five planes from her flight deck as she neared the coast. The

planes, bearing naval medical officers and hospital corpsmen with urgently needed medical supplies, landed at Managua within 24 hours after the "Lexington" had left Guantanamo Bay, Cuba, 715 miles from Nicaragua. The planes were launched 150 miles from the shore and 370 miles from Managua. The following day, the "Lexington" launched another relief flight of six planes with all remaining medical supplies and personnel, 100 cots and 200 blankets. A Marine Corps transport plane, loaded with Red Cross medical supplies, arrived in Managua a few days later, after completing a 2,100 mile flight from Hampton Roads, Va.

The rapid improvement in the design and construction of aircraft and

CALLED TO PRESIDENT'S CAMP

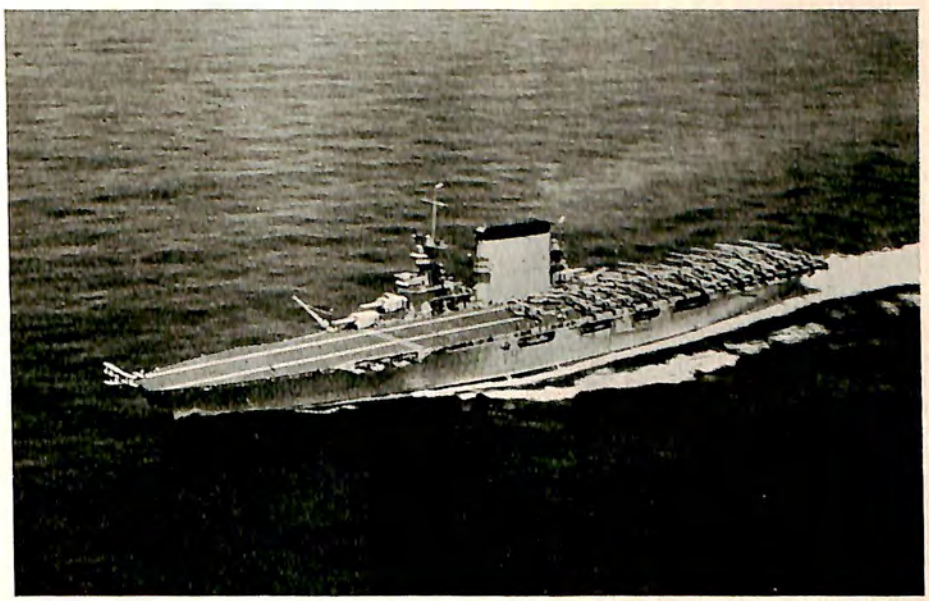
Assistant Secretary of Navy for Aeronautics Ingalls and Secretary Adams don parachutes to fly to Rapidan in Navy's autogiro.

the skill of pilots and maintenance personnel can be credited with the Navy and Marine Corps' brilliant operations record for 1931. During the fiscal year 1931, regular **and** reserve pilots of the Navy made 224,102 flights lasting a total of 248,570.45 hours with 20 fatalities. Marine fliers made 24,591 flights totaling 23,884.70 hours with five fatalities. The grand totals of the Navy Department's activities, including both Navy and Marine Corps, were 248,693 flights aggregating 272,455.15 hours with 25 fatalities.

The efficiency of Naval aviation was due to no small degree to the excellent direction afforded it by the Assistant Secretary of the Navy for Aeronautics, David S. Ingalls, and the Chief of the Bureau of Aeronautics, Rear Admiral William A. Moffett.

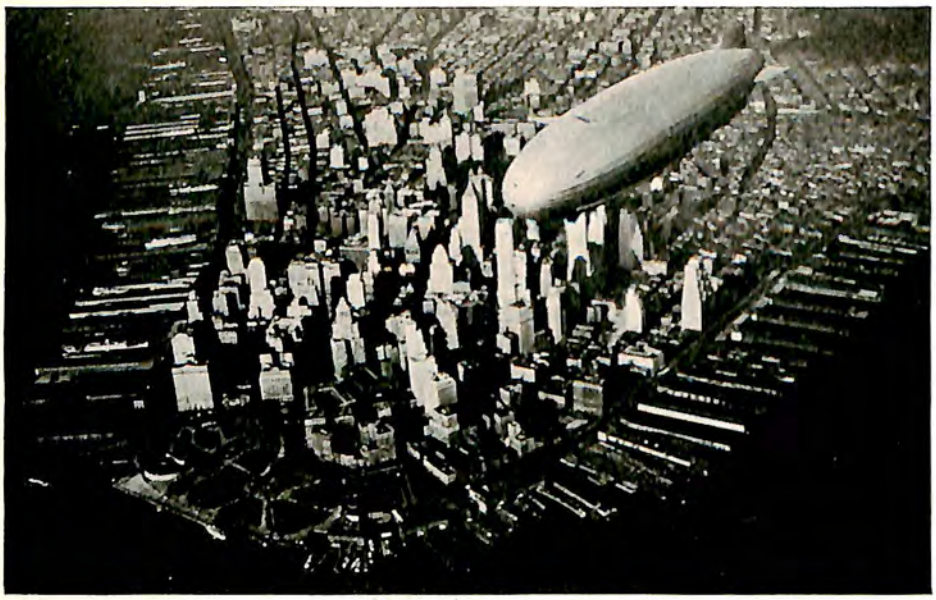
NAVAL SURVEY EXPEDITION

Keystone Loening (Wright Cyclone) amphibian of the Navy's Porto Rican-Nicaraguan Aerial Survey seen over Porto Rico making maps.



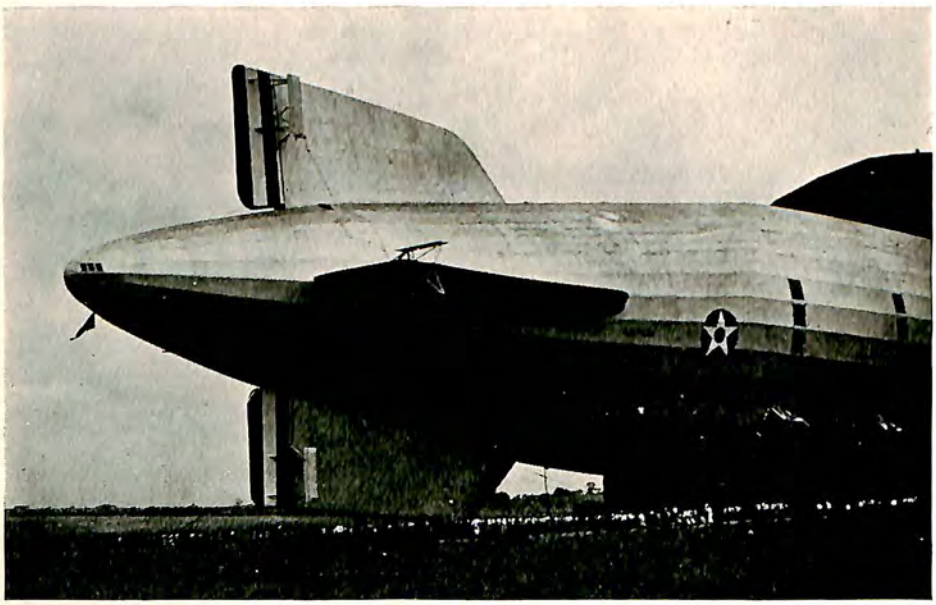
LAND—WATER—AIR

Whether on the aircraft carrier "Lexington," on the sea or in the air, this Keystone-Loening (Wright Cyclone) amphibian is at home.



SKY QUEEN VISITS NEW YORK

U.S.S. "Akron," world's largest airship, pays its initial visit to New York, flying over the Battery, after acceptance trials.



NOSING INTO GIANT DOCK

Ground crew beneath the U.S.S. "Akron" is dwarfed by giant rudder and fin of the airship as she noses into Akron dock.

CHAPTER VII

AMERICA TAKES LEAD IN AIRSHIPS

Navy Commissions World's Largest Airship—Frames Laid for "ZRS-5"—"Los Angeles" Scores in Panama Maneuvers—"Graf Zeppelin" Continues Impressive Record—British Drop Airship Program

AMERICA entered 1932 the recognized world leader in lighter-than-air development, with two giant airships in service and the frames for the third nearing completion in the world's largest airship dock at Akron, designed to house even larger commercial airships of the near future for trans-Atlantic and trans-Pacific service on regular schedule. Germany continued to operate the "Graf Zeppelin" with marked success, six South Atlantic crossings and flights to Egypt, Iceland, England and the Arctic being completed during 1931. Great Britain, still suffering from the shock of the loss of her sky queen, the "R-101," and severely frostbitten by economic considerations during the gold crisis, not only dropped her Empire airship program during 1931 but ordered her only airship, the "R-100," scuttled.

The year 1932 promised to be an important one in the realm of lighter-than-air activities. The Navy Department, speculating on the manifold cruising possibilities of its new air giant, the U.S.S. "Akron," considered extensive trans-oceanic flights over the Atlantic and Pacific and into hitherto unexplored sections of South America in its contemplated program, part of which was to be carried out in 1932. The U.S.S. "Los Angeles," having proved its value in maneuvers with the fleet off Panama and as a training airship, stood ready to enter its eighth year of service, the longest ever performed by an airship. The "Graf Zeppelin," with more than 200 flights to her credit, was to continue trans-Atlantic voyages to South America on schedule. In the meantime, two new giant airships were under construction in Akron and Friedrichshafen; the one in Ohio under contract for the United States Navy, the other in Germany to join the "Graf Zeppelin" as another step toward the realization of regular trans-oceanic service by airship. The German ship, known as the "LZ-129" and considerably larger than the "Graf," was scheduled for completion in 1932. The American

ship, known as the "ZRS-5" and almost identical to the "Akron," was to be ready early in 1933.

U.S.S. "Akron" Joins the Fleet

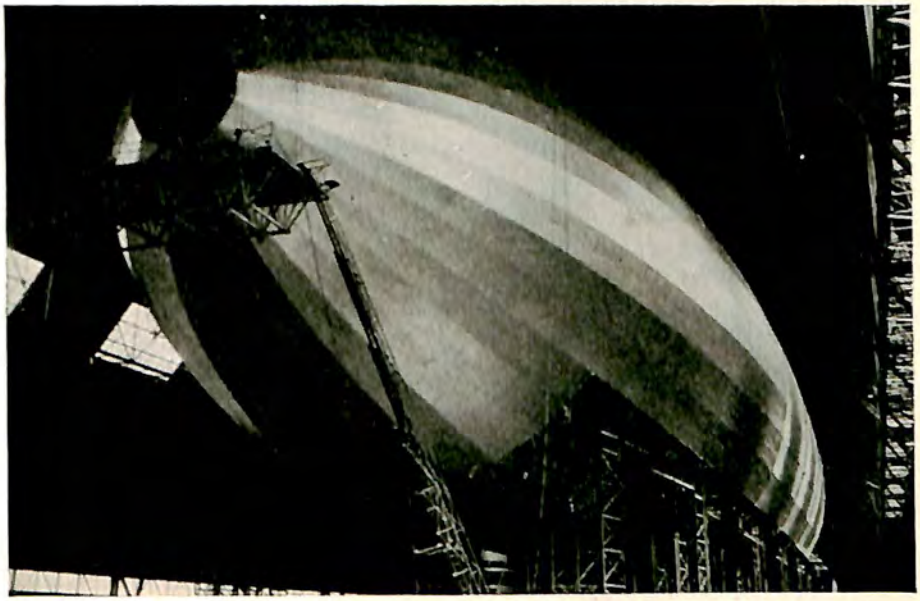
It was a gala day in Akron September 23 when the great orange-peel doors of the Goodyear-Zeppelin Corporation's dock slid open to let the world's biggest airship slowly move out, stern first, pushed by the mobile stub mooring mast at her bow. The ceremonies were not as formal as those which had attended the christening of the great ship as the U.S.S. "Akron" by Mrs. Herbert Hoover August 8, but to engineers and the lay public alike this was the great day. The "Akron" was to fly!

Crewmen went to their stations within the ship's envelope. Then, with the ship moored in midfield, the first flight guests climbed up the stairway into the control cabin: Charles Francis Adams, Secretary of the Navy; David S. Ingalls, Assistant Secretary of the Navy, Rear Admiral William A. Moffett; Paul W. Litchfield, president of Goodyear-Zeppelin Corporation; Dr. Karl Arnstein, designer of the ship; and many another until 113 persons were aboard, more than an airship had ever carried.

With Lieut. Comdr. Herbert V. Wiley, executive officer, barking commands to the ground crew, the great ship was prepared for its first flight. A signal to Lieut. Comdr. Charles E. Rosendahl, veteran of the "Shenandoah" and commander of the new ship, told him that all was in readiness. He leaned from the control cabin, a megaphone to his lips and shouted: "Up Ship!" A band played "Anchors Aweigh." A mighty cheer went up from the ground crew. Automobile horns on the surrounding hillsides tooted in a noisy chorus. And the giant airship rose gracefully into the air, the blue flag of the Secretary of the Navy hanging from her control car, the U.S. ensign flapping at her stern.

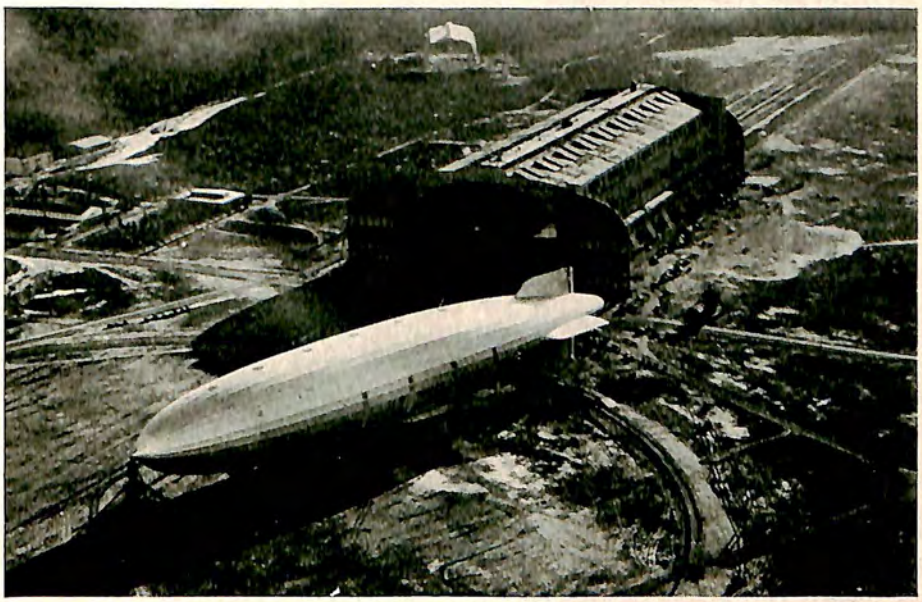
The "Akron" then faced many a performance test and long hours of cruising under close scrutiny of Navy and Goodyear officials before a message from the Navy Department on October 21 signified "preliminary acceptance" of the ship, thereby authorizing the Goodyear-Zeppelin Corporation to proceed with construction of a sistership to the "Akron" at a cost of $2,450,000. The "Akron" had cost the Navy Department $5,375,000. The new sky queen was commissioned a ship of the Navy October 27, Navy Day, with appropriate ceremonies at Lakehurst, where it was to be berthed alongside of the U.S.S. "Los Angeles" until a new Navy airship dock, under construction at Sunnyvale, Cal., was ready to receive it.

On November 3, the "Akron" added another record to its long list of "biggests" and "greatests" when it took 207 persons aloft on a 10 hour flight, wresting an honor from the Dornier DO-X which had carried 169 persons on an hour's flight in Switzerland. Seventy-six of the "Akron's"



CONSTRUCTING GIANT SHIP

U.S.S. "Akron" looking aft as it neared completion in the Goodyear-Zeppelin dock at Akron, showing special construction machinery.



"AKRON" ARRIVES AT LAKEHURST

Successfully completing her acceptance trials, the U.S.S. "Akron" arrives at Lakehurst to take her place alongside the "Los Angeles."

passengers were members of the crew, while the others were personnel of the Naval Air Station at Lakehurst.

The "Akron" qualified as the marvel of the age as a fighting ship. She carried 16 heavy calibre machine guns, mounted at strategic points throughout the ship, and five high-speed fighting airplanes, housed in a hangar concealed within the hull and launched by a special trapeze. The speedy fighting planes of the "Akron" were of unusual design, as will be noted from an examination of a detailed three-view drawing of one of the ships, produced by the Curtiss Aeroplane and Motor Company, in the design section of this volume.

Trans-Ocean Routes Await Legislation

But the "Akron" and her sistership hold even greater importance as the forerunners of commercial airships of similar or greater size for regular service across the Atlantic and Pacific. Carrying out of such a plan awaited only the passage by Congress of necessary legislation, such as the McNary-Parker Merchant Airship bill, to insure the backers of proper legal status and mail contracts similar to those provided trans-oceanic steamship lines.

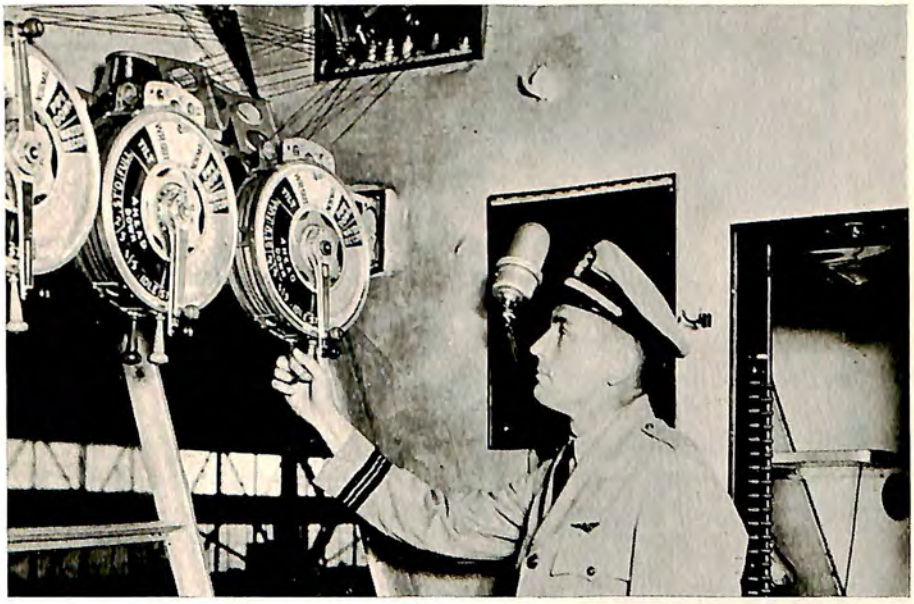
Hearings on the McNary-Parker bill early in 1931 before the House Committee on Interstate and Foreign Commerce provided widespread interest in the potential possibilities of trans-oceanic airship services for mail and passengers. The hearings were not completed, however, until the closing days of the Congressional session, and, due to an exceptional number of measures in the legislative hoppers, the McNary-Parker enabling legislation was held over for consideration in 1932. Officials of International Zeppelin Transport Company and the Pacific Zeppelin Transport Company, organized late in 1929 to operate trans-oceanic airship services, indicated that the early beginning of world airship service depended to a great degree on favorable action by Congress on the enabling legislation.

The International Zeppelin Transport Company, in which both German and American interests were represented, looked toward the establishment of a trans-Atlantic airship line, while the Pacific Zeppelin Transport Company, an entirely American enterprise, expected to establish a line extending from the Pacific Coast to the Hawaiian Islands and the Philippines, and eventually to the Orient.

Engineers of the two companies spent 1931 in gathering data on possible terminal sites on the Atlantic and Pacific coasts, on operating costs, and the best weather routes for trans-oceanic airship services. Some plan of cooperation was to be worked out in which the German group would provide German ships and European terminals and the American group would provide American airships and American terminals. Weather rec-

ON BOARD THE "AKRON"

Officer studies weather chart aboard the giant airship to determine her course on flights during the acceptance trials.



COMMANDER OF THE "AKRON"

Commander Charles E. Rosendahl, assigned to command the new airship, seen in the control cabin during one of the early flights.

ords for 20 years were analyzed for a number of places along the Atlantic seaboard from New York to Georgia, and it was understood that selection of a site for the American terminal was narrowed down to points near Baltimore, Richmond, Washington and Alexandria. Engineers studying the problem found that the region west of Chesapeake Bay and east of the mountains escaped the full force of ocean gales and was protected by the mountains from north and northwest storms.

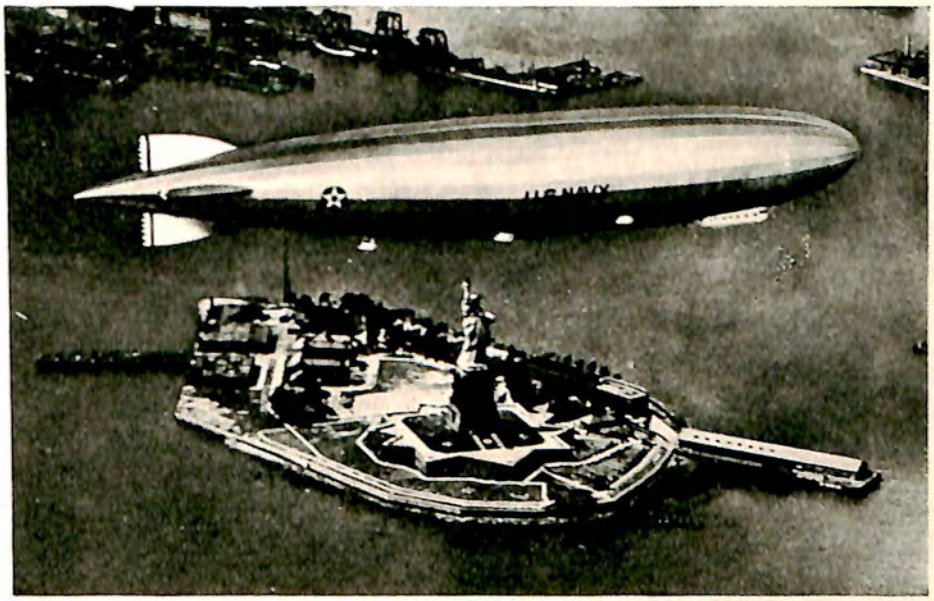
The general plan for commercial operation of Atlantic airship lines embraced a service using four ships, two American and two German, giving schedules twice a week, but at the start only two airships would be in service, one from each side of the Atlantic in weekly sailings. It was believed that airships of the "Akron" type—6,500,000 cubic feet—or somewhat larger would be admirably adapted for such a service, if necessary modifications from the military ship were made for commercial use. Revised for commercial purposes, a similar ship could carry 100 passengers and 25,000 pounds of mail and express across the Atlantic.

Studies Developed in Europe

Dr. Karl Arnstein, vice-president and chief engineer of the Goodyear-Zeppelin Corporation and designer of the U.S.S. "Akron," the U.S.S. "Los Angeles," and 70 war-time Zeppelins, sailed for Europe in December to discuss airship problems at Friedrichshafen and to learn further details of the program of the Luftschiffbau-Zeppelin in connection with its new ship, the "LZ-129," being constructed for trans-Atlantic commercial service. The new German airship was designed to use helium and obtain its power from Diesel engines. Dr. Arnstein planned to visit the D.V.L., German Research Institution for Aircraft, at Berlin and to make a particular study of Germany's progress on the perfection of Diesel engines.

How the "Graf Zeppelin's" trans-Atlantic crossings from Germany to South America on regular schedule became so commonplace in 1931 as to warrant little attention in American newspapers has been described in the chapter on "History-Making Flights of 1931." The "Graf" had become a veteran world traveller, which the public had learned to expect to do great things. Therefore its flight from Germany to Cairo and the Holy Land in April caused little or no comment, although the flight was made more than a half-day ahead of schedule. Other jaunts through central Europe, to England and to Iceland were accepted as matter-of-fact. The latter was in preparation for its exploring trip into the Arctic, which was to receive more attention in the press than all of its other 1931 achievements put together.

In July, the "Graf" headed north on her 202nd flight, made a stop at Berlin, then pushed on to Leningrad, the island of Novaya Zemlya and



VETERAN OF THE SKIES

Continuing one of the longest careers ever enjoyed by an airship, the U.S.S. "Los Angeles" is seen on a flight over the Statue of Liberty.

"LOS ANGELES" ON MANEUVERS

Aircraft Carriers "Lexington" and "Saratoga," and U.S.S. "Patoka" seen from "Los Angeles'" control car during 1931 fleet maneuvers.

Franz Josef Land, where philatelists' mail was exchanged with the Soviet ice-breaker "Malygin" when the "Graf" lowered itself to the icy waters of the Arctic sea for a brief contact with the Russian explorers. The expedition, sponsored by the Aero-Arctic, a German society, included Prof. Rudolph Samoilovitch of Leningrad; Lincoln Ellsworth and Lieut. Comdr. Edward H. Smith of the United States. The scientists reported collection of more data than could have been obtained from two years of Arctic exploration with ordinary methods, including the discovery of new ranges of mountains, numerous changes in geographical maps, and important weather information.

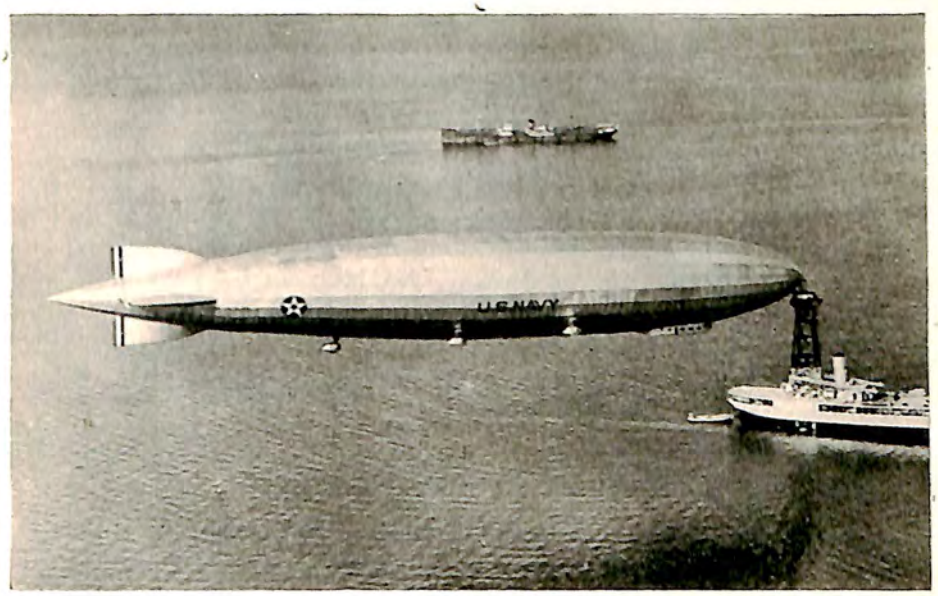
"Los Angeles" In Fleet Maneuvers

The U.S.S. "Los Angeles," continuing to be an important factor in the United States Navy's research and training program for airship development, left its complacent existence as a "non-military" airship, under terms of the post-war agreement, to become a "cruiser of the air" during the 1931 fleet maneuvers of the Navy off Panama. Its success in maintaining contact with theoretically friendly vessels and discovering the main body of the hostile fleet in the 1931 maneuvers, before it was sighted for surface vessels, brought a commendatory "Well done" from Assistant Secretary of the Navy Ingalls and Rear Admiral Moffett who were with the airship on maneuvers. It operated more than 2,000 miles from its Lakehurst base for nearly a month, mooring to the mast of the U.S.S. "Patoka."

Tests of the new fighting planes for the U.S.S. "Akron" were made on the "Los Angeles" before they were attached to the new airship, proving conclusively the practical use of such planes for reconnaisance and in warding off an attack. The new planes were hooked onto the "Los Angeles" in hundreds of contacts, several of them near the close of the year being made at night. The "Los Angeles" made scores of training flights throughout the year to all parts of the eastern half of the country, carrying many guests among them a score of newspaper editors and on another occasion, King Prajadhipok of Siam and his queen consort.

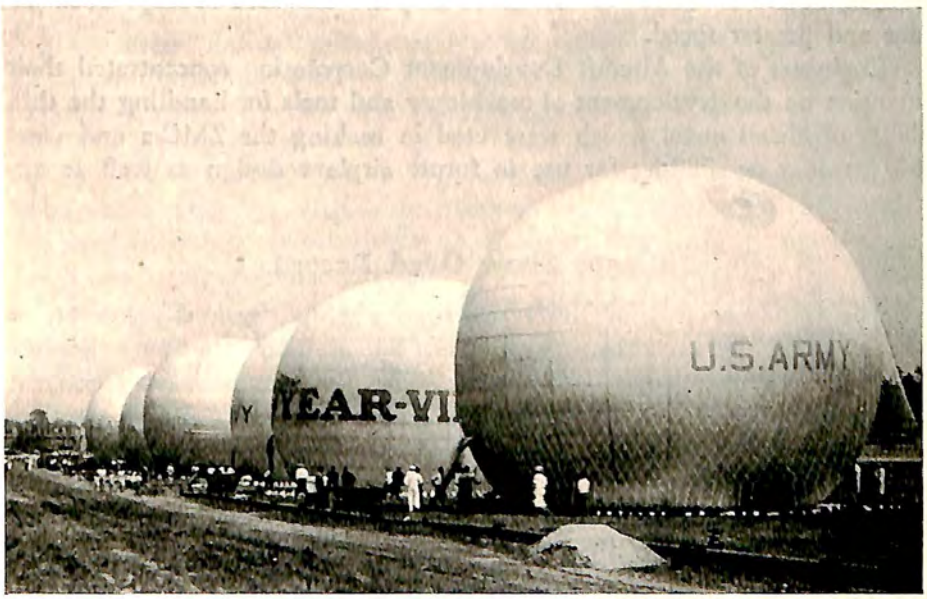
Mobile Mast Facilitates Handling Ship

The "Los Angeles" was used in numerous tests leading to the development of a suitable stub mooring mast for the new giant airship "Akron." A decided improvement over former methods of taking large airships in and out of their docks by reducing the personnel of the handling crew, the new "motorized hitching post" for airships was 76 feet in height, weighed 130 tons and was powered with a 240 horsepower gasoline engine. Structurally, it was an open pyramid or tripod with the corners of its triangular base equally spaced on a circle 100 feet in diameter. At each corner of the base was a caterpillar tractor, the two rear tractors serving to drive



MOORED TO FLOATING MAST

With high ranking naval officers aboard, the U.S.S. "Los Angeles" moors to the stub mast of the U.S.S. "Patoka" during maneuvers.



NATIONAL BALLOON RACE ENTRIES

Six teams in 1931 National Balloon Race prepare to take-off from Akron in contest won by Lieuts. Settle and Bushnell of the Navy.

the mast forward, while the forward tractor was used for steering the huge "hitching post" as it maneuvered about the airport.

Mooring devices, consisting of a cone on the nose of the airship, and a cup on the mast, into which the cone fitted and was locked, became standardized on all airships and masts, thus enabling any airship to moor to any mast. The mobile mast, while more than sufficiently stable to provide an all-night mooring for a Zeppelin, found its chief utility in pulling the ship in and out of the dock. Aiding in the operation of taking the ship in or out of the dock, were docking rails, built out from the dock, and to which handling lines of the ship were attached. Previous practice necessitated use of many men on each handling line. Looking toward the future, the mast was constructed to make possible an increase in its height to accommodate ships of increased size.

Metalclad Airship Research

The Aircraft Development Corporation of Detroit continued a research and development program giving out of the lessons learned in the building of the metalclad airship ZMC-2 for the United States Navy. The ZMC-2 was operated throughout the year by the Navy from the Lakehurst Naval Air Station as a training ship. The unique features of the metalclad ship, a distinctly American development, were watched closely by Navy officials on duty at the air station to determine its potential value in ships of larger size and greater speed.

Engineers of the Aircraft Development Corporation concentrated their attention on the development of machinery and tools for handling the thin sheets of alclad metal which were used in making the ZMC-2 and were said to offer possibilities for use in future airplane design as well as airships.

Blimps Show Good Record

The Goodyear fleet of small non-rigid airships, generally known as blimps, continued to attract tremendous interest and attention wherever they appeared throughout the country. The fleet was built by Goodyear primarily to demonstrate lighter-than-air and to train personnel in the fundamentals of ship handling. With prospects bright for commercial airships soon to be flying between continents with passengers and tons of mail and express, it was obvious that men must be ready to fly and land them.

Goodyear had 26 qualified airship pilots at the end of 1931 who devoted full time to flying. In addition to its main hangar at Akron, the war-time home of many airships, Goodyear had hangars at Gadsden, Ala., and Los Angeles, Cal. In the year 1931, Goodyear rebuilt and enlarged two of its airships—the "Vigilant" and "Mayflower"—renaming them the

"Columbia" and "Reliance." The "Columbia" operated during 1931 from Holmes Airport in New York City, and plans called for keeping it there during 1932. The "Volunteer," another of the fleet, operated from the Los Angeles base, while the other four ships operated from Akron in the spring, summer and fall, two or three going to Florida for operations in the South during the winter months. More than 65,000 passengers had been carried on the fleet of six Goodyear airships without injury to a passenger.

The "Defender" was the largest of the fleet, with a gas capacity of 185,000 cubic feet. The smallest was the "Pilgrim," with 56,000 cubic feet. The other four ships each have a capacity of 112,000 cubic feet. A seventh ship, the "Resolute," was scheduled to be built in 1932 and to be launched in the spring. Helium was used in all ships of the Goodyear fleet.

The year 1931 saw the adoption of gelatine-latex bags for the airships. This treatment of cotton fabric, evolved for the gas cells of Zeppelin type ships as a substitute for goldbeater skin, was recognized quickly as applicable to non-rigids, having much greater diffusion, some saving in weight and better weathering qualities.

New Lighter-Than-Air School

The year 1932 was to see the completion and operation of a new lighter-than-air school in Akron, the result of a bequest by the Guggenheim Fund for the Promotion of Aeronautics for the establishment of the Guggenheim Foundation for Lighter-than-air Research. The building, at the northwest corner of Akron's municipal airport, was started in October, 1931.

The University of Akron, granted $175,000 for lighter-than-air research work, was to use $120,000 of this amount to cover costs of operation for five years, while the remaining $55,000, together with an additional sum secured by bonds voted by citizens of Akron, was to be used for construction and equipment of the building.

Dr. von Karmen of the California Institute of Technology was director of the school. The California Institute was granted $75,000 for furthering lighter-than-air research by the Guggenheim Fund, and the University of Akron was to work in conjunction wtih the California school.

No International Balloon Race

No international balloon race for the Gordon Bennett Trophy was held in 1931, due to various reasons, the chief one being reluctance of any city to attempt to finance the project. The National Balloon Race was held at Akron, July 19, with six entrants. Ward T. Van Orman, veteran Goodyear pilot, winner of five national and three international races, and holder of the James Gordon Bennett Trophy in 1931, headed the technical com-

mittee handling the national race. Had there been an international contest, Van Orman and the winner of the 1931 national race would have represented the United States.

The United States Navy balloon piloted by Lieut. T. G. W. Settle with Lieut. Wilfred Bushnell as his aide won the National Balloon Race by travelling 215 miles, an unimpressive distance, to Marilla, N. Y. The Goodyear-Zeppelin entry was second, landing at Stevensville, Ont., 190 miles from Akron. The Radio Station WJR Detroit entry was third, landing near Erie, Pa., 110 miles. Heavy wind, thunder-storms and lightning harrassed the contestants in the most severe weather any of the pilots had experienced in a balloon race.

CHAPTER VIII

HISTORY-MAKING FLIGHTS OF 1931

World Girdled By Air in Eight Days—Eighteen Planes Successfully Span Atlantic—First Non-Stop Pacific Flight—World Speed, Distance, Duration and Altitude Records Shattered

ADVERSE economic winds in 1931 failed to block the achievement of the most crowded year of spectacular flights in the history of aviation. In fact, the depression, if it had any effect at all, merely minimized the number of poorly financed, ill-planned, abortive attempts whose failures in former years cast a shadow on brilliant achievements. Five eastbound flights along the Great Circle route across the North Atlantic were successful, without a single failure, two of the planes continuing around the world, one of them in eight days, the other making the first non-stop Pacific flight.

The world's records for distance, speed, duration and altitude were broken; 18 airplanes carrying 79 persons successfully crossed the Atlantic; more than 300 persons spanned the South Atlantic in six flights of the "Graf Zeppelin"; and three planes crossed the Pacific, one non-stop. The American transcontinental record was cut to 11 hours and 16 minutes; scores of inter-city speed records in Europe and America ware lowered; and the fastest times for flights from London to Australia and South Africa were bettered.

For the first time in history, man flew faster than 400 miles an hour, farther than 5,000 miles in a non-stop straightaway; longer than 84 hours without refueling; and ascended more than ten miles above the earth. The most interesting of the record-breaking achievements, which might be classed as "history-making," deserve to be reviewed, for they offer a fascinating story of the year's progress.

'Round-the-World In Eight Days

Man has used the speed with which he has been able to circumnavigate the world on which he lives as the measuring stick of transportation's progress since the time of Magellan's arduous 1,083 day journey by sea. Sir Francis Drake was hailed for his achievement when he cut 31 days

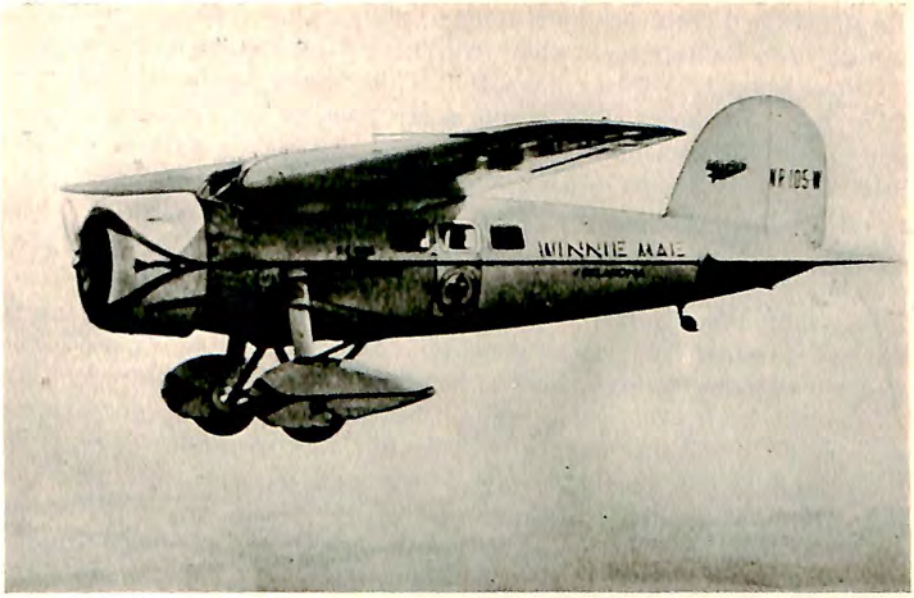
from the first globe-girdler's record in 1580. Nellie Bly set the world agog with her 72 day record for the journey by railroad and steamship in 1889; and John Henry Mears cut that mark in half with his speedy trip of 35 days in 1913.

The United States Army 'round-the-world fliers could hardly hope to break Mears' record, but their circumnavigation of the globe—the first by airplane—was an achievement of the first order, although it required 175 days in 1924. The combination of plane, steamship, railroad and automobile then appealed to the would-be record breakers. In 1926, Edward S. Evans and Linton Wells did it in 28 days. Not to be outdone by the new record-holders, Mears with C. B. D. Collyer as pilot used planes and steamships in 1928 to cut the time to 23 days, 15 hours and 21 minutes. The majestic dirigible "Graf Zeppelin" climaxed a series of brilliant flights in 1929 with a 19,500 mile world trip in the record time of 21 days, 7 hours and 34 minutes.

Explaining that "we want to take the record away from the balloons," Wiley Post, one-eyed Oklahoma pilot, and Harold Gatty, able Australian navigator, applied for passports in Washington late in May after flying their cream-white Lockheed Vega (Pratt and Whitney Wasp) monoplane "Winnie Mae" from Oklahoma to prepare for their globe-girdling journey. Their announcement from Oklahoma in March, briefly outlining plans for a world flight in less than ten days, had been crowded into obscure corners of most newspapers.

The two fliers were at Roosevelt Field long before sunrise Tuesday, June 23, huddled in the automobile of a friend to avoid a drenching rain that threatened to delay their start after all preparations had been made. Their plane and engine had passed rigid inspection of factory experts; they had arranged for gasoline and oil at definite stops along their carefully laid out routes; and they were anxious to get away. Post stuck a swarthy hand out the window of the automobile and observed that the rain was slacking. "All right, Harold; let's go," he said as he tumbled out of the car and walked toward the "Winnie Mae," calling to a small group of drenched spectators: "Somebody want to crank me up?"

The light of photographers' flares and the stabbing finger of a revolving beacon picked out the "Winnie Mae" for a moment at the head of the runway. Then a roar from the super-charged Wasp motor, a streak down the field, and the ship's navigating lights were blinking a "good-bye" from the North at 4:56 A. M. Before noon, less than seven hours later, the white monoplane sat down on the airport at Harbor Grace, N. F., 1,153 miles up the coast. Three irritating hours passed, while inadequate fueling equipment slowed up the task of taking on a heavy load of gasoline, before heading out over the Atlantic, spanked along by a 30-mile breeze. For the first part of his ocean trip, Post "had little to do." He lounged in



'ROUND-THE-WORLD IN 8 DAYS

Wiley Post and Harold Gatty flying their Lockheed Vega (Pratt and Whitney Wasp) monoplane "Winnie Mae" shortly after take-off.

BERLIN LIONIZES THEM

Post and Gatty receiving a hearty welcome at the hands of German admirers after landing the "Winnie Mae" at Tempelhof Airdrome.

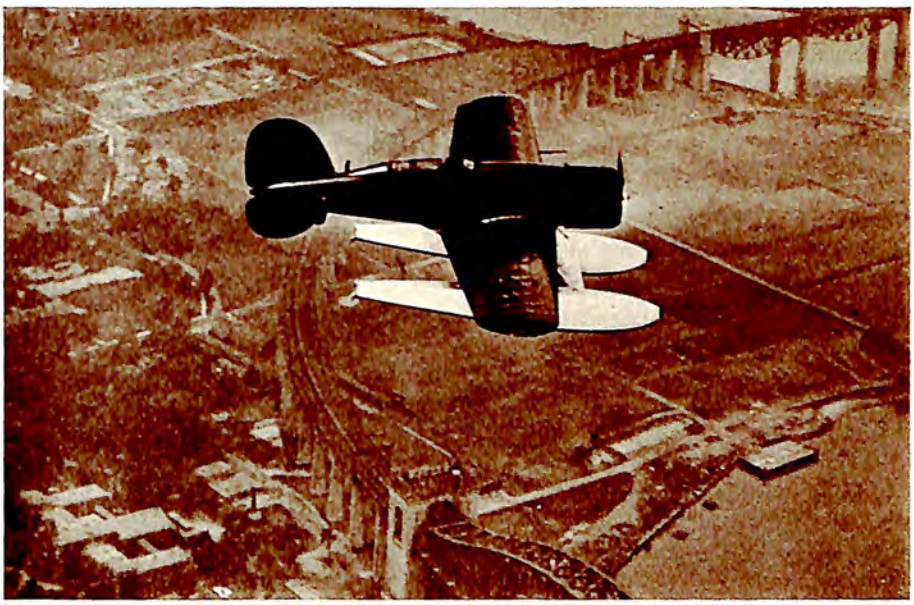
his upholstered chair, one hand resting lightly on the stick, his good right eye glued to the compass, tachimeter, altimeter, and other instruments.

Press wires back home buzzed with the stories of the fliers' careers. How Post, after an excellent record as test pilot for the Lockheed factory, got a job as aerial chauffeur to F. C. Hall, one time drug clerk who struck a fortune in Oklahoma oil and decided to back the Post-Gatty flight as a tribute to his daughter, Mrs. Winnie Mae Fain, for whom the ship was named. How Gatty, a graduate of the Australian Naval Academy, had studied aerial navigation under Lieut. Comdr. Philip V. H. Weems, U. S. N., and had recommended himself to Post's attention by his superb navigation when he directed Harold Bromley back to Japan on an attempted trans-Pacific flight from 1,200 miles at sea.

But the best of navigators is impotent with neither sky nor horizon to work with, and that was the "Winnie Mae's" situation half way across the Atlantic. "I don't think we can honestly say we were lost," Post said later, "but we just didn't know where we were" when they found themselves over land next morning. They spotted an airport in a hole through a bank of clouds, landed, and asked: "Is this England, Scotland or Wales?" It was Sealand Airdrome near Chester, England, 16 hours and 17 minutes from Harbor Grace. In a little less than two hours, the fliers were off for Berlin, landed first at Hanover by mistake. Fatigue was beginning to tell on the pilot who was pushing on after a flight which many pilots before him were willing to let go down in history as their supreme achievement. Post neglected to refuel at Hanover and turned back to that field again 15 minutes after leaving.

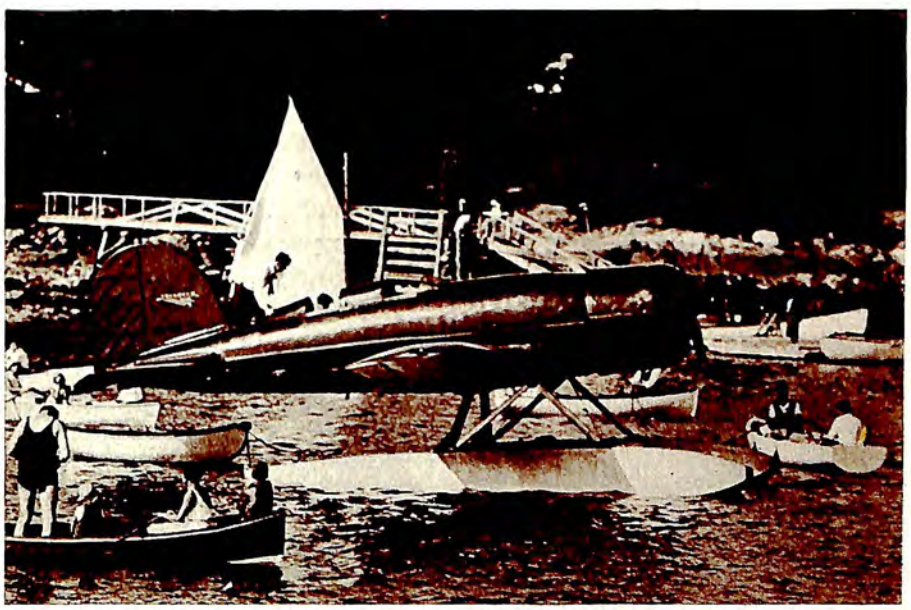
The sun was just setting when they landed on a corner of Tempelhof Airdrome at Berlin, unnoticed for almost a quarter hour by the crowd which had waited to shout its "Hochs" and "Kolossals," then sweep the fliers across the field on the strong shoulders of German admirers. Sympathetic airport officials finally stopped the barrage of reporters' questions long enough for them to eat their first meal since leaving America the day before. Radio announcers had been unsuccessful in their attempt to draw out an interesting account of the fliers' experiences for the benefit of German and American audiences. Contracts with Pathé films, for whom Gatty was making an exclusive picture record of the flight, sharpened the natural reticence and boyish shyness of both fliers. Bathed at the airport hotel, where Gatty fell asleep in the tub, they finally climbed into bed at 11 o'clock, Post wearily dictating an account of their flight under an exclusive contract with the New York Times, before dropping off to sleep. At 7:30 o'clock (Berlin Time) the next morning, they were Moscow bound.

Under a creeping low ceiling of fog and rain, they did 1,000 miles of "hedgehopping" across Poland into Russia. But Post and Gatty appeared



LINDBERGHS ON ORIENT FLIGHT

Col. Charles A. Lindbergh tests his Lockheed Sirius (Wright Cyclone) monoplane over Hell Gate Bridge, showing plane's Edo automatic water rudders.



FAREWELL TO LINDY JUNIOR

Col. and Mrs. Lindbergh receiving best wishes of summer colony at North Haven, Me., where they stopped to visit their infant son.

fresh and vigorous to the Ossoviakhim (Soviet Society for Aviation and Chemical Defense) who greeted them late that afternoon. Gatty was offered a Russian cigarette, but he was still protecting his throat from a pack bought in New York "day before yesterday." There was a nine-course dinner at the Grand Hotel that night, although the fliers had originally planned to push on. They had but two hours' rest when they returned to the airport soon after midnight. Russian mechanics, confusing gallons with liters, had overloaded the plane and the excess fuel had to be siphoned out. It was 5 A.M. (Moscow Time), when the plane roared into the East. It followed the Trans-Siberian Railway over the Ural Mountains, landed after 11 hours at Novo-Sibirsk.

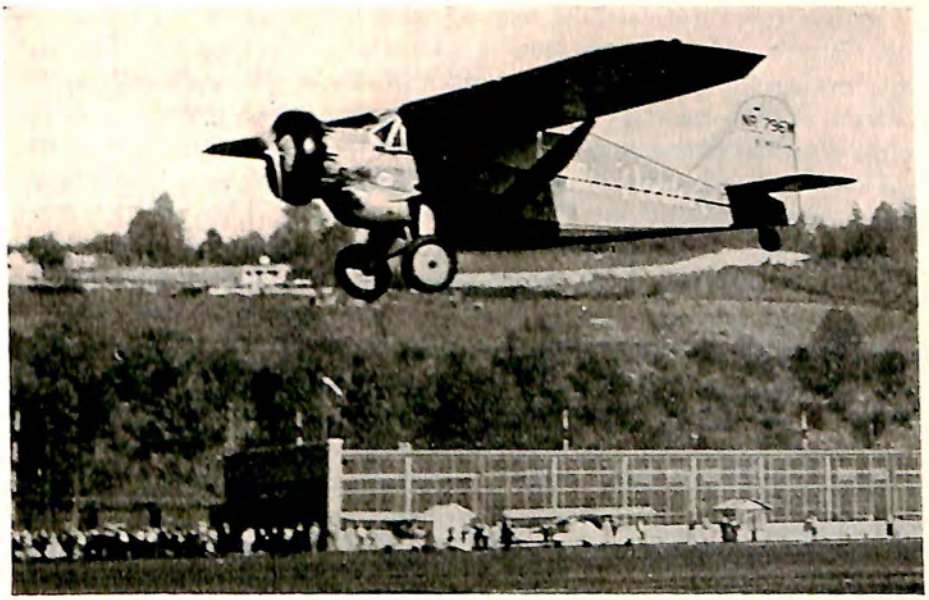
Another respite of eight hours, then on to Irkutsk, 1,050 miles farther. Besieged by an excited group of Russian officials, the fliers turned immediately to the task of refueling and checking a course across the desolate Yablonio Mountains to Blagovyeschensk. There was no time to celebrate the fact that they had come just half way round the world from New York (8,050 miles) in 3 days, 19 hours. They were 28 hours ahead of their "round-the-world-in-ten-days" schedule and had but eight hours' sleep since leaving New York, but they were anxious to push on and, with a wave of the hand, they were off again.

At Blagovyeschensk, 850 miles farther, the fliers encountered their first trouble—not with the plane or engine—but with mud. The "Winnie Mae" mired deep in the mud of the Siberian airport. Patient plow horses and willing peasants tugged at the plane, but to no avail. After a sleepless night for the fliers and 14 hours' work, a detachment of soldiers and an American-built tractor pulled the plane out.

At Khabarovsk, Post and Gatty deliberately sacrificed 26 hours of their ahead-of-schedule time by giving their plane a minute inspection and taking 12 hours' sleep in preparation for their hazardous 2,100 mile dash to Nome, Alaska. They found plane, engine and instruments in perfect condition. They took off in the face of doubtful weather over the Gulf of Tartary, the Kamchatka Peninsula and the Bering Sea. The 24-hour Arctic day was in their favor. They reached Alaska after completing their Pacific jump, chose to land at Solomon Beach, 36 miles from Nome.

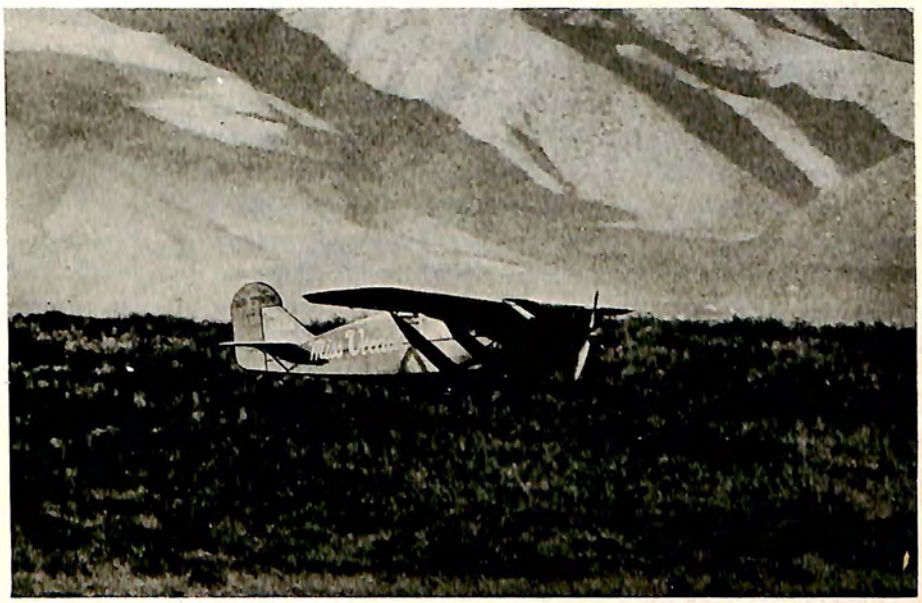
The plane nosed up in taking off with a heavy load of fuel and an accident was narrowly averted because of the poor condition of the field. Post worked on the propeller, which struck and bruised Gatty when it was whirled for another start. The fliers were on their way after little more than two hours at Solomon Beach, but with a lighter fuel load which necessitated their dropping down on the improved airport at Fairbanks for additional fuel. They not only seemed certain to break the "Graf Zeppelin's" record but also their own estimate of ten days.

Flying through a heavy rain that had soaked the airport at Edmonton



AFTER FIRST PACIFIC FLIGHT

Hugh Herndon and Clyde Pangborn taking-off from Boeing Field, Seattle, for New York to complete world flight in Wasp-powered Bellanca.



END OF NON-STOP PACIFIC HOP

Wasp-powered Bellanca monoplane of Hugh Herndon and Clyde Pangborn about to land without landing gear at Wenatchee, Wash., on Pacific flight.

for 24 hours and drenched the huge crowd that waited their arrival, Post and Gatty made their only landing in Canada. Enterprising National Broadcasting Co. officials had arranged with Pathé films, through a subcontract, to carry the fliers' voices to the American radio public. Prodded by the questions of announcers, they told little snatches of their experiences, said they "weren't so tired" and that "we expect to be in New York tomorrow night."

And in New York they were on the following evening, after an all-day flight from Edmonton, where Post whipped the plane off a concrete highway adjoining the airport rather than risk the muddy field, then refueled in Cleveland in late afternoon, to push on to Roosevelt Field, their starting point, before dark. Ten thousand New Yorkers, stirred to a higher pitch than at any time since the news of Lindbergh's landing in Paris was screamed by excited newsboys in Times Square, waited at Roosevelt Field.

The swift-flying "Winnie Mae" came out of the West as the sinking sun turned the cloud-fleeced sky into a brilliant pink back drop. A white flash in the sky, the plane tore past slow-flying biplanes, monoplanes and flying boats in the air, banked steeply and circled the field twice. Its wheels touched the ground at 8:47 P.M. (Eastern Daylight Time). The crowd broke through the police cordon, and carefully laid plans for an orderly reception went awry. Police clubs flew as the crowd claimed the smiling fliers.

Their time for the epoch-making world flight: 8 days, 15 hours and 51 minutes. It was without doubt the outstanding flight of the year, if not in the history of flight. It was a real tribute to the ability of the pilot and navigator, the plane and engine, the instruments and equipment and the careful, but unheralded, planning which spelled success.

They were royally fêted, received by New York's Mayor Walker, then by President Hoover, and their reception climaxed with a dinner in their honor given by the Aeronautical Chamber of Commerce of America in Hotel Astor. Their names were placed beside those of Lindbergh and Byrd, and their flight commemorated by the presentation of twin bronze plaques designed by Julio Kilenyi, New York sculptor, and struck by the Aeronautical Chamber of Commerce. Later they flew to Oklahoma, Post's home, to be lionized by the people of Chickasha who had built an airport to receive the fliers during the short time they had been away on their globe-girdling jaunt.

America Regains World's Distance Record

One of the world's most coveted aviation records—that for long distance without refueling—was brought back to the United States for the third time in recent years when Russell N. Boardman, one-time cowboy, motor-

cyclist and wingwalker, and John Polando, former garage mechanic, flew their Bellanca (Wright Whirlwind) monoplane "Cape Cod" from New York to Istanbul, Turkey, in 49 hours and 20 minutes.

With a heavy load of 718 gallons of gasoline and 21 gallons of oil, they pulled the "Cape Cod" up from the 4,200 foot concrete runway of New York's new Floyd Bennett Field in the early hours of July 28, headed up the New England coast and out over the well-traveled Great Circle course on a meticulously planned flight that was to place them in the Turkish capital and in possession of the record held by Major Dieudonne Coste and

NEW YORK HONORS GLOBE GIRDLERS

Wiley Post and Harold Gatty returned to a ticker-tape welcoming parade up Broadway after their world flight in 8 days, 15 hours and 51 minutes.

Maurice Bellonte of France. Coste and Bellonte flew 4,912 miles in 1930 on their non-stop flight from Paris across Europe and Asia. Italy had previously held the record when its brilliant fliers, Ferarrin and Del Prete, flew from Rome to Brazil, 4,456 miles without stop. Italy took the record from Colonel Clarence Chamberlin, who with Charles A. Levine, flew 3,911 miles from Roosevelt Field to Eisleben, Germany, in 1927. Chamberlin had bettered Charles A. Lindbergh's New York-to-Paris record of 3,610 miles made a few months before.

For two nights and a day, the "Cape Cod" was unsighted from land or sea, even when the fliers dropped a copy of the New York Times upon Le Bourget Field, marked for the president of the Paris Municipal Council.

Flying high above a solid blanket of clouds on most of their ocean flight, they kept a perfect course by instrument, hit Paris "on the nose," took a new bearing to cross the Alps, then sped through the Balkans to complete the crossing of not only an ocean, but a continent. The glasses of the American ambassador to Turkey and a group of Turkish officials with him picked out the yellow and black plane as it circled high above the Yeshilkeuy Airdrome at Istanbul, the first to see it since leaving New York.

Their new distance record was 5,011.8 statute miles, although they actually traversed 5,040 miles. For their superb piloting and navigation, for being the first eastward trans-Atlantic fliers since Lindbergh (1927) to reach their announced destination non-stop, President Mustafa Kemal Pasha presented the pilots with the highest awards of the Turkish Aviation Society, diamond-encrusted medals, previously awarded by twice: to Charles A. Lindbergh and to the Russian flier who spanned the Black Sea. The fliers were royally fêted, made numerous speeches in which they praised the new spirit of modern Turkey and shifted the credit for their flight to the Bellanca monoplane, Wright engine, Sperry and Pioneer instruments.

Rumors spread fast that they would fly on around the world, that they would attempt a trans-Pacific flight for the rich cash awards, that they would race Hugh Herndon, jr., and Clyde Pangborn, who left New York 17 minutes after them on a globe-girdling trip. The fliers put an end to the rumors when they announced that their job was done, their end accomplished, and that they were ready to fly to Marseilles, take a steamship for home. They returned to enthusiastic welcomes in New York, Boston and Washington after being what Boardman called "the first Americans to go to Europe without visiting Paris." "We must go there next," the fliers added.

First Non-Stop Pacific Flight

The North Atlantic had been spanned non-stop 14 times by airplanes; the Pacific not once. That was the situation in the middle of July when two teams of fliers set their eyes on the 5,000 mile trans-Pacific stretch. Several fliers had reached Hawaii from the United States; Kingsford-Smith flew on from Hawaii to Suva and Australia. United States Army and Soviet fliers had crossed Bering Sea over the route Post and Gatty took later, but the big money prizes for the first non-stop Pacific flight from Japan to the United States had withstood four attempts in two years.

Reginald Robbins, who captured the world endurance refueling record in 1929, and Harry S. Jones, bachelor sportsman and promoter who handled the refueling plane for the endurance flight, were the fifth challengers. In their Lockheed Vega (Wright Whirlwind) monoplane "Fort Worth," they climbed out of Seattle's Boeing Field July 8, kept a rendezvous with their tri-motored Ford refueling plane over Fairbanks, Alaska, that eve-

ning and took on 200 gallons of gasoline. Both flew to Nome, made a contact in a brisk wind to put 435 more gallons aboard the "Fort Worth" for the flight to Japan. After taking 300 gallons, the plane became unmanageable in the strong wind. They finally gave up, landed at Nome. Another attempt was made with similar results, bad weather and strong winds forcing the Texans to abandon the flight and the rich prize.

Two other fliers, Don Moyle and Cecil A. Allen, staked their faith in the huge monoplane in which Harold Bromley and Harold Gatty made an unsuccessful attempt to span the Pacific. Renaming the old "City of

IN MUD AT EDMONTON

Wasp-powered Lockheed Vega 'round-the-world plane "Winnie Mae" in the mud at Edmonton, Can., before last hop to United States.

Tacoma" as the "Clasina Madge" in honor of the daughter of the backer, John Buffelin, Tacoma lumberman, Moyle and Allen left Samishiro Beach, Japan, September 8, to fly to Seattle. They were sighted 110 miles from the starting point. They were not seen again. More than a week passed before they were found marooned on a small Siberian island, and rescued. The sixth challengers for the prize and the title of "first Pacific fliers" had failed.

The eyes of Hugh Herndon, jr., New York socialite, and Clyde Pangborn, old-time barnstormer, were on a bigger stake than the honor of being the first to cross the Pacific non-stop when they took off from New York's Floyd Bennett Airport on the morning of July 28th, chased after the

Istanbul-bound "Cape Cod'" which had left the same field 17 minutes before them. They were out to break the eight-day record of Post and Gatty for circling the globe. Their plane, the Bellanca (Pratt and Whitney Wasp) monoplane "Miss Veedol," was much slower than the "Winnie Mae," but it had a longer cruising range and Herndon and Pangborn could take turns at the controls while Post was required to fly without relief.

Herndon and Pangborn struck bad weather over the Atlantic, lost their way, and completed their trans-oceanic hop at Moylesgrove, Wales, in 31 hours and 42 minutes. They had planned to make Moscow the first stop, then push on. Instead, they stopped at Croydon, near London, for fuel; and made another stop at Berlin. They were then 21 hours and 28 minutes behind Post and Gatty's schedule, but were confident they could make up the time over Siberia.

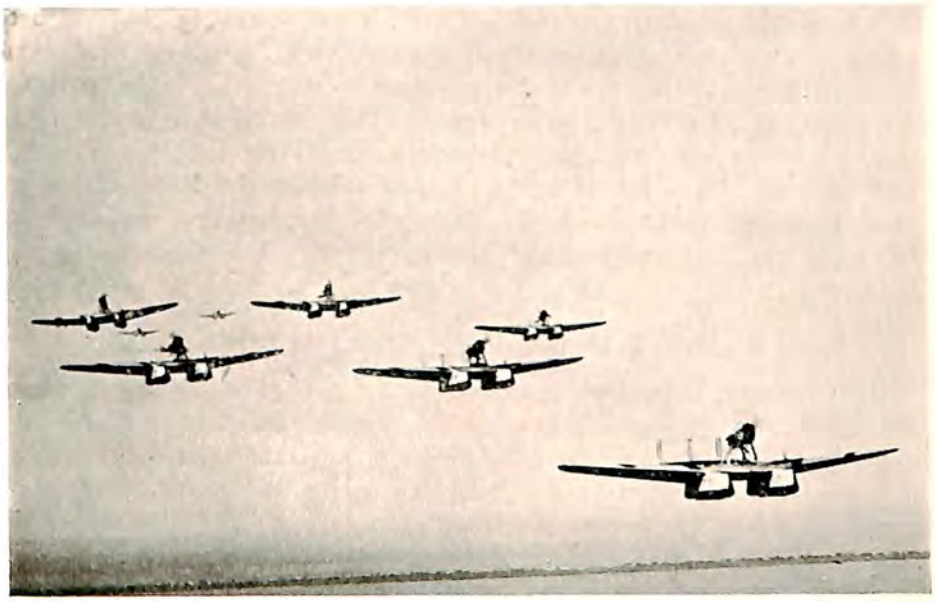
They cut their stay in Berlin short and left only 13 hours and 14 minutes behind the record time. They had cut two more hours from this margin by the time they left Moscow on the fourth day. They lost time in landing off their course at Jietiegari after crossing the Ural Mountains, but pushed on to Omsk. After three hours there, they headed East again but were 23 hours and 53 minutes behind the record schedule. When they left Chita, their next stop, they had lost a margin of six more hours. Fighting what they described as "the worst weather they had experienced," they finally reached Khabarovsk, damaging a wing in landing on the muddy airport there. They were then 27 hours and 22 minutes behind the record, although they had taken only 141 hours and 32 minutes for the flight from New York. Further delays caused by bad weather and necessary repairs to their plane, forced them to abandon their attempt to break the record.

Telegrams from Tokyo urged them to come to Japan and attempt a non-stop trans-Pacific flight for the $25,000 prize offered by the Japanese newspaper, Tokyo Asahi. Bitterly disappointed because of their failure to break the record, Herndon and Pangborn decided to continue their world trip with a stop in Japan to get a fresh start for the trans-Pacific honors. They became the seventh challengers. They telegraphed the American Embassy in Tokyo for permission to fly over and land on Japanese soil, a side-trip they had not planned in applying for their original permits; but neglected to wait for a reply before taking off.

At Tachikawa Airport, the fliers were met by a squad of Japanese police, headed by a highly indignant chief of foreign police. They were questioned for their permits, asked to trace their route on the map, asked if they had taken photographs. Herndon and Pangborn answered all questions unhesitatingly. They had flown over Tsugaru Strait, which is fortified; the naval post at Ominato; the concealed fortifications near

Tokyo Bay. They had landed for a few minutes at a new airport at Hanedo, not yet opened to traffic. All were forbidden areas, and they had taken motion pictures of them!

Days and days of questioning followed, during which the fliers were treated courteously but held virtual prisoners. In vain the fliers protested that they had not intended to photograph forbidden areas. The judge fined each $1,025—$1,000 for violating Japan's civil laws by flying over the country without a permit, and $25 for photographing forts. Permission for them to leave the country by air was held up. They watched



SPAN ATLANTIC IN FORMATION

Nine of the Italian squadron of Savoia Marchetti S-55 (Fiat) flying boats seen in formation on their flight across the Atlantic.

Moyle and Allen prepare for and set out on the flight they hoped to make. When Moyle and Allen were reported lost, further objections to the granting of Herndon and Pangborn's permit were pressed. Finally, permission was granted for one attempted take-off. If they failed, they must return to the United States by steamship.

It was something of an anti-climax to their experiences when they got off from Samishiro Beach, 280 miles north of Tokyo, October 3. Soon after they headed over the ocean, Herndon cut a wire which let the plane's landing gear drop into the sea, reducing the load by 300 pounds and the head resistance by 17 per cent. It meant that when the plane landed, they must come down on the fuselage, which was strengthened with metal strips.

If they could make Salt Lake City, they would set a new distance record, bettering the New York-Istanbul flight of Boardman and Polando. They did fly as far as Spokane, but turned back and landed at Wenatchee, Wash., completing the first non-stop Pacific flight and one of the longest trips in history, 4,558 miles in 41 hours. The ship landed on its iron belly, slid along in a cloud of dust, tipped up on its nose. The propeller snapped, but the plane settled back with a thud. The fliers were not scratched. As they crawled out of the plane, they were met by a representative of the Tokyo Asahi, waving the coveted $25,000 prize check.

With a new landing gear and propeller on their plane, Herndon and Pangborn started a leisurely trip across the country, timing themselves to arrive at their starting point, Floyd Bennett Field, Sunday, October 18, during the Four-Field Flying Show staged by the aviation industry for the benefit of New York's unemployed. They ended their world flight just 82 days after the start, adding their names to the list of world fliers and with the distinction of being the first to span the Pacific non-stop. Japan hailed the flight as a great achievement, but Japanese officials failed to lift the ban forever prohibiting Herndon and Pangborn from flying over Japanese territory.

British Raise World Speed Records

England won permanent possession of the Schneider Trophy, September 13, without a contest. Those last three words spelled bitter disappointment for Great Britain's gallant Schneider team, which had spent months of hazardous preparation for the great race only to have their competitors, France and Italy, drop out at the last minute due "to bad weather, ill luck and the loss of pilots and machines." The zest of real competition gone, the British pilots had a difficult time spurring themselves on to a superior performance. Lady Houston, who had made the British entry possible when she donated $485,000 to cover expenses which Prime Minister Ramsay MacDonald refused to approve, was likewise disappointed, although the tens of thousands who crowded vantage points on the Solent would never have known it from the gayety of her flag-bedecked yacht on the day of the race.

That brown-eyed, boyish-faced Flight Lieut. J. H. Boothman and lanky, sober-faced Lieut. George H. Stainforth did turn in superior performances was without question. Rain, a heavy fog, and rough water on the scheduled day of the race, September 12, only added to the fliers' disappointment, but the following day was perfect for speed flying.

After completing taxiing trials, Flight Lieut. Boothman took his Vickers Supermarine (Rolls Royce) S-6B off the water at Calshot in a wall of spray. In another few seconds he was darting over Ryde pier on the first lap of the triangular course. To those on the ground directly beneath the

path of the plane, its passing was marked by a rumbling that seemed to shake the earth and set the spectators' nerves to tingling. To those who saw it from a distance, the sharp sound was trailing the machine by more than a mile, so fast was it flying. The first two laps were fastest, averaging 342.9 miles an hour. When he crossed the finish line and shot his plane skyward to lose speed for a landing, his average time for the Schneider course was 340.08 miles an hour, a new record for all time. The best previous time made by the British in 1929 was 328.6 miles an hour. Boothman brought his ship in at Calshot, making the hazardous landing at

ITALIAN AIR MINISTER LEADS

General Italo Balbo commanded the trans-Atlantic flight by radio from his place in the leading plane of the formation.

about 110 miles an hour. He had won permanent possession of the Schneider Trophy for Great Britain.

The world's straightaway record for three kilometers, the ultra-ultra in speed courses for airplanes, was always closely allied with the Schneider race although it was not a part of it. Squadron Leader A. H. Orlebar set a new world speed record of 357.7 miles an hour following the 1929 Schneider contest, and it remained only for England to raise this a notch or two with its new machines, the S-6Bs.

Lieut. Stainforth attacked Orlebar's record following Boothman's performance, diving six times across the short course to average 379.05 miles an hour and reach 388.6 miles an hour on his fastest lap, a new achievement

for man in the air. But another opportunity awaited him later in the week when a specially built Rolls Royce engine, burning a mixture of refined gasoline, wood alcohol and ethyl, and developing more than 2,600 horsepower, was to be installed.

Into a gusty sky, Lieut. Stainforth took off on September 29 for his attempt to break his own world record and raise the British speed to a height which would challenge the genius of other nations for several years, at least. He dived across the starting line at about seven miles a minute, 100 feet above the surface of the water. Electric timing cameras caught the shadow of the plane as it flashed back and forth. Spectators watched nervously as he made a landing at more than 100 miles an hour in a choppy sea. "I believe I've broken the record," he said quietly and without a smile, then went to the officers' mess.

When the timing films had been developed and inspected early the next morning, officials found him playing "shove ha'penny" in the messroom. They told him his average time was 408.8 miles an hour, his best lap was 415.2 miles an hour. "I thought I'd done it," Stainforth said undemonstratively, then turned back to his game. Later official announcements placed his record at 406.997 miles an hour, with his fastest lap at 409.5 miles an hour.

It was doubtful whether another British flier would soon raise the record, principally because the government did not favor a continuance of the high speed program while many experts advised the pondering of lessons learned in the Schneider ships applying them to every-day types. The Schneider ships themselves were considered without value, except as a highly developed experimental laboratory. Stainforth's engine at its world record performance speed could not last more than 40 minutes to an hour. It, nevertheless, signalized another milestone of man's achievement in the air.

Italian Squadron Spans South Atlantic

One of the greatest mass flights in history and the first formation flight across an ocean was achieved by the Italians when a squadron of 10 Savoia Marchetti S-55 (Fiat A-22) flying boats reached Rio de Janeiro, Brazil, on a 6,450 mile flight from Orbetello, Italy, in seven hops including the spanning of the South Atlantic from Bolama, Africa, to Natal, Brazil, 1,875 miles.

Long one of Premier Mussolini's dreams—the spanning of the Atlantic by an entire formation of planes flying with military precision—the flight was headed not by an over-enthusiastic flight officer, but by the Italian Air Minister, General Italo Balbo. They left Italy with a squadron of 14 flying boats December 17 after months of planning and preparation for what was to be a "dress rehearsal for a later North Atlantic flight to the United

States." The first of the year found them off the coast of Africa, ready for the ocean hop.

Up from the waters off Bolama on a dark, moonless night, over a sea whose surface they could not see, over a maritime mirror whose horizon was invisible, the squadron took off in groups of three. The first group of three black-winged ships, led by General Balbo himself, vanished into the night, followed by a green-winged triad. Next came the red wings, but the third plane of that group faltered under its 10,000 pound load, nosed down into the sea, killed its mechanic. The last triad, white-winged, was in the

VIKINGS OF THE AIR

Parker D. Cramer (right) and Oliver Paquette who were lost after proving the feasibility of the Transamerican Airlines' Atlantic route.

air ten minutes when its second plane crashed, burst into flame, sank with its crew of four. General Balbo learned their fate by radio, but led on. Before leaving Orbetello, near Rome, the young air minister told his chief, Benito Mussolini, that he foresaw the loss of three machines, would consider the flight successful if only six reached Natal safely. Within an hour after the crashes, two spare planes left Bolama, had taken off in pursuit of the squadron to replace their fallen brothers.

Through floating clouds, dimly illuminated by the full moon which General Balbo had awaited, the planes flew south and west—never losing their positions in the close formation—across the narrowest neck of the South Atlantic, checking their course by radio with the seven Italian

cruisers strung along the route 225 miles apart. Radio kept General Balbo informed at all times. In mid-morning one of the replacement planes buckled under the strain, reported itself down with a leaky radiator near St. Paul's Rocks, 500 miles from its destination, where a cruiser promptly picked it up. The other replacement, too, flew with a leaky radiator for seven hours, finally came down 100 yards from a convoy cruiser. One of the planes forced down was sunk later in collision with the cruiser towing it. Balbo's prediction was fulfilled: although four planes came down, three were wrecked.

At the end of 17 hours and 10 minutes, the "black star" triad glided through a driving rain onto the Potengy River at Natal, to the cheers of a great throng of drenched Brazilians. On their tails came the green-wing triad; 25 minutes later the formation of surviving red and white wings. Rome went mad with joy, and the government let the crowds celebrate a full day before divulging the fact that five fliers had been killed in the flight, three ships lost and one disabled.

To Mussolini, the flight was a huge success. Fifty-one men and ten machines had successfully negotiated the Atlantic in a single formation flight. Balbo was given the honors of a returning conqueror, fêted at every turn, his achievement applauded by tens of thousands of loyal Italians who lined the streets as he paraded with his flying companions in Rome. The flight, Mussolini announced, presaged a longer and more important formation flight to the United States as the next achievement.

Do-X Spans Atlantic; Reaches New York

When the world's largest airplane, the Dornier Do-X, alighted on the waters of New York Harbor shortly after noon August 27 with 70 passengers aboard, the great air liner finished a 12,000 mile trip that took ten months and extended from Lake Constance on the German-Swiss frontier through Holland to England, France, Spain, Portugal, down the west coast of Africa, across the South Atlantic, down the South American coast to Rio de Janeiro, then up through the West Indies to Miami, Charleston, Norfolk and finally New York.

The trip was so widely heralded and so beset with minor difficulties which promoted the creation of major rumors that it caused widespread comment. But none of the thousands who thronged the Battery to get a glimpse of this new giant of the sky at the end of its long journey failed to be inspired with the sight. It was the second trans-Atlantic flying boat to glide into the busy waters of the Upper Bay, Von Gronau having completed his North Atlantic crossing from Germany there in 1930. But Von Gronau's ship was but a toy in size compared with this 53-ton giant of metal and fabric with its crew of 17 and passenger accommodations for 70 to 100.

The highlights of the Do-X's history-making journey was its crossing of the South Atlantic to Natal, Brazil, from the west coast of Africa, finally justifying the presence of the horseshoe which hung in the navigation room of the great ship. After a short flight from Bolama, Portuguese Guinea, West Africa, to Cape Verde Islands, where it remained a week, the Do-X made its longest flight of 1,400 miles to Fernando Noronha Island, made a landing there in the dead of night, 200 miles off the Brazilian mainland. It then made a short hop to Natal on the mainland. Beside Capt. Friedrich Christiansen, the Do-X carried 12 persons on the

CONTINUE ARCTIC SURVEY

Two Transamerican Airline pilots, E. L. Preston (left) and R. H. Collignon, continue work of Parker and Cramer in Packard Diesel Stinson.

Atlantic lap, including the Portuguese Admiral Gaga Coutinho, long-forgotten as the first flier to span the South Atlantic.

With a new captain, Fritz Hammer, and later joined by the American co-pilot Lieut. Clarence H. Schildhauer, the Do-X proceeded up the east coast of South America, through the West Indies to receive great ovations from Americans in Miami, Charleston, Norfolk and New York. The crew received medals from the hands of Mayor Walker, was greeted by President Hoover, and heaped new praise on the performance of the American-built Curtiss Conqueror engines every time the subject was mentioned. With the exception of the breaking of an aluminum crankcase casting on one of the motors after the South Atlantic flight, the engines functioned perfectly

throughout the trip, had no part in delaying the giant ship on its 12,000 mile cruise.

Doolittle Breaks Transcontinental Record

When Capt. Frank M. Hawks, superintendent of the aviation division of the Texas Company, sped across the continent in 12 hours, 25 minutes and 3 seconds, August 13, 1930 with his Travel Air (Wright Whirlwind) "Mystery Ship," he turned his attention to new worlds to be conquered, spending most of 1931 in setting up new inter-city records in Europe and the United States.

Hawks' record, however, did not withstand the well-planned attempt of Major James H. Doolittle of Shell Petroleum Company to capture it. Working in secret throughout the winter months, Doolittle planned his flight to cut Hawks' time and win the rich Bendix prize for the premier derby of the National Air Races.

The starter's flag dropped at United Airport, Burbank, Cal., at 5:35 A.M. (Eastern Daylight Time), September 4. In a scant 400 feet in his tiny Laird (Pratt and Whitney Wasp) biplane "Solution" was off the ground, hurdling the mountains, streaking through the still air of the Mojave Desert to make its first landing at Albuquerque, N. M. Another stop was made at Kansas City, then a dash across the midwest prairies to land in a splash of mud at Cleveland, refuel and continue on to New York, landing at the Newark Airport in 11 hours and 16 minutes elapsed time for the 2,882 miles. His average speed was just under four miles a minute. But his day's flying was not done, he headed west and landed in Cleveland little more than an hour later to claim his prizes.

In October, Doolittle shot his tiny ship from Ottawa, Canada, to Washington, D. C., to Mexico City on a three-capital flight in 12 hours and 36 minutes, setting another record that would offer real competition to challengers.

Hoiriis and Hillig Fly North Atlantic

Thirteen hours after Post and Gatty left Harbor Grace on their record world flight, a Bellanca (Wright Whirlwind) monoplane with red wings, the name "Liberty" and the crossed flags of Denmark and the United States on its sides, sped out across the Atlantic with no more serious purpose than to fulfill the desire of a 55-year-old German-born photographer and a youthful Danish-born pilot to visit their homelands and indulge in "some pigs knuckles, sauerkraut and beer."

In 1929, Otto Hillig, who amassed modest wealth as a summer resort photographer in the little town of Liberty, N. Y., after coming to America from Germany at 15 years of age, had tried to return home in a blaze of glory as a passenger aboard the "Graf Zeppelin." He had booked passage,

but somebody blundered and at the last moment Hillig was left out. He sought a writ to prevent the "Graf" from sailing, sued for $100,000 damages and obtained an out-of-court settlement, depositing the money in a Liberty bank.

Holger Hoiriis, a youthful barnstormer who had been in America seven years and had a secret longing to fly back to his home in Denmark, dropped into the field at Liberty, N. Y., months later and suggested that Hillig finance a trip with Copenhagen as the first stop. With the aid of friends, he scraped enough money together to buy a Wright-powered Bellanca for the journey.

NEW YORK-ISTANBUL NON-STOP

John Polando (left) and Russell Boardman in front of their Bellanca (Wright Whirlwind) monoplane "Cape Cod," world's distance record holder.

Unheralded, except in a joking way, the pleasure-bound pair set out from the Teterboro Field near Hasbrouck Heights, N. J., reaching the jumping-off point at Harbor Grace without trouble. Post and Gatty landed on the Newfoundland field a few hours later, and Hillig and Hoiriis helped to speed them on their way around the world, then turned to completing preparations for their own trip.

The weather over the Atlantic, none too good for the "Winnie Mae's" crossing, had not improved. The "Liberty" was forced to fly high over continuous cloud banks; finally land was sighted through a hole in the clouds. At first, it was thought to be England, then Spain, France or Bel-

gium. Ostend was picked out clearly and a short time later Hillig begged his Danish pilot to land on an airport they spotted beneath them. Hoiriis, fighting off sleep after 32 hours in the air, insisted they continue to Copenhagen, but Hillig finally persuaded him to land on the field, which they found to be Krefeld, Germany. The pilot fell asleep, while Hillig told a mechanic to "put in 50." Fifty liters of fuel were poured into the tanks, and Hoiriis took off for Copenhagen thinking he had 50 gallons. The engine sputtered and an emergency can was used to replenish the tanks sufficiently to make a landing on the airport at Bremen. Too tired to continue, they agreed to make their grand entrance into Copenhagen the next day. Knighted by the king and well filled with the objects of their visit, they left Copenhagen for Hillig's home at Gera, Germany.

Returning to an enthusiastic reception in Liberty, N. Y., Hillig soon sold his plane and returned to his photographic shop, saying that if he was remembered at all, he "desired to be remembered as the first man to fly across the Atlantic and then go back home and go to work."

First New York to Hungary Flight

Capt. George Endres, wartime flier in the Austro-Hungarian army, and Capt. Alexander Magyar, his pupil, longed to be the first to fly from the United States to Budapest. They met Emil Szalay, Flint, Michigan, sausage-maker, in the office of the Detroit Hungarian News, proposed the flight as a great demonstration of protest against the division of Hungarian territory by the Treaty of Trianon and to fulfill sausage-maker Szalay's long-standing promise "to do something good for the Hungarian people."

The Lockheed Sirius (Pratt and Whitney Wasp) monoplane "Justice for Hungary" was winging its way over the Atlantic July 15 after a stop at Harbor Grace. Szalay had mortgaged his salami factory for $20,000, had taken a steamship for Hungary to await the fliers' arrival. Additional funds had been raised through the sale of 5,000 postcards, which the plane bore as it sped over an ocean which its pilots did not see during their speedy 16 hour crossing.

Magyar obtained many radio bearings, hit the coast of France only a trifle off his course. They had estimated 26 hours flight to Budapest with two hours fuel to spare. But headwinds over Europe upset that. Just 25 miles short of their goal, at 12 minutes past the 26th hour, the engine gasped for gas. Endres landed the plane in a rough field, damaging the undercarriage and propeller. Had they been able to reach the Budapest airdrome, 25 miles away, they would have been the first trans-Atlantic fliers since Lindbergh to reach their announced goal non-stop, an honor which fell to Boardman and Polando on their record distance flight later in July. Another plane whisked them to the Matjasfoeld Airdrome, where, amid a great throng, waited Premier Stephen Bethlen and his cabinet,

sausage-maker Szalay, Endres' wife and son, and Capt. Magyar's aged mother who had not seen her son for five years.

While less spectacular than long distance flights across oceans and continents, world records for duration and distance over a closed course hold an equally important place in the list of coveted honors from the standpoint of the engineer. The year witnessed many successful attempts to break records in these categories.

America Recaptures World's Duration Record

Flying a Bleriot 110 powered with a Hispano-Suiza engine, Lucian Bossoutrot and Aime Rossi of France established a new world's record over

HEADED FOR HUNGARY

Captain Magyar crawls into the rear cockpit of his Lockheed Sirius (Pratt and Whitney Wasp) monoplane for non-stop flight to Hungary.

a closed circuit for distance at 5,468 miles and for duration at 75 hours and 23 minutes near Oran, Algeria, February 26 to March 1. Before the end of March, Jean Mermoz, South Atlantic flier, and Antoine Paillard were in the air with a new Bernard 80 (Hispano-Suiza) monoplane. On April 2, they landed after raising the world's distance record for the closed circuit to 5,679 miles.

Then two American pilots, Walter E. Lees and Frederick A. Brossy, stepped into the competition with a Bellanca Pacemaker, powered with a Packard Diesel engine, flying a monotonous course over Jacksonville, Fla., April 12 to 15, to establish a new American duration record of 74 hours

and 12 minutes, but falling short of the world mark by little more than an hour. Going up again with the same plane May 25, they stayed aloft 84 hours and 32 minutes without refueling, far surpassing the French fliers' record and bringing the duration honors back to America again.

On June 4 and 5, new world duration and distance records for seaplanes over a closed course were established by Lieut. de Vaisseau Paris and Lieut. Gonord of France, when they flew their Latécoère 28-3 (Hispano Suiza) seaplane 3,113.8 miles in 36 hours and 57 minutes over Arachon, France. Two days later, Joseph Le Brix and Marcel Doret, flying a specially-built Dewoitine (Hispano-Suiza) "Trait d'Union," failed to break the duration record captured by the Americans, but established a new world record over a closed circuit for distance at 6,441.881 miles, near Istres, France. In July, they attempted a flight in the same plane from Paris to Tokyo, but were forced to jump when their engine failed during the night over Siberia. Successful in their efforts to have François Coty, perfume manufacturer, finance an identically constructed ship, Le Brix, Doret and a mechanic, René Mesmin, headed East from Paris in September. Rain and fog forced them to fly low East of Moscow. After 20 hours, Doret bailed out, landed safely. Le Brix and Mesmin died in the crash, failed to complete their flight to break the record of Boardman and Polando for straight-line distance.

England to Australia and Africa Flights

British fliers, paying little attention to the possibilities for fame on long trans-oceanic or non-stop flights, continued to consider races against time from London to Australia and London to Cape Town their most fascinating field. Most of the flights were made with speedy, light planes.

Early in April, Lieut. Comdr. Glen Kidston of England, flying an American-built Lockheed Vega (Pratt and Whitney Wasp) monoplane, broke the record from London to the Cape in 6 days and 10 hours. In November, a 19-year-old London débutante, Peggy Salaman, with Gordon Store as co-pilot, reached Cape Town from London in her little Puss Moth (Gipsy III) monoplane in five and one-half days. The distance is 7,000 miles.

The London to Australia route received even greater attention from the record-seekers. While Kidston was on his way to South Africa in April, Charles W. A. Scott in a De Havilland Moth 60M (Gipsy II) was on his way to Australia to London to set a new record of 9 days, 3 hours and 40 minutes for the 11,000 mile flight. He broke Air Commodore Charles Kingsford-Smith's record of 9 days and 22 hours for the journey. Early in August, J. A. Mollison flew a ship similar to Scott's from Australia to London in 8 days and 21 hours, again lowering the record. He said it was "too far and too tiresome" to try again.

Scott, provided with another ship at the expense of Lord Wakefield, made the return journey in June from Australia to London in 10 days, 13 hours and 25 minutes, about 48 hours faster than Kingsford-Smith made the trip in the Fokker (Wright-Whirlwind) "Southern Cross."

Scott's eastbound record was broken November 9 when C. A. Butler, flying a diminutive Comper Swift with a 75 horsepower engine, arrived in Australia from London in 9 days, 2 hours and 29 minutes, cutting an hour and 42 minutes from the old record. Butler said his fuel bill was less than $150, since the little ship flies 24 miles to the gallon and has a

BREAKS TRANSCONTINENTAL RECORD

Maj. James H. Doolittle in the Laird Solution 400 (Pratt and Whitney Wasp, Jr.) biplane in which he crossed the continent in record time.

speed of 120 miles an hour. Butler wore carpet slippers to save the extra weight of shoes.

Women's Records Broken

The day before Mollison set out for Australia, Amy Johnson, former London stenographer who took up flying to escape the humdrum of office routine and became the "Empire's flying heroine," left London for Tokyo in a De Havilland Puss Moth (Gipsy III) with C. S. Humphries as mechanic. She completed the trip in 10 days to share with Miss Salaman the the year's honors for the longest flights undertaken by women.

Ruth Nichols, New York society girl, hoped to be the first woman to

fly solo across the Atlantic, but her hopes were crushed when her Lockheed Vega (Pratt and Whitney Wasp) monoplane crashed before she was able to start the Atlantic lap of her journey. She had previously set a new women's altitude record of 28,743 feet over the Jersey City, N. J. Airport, March 6, and a new women's speed record of 210.636 miles an hour near Detroit, Mich.

Early in January, Evelyn Trout and Edna May Cooper established a women's refueling duration record of 123 hours at Los Angeles, Cal., in a Curtiss Robin (Curtiss Challenger). Amelia Earhart claimed an altitude record for autogiros at 18,415 feet made at Willow Grove, Pa., with a Pitcairn (Wright Whirlwind) autogiro. Mrs. Mae Haizlip established a women's altitude record for light airplanes of 18,097 feet at St. Clair, Mich., in a Buhl Bull Pup (Szekely) monoplane. Mme. Maryse Bastie of France set a new women's distance record of 1,849.763 miles on a flight from Paris to Urino, Russia, in a Klemm (Salmson) monoplane.

Ruth Nichols lowered the women's distance record established by Mme. Bastie with a flight from Oakland, Cal., to Louisville, Ky., non-stop on October 25. The distance was computed as 1,966 miles, a new world record to be added to the laurels of her Lockheed Vega (Pratt and Whitney Wasp) monoplane.

Balloon Betters Airplane Altitude Record

With the world's altitude record for airplanes safely secured for the United States by Lieut. Apollo Soucek's flight to 43,166 feet in 1930, no effort was made by the United States or any other nation to better that mark for airplanes during 1931. However, Auguste Piccard, 47-year-old Swiss professor of physics in the University of Brussels, and Charles Kipfer, 20 years his junior, successfully undertook a trip into the stratosphere in a hydrogen-filled seven-foot sphere "CH-113," which carried the Swiss flag to a new height of 51,775 feet above Germany and Austria.

Their record exceeded that of Capt. Hawthorne Gray of the United States who reached 42,000 feet before death in the rare atmosphere overtook him. It also surpassed the mark made by Lieut. Soucek for airplanes. Its significance was confined to scientific studies of the upper atmosphere and stratosphere, which might point a way to their usefulness as a medium for flight.

"Graf" Spans Atlantic Six Times; "Akron" Sets Record

While activities in the lighter-than-air field are reviewed fully in another chapter, it is interesting to note here that the "Graf Zeppelin" continued to span oceans and continents with such ease that dispatches concerning its movements obtained from three to 20 lines in American newspapers during 1931 as compared with columns in former years.

The "Graf" completed its eighth, ninth, tenth, eleventh, twelfth and thirteenth crossings of the Atlantic during 1931, making three round trips from Friedrichshafen, Germany to Pernambuco, Brazil, with mail, passengers and express on a commercial schedule. The eighth crossing of the Atlantic—the 216th flight in its log—was the first non-stop trip from Germany to Brazil, August 29 to September 1, made in 71 hours. The return to Germany, September 4 to 7, was made in 81 hours.

The second round trip to Brazil was achieved in a 69 hours westward flight, September 18 to 20, and a 79 hour eastward flight through rains,

WINS BENDIX TROPHY RACE

Major Doolittle, certain of the Bendix trophy prize, refuels at Cleveland to continue flight to New York to break coast-to-coast record.

September 25 to 28. The third round trip was made with the westward journey, October 17 to 19, a two-day cruise to Rio de Janeiro, October 21 and 22, and the eastward flight, October 23 to 26. This completed the thirteenth crossing of the Atlantic and the sixth non-stop flight from Germany to South America. The "Graf" also made an excursion into the Arctic earlier in the year with a group of distinguished scientists aboard.

The new American sky queen, the U.S.S. "Akron," captured the honor of carrying the largest number of persons into the air when 207 persons were taken aloft on a 10 hour flight from Lakehurst, N. J. This exceeded the record made by the Dornier Do-X when it carried 169 persons on an

hour's flight over Lake Constance, the largest ever carried by any heavier-than-air or lighter-than-air craft.

Lindberghs Fly to Tokyo

Early in June, Col. Charles A. Lindbergh telephoned the State Department in Washington and said that Under-secretary Castle might announce that Colonel Lindbergh and his wife would fly to the Orient—"if the press was interested." The press was interested. In fact, clippings collected in the Aeronautical Chamber of Commerce library on important flights of the year showed that the Lindberghs' flight to the Orient received more columns of publicity in New York newspapers than any other flight of the year including the remarkable world flight of Post and Gatty, the trans-Pacific flight of Herndon and Pangborn, the New York to Istanbul distance record and others.

This, despite Lindbergh's insistence that he and Mrs. Lindbergh were only on a vacation flight, which "had no start or finish, no diplomatic or commercial significance, and no records to be sought." Flying a Lockheed Sirius (Wright Cyclone) monoplane, equipped with new rudder-type Edo floats, the Lindberghs made farewells in Washington, New York and at North Haven, Me., where Charles Augustus, jr., was left in the care of relatives. They flew to Ottawa, Moose Factory, Churchill, Baker Lake and Aklavik in Canada; Point Barrow, Shishmaref, and Nome in Alaska; Petropavlovsk in Siberia; on through the Kurile Islands to Tokyo, Japan. Everything went well until they reached the storm-swept Kuriles where a series of minor troubles delayed them, marred the Lindbergh legend. After being fêted in Japan, the Lindberghs flew to China, aided in flood relief work, took a ducking in the chilly waters of the Yangtze River at Hankow when their plane capsized as it was being lowered from the British Aircraft Carrier "Hermes." News of the death of Mrs. Lindbergh's father, Senator Dwight W. Morrow, a few days later caused the abandonment of their vacation trip and immediate return to the United States. They arrived home in New Jersey October 23 after a speedy 39 hour trip from the Pacific coast in a borrowed Lockheed Vega (Pratt and Whitney Wasp).

Hawks Leads Inter-City Speed Fliers

Captain Hawks' speed dashes in his Travel Air (Wright-Whirlwind) low-winged monoplane "Texaco 13" brought him recognition during 1931 by the Ligue Internationale des Aviateurs, world-wide pilots' organization, which selected him as the world's outstanding airman for 1930. The league's medal was presented to him in Paris during the French Colonial Exposition after Hawks had set Europe to buzzing about his achievements as a flying epicure—arising in Paris, breakfasting in London, lunching in Berlin, and back to Paris for dinner. The Old World had justly

prided itself on the achievements of its Schneider fliers—breaking world records over relatively short courses—but it had not a single machine that could stand long flights day after day with the same engine at speeds above 200 miles an hour.

Hawks' flights between Old World capitals at record speeds, therefore, were all the more spectacular. His best record times during a 20,000 mile tour of Europe which included 11 countries were: Paris to London, 218 miles, in 59 minutes, April 23; London to Berlin, 620 miles, in 2 hours and 57 minutes, May 12; Stockholm to Malmo, 320 miles, in 1 hour and 30

SHIP, ENGINE AND FUEL

Bellanca (Packard Diesel) monoplane with the tins of oil which kept it aloft for a new world's non-refueling record of 84 hours.

minutes, May 21; Malmo to Paris, 650 miles, in 3 hours and 15 minutes, May 21; Copenhagen to Amsterdam, 460 miles, in 2 hours and 30 minutes, June 1; Paris to Rome, 700 miles, in 3 hours and 30 minutes, June 10; Budapest to Rome, 650 miles, in 3 hours and 30 minutes, June 12; London to Rome, 950 miles, in 4 hours and 38 minutes, June 17; and Rome to London, 950 miles, in 5 hours, June 17. He broke his own records on the latter two flights before preparing to sail for Canada.

Flying from Montreal to New York, 350 miles, upon his return to the United States, July 7, Hawks set another inter-city record in 1 hour and 45 minutes. Two weeks later, he made a round trip flight between New York and Havana in one day, making the journey southward in 8 hours and 8 minutes and northward in 7 hours and 30 minutes. Other inter-

city records which he set up after his return were: New York to Binghamton, N. Y., 160 miles, in 35 minutes, August 1; Wheeling to New York, 390 miles, in 1 hour and 45 minutes, August 4; New York to Chicago, 750 miles, in 4 hours and 4 minutes, August 12; Chicago to New York, 3 hours and 20 minutes, October 5; and Memphis to New York, 975 miles, in 4 hours and 50 minutes.

With two major flights to his credit during 1931—one of them Captain Hawks' favorite transcontinental speed course—Major Doolittle also made some fast inter-city flights in his little Laird (Pratt and Whitney Wasp)

FLY ATLANTIC FOR SAUERKRAUT

Otto Hillig, photographer, and Holger Hoiriis, pilot, over New York in the Bellanca (Wright Whirlwind) monoplane "Liberty" on Atlantic hop.

speed plane. Among them: Mexico City to St. Louis, 1,500 miles, in 6 hours and 35 minutes flying time, October 26; Indianapolis to Chicago, 166 miles, in 46 minutes, September 27; St. Louis to Indianapolis, 240 miles, in 52 minutes, September 26; and New York to Memphis in 4 hours and 57 minutes, September 21.

James Goodwin Hall flying his Lockheed Altair (Pratt and Whitney Wasp) monoplane "Crusader" made strong bids for inter-city record honors, taking several of Hawks' records during the year only to have the major ones retrieved by Hawks when he returned from Europe. Hall's record for spanning the United States from Mexico to Canada, made in the spring, was bettered by James Wedell when he flew his Wedell-Williams Special (Pratt and Whitney Wasp) from Agua Caliente, Mexico,

to Vancouver, B. C., December 1, in 6 hours and 40 minutes, clipping an hour and eight minutes from Hall's record. Capt. Hawks also had his eyes on this record near the close of the year.

Expeditions Seeking Northeastern Passage

When Capt. Wolfgang Von Gronau and his three companions at their five-year-old Dornier Wal (2-B.M.V.) flying boat on the waters of New York Bay just off the Battery in 1930, serious attention was focused on the possibilities of a northeastern passage to Europe from the United States

"Flight"

BRITISH CAPTURE SCHNEIDER TROPHY

Vicker Supermarine S-6B (Rolls Royce R) seaplane being towed back to Calshot after winning trophy at 340.08 miles per hour speed.

through the sub-Arctic. Von Gronau had made the flight without the sanction and support of the German government or his employers. In fact, the first two laps were made before the other three members of the crew were informed that they were on a trans-Atlantic flight.

Flying with the cooperation and financial support of the Deutsche Luft Hansa, Von Gronau and his same crew repeated their flight from Germany to the United States between August 8 and September 1, 1931, flying from Lyst on the Island of Sylt to Chicago's lakefront, 4,913 nautical miles, in 57 hours and 13 minutes flying time. Von Gronau's companions were his three students: Eduard Zimmer, co-pilot; Franz Hack, mechanic; and Fritz Albrecht, radio operator. They became the first fliers to make two successful crossings by air from Europe to America.

With its executives' eyes fixed on the possibilities of this same route for trans-Atlantic mail and passenger service on regular schedule, Transamerican Airlines Corporation early in 1931 quietly inaugurated plans for an overland route between the United States and Europe. With a world-noted advisory staff, it mapped out the 4,369 mile Transamerican route extending from Detroit to Copenhagen by way of Canada, Baffin Island, Greenland, Iceland and the Faroe Islands.

Parker D. Cramer, noted Arctic flier, and Louis Oliver Paquette of the Canadian Government Radio Service, were chosen to make the initial flight survey. All details of the plan were kept secret to prevent confusion of this working survey with the spectacular. Cramer and Paquette left Detroit in July, visited Canada, Baffin Land and flew over the hitherto uncrossed Greenland ice caps before the newspapers learned of their flight. They went on, investigated conditions in Iceland and the Faroe Islands. Then, on the last and easiest lap of their survey, after having demonstrated the feasibility of the Transamerican air route to the satisfaction of their backers, they were lost in a storm and perished.

Two air mail pilots of Transamerican Airlines, Lieut. Edwin L. Preston and Robert H. Collignon, continued the survey with a pontoon-equipped plane, until lack of fuel in the northern regions together with the approach of the Arctic freeze-up, made temporary suspension of the survey advisable. At the end of the year, Transamerican Airlines was proceeding quietly with plans for further investigation of this route to Europe.

Hinkler Spans South Atlantic

Just as the United States and Germany hoped to develop a satisfactory sub-Arctic route between the two continents, so had several nations of Europe kept a firm eye fixed on the possibilities of speeding mail and express across the narrowest neck of the South Atlantic between Africa and Brazil. The route had been crossed many times from East to West, not once from West to East.

Bert Hinkler, whose flights between England and Australia won him the acclaim of the British Empire, disclosed none of his plans when he flew from New York to the Island of Jamaica, a British possession in the Caribbean, on a non-stop journey in his diminutive Canadian-built Puss Moth (Gipsy III). A few days later he hopped to Trinidad, then continued into Brazil, where he was held by police for lack of identification and landing permits, and then suddenly hopped off on the first successful West-to-East flight across the South Atlantic. He flew the 1,600 miles between Natal, Brazil, and Bathurst, near St. Louis, Senegal, Africa, in 25 hours and 5 minutes. Aeropostale officials, who aided Hinkler in final preparations for the take-off, hailed the flight as another milestone toward regular South Atlantic airplane service.

CHAPTER IX

AIRPORTS: TERMINALS OF THE AIRWAYS

Spend Twenty Million Dollars For Operation and Expansion—Traffic Steadily Increases—Newark, Camden, Cleveland and Chicago Lead—Study Small Airport Problems

STIMULATED by the rapid growth of air transport lines during 1931, municipalities and private initiative sought to supply the needs of this growing system with adequate terminals and to provide a comprehensive system of airports for the private and industrial flier as well. While the total amount expended during the past year did not reach that spent during 1930, when scores of major projects were completed, it was commensurate with the needs of the rapidly expanding transport lines.

Nearly $20,000,000 was spent for the operation, construction, expansion and improvement of airports in all sections of the country during the year, nearly $14,000,000 of which was expended for new construction and expansion and the remainder for maintenance and operation. These figures were obtained by the Aeronautical Chamber of Commerce in a special annual survey for The Aircraft Year Book obtained from reports of more than 200 typical airports and computed to include the 760 most important ports of the country. This list of nearly 800 airports, which excludes intermediate, auxiliary and poorly conditioned fields, may be found in the Aeronautical Directory section of this volume. It is compiled by states and gives the name of the manager of each port.

The Department of Commerce listed 2,034 ports, including auxiliary and intermediate fields, in the United States at the close of 1931. The total investment in these widely scattered ports, many of them owned by states, municipalities or counties, some of them federally maintained, and scores of them the products of private initiative, was estimated to be well over $225,000,000. This list of more than 2,000 ports included 645 municipal airports, 663 commercial ports, 364 intermediate fields, 51 Army stations, 12 Navy bases, and 294 marked auxiliary fields. The Aeronautical Chamber of Commerce estimated on the basis of new construction projects reported to it for 1932 that at least $6,760,000 would be spent in further construction and expansion.

The survey showed that 5,469,862 landings were made on the 760 major ports during 1931, an increase of about 500,000 over the 4,961,950 landings reported in 1930. The report on total number of scheduled air transport passengers handled at these ports jumped from 1,475,348 persons in 1930 to 1,643,708 passengers in 1931. The total number of passengers carried from these ports in chartered planes ,private planes and in student instruction, however, fell from the 1930 figure of 3,799,099 persons to 2,785,436 passengers in 1931.

Strict economies were effected in the maintenance of most ports, as will be seen from the 1931 total maintenance cost of $5,350,855 as compared

BIRMINGHAM'S NEW AIRPORT

Southern colonial style terminal building on Birmingham's new municipal airport with American Airways' plane being loaded.

with $7,669,570 in 1930. That the managers of these ports hoped to make further economies in the maintenance of the fields during 1932 could be seen from the fact that they estimated 1932 maintenance costs at $3,454,076. It was interesting to note that the actual maintenance expenditures for 1931 were about $675,000 under the estimates made by their managers late in 1930. While there was a wide range in maintenance costs of the 750 airports, varying for the largest municipal terminal to the smallest commercial field, the average maintenance cost was $7,031 in 1931, about $965 under the estimates for the year. The average maintenance cost for 1932 was estimated at $4,539, a considerable saving. The proposed expansion pro-

grams for 1932 contemplated an average expenditure of $25,208 per airport.

The past year saw 20,880 acres made available in new landing area, either as additions to existing fields or in new ports completed during 1931. This was almost 10,000 acres less than the amount added during the extensive expansion period in 1930. The Department of Commerce, under its program of airway development, maintained 31,683 miles of domestic airways, of which 17,500 miles were lighted. Approximately 3,000 miles of lighted airways were added to the system for night flying during 1931. Other activities of the Airways Division of the Department of Commerce in providing new beacons, navigational aids and new intermediate fields

LOBBY OF NEW ALABAMA PORT

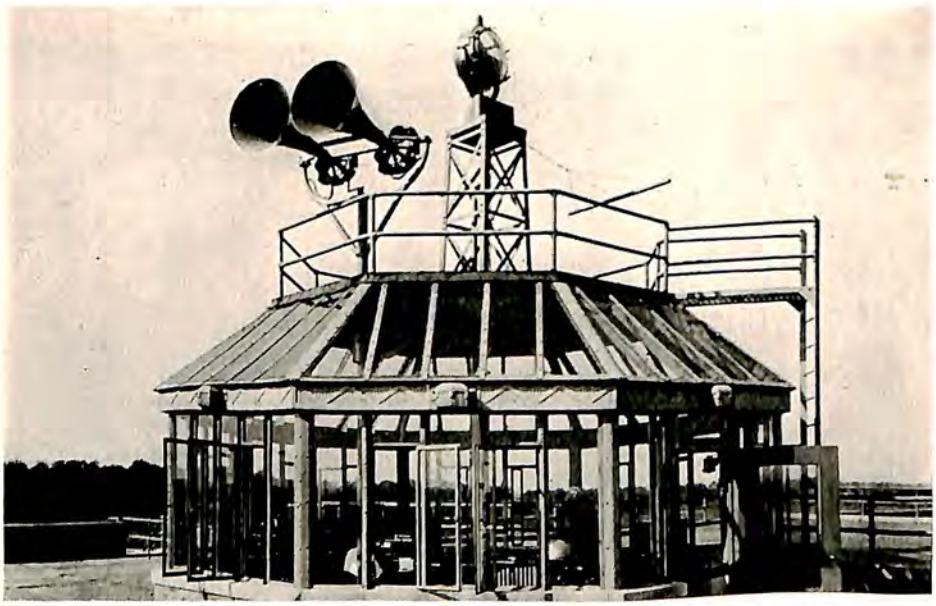
Interior of the terminal building on the new Birmingham, Ala., municipal airport showing the furnishings of the passenger lobby.

are discussed in another chapter devoted to the work of the Department of Commerce Aeronautics Branch.

The Aeronautical Chamber of Commerce survey embracing written reports from more than 200 principal airports showed that the six most important air traffic centers in the United States during 1931 were Newark Municipal Airport at Newark, N. J.; Central Airport at Camden, N. J.; Cleveland Municipal Airport at Cleveland, O.; Chicago Municipal Airport at Chicago, Ill.; San Francisco Bay Airdrome at Alameda, Cal.; and the Tulsa Municipal Airport at Tulsa, Okla. Tulsa stood at the head of the list in 1930 and Newark was eighth. Traffic at these six principal American

airports was heavier during 1931 than that on any of the major commercial airports of Europe, including London's Croydon, Berlin's Tempelhof, or Paris' Le Bourget.

The Newark Airport was handling 118 regular transport schedules a day at the close of the year, with as many as 134 daily during the height of the season. More than 25,000 landings were made with 106,000 transport passengers, 3,400 non-scheduled passengers, 1,527,547 pounds of mail, 15,872 pounds of express, and 25 students soloed. The Newark port was handling 400 passengers daily at the opening of 1932. Extensive con-



TRAFFIC CONTROL TOWER

Operations officer's voice can be heard more than three miles through address system in control tower of Wayne County Airport, Detroit.

struction work was completed during 1931, including the addition of 30 acres in area, lengthening the runways 1,000 feet, and the building of passenger terminals and hangars for National Air Transport, Inc., Eastern Air Transport, Inc., and the New Jersey National Guard, as well as a new restaurant seating 100 persons.

In point of number of transport schedules operating from the port daily, the Central Airport at Camden reported an even larger number than Newark, with 146 transport planes per day. While no record of mail or express was kept, 25,550 landings were reported for 1931 with 137,000 scheduled transport passengers passing through the field, 30,000 of which were handled through the station. An additional 27,000 non-scheduled

passengers and 78 students under instruction were reported. Extensive improvements, including the adding of 90 acres of land, the installation of a new 5,000,000 candlepower auxiliary floodlight and a wind tee showing automatically wind velocity, were under construction at the close of the year.

The Cleveland Municipal Airport reported 54,750 landings during the year, exclusive of student activities, with 72,780 air transport passengers on scheduled air lines, 2,930,600 pounds of mail, and 547,500 pounds of express. Seventy-eight students were soloed on the port during the year.

24-HOUR DAY OPERATIONS

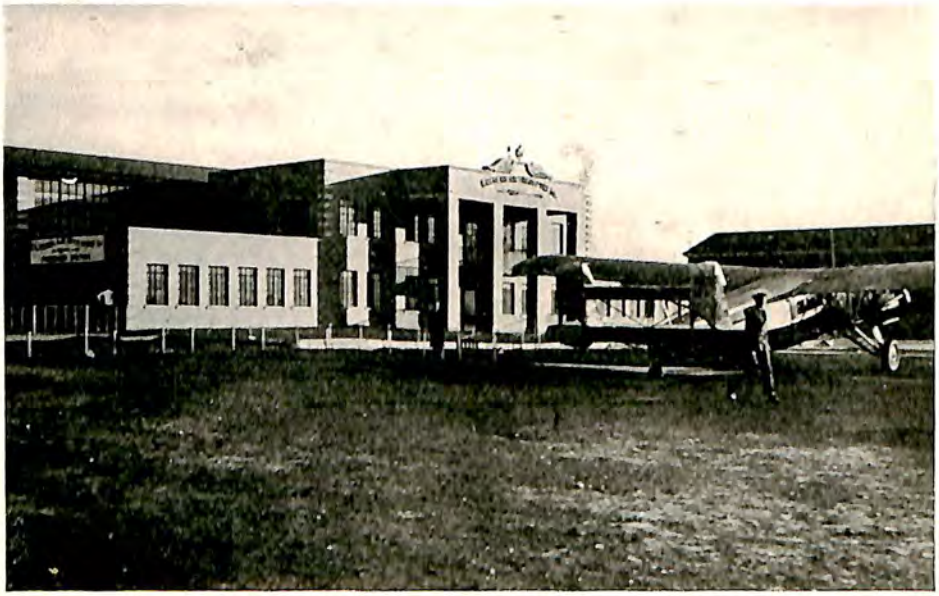
Night view of the Wayne County Airport at Detroit, showing flood lighting of the main hangar, revolving beacon and illuminated wind tee.

The National Air Races' administration building and permanent grandstand were constructed on the port at a cost of $100,000, but no other improvements were necessary on the 1,000-acre field, which was the largest in the world in size.

The Chicago Municipal Airport reported 36,867 landings with 48,593 scheduled air transport passengers, 4,555 non-scheduled passengers, 2,212,916 pounds of mail and 26,145 pounds of express. No students were instructed on the port, devoted exclusively to transport and charter operations. Chicago was by far the greatest terminal in the midwest, principally because of its strategic location. During 1931, 360 acres of land were added,

a new rolled cinder runway laid, a new administration building and passenger terminal constructed and three new hangars built.

The San Francisco Bay Airdrome at Alameda, Cal., one of the principal gateways by air to 'Frisco, recorded 34,960 landings during 1931 with 46,534 passengers on scheduled air lines and 22,862 non-scheduled passengers. No student instruction was permitted at the field, devoted principally to the 64 daily arrivals and departures of five major air transport lines operating from San Francisco. Two new rolled earth runways were completed and an addition built to present hangar facilities, which were due for considerable expansion in 1932.



NEW STATION AT NEWARK

Eastern Air Transport's terminal building on the Newark Airport with a Curtiss Kingbird (2 Wright Whirlwinds) in foreground.

The Tulsa Municipal Airport at Tulsa, Okla., reported 21,900 landings and take-offs during 1931 with 93,844 non-scheduled passengers, but no record of air line passengers was reported. In the three years and one-half that the port has been the center of transport activity in the Southwest, 270,000 persons were cleared from it without a scratch to a passenger. Its manager reported an operating profit of more than $10,000 for 1931.

The year witnessed the opening of several of the finest new airports yet constructed, including New York's new municipal port, Floyd Bennett Field, with the longest runways in the world; Birmingham's new $1,000,000 terminal; Indianapolis' fine new municipal airport; the Metropolitan Air-

port at Norwood, Mass., serving Boston; Rentschler Field at Hartford, Conn., and the Aberdeen Municipal Airport at Aberdeen, Wash. The Allegheny County Airport at Pittsburgh, Pa., designed to have the largest surfaced area of any port in the world, was nearing completion for formal dedication in 1932. The Shushan Airport at New Orleans, being constructed at a cost of $2,000,000, also was to be completed in 1932.

The Birmingham Municipal Airport, built at a cost of more than $1,000,000, covered 319 acres of land, with asphalt runways in the prevailing winds, complete night lighting equipment, a terminal building in Southern Colonial style, and the most modern hangar facilities. The port

WORK ON NEW PITTSBURGH PORT

Air view of the new Allegheny County Airport at Pittsburgh, scheduled for completion in 1932, with enormous surfaced areas for landing.

was formally dedicated and opened to traffic June 1, becoming a regular stop on the southern transcontinental mail and passenger route.

The Indianapolis Municipal Airport, built at a cost of $740,000, began operations February 16 and obtained the ninth A-1-A rating issued by the Department of Commerce attesting to its being a first-class port. An all-way landing area of 300 acres was available for immediate use, with the city owning 900 additional acres adjoining to provide for future expansion. A combination administration building, passenger terminal and hangar was built at a cost of $135,000.

The Ford Airport at Dearborn, Mich., one of the first ports in the

country to be completely fitted out with modern equipment, lengthened two of its runways during the year, added ten acres of additional area and constructed one of the finest airport hotels in the country, the Dearborn Inn, directly across from the passenger terminal and adjacent to the field.

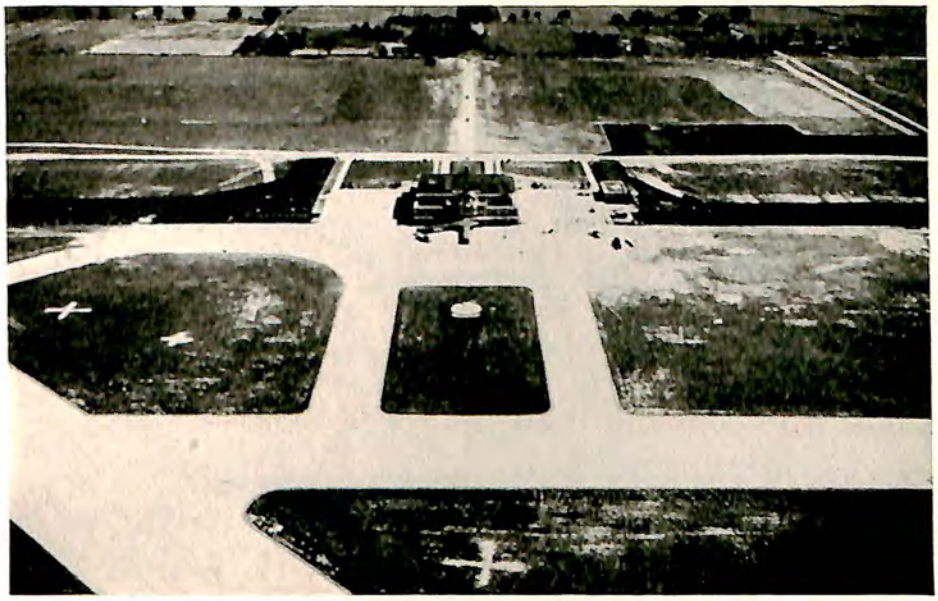
Wold-Chamberlain Field, the Minneapolis municipal airport, reported an increase in nearly every department of its activities during 1931, necessitating the addition of 100 acrees of area and the installation of additional lighting facilities. Records showed 16,295 passengers handled during the year.

INDIANAPOLIS PORT DEDICATED

Modern administration-terminal building on the new Indianapolis Municipal Airport completed and dedicated during 1931.

The Kansas City Municipal Airport carried on one of the most extensive expansion programs of the year, adding 90 acres of area, completing two asphalt treated cinder runways, a new lighting system, and four major buildings, including the United Air Lines divisional shops, a 125 by 120 foot building; the general headquarters of Transcontinental and Western Air, Inc., a 497 by 174 foot structure; a new United States Post Office; and a Weather Bureau building.

Boeing Field, the King County Airport at Seattle, Wash., added 14 acres of area, installed additional lighting facilities, and built two 100 by 200 foot steel and brick hangars, a repair depot, and a supply shop, costing a total of $200,000. Plans included 250,000 square yards of dredging to



FLYING INTO INDIANAPOLIS

Passengers get a good view of the concrete runways and new terminal building of the Indianapolis Municipal Airport from the air.

ON CLEVELAND'S LAKEFRONT

Marine terminal of Transamerican Airlines Corp. on Cleveland's lakefront, only a few minutes from the heart of the downtown district.

put the entire airport on a proper grade. The Portland Airport on Swan Island at Portland, Ore., one of the finest ports in the northwest, proved adequate for 1931 traffic without making alterations or adding facilities.

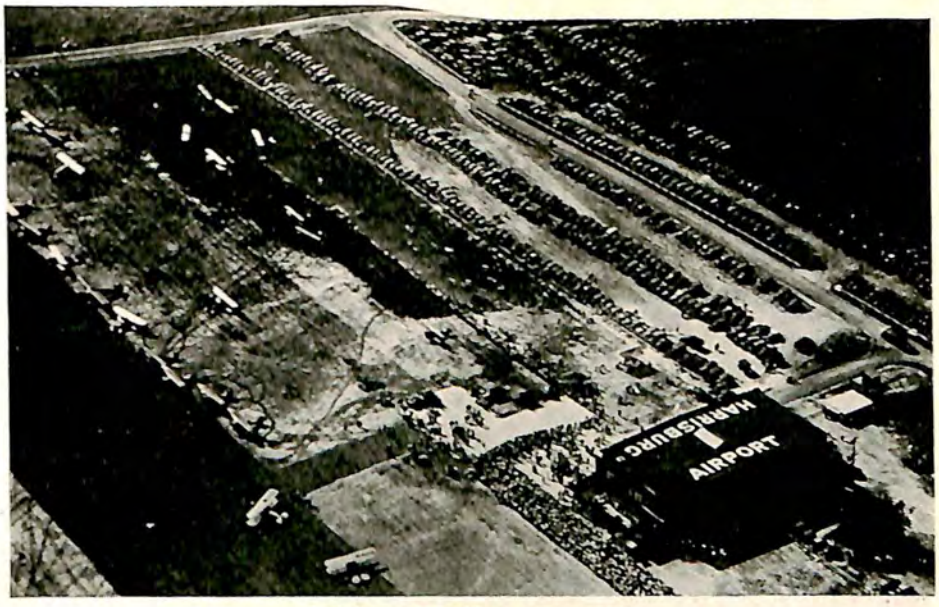
Buffalo, N. Y., completed its seaplane base at the mouth of the Niagara River in Buffalo Harbor near the close of the year and opened it to traffic. It included a concrete ramp 75 by 140 feet and an apron 200 by 342 feet. Complete service facilities were to be available after the 1932 ice breakup in April. With the opening of a new air transport line through central New York points, Rochester, N. Y., extended two of its runways, installed a new

CLEVELAND'S GREAT LAND PORT

Transamerican Airlines' Fokker (Wright Whirlwind) transport loading passengers at the terminal of Cleveland's municipal airport.

auxiliary code beacon, rebuilt its waiting room and reported a rapid increase in business.

The Rhode Island State Airport, dedicated and opened to traffic September 26, was one of the year's most interesting projects in that it was the first state-owned airport in the United States. Two hangars with complete service facilities were completed on the 411 acre port built at a cost of $350,000. It was a busy center of passenger flying and student activity from the time of its formal dedication until the close of the year. Development of the Greenbrier Airport at White Sulphur Springs, W. Va., was another interesting enterprise because it indicated the possibilities of providing airports in conjunction with hotels and resorts ordinarily inac-



HARRISBURG'S PORT BUSY

Penn School of Aviation base and regular stop on coast-to-coast route; crowds gather at the Pennsylvania state capital airport.

DISPATCHES NIGHT PLANES

Dispatcher at United Airport in Burbank, Cal., with devices for signalling night planes, red as a warning and green as instructions to land.

cessible by other means of transportation. A new 90 by 100 foot steel hangar was constructed during the year on the grass all-way field, and a waiting room was built in a road filling station adjacent to the hangar. The airport was only one mile from the hotel and resort center.

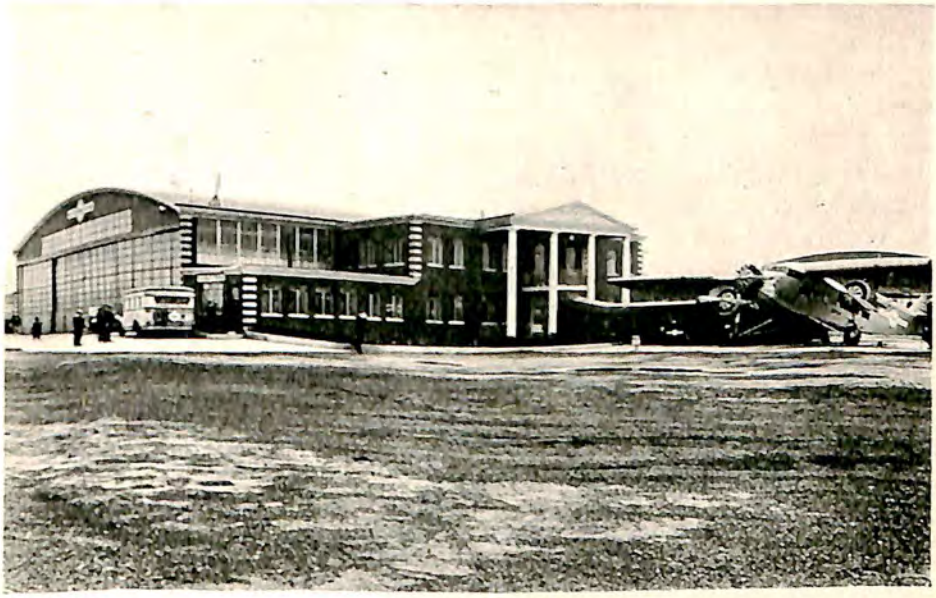
While the principal transport terminals in major cities, built at a cost of from $500,000 to $5,000,000 each, were found to receive the major share of attention in the discussion of airport progress, the Aeronautical Chamber of Commerce through its Airport Section made a concerted effort to devote special attention to the requirements of the small airport, so neces-

NIGHT LANDINGS IN 'FRISCO

Stinson (3 Lycomings) Airliner of Century Pacific Lines, Ltd., being loaded at San Francisco Municipal Airport for Los Angeles.

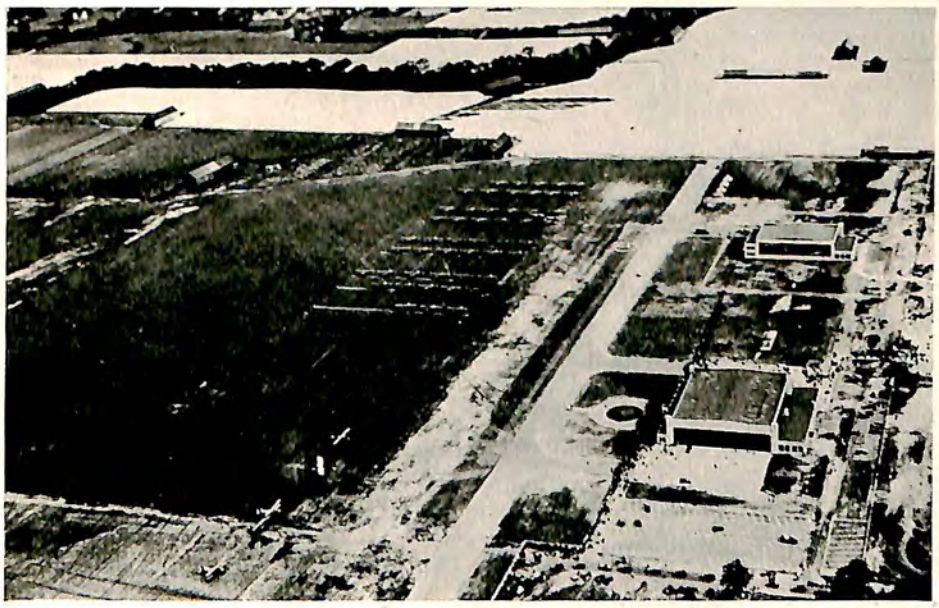
sary to the proper development of numerous landing areas along the airways and convenient spots for private flying. The North Central Airport Conference at Indianapolis, September 24 and 25, during the dedication ceremonies of the new Indianapolis Municipal Airport, and the meeting of Long Island Airport Officials called by Charles L. Lawrance, president of the Chamber, were particularly devoted to the problems of small airport development. The National Airport Conference of the Aeronautical Chamber of Commerce in Tulsa, Okla., March 25, 26 and 27, also turned over one session to the consideration of papers from qualified engineers on the small town airport.

The North Central Airport Conference went on record urging the sev-



NEW UNITED TERMINAL

Ford (3 Pratt and Whitney Wasps) transport of United Air Lines being loaded with Chicago passengers at the new terminal in Newark.



RENTSCHLER FIELD DEDICATED

Army Air Corps planes on maneuvers stop at Rentschler Field to aid in dedication exercises for new United field at East Hartford, Conn.

eral states through their respective Directors of Aeronautics to do everything possible to encourage and aid in the construction of landing fields in small towns and cities, thus extending the benefits of aviation to a larger section of the public. The experience of the Aeronautics Branch of the Department of Commerce in constructing suitable intermediate fields along the airways was suggested as a guide for this type of small town airport development.

The Department of Commerce learned through its several years' experience in constructing such fields that the average area needed to care for

NEW DENVER PORT HANGAR

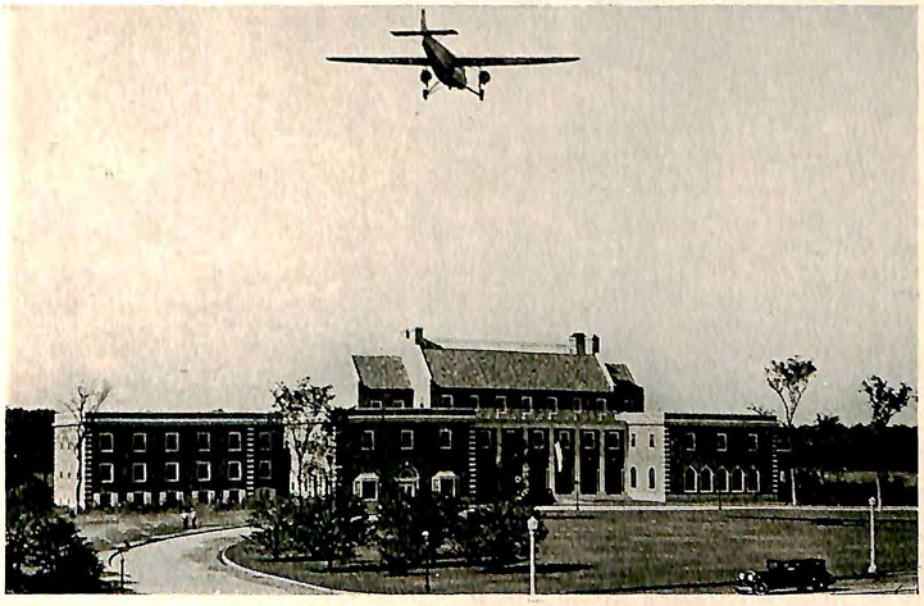
Ford tri-motored transport taking off over the new hangar of the Denver Municipal Airport, which holds an A-1-A airport rating.

present transport planes and private ships was 100 acres, with soil which permitted good drainage, few obstructions to be eliminated or marked, a suitable native vegetation to insure a good, perennial, erosion-resisting sod surface, simple fencing, proper marking for quick identification from the air, and a lighting system including a beacon, course lights, boundary lights, range lights, obstruction lights, and an illuminated wind indicator.

Through experience the Department of Commerce learned that such a field could be installed for approximately $7,500, of which $1,058 was for lighting and marker equipment; $2,675 for the installation contract; $134 for freight; $420 for power line extensions; and $3,160 for field preparation. The conditioning costs on such a field were divided as follows: $836

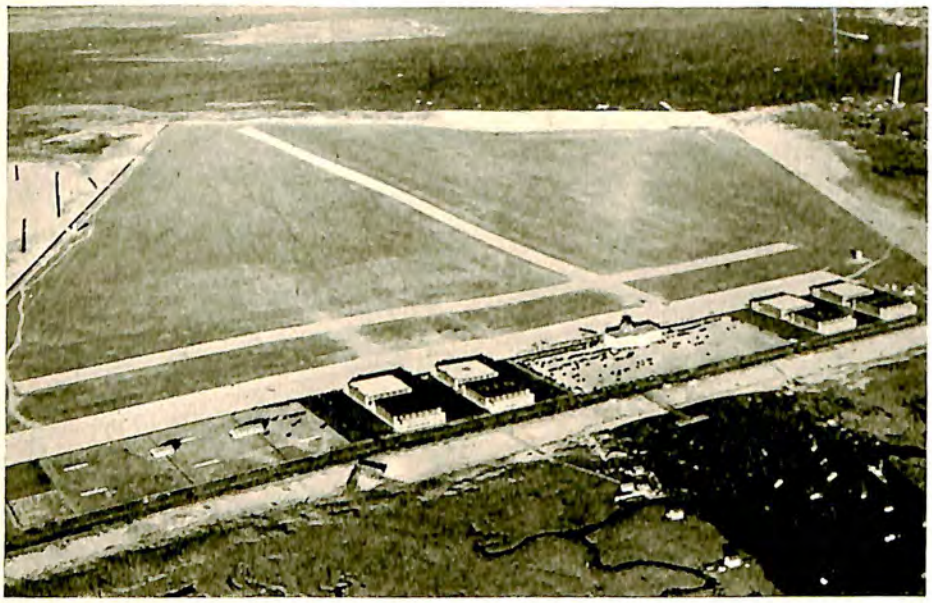
IN FAR NORTHWEST

Busy day on Tacoma Field at Tacoma, Wash., showing the long runway and hangar surrounded by hundreds of parked motor cars.



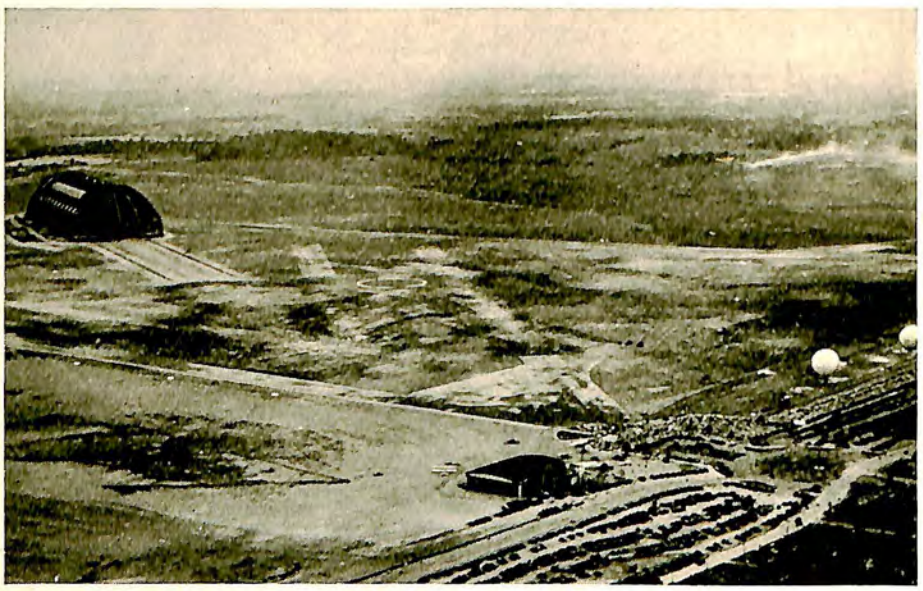
FORD OPENS AIRPORT INN

Ford tri-motored transport flying over the new Dearborn Inn, a beautifully appointed hotel opened in 1931, adjacent to Ford airport.



NEW YORK'S NEW PORT OPENS

Floyd Bennett Field, constructed by the City of New York at a cost of several million dollars, was formally dedicated during 1931.

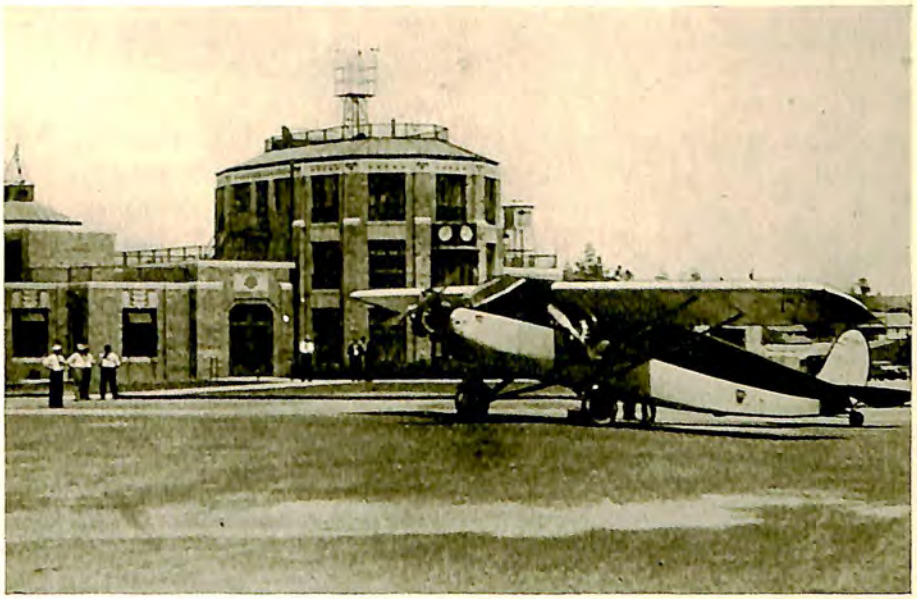


WORLD LIGHTER-THAN-AIR CENTER

Akron Municipal Airport with its new passenger terminal in the foreground and the giant airship dock in the background.

for grading; $977 for clearing, grubbing, and surfacing; $299 for seeding; $214 for removing obstructions and clearing approaches; $310 for drainage; $394 for fencing; and $130 for the ground marker. The annual maintenance cost of such a lighted field was about $1,500 per year, of which $1,000 was for lighting upkeep. These figures indicated the small cost attached to the construction of a small town or city airport.

The National Airport Conference at Tulsa provided an important forum for discussion of the nation's principal airport problems by managers, engineers, constructors and equipment manufacturers. The conference



AKRON GETS DIRECT SERVICE

Akron's municipal airport becomes a regular stop for Stinson (3 Lycomings) Airliners of Pennsylvania Airlines, Inc., carrying passengers.

adopted a Uniform System of Accounting developed by the Aeronautical Chamber of Commerce for the specific use of airport operators, and approved a standard scale of charges for airplane storage at ports throughout the country, ranging from $2 to $10 daily, depending upon the size of the plane.

The Airport Section, through a special committee appointed at the request of the National Airport Conference, completed an important study of traffic control methods and drew up certain rules and regulations for the consideration and adoption of the Department of Commerce. The Section also participated in a conference with the Department of Commerce

on the marking of obstructions near airports growing out of a protest of the National Electric Light Association and other trade associations representing public utilities. The conference resulted in a modification of existing regulations to clarify portions which were at variance with the practice and intent of the Department, and at the same time insured the safety of air traffic through proper obstruction marking.

CHAPTER X

FLYING FOR SPORT AND BUSINESS

Private Fliers Log 30,000,000 Miles—First Seaplane Cruise Staged—Two New Aviation Country Club Units Opened—American Fliers Take Planes to Europe For Tours

PRIVATE ownership of aircraft by individuals and corporations employing them for sport or business flying had grown to more than 40 per cent. of the total number of licensed planes in the United States at the close of 1931, as compared with five per cent. of all licensed planes in 1926 when the Department of Commerce first took over the task of registration.

While sport and business flying combined did not reach the impressive total of 40,000,000 miles which were flown in 1930, it was estimated that planes in this category flew more than 30,000,000 miles during 1931. This did not take into account the mileage flown by aerial service operators or air transport lines employed by business or industrial houses to meet their daily needs. Strict economy, made the order of the day, and the adaptability of the growing network of air transport lines to the needs of business men accounted for the decrease in mileage, which was more pronounced in the industrial field than among sportsmen who flew for the mere joy of it.

More than 350 firms were using fleets of privately owned planes in the development of their business. Insurance companies, newspapers, oil drillers and sales companies, attorneys, power interests, express companies, advertising agencies, roofers, department stores, publishing houses, automobile, accessory and tire manufacturers and dozens of other industrial concerns operated planes for their own use.

There were 8,757 private fliers in the United States at the close of 1931, more than 3,750 of whom owned their own planes for business or sport flying. This represented a greater number of private fliers than any other country in the world. California had the greatest number of private fliers; New York was second; Illinois, third; Pennsylvania, fourth; and Michigan, fifth.

The number of women fliers—few of whom were professional pilots—

mounted rapidly during 1931. The Department of Commerce reported 39 women holding transport licenses, 53 with limited commercial licenses, and 402 with private pilot's licenses on November 14, 1931.

Amateur Fliers' Status Established

There was a definite movement during 1931 to stimulate interest in flying as a sport by separating the sheep from the goats in the cloud swept meadows of the sky. The United States Amateur Air Pilots' Association was formed by a group of flying sportsmen to establish the amateur standing of those pilots who fly without interest in financial reward, and to definitely label the professional pilot.

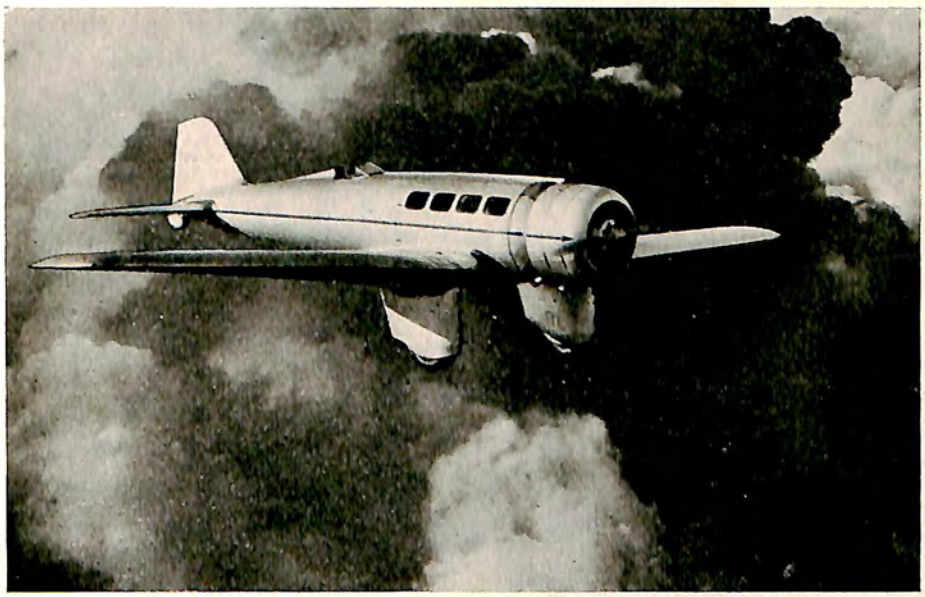
Facilities for the registration of private aircraft insignia, somewhat along the lines of Lloyd's Yachting Register, were provided by the association. Instead of the conventional pennant of the yachtsman, the amateur fliers chose an equilateral triangle and bar design, within which any interior figure not previously registered might be used. The bar design indicated the flier's home state. These insignia were painted in bright colors on both sides of the fuselage of airplanes used for pleasure flying, serving as a medium for differentiating them from commercial ships in addition to affording an identification mark for the owner. Some of the insignia were adaptations of the owners' private yacht signals, others incorporated family crests, or modifications of the aircraft insignia of the Army or Navy air squadron with which the amateur pilots served during the War. The designs were registered without additional cost for members of the association. Group insurance rates, promotion of private flying fields, and plans for amateur races and flying meets were planned for members of the association.

The United States Amateur Air Pilots' Association defined the professional pilot as one who is paid directly or indirectly for piloting an airplane, autogiro or balloon; or for giving instruction in piloting; or one who engages in the sale of aircraft or aircraft accessories. This rule did not apply, however, to any professor or teacher of aeronautics or aerodynamics in a recognized college or university. The association's executive committee also reserved the right to consider for amateur ranking officers, directors or employees engaged in the manufacture and sale of aircraft or accessories upon receipt of a signed statement from the applicant testifying that an aircraft is owned exclusively for amateur flying.

The association considered a pilot had forfeited his amateur standing by entering a competition open only to professionals; by accepting any pecuniary reward for using, or permitting himself to be advertised as using, the goods of a manufacturer, agent or merchant; by accepting any pecuniary reward for appearing at any air meet or air port; by flying less

RESORT OPENS AIRPORT

Private Ford (3 Pratt and Whitney Wasps) club plane of Frederick B. Rentschler takes off from White Sulphur Springs, W. Va., resort field.



FAST LOW-WING SHIP

Northrop (Pratt and Whitney Wasp) Alpha, all-metal, seven-place monoplane now being manufactured by Stearman Aircraft Company in Wichita.

than 10 hours annually; or by being guilty of unsportsmanlike conduct. Only individuals whose amateur ranking was approved by the association and who held pilot's licenses granted by the Department of Commerce or a licensing department of a foreign nation, recognized by the association, were eligible to enter any contest held under the auspices of the association.

Race for Lawrance Trophy

The new organization staged its first contest during the National Air Races when 12 amateur pilots left the Aviation Country Club at Hicksville, L. I., N. Y., for Cleveland in a race for the Charles Lanier Lawrance Trophy, a 36 inch bronze figure of Victory. Stops were made at control points in Albany, Syracuse, Buffalo and Akron; Allan Eustis being declared the winner at Cleveland with a 98 per cent. efficiency mark.

Plans for this land plane cruising race in 1932 were designed to place it on a national basis comparable to the British King's Cup Race. The Lawrance Trophy was to be at stake in 1932 for a race from both the Atlantic and Pacific coasts, with a rendezvous at Akron to permit the pilots to fly into Cleveland as a group. Measured course handicaps and allowances were planned to equalize conditions for contestants in either section of the race.

The Amateur Air Pilots' Association was to promote and supervise special races for amateur fliers in 1932 at the All-American Air Races at Miami in January and the National Air Races in Cleveland.

Two New Aviation Country Clubs

Combining an excellent 18-hole golf course, a modern yacht club, three tennis courts, an all-way flying field, summer and winter sports facilities including hunting, ice-boating, and horseback riding, the third of a national chain of Aviation Country Clubs was formed late in 1931 at Westport on Lake Champlain in Essex County, New York. The second club was opened with an air circus at the Curtiss-Essex Airport in Caldwell, N. J., where a clubhouse was formally opened with ceremonies attended by 400 members of the Aviation Country Clubs and their guests. The Aviation Country Club of Long Island at Hicksville was in its third year of successful operation, showing a profit in 1931 over its $75,000 annual operating expenses. Members of one club had privileges of all other clubs organized in the chain.

Since the Aviation Country Club of Long Island inaugurated the plan for a national chain in 1929, 48 of its new members soloed at the club. What is probably even more important from the viewpoint of the aircraft industry, its members—in three years—bought new planes with a total value

LUXURIOUS PRIVATE TRANSPORT

Stinson Airliner (3 Lycomings) club plane, showing interior luxuriously furnished for private owner, with table set for party of four.

AIR CRUISER DELUXE

Salon and club compartments of the new Bellanca Aircruiser, showing luxurious furnishings of ship designed for private fliers.

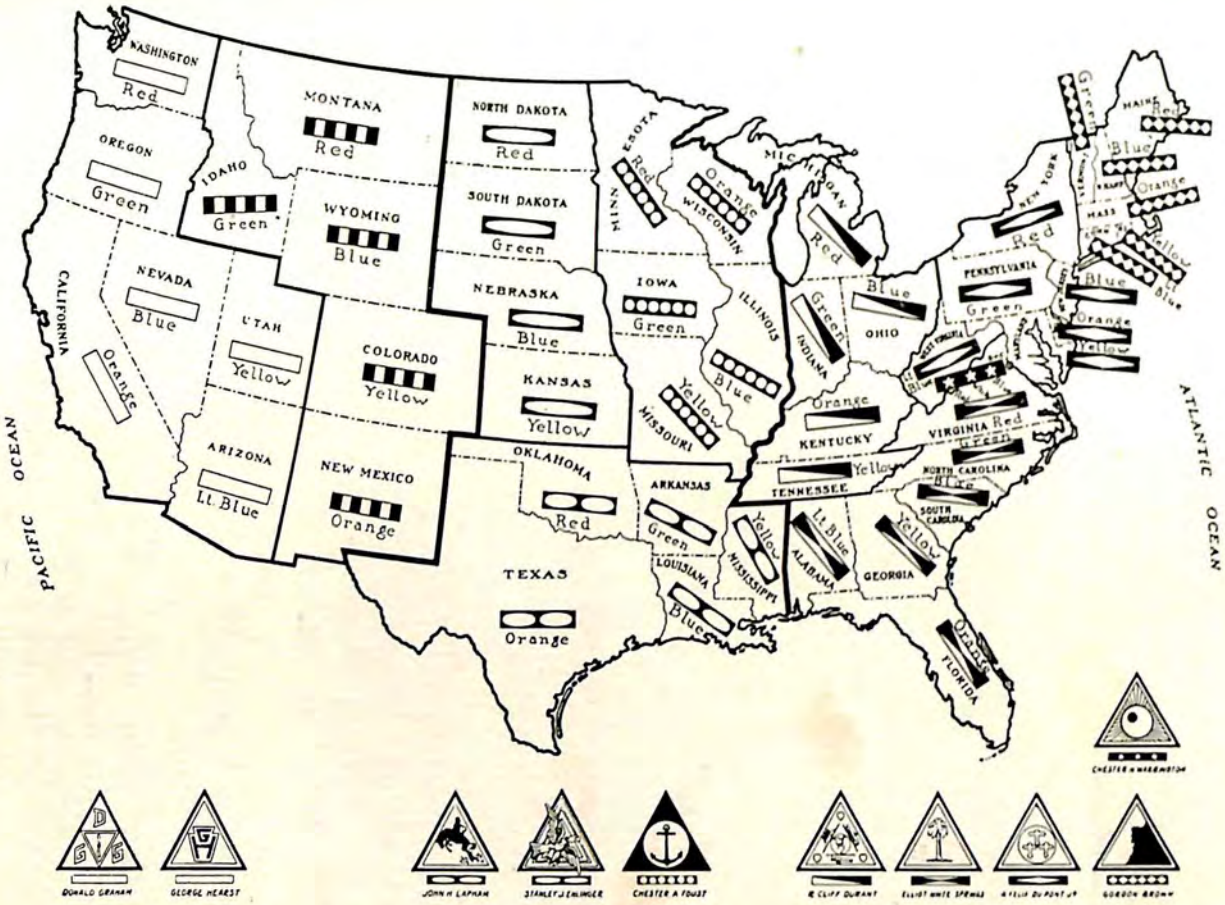
of $1,955,795. In 1929, members of the club bought planes costing $807,800; in 1930, $589,795; and in 1931, $558,200. These figures included the total cost of planes bought by club members, although some of the members were associated with the aircraft industry and might have purchased the planes without being influenced by the facilities of the Aviation Country Club.

Eliminating the purchases of all members in any way identified with the aircraft industry, the "strictly amateurs" purchased a total of $1,360,875 worth of new planes in the three years. The value of planes bought by this group in 1929 was $494,680; in 1930, $377,995; and in 1931, $488,200. This showed an increase in new airplane purchases during 1931 over 1930.

Members of the Aviation Country Club of Long Island owned 180 airplanes and autogiros. Members who bought new planes during 1931 and the names of the ships they bought were: Carl Breur, Ken-Royce; Archibald M. Brown, Waco; Mrs. Marjorie Brown, Curtiss Robin; William Thayer Brown, New Standard; Hays R. Browning, Stinson; General Howard Borden, Stinson; R. L. Brooks, Monocoupe; William D. Campbell, Bellanca; Powell Crosley, Lockheed and Douglas; Ward F. Davison, Fairchild; Miss Margery Durant, Sikorsky; Col. Holland S. Duell, Waco; A. Felix du Pont, jr., Stinson; Richard du Pont, Privateer; Thomas Eastman, Bird; Sherman Fairchild, Fairchild; Miss Jessamine Goddard, two Monocoupes; George C. Graves, Fokker; J. Goodwin Hall, Lockheed; Harry E. R. Hall, Gee-Bee; Robert D. Huntington, Privateer; Mrs. Opal Logan Kunz, Travel Air; Roger Kahn, Bellanca and Puss Moth; Roger Lester, Stinson; Jordan Lambert, Lockheed, and Travel Air; Olney B. Mairs, jr., Travel Air; Harold Moon, Gee-Bee; Miss Laura Morgan, Bird; Charles McKnight, Fairchild; John W. Patterson, Waco; George M. Pynchon, jr., Pitcairn autogiro and Fairchild; Roy A. Ramey, jr., Curtiss Robin; George C. Rand, Waco; Charles C. Rumsey, Cessna; D. V. Shaw-Kennedy, Bird; W. E. D. Stokes, jr., Travel Air; E. R. Senn, Stinson; H. Garrison Sellech III, Stinson; Allen J. Smith, Curtiss-Wright Junior; Granville B. Smith, Avian; Lawrence Sharples, Travel Air; F. H. Taylor, Stinson; Henry H. Timken, jr., Ford; Oliver M. Wallop, Bird; Malcolm P. Whittaker, Travel Air; Eric W. Wood, Bellanca; Paul LeB. Whitney, Stinson; John T. Wack, Sikorsky; and F. W. Zelcer, Laird.

Invitation Seaplane Cruise

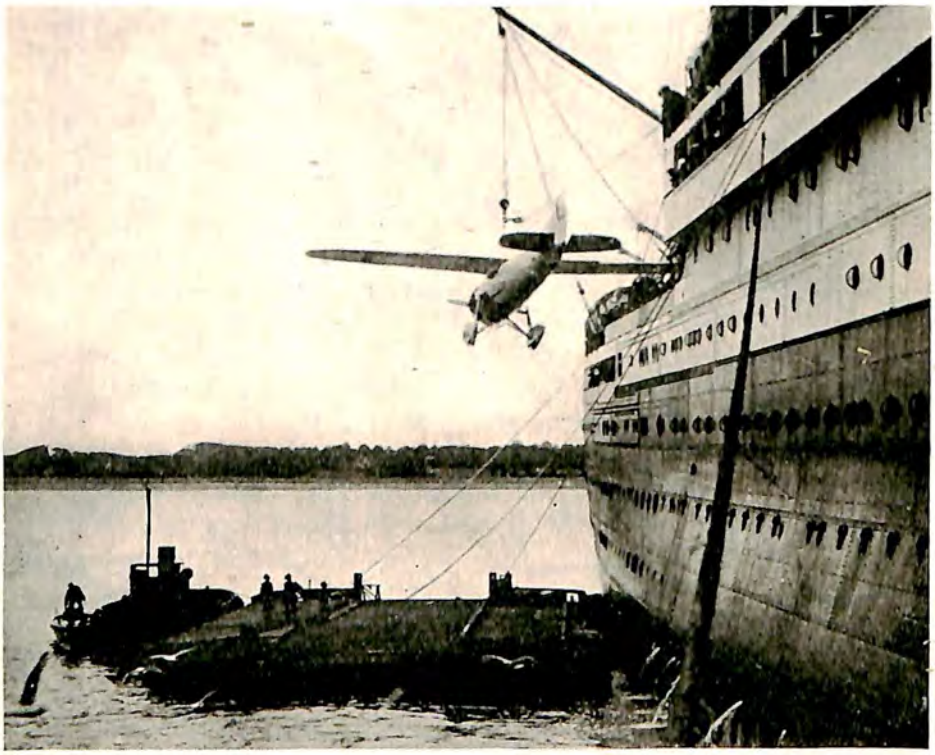
The Aviation Country Clubs staged their first annual Invitation Seaplane Cruise in July when a fleet of 18 seaplanes and amphibians took off from Oyster Bay on the north shore of Long Island upon the signal of Commodore Charles L. Lawrance, national president of the Aviation Country Clubs. This innovation in amateur cruises was not undertaken to create records, race for a prize, demonstrate reliability, or anything else, except the



AMATEUR AIR PILOTS' INSIGNIA WITH STATE BARS

real enjoyment to be found in a carefully planned social program on an air cruise with seaplanes and other marine aircraft.

The cruising fleet flew down the East River along Manhattan, around the Statue of Liberty, along the south shore of Long Island to Islip, where a stop was made for luncheon and 18-holes of golf at the Timber Point Club as guests of the Fleet Commodore. Into the air again late the first afternoon, the ships headed down the Island to Shinnecock Bay, Shelter



FLEETSTER TOURS EUROPE

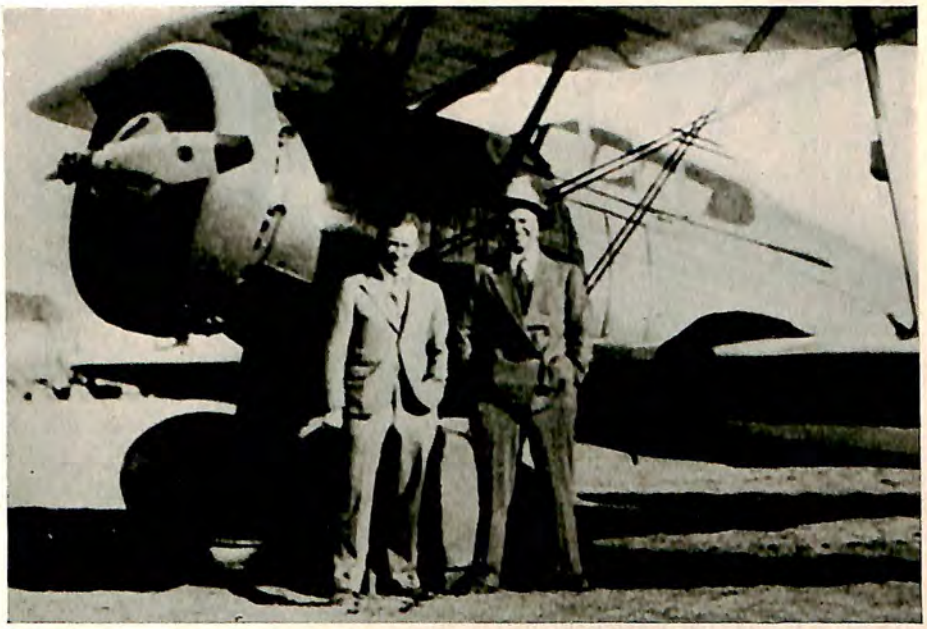
Hornet-powered Consolidated Fleetster of George F. Harding being unloaded in France for air tour of Harding party through Europe.

Island and Gardiners Bay, skirting Plum Island and across the Race of Long Island Sound to Watch Hill, where the first night's stop was made.

The second day found the fleet flying along the coast of Rhode Island, around Martha's Vineyard to Nantucket for luncheon. Then by a compass course over 30 miles of sea to the Cotuit Yacht Club for refueling and tea as the guests of A. Felix du Pont at his Cotuit estate. Pushing on along the coast line, famed for its quaint towns and great sand bluffs, the second night's mooring was made in Provincetown, Mass., harbor.

The fleet followed the original course of the Pilgrims on the third day directly across Massachusetts Bay, circling Plymouth Rock, then along the west shore of Cape Cod Bay to Vineyard Haven, where cruise members were guests of Mr. and Mrs. W. H. McAdoo for luncheon and a game of baseball. Late in the afternoon, the ships pushed on to Marion, where the party were the guests of Richard F. Hoyt at his estate, for tennis, a swim, dinner and overnight.

The final day's route led across New Bedford Harbor, landing at Col.



WILL ROGERS A VETERAN

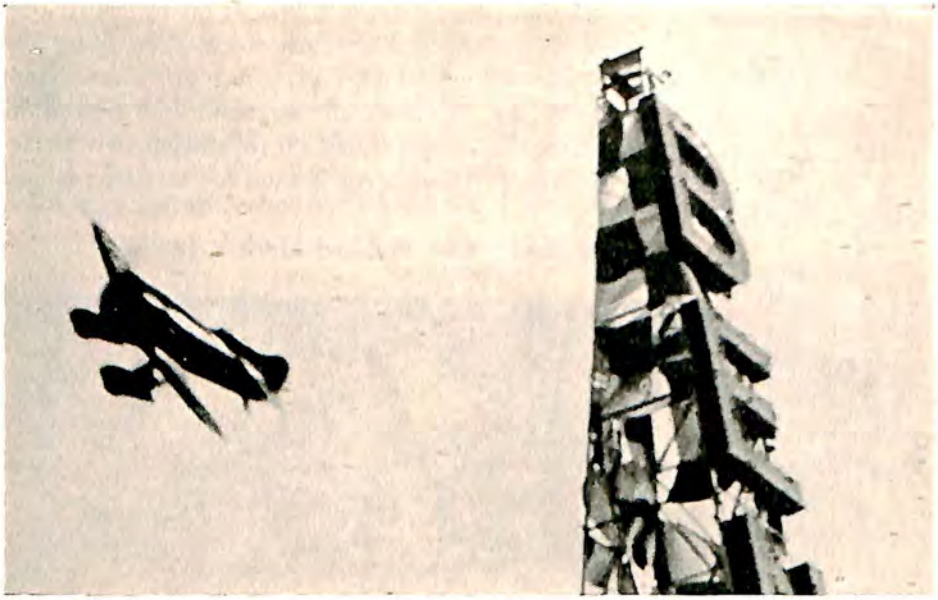
Using planes almost exclusively, Will Rogers is seen with Capt. Frank M. Hawks in front of Curtiss Helldiver (Wright Whirlwind).

E. H. R. Green's airport on his estate at Round Hill, South Dartmouth, Mass., for a visit to an old whaler, then off across Newport, Point Judith and Block Island to land in Lake Montauk, where the cruise officially ended with the party as guests of the Commodore of the Montauk Yacht Club. The success of the cruise recommended the planning of another one in 1932.

The Aviation Country Clubs staged frequent invitation air meets on their home airports and planned an extensive program of feature races and contests for 1932.

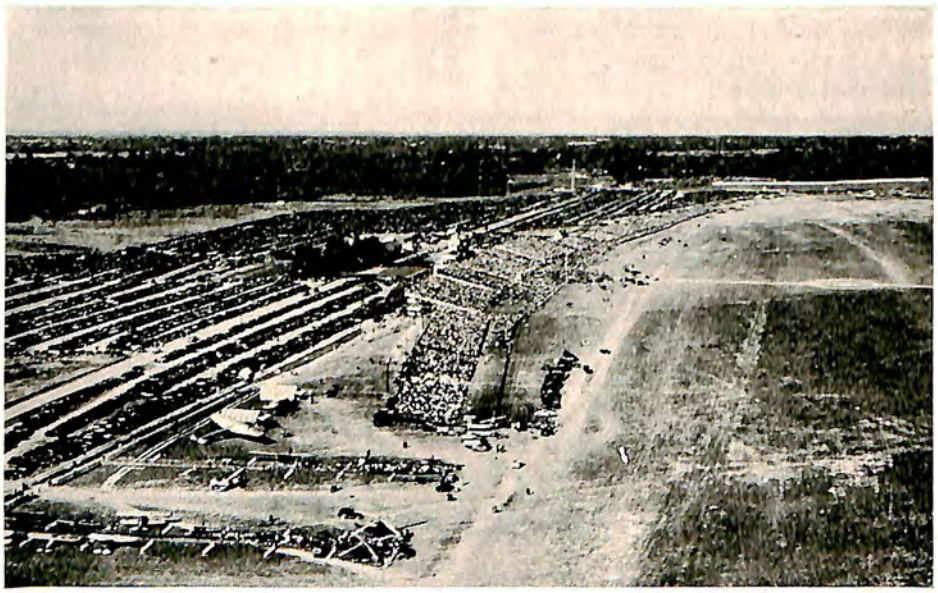
Flying Clubs and Subsidies

Unlike flying clubs in other parts of the world, the Aviation Country Clubs and other flying organizations in the United States received no sub-



WINNING SPEED CLASSIC

Lowell Bayles in Gee Bee racer powered with a supercharged Wasp, Jr., engine rounding Bendix home pylon to win Thompson trophy speed contest.

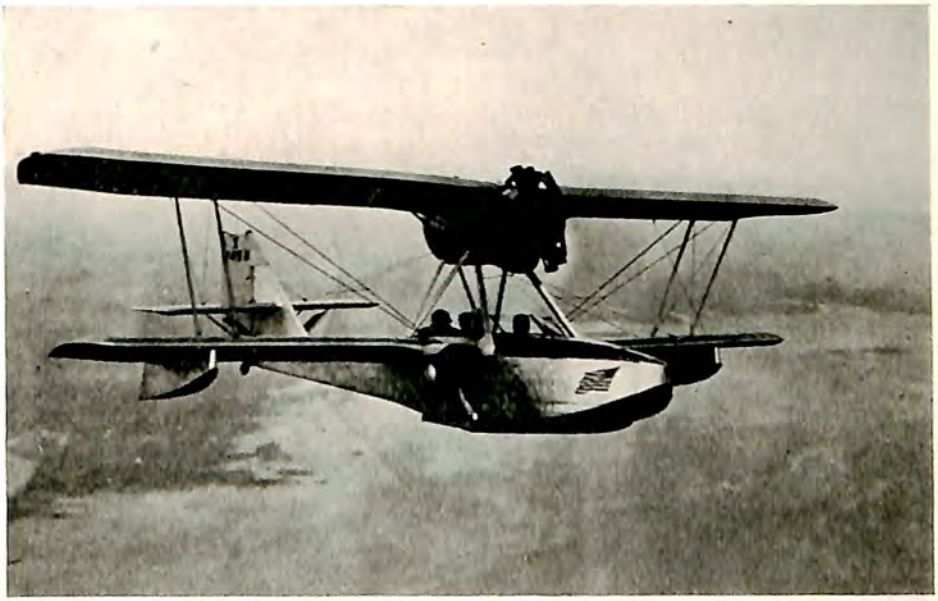


CROWDS THRONG AIR RACES

Grandstands of the permanent National Air Races' stadium at Cleveland during the height of the 1931 racing program.

sidies, grants or financial encouragement from the government, federal or state. In fact, members of the American clubs under government taxation laws had to pay a 10 per cent. tax on their membership fees. In contrast to this, flying clubs in England, Canada, Australia and other foreign countries received £20 for each student soloed by the club plus a bonus for flying hours. In addition, the clubs received £10 annually for each pilot who maintained his license.

The foreign flying clubs were encouraged by their governments on the grounds that they built up a reserve corps of pilots who might be trained for



STAINLESS STEEL SPORT AMPHIBIAN

New American Aeronautical Savoia Marchetti (Kinner) spot welded stainless steel amphibian designed for four passengers.

military service in case of an emergency. It was estimated that the United States spent $12,000 per year to keep a military pilot in the service trained, and about half that for reservists. Experience in most of the foreign clubs indicated that few of the pilots trained in the flying clubs had sufficient funds to own their own planes and depended on the use of club planes to keep in training. This was in direct contrast to the basis upon which the Aviation Country Clubs were built, relying on wealthy aviation enthusiasts for their memberships.

The Australian light airplane clubs, during the first eight months of 1931, had 126 pilots who flew a total of 7,900 hours. The Canadian clubs,

FISTIC HERO LIKES FLYING

Jack Dempsey, former heavyweight champion of the world, being served refreshments aboard an Atlanta-bound plane of Eastern Air Transport, Inc.

A FLYING ROOSEVELT

Governor Roosevelt of Porto Rico receiving farewells from Mayor J. T. Alsop, jr., of Jacksonville, Fla., enroute to Washington.

in 1930, obtained 50 commercial licenses and 178 private licenses and flew 14,686 hours. A survey made by American aviation enthusiasts disclosed the fact that the members of the Aviation Country Club of Long Island alone flew a greater number of hours than all of the government-subsidized flying clubs of the world put together.

There were more than 500 members in the Long Island, New Jersey, Lake Champlain and Philadelphia Aviation Country Clubs, and other clubs in the chain were to be opened in 1932 in Boston, Philadelphia, Westchester, Chicago, Cleveland, Los Angeles and San Francisco.

FLYING OIL EXECUTIVES

Flying high above California's mountains, a Hornet-powered Boeing tri-motored transport used by executives of Standard Oil of California.

Americans Take Planes To Europe

American private fliers looked upon air tours of Europe in their own planes with increasing popularity during 1931. Miss Margery Durant, daughter of the motor car manufacturer, took her black-and-white Lockheed Vega (Pratt and Whitney Wasp) monoplane "Ariel" to Europe with her and made a three months' air tour of the principal centers of the continent, in northern Africa and western Asia, aggregating 12,000 miles. The trip through 19 countries cost less than seven cents a mile.

Illinois' State Senator George F. Harding with his wife and two friends made an extended air tour of Europe in his Consolidated Fleetster (Pratt

and Whitney Wasp) monoplane, with William S. Brock, trans-Atlantic flier, as pilot. Their itinerary included London, Paris, Berlin, Amsterdam, Prague, Brussels, Lisbon, Madrid, Vienna and Budapest before shipping the plane home on the liner which carried them to New York.

Smith Reynolds, one of the heirs to the Reynolds tobacco fortune, dropped alongside the Berengaria in a small amphibian shortly before sailing time late in August and asked to be hoisted aboard. He had booked

COUNTRY CLUB SEAPLANE CRUISE

Seven of the 18 seaplanes in the first annual Aviation Country Clubs' invitation air cruise ready to take-off from Oyster Bay, L. I.

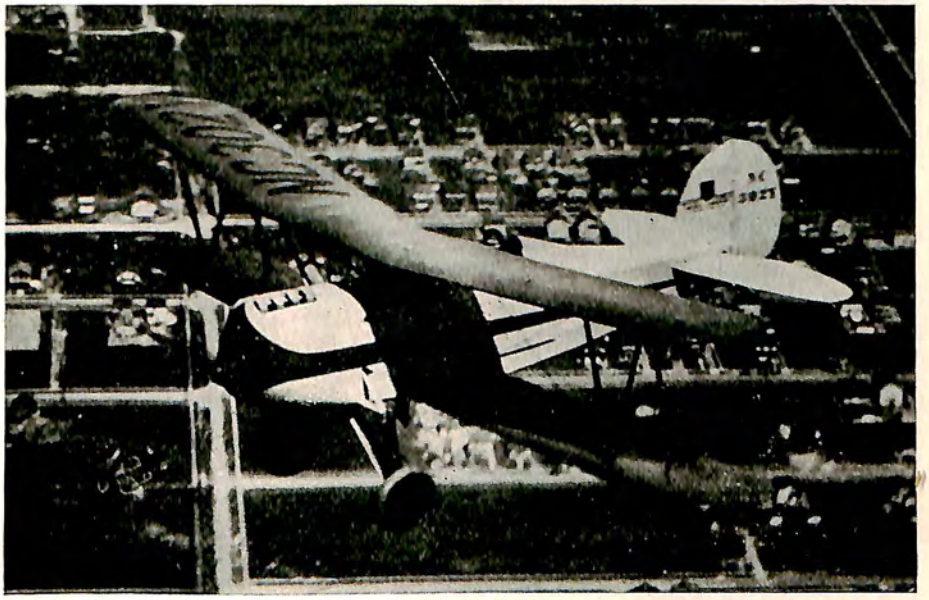
passage, but hadn't mentioned the plane. On reaching Southampton, he flew across France and Spain to North Africa and planned to fly on to India, the Dutch East Indies and Japan.

Mr. and Mrs. Charles Healey Day in an airplane of Day's design left New York early in the spring to fly around the world on a pleasure jaunt, shipping the plane across the Atlantic and Pacific, and flying across Europe, Asia and the United States. They returned to New York in the fall with many interesting stories of their experiences on the world flight.

Col. and Mrs. Charles A. Lindbergh's flight from Washington across Canada, Alaska, the north Pacific, to Japan and China on a vacation jaunt has been described in an earlier chapter.

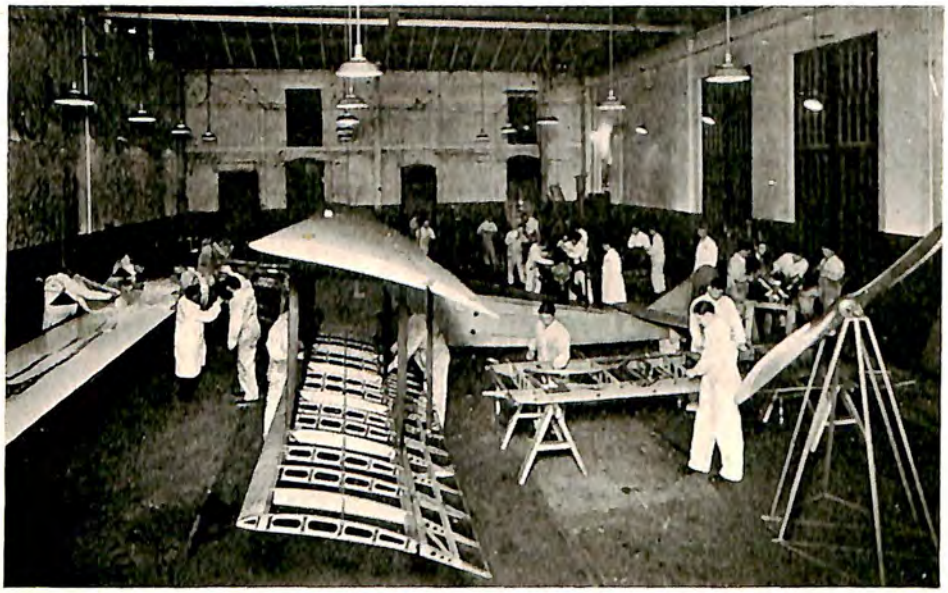
BEARS PRIVATE FLIER'S INSIGNIA

DeLuxe Stearman Business Speedster (Wright Whirlwind) biplane, decorated in gold and white, for A. Felix du Pont of Wilmington, Del.



FOR SPORT OR TRAINING

Great Lakes Trainer (American Cirrus) biplane designed for sport flying or training purposes with features to attract private fliers.



PENN SCHOOL MECHANICS CLASS

Students of Penn School of Aviation shown fabricating wings in the foreground and studying engine mechanics in the background.

ANALYZE ENGINE CONSTRUCTION

Penn School of Aviation students receiving detailed course of instruction in aircraft engines as part of school's curriculum.

CHAPTER XI

AIRPLANES: VERSATILE MACHINES OF WORK

Seventy Million Miles Flown By Aerial Service Operators—Aerial Photography and Mapping Increase—Student Training Declines—Nearly Two Million Persons Carried—Rates Lowered

THE versatility of the airplane in the hands of the aerial service operator continued to increase its value as a "machine-of-all-work" and made it possible for the well-organized operator to broaden the scope of his activities during an unusually lean year. While the number of aerial service operators in business during 1931 was cut to less than half that which offered services to the public during the peak period of 1929, the companies still operating carried on a far more versatile use of their planes to serve the needs of business and industry than in previous years.

More than 70,000,000 miles were flown, nearly 2,000,000 passengers were carried and thousands of square miles were photographed and mapped by these aerial service operators whose versatile planes were in service for short pleasure and sight-seeing trips, longer chartered flights, student instruction, student solo flights, aerial advertising, demonstration and exhibition flying, aerial photography, mapping, crop dusting, seeding and aerial surveys.

The Aeronautical Chamber of Commerce analysis of the Department of Commerce directory of aerial service operators revealed that, during 1931, 295 were actively conducting flying schools, 256 were doing short hop and charter business, 164 were in aerial advertising, 8 dusting crops or seeding huge tracts of land, 95 taking aerial photographs and making maps, and 112 doing exhibition or demonstration flying to promote aircraft sales to private or industrial owners. Most operators offered from four to six of these services, and allowing for this duplication, the directory analysis showed 352 operators doing business during 1931. This was less than half the 800 listed as active in the peak year of 1929, and little more than half the 600 catalogued in 1930. The poorly situated, badly managed, and ill-financed ventures were unable to weather the economic storm during 1931. While they reported some decrease in their business volume during this generally depressed period, those companies remaining in business indicated that, through strict economy, they had been able to meet operating

costs and were prepared to hold their ground or expand their business as economic conditions in 1932 warrant it.

The following survey of aerial service operations for 1931 made for The Aircraft Year Book by the Aeronautical Chamber of Commerce provides an interesting picture of the airplane's versatility in this field. The final survey, based on replies from 76 typical operators and computed to embrace the 352 listed by the Department of Commerce as doing business, showed that such operators were based at 627 airports, 55 per cent of which were equipped for night flying. The number of aerial service bases equipped for night operations showed a 10 per cent. increase in 1931, indicating the growing importance of 24 hour flying to meet the needs of business and industry.

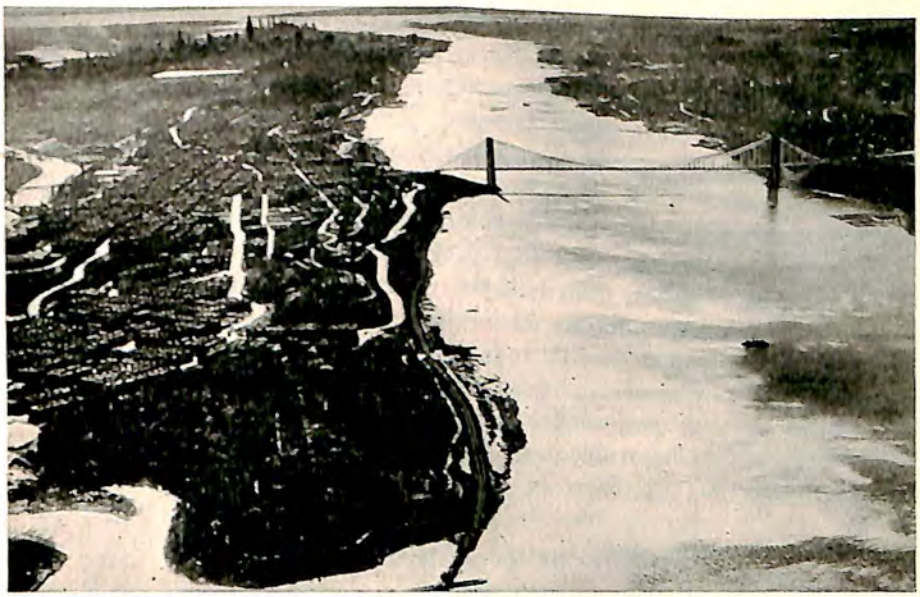
A large part of the commercial airplanes in service during 1931 were in the hands of aerial service operators. The Chamber's estimate based on reports from aerial service operators indicated that 2,818 planes were being used in this field, 2,665 of them being single-engined land planes; 3 twin-engined land planes; 38 tri-motored land planes; 32 seaplanes; 74 single-engined amphibians; and 6 twin-engined amphibians.

More Than 70,000,000 Miles Flown

The decline in the number of miles and hours flown by aerial service operators, which set in soon after the peak was reached in 1929 at the time of the general financial crisis, continued during 1931, but at a less rapid rate than in 1930. The statistical estimates show 842,150 hours flown in 1931 as compared with 1,128,937 hours in 1930 and 1,304,207 hours in 1929. The number of hours flown annually, however, decreased 35.5 per cent. since 1929, while the number of operators actively engaged in this field decreased 56 per cent., indicating that the well-established concerns were taking advantage of the slackened competition to obtain their share of available business formerly secured by competitors. In 1929 and 1930, aerial service operators were more apt to specialize on one or two lines of activity such as student training and charter flights or exhibition flying and aerial advertising, but in 1931 they broadened their activities to get the utmost out of their equipment's usefulness.

On the basis of the number of hours reported flown during 1931, it was estimated that 71,582,750 miles were flown during the year as compared with 95,959,645 miles in 1930 and 104,336,560 miles in 1929.

The number of hours devoted to short hops and charter flights during 1931 showed a 31.8 per cent. drop below 1930 levels. The time spent in aerial photography and mapping, however, was 84.9 per cent. greater than in 1930 and more than 800 per cent. greater than 1929. Hours devoted to crop dusting from the air showed a somewhat similar increase.



FIRST NEW YORK-NEW JERSEY BRIDGE

Curtiss-Wright Flying Service's aerial survey division gets an unusual view of the new George Washington Bridge with Manhattan in background.

NEW YORK GROWS SKYWARD

Curtiss-Wright Flying Service obtains spectacular view of lower Manhattan, showing financial district, Battery and bridges.

Students' solo accounted for 271,591 hours in the air; student instruction, 298,121 hours; short hops, 98,112 hours; charter flights, 79,426 hours; photography, 13,474 hours; mapping, 15,159 hours; dusting, 6,774 hours and miscellaneous activities, 55,582 hours.

The number of passengers carried by aerial service operators on short hops and charter trips in 1931 totaled 1,875,992 persons, as compared with 2,621,769 persons in 1930. Illustrative of the increase in efficiency of aerial service operators was the fact that they flew 75 per cent. of the mileage flown in 1930 with less than half the number of pilots employed during that year. The total number of employees of all kinds engaged in the aerial service business during 1931 was 9,141 as compared with 12,283 in 1930 and nearly 21,000 in 1929. Of this total 1,019 men were employed as pilots in 1931, as compared with 2,114 in 1930 and 3,658 in 1929. The number of hours flown by each pilot increased progressively from 293 hours annually in 1929 to 826 in 1931.

Lowest Rates In History

With lower prices for material and supplies and increased operating efficiency, practically all operators reduced their rates during 1931 to the lowest point in history. The average charter rate per mile for single-engined land planes in 1931 was 25 cents, as compared with 30 cents in 1930 and 45 cents in 1929. The rate per mile for tri-motored land planes was 95 cents in 1931, as compared with $1.22 in 1930 and $1.35 in 1929. The charter rates for seaplanes and amphibians remained practically unchanged. Seaplanes remained at 50 cents per mile and single-engined amphibians averaged $1.00 per mile, while the rate for twin-engined amphibians was reduced slightly from $2.00 per mile in 1930 to $1.90 per mile in 1931.

Rates for short hops continued to decline, the ten-minute ride during 1931 averaging $1.75 as compared to $2.46 for a 10.5 minute ride in 1930 and $3.26 for a 9.5 minute ride in 1929. The average load remained constant at 2.6 persons.

The types of equipment used in aerial service operations changed very little from 1929 to 1931. The average capacity of the single-engined land plane was between two and three persons; tri-motored land planes in service ranged from 10 to 14 persons capacity; seaplanes averaged three persons; single-engined amphibians, six places; and twin-engined amphibians, eight places.

Although there were only 3,822 engines in use during 1931 as compared with 6,204 motors in 1930, the continued trend toward air-cooled engines was evident. In 1931, there was a total of 3,244 air-cooled engines in service, more than six times the number of water-cooled engines—538.

In 1930, there were 4,115 air-cooled engines in the hands of aerial service operators, which was twice the number of water-cooled engines—2,089. The number of air-cooled engines below 100 horsepower increased to 837 in 1931 from 457 in 1930. The largest number of air-cooled engines was rated between 100 and 200 horsepower with 1,322 in this class during 1931 as compared with 2,298 in 1930; while there were 680 air-cooled engines between 200 and 300 horsepower and 405 with more than 300 horsepower. In the water-cooled class, 535 engines were rated at 100 horsepower or less in 1931, as compared with 1,729 in 1930; while 43 engines were listed in the 100 to 200 horsepower class in 1931 as compared with 267 in 1930.

During 1931, these engines performed 894,372 hours of service. The average engine ran 234 hours, as compared with an average of 190 hours in 1930, showing much more efficient use of power equipment during the year. Air-cooled engines of between 100 and 200 horsepower averaged 205 hours during the year, while those of more than 300 horsepower averaged 333 hours annually. Water-cooled engines of less than 100 horsepower averaged 200 hours during the year.

Decrease in Student Training

Training toward pilots' licenses during 1931 was given 5,105 students, according to the license lists compiled and published by the Aeronautical Chamber of Commerce. Three hundred and fifty-eight received instruction and solo toward transport licenses; 153 toward limited commercial licenses; and 4,594 toward private licenses. The total number receiving instruction, while considerably under the 6,851 students in 1930 and 6,968 students in 1929, was large enough to indicate the continued interest of the younger generation to learn to fly for business or pleasure.

While a few operators reporting to the Aeronautical Chamber of Commerce in 1931 showed an increase of from 5 to 15 per cent. in their volume of business, a majority reported a smaller volume than in 1930. Some reported no change in their gross receipts as compared with 1930. The total gross receipts of all aerial service operators during 1931, exclusive of airplane and engine sales, was estimated at from $18,000,000 to $20,000,000.

Curtiss-Wright Maintains Largest Chain

The Curtiss-Wright Flying Service, a division of the Curtiss-Wright Corporation, continued to hold a predominant position among aerial service operators with bases on 30 widely scattered airports, 20 of which were equipped for night flying. The consolidated operations figures of this chain, naturally, exceeded those of any other single operator. This division of Curtiss-Wright carried 147,656 passengers during 1931 as compared with

214,559 in 1930 and 86,589 in 1929. Hours flown by the division during the year totaled 28,428 divided as follows: short hops, 4,240 hours; charter flights, 3,950 hours; aerial photography and mapping, 558 hours; crop dusting, 450 hours; student instruction, 11,310; student solo, 6,670 hours; and miscellaneous, 1,250 hours. Curtiss-Wright continued to maintain the largest organization for the training of students, having graduated 470 pilots during 1931 and having more than 1,000 in training at the end of the year.

Parks Air College at East St. Louis, Ill., operated one of the largest single-unit schools for the instruction of students, training 32 transport pilots, 27 limited commercial pilots and 18 private pilots in 1931. Penn School of Aviation at Pittsburgh, a division of Pittsburgh Aviation Industries; Boeing School of Aeronautics at Oakland, a division of United Aircraft and Transport Corporation; and Roosevelt Aviation School, Inc., at Mineola, a division of The Aviation Corporation, were representative of the large number of schools having high standards, extensive and thorough ground school and flying courses which drew students from all parts of the country. The complete list of schools obtaining Approved Certificates from the Department of Commerce is included in the Aeronautical Directory in the back of this volume.

Photography and Mapping Increased

Oil companies prospecting for favorable geological formations, lumber companies surveying huge timber tracts, state highway departments making road surveys, cities and counties planning civic developments, and large industrial organizations finding new uses for aerial photography caused operators in this field to double their activity during 1931.

Fairchild Aerial Surveys, Inc., a division of Fairchild Aviation Corporation, flew 1,500 hours in this type of work during 1931. Aerial photographs and engineering maps of all types, including line maps and topographical maps of the United States and Mexico, were produced for engineering companies. Aerial obliques were furnished to newspapers, advertisers and publishers. In May, Fairchild Aerial Surveys acquired the capital stock of the Aerotopograph Corporation of America, and secured exclusive rights in the United States, Canada and Mexico to patents of the Zeiss-Aerotopograph of Jena, Germany. These processes covered a new method of producing accurate topographical maps from aerial and terrestrial photographs. Fully equipped laboratories and drafting rooms were maintained in New York, Dallas, Los Angeles and Mexico City. Photographers and photographic bases were maintained in addition at Chicago and San Francisco.

The aerial survey division of the Curtiss-Wright Flying Service flew

558 hours during the year on aerial photographic and mapping surveys. The availability of the Curtiss-Wright organization with its 30 strategically located bases aided the development of its survey work. It maintained one of the largest and most up-to-date laboratories in the country in New York City.

The Dallin Aerial Surveys of Philadelphia completed a map covering 400 square miles in and around the Quaker City. The work, completed in seven months, required the taking of 1,690 photographs and was one of many tasks successfully completed during the year by the company.

Crop Dusting Increases

The volume of crop dusting done during 1931 doubled, with 6,774 hours flown on such missions as compared with little more than 3,000 hours in 1930, when drought, which reduced the rate of propagation of the boll weevil, eliminated any hope of saving the cotton crop by dusting.

The Farm Flying Service at Oakland, Cal., operated by a graduate of the University of California College of Agriculture, devoted all of its attention to crop dusting and seeding, flying 500 hours during the year to distribute 305,000 pounds of seed or poison at the rate of three acres per minute. Seven planes were employed to plant 17,000 acres of rice, and later 800 acres of cattle range land were planted with clover seed for feed. Beans, melons, cauliflower, peas, grapes, walnuts, prunes and citrus crops were included in the dusting operations with good results.

Curtiss-Wright Flying Service flew 450 hours to carry out its cotton dusting contracts in the South and similar operations were carried on by the Aero Dusters of Los Angeles; Delta Air Service of Monroe, La.; and Southern Airways, San Antonio, Texas.

FLYING NEWS PHOTOGRAPHER

William A. Kuenzel, chief photographer of the Detroit News, taking news photos with a special Fairchild camera from News' speed plane.

DETROIT: FOUR MILES HIGH

Photographer Kuenzel's "prize picture of the year" for the Detroit News, a shot from 19,000 feet from River Rouge to Lake Huron.

CHAPTER XII

AVIATION AND THE PRESS

Unsung Sagas of Flying Reporters—Eighty-seven Aviation Editors—Press Associations Use Planes Extensively—Newspapers Buy New Planes—Industry Lays Problems Before Editors

AVIATION and the press experienced a growing bond of common interest; first, because both industries had their fortunes inextricably tied up in their need for speed and more speed to properly serve the public; and, second, because aviation was an important news source and the constructive presentation of its progress by newspapers was considered a major factor in the rate of the industry's growth.

Newspapers, always quick to utilize a new instrument capable of speeding up the tempo of gathering news from the corners of the Earth, were among the first enterprising organizations to employ aircraft in their daily tasks. At first, their use was little more than a series of isolated "stunts" which presaged a wider use as the speed and reliability of aircraft increased. The year 1932 found many leading newspapers owning planes or fleets of planes, while others chartered ships to cover major news stories in their territories and all utilized the network of air mail and air transport lines to obtain news pictures or to transport reporters and executives.

The marked extent to which airplanes entered the daily tasks of leading newspapers and press associations was revealed in a survey made by the Aeronautical Chamber of Commerce of America directed to include the 350 newspapers having daily circulations in excess of 15,000, many of which had daily sales of more than 100,000. The results of the survey are presented here for the first time.

Without exception, the newspapers reporting indicated some use of airplanes during 1931. The smaller papers relied upon the air mail or special arrangements with air transport lines to speed news pictures to them, making it possible to keep pace with larger metropolitan dailies in serving readers. Thirty-one newspapers chartered special airplanes during 1931 to carry reporters to the scenes of the "biggest story of the day" or to rush good news pictures to make waiting editions. Eleven other newspapers employed specially chartered planes to build circulation in rural sections or place their editions at summer resorts or in important centers

ahead of competitors. Seven newspapers owned and operated one or more planes to carry reporters, photographers and executives.

All placed aviation news among the most important subjects capable of gaining reader interest. Eighty-eight newspapers had aviation editors especially assigned and trained to develop by-line news stories on aviation. A score of others had one or more reporters qualified to cover aviation stories who were assigned to important stories evaluated on news merits, although they did not bear titles as aviation editors. Forty-eight leading newspapers devoted regular feature columns or pages to aviation, either daily, semi-weekly or weekly. Twenty-eight were weekly pages or columns, fifteen of which appeared on Sunday. Fourteen were daily and three were semi-weekly.

Another group of newspapers reported the assignment of well trained writers to develop special aviation feature stories which appeared under the reporter's by-line three or four times each week, based on news merits. These could not be classed as regular aviation columns or pages, but were equally as valuable in keeping readers informed of the latest developments in this new field. From the information obtained with the cooperation of newspapers throughout the country it was possible to develop a directory of newspapers which had aviation editors, regular aviation pages or columns, and made frequent charters of airplanes during the year. The directory, listing the aviation editors by name and classified by states, will be found in Part V, the Aeronautical Directory, of this volume. The combined daily circulation of these papers was in excess of 15,000,000.

Press Associations Use Planes

Perhaps the most extensive use of airplanes—the profits of which accrued to hundreds of newspapers—was made by the great press associations, The Associated Press, United Press, International News Service and Universal Service, and the principal news picture agencies, Acme News Pictures, Associated Press Photo Service, Times-Wide World Photos, International News Photos, and similar organizations engaged in presenting today's news of the world in news and picture today. The experience of The Associated Press was probably typical of these enterprising news and picture organizations.

Airplanes were used by The Associated Press in 1931 to carry news pictures approximately 500,000 miles. This included chartered flights and other flights to take photographs and transport news pictures, but excluded any record of the extensive use of air mail for news pictures.

"The airplane has definitely established its place in the news photo organization as a necessity rather than as a stunt," N. A. Huse, executive editor of The Associated Press Photo Service, said in reporting his organization's use of airplanes in 1931. "The news photo is a perishable com-

"GOOD NEWS III" AUTOGIRO

Charles Gatschet, chief pilot of the Des Moines, Ia., Register and Tribune lands the newspaper's autogiro at the Des Moines airport.

REGISTER AND TRIBUNE "SCOOP"

Two million dollar Spencer, Ia., fire photograph taken from Stinson newsplane "Good News II" and published in Des Moines paper on same day.

modity and once it is outdated its value is nil. The airplane used in connection with the sending of photographs by wire and wireless has speeded the tempo of gathering and distributing news pictures to its highest pitch.

"Speed being the first requisite of the news picture organization, it is only logical that the airplane is called into use to gain precious minutes to beat newspaper deadlines. As a result, fast planes, skilled pilots and knowledge of flying conditions must be merged to get the news pictures to Associated Press members in the fastest possible time. The growth of The Associated Press a a world-wide news picture organization has, to no small degree, been dependent on the steady growth of aviation as a reliable and speedy means of getting the pictures to the newspapers."

The Associated Press Photo Service used airplanes on every major news story in 1931. Within the space of two weeks, the "Viking," a ship used by a moving picture expedition in the filming of an Arctic feature, blew up off the coast of Nova Scotia; on March 31 an earthquake destroyed the town of Managua, Nicaragua. On the same day a passenger plane carrying Knute Rockne, noted football coach, crashed on a Kansas hilltop.

In three widely separated sections of the world and in an incredibly short space of time, three major news stories had broken and headlines flamed across newspaper front pages. In each case, before the story was in newspaper type plans were being made for flying the pictures to some one of the telephoto points in the United States for distribution.

Covering "Viking" Explosion

In the case of the "Viking" explosion, Robert Fogg, Concord, N. H., pilot, wrote a little publicized saga of northland flying that had seldom been equalled in the field of aviation. Flying a plane with skis for landing in the snow, Fogg carried a cameraman to the isolated hamlet of Horse Island in sub-zero temperatures to obtain first and exclusive pictures of the survivors of the blast. In landing one of the skis was damaged and repaired with boards and wire. On the return trip, Fogg once shoveled a path through ten feet of snow to get his plane into the air.

From the Arctic to the scrambled wreckage of the city of Managua, Nicaragua, in the tropics was a wide jump. Deaths were estimated at 2,000 and property damage at $70,000. First photos of the wrecked city were flown to Havana by The Associated Press, thence to Miami by an amphibian plane and by fast plane from Miami to Atlanta and New York.

From the center of the United States—in Kansas—were flown the Rockne crash pictures in a night flight to the telephoto station at St. Louis.

When Colonel Lindbergh and his wife landed in Nome, Alaska, on their way to Japan during the summer, The Associated Press brought the first pictures to the United States in a long flight from Nome to Seattle.

The Herndon-Pangborn landing at Wenatchee, Wash., to complete the first non-stop flight across the Pacific, was flown to San Francisco and telephotoed throughout the country. Photographs of the devastation wrought by the hurricane which struck Belize, Honduras, were obtained by a chartered flight from Miami to Belize and return through the tail-end of the tropical storm.

Other major news stories in which airplanes were used for the taking and transportation of photographs included: the arrival of the Do-X; the launching and test flights of the "Akron"; the Gar Wood-Kaye Don motorboat races; the Lindbergh take-off from North Haven, Maine; the Yale-Army and Harvard-Army football games; the Post and Gatty arrival; the spectacular fire at the "Little Sisters of the Poor" home in Pittsburgh; and the World Series.

Fly World Series Photos

In the case of the World Series at Philadelphia, daily flights brought the pictures to New York to the telephoto station. Pictures were developed while the plane was high in the air and rushed direct to the telephoto station from the air field.

Similarly other news associations and photo services used planes to take and transport their pictures or speed reporters to a banner story. The International News Photos scooped all other services on the Preakness by chartering a plane to carry its photographer from a field near the Baltimore race track to the commercial airport, where connections were made on the regular passenger plane of the Ludington Line to reach New York an hour ahead of competitors.

The United Press made a unique use of planes when Carl D. Groat, United Press news director, ordered United Press men throughout the country to page local specialists for a small supply of a certain newly discovered hormone considered the only possible remedy to save a mother of five children believed dying in a Chicago hospital. None of the rare remedy could be found in Chicago or vicinity, but a United Press man discovered some in the hands of a Buffalo physician and in a few hours, with the aid of airplanes and police escorts, it was in the Chicago hospital. Administration of the remedy was successful and the mother was reported recovering at the close of the year. United Press men had long become accustomed to flying when they had to reach a story in a hurry, and many of them were reported to use the regular air lines by preference when circumstances of the trip permitted.

The Birmingham (Ala.) News and Age-Herald sent its alert flying photographer to get an air view of the State Training School for Girls when it was under investigation by the state legislature which charged cruel treatment of inmates and the paper had been barred by officials of

the institution. Again, its aviation editor flew to Los Angeles for the story of the opening of the southern transcontinental air mail route. The Little Rock Arkansas Gazette sent its aviation editor on the annual Arkansas Air Tour.

Planes Cover Major Disasters

When a section of the Los Angeles aqueduct in the mountains bordering the Mojave desert was dynamited before dawn, the Los Angeles Evening Express sent reporters and photographers by plane to the scene, 200 miles away, and secured coverage and art which appeared in late editions of the same day. The St. Francis dam disaster in San Fracisquito canyon was covered by the Express by airplanes. Planes were brought into play again to speed reporters to Phoenix when the Winnie Judd murder case was front page news. A blimp and airplane were used to score a picture scoop of the steamship "Harvard" on the rocks off Santa Barbara, Cal. The Express kept a list of 20 planes available for charter at a moment's notice, covering football games, outstanding aeronautical events, murders, kidnappings and major disasters.

Not to be outdone by the Express, the Los Angeles Times used planes frequently. Four hours after the Judd murder case broke, reporters of the Times were in Phoenix—366 miles away. The trail of an escaped murder suspect, William Tallman, led a Times man twice to San Francisco by air. Times reporters and photographers were with scientists in a specially chartered airplane two miles in the air when the Earth was attacked by a shower of Leonids. Pictures of the Southern California-California football game were flown to Los Angeles in one hour and fifty-eight minutes, a 345 mile hop.

The San José (Cal.) Mercury Herald sent a flying reporter with state forestry officials to get a story and photographs of forest fires in central California; and, again, to photograph the site of a new city improvement project and the proposed West Coast airship base of the Navy near San José. In Connecticut, the Hartford Times' aviation editor flew with state aeronautical officials in an airplane patrolling the scene of football games and on other news and photographic missions.

In the national capital, the enterprising aviation editor of the Washington Daily News had flown 50,000 miles on out-of-town assignments during his four years on the job. In Illinois, the Chicago Tribune—whose editor owns an airplane for his personal use—chartered planes to make air views of the Navy airship "Akron" on its first flight over the city and to get new pictures of the unemployment relief air show sponsored by the Tribune. The Chicago Daily News, Chicago Herald and Examiner, Chicago American and Chicago Evening Post similarly employed planes for special occasions. The Rockford (Ill.) Register Republic dispatched its

PANTAGRAPH'S "SCOOP III"

Stinson (Lycoming) monoplane "Scoop III" of the Bloomington Pantagraph landing at home airport after returning from big news story.

© *Buffalo Times*

DISCOVER MAROONED MEN

J. Winton Lemen, Buffalo Times staff cameraman, got this unusual news photo of men marooned on ice floe in Lake Erie, crying for help.

aviation editor to the scene of a southern Wisconsin tornado disaster when reporters working on the ground were unable to learn the extent of the damages. The flying reporter got his story and photographs in an hour and twenty minutes.

"Scoops" Made Easy by Air

In Louisiana, the New Orleans Times-Picayune printed news pictures of the Tulane-Georgia football game at Athens, Ga., 30 hours ahead of its contemporaries by arranging a charter trip of a Wedell-Williams racing plane to carry photographs the 550 air line miles in one hour and fifty-three minutes, a 229 mile an hour average. The final gun ended the game at 4 : 15 o'clock (New Orleans Time) and action photographs were in the first edition when presses started to roll them off at 7 : 30 o'clock.

In Massachusetts, the Boston Evening Transcript sent its expert photographer in one of the bombing planes of the Army's air division during the "battle of Boston" feature of the 1931 maneuvers. The battle's acrobatics were too much for the photographer's stomach to stand, but sick as he was, he rose to the occasion and shot what Army fliers called the "best picture of the maneuvers," pursuit planes diving to attack the bombers in which the photographer rode. His conservative editor displayed it as a quarter page picture that night. It is reproduced with the Transcript's permission in this volume. The Berkshire Evening Eagle in Massachusetts created special interest in its new rotogravure section by flying the roto sections to Pittsfield from Philadelphia.

In Michigan, the Grand Rapids Press and other newspapers of Booth Newspapers, Inc., sent their outdoor editor to Isle Royale, 14 miles off the Canadian shore of Lake Superior, to obtain the first winter pictures of the lonely wilderness which is to become a national park. The party lived 11 days on the island, fitted their plane with skis and returned with the pictures of their experience. The ski-equipped plane was damaged slightly in landing on dry ground, but none was injured.

In Minnesota, the Minneapolis Star had an arrangement with Northwest Airways to transport papers to La Crosse, Wis., as the first step in a plan to extend its airplane delivery service. The St. Paul Dispatch and Pioneer Press dispatched a plane with reporter and photographer to get an exclusive story of the shooting of the sheriff of Fairmont, Minn., by a demented Mexican, who barricaded himself in a shack and battled with police until he was slain in a dash for freedom.

Bank Robbery Covered by Air

In Nebraska, the Lincoln Nebraska State Journal dispatched its flying reporter-photographer, Richard O. Bennett, to Hastings in May when news

BUYS FIRST AUTOGIRO

Pitcairn (Wright Whirlwind) autogiro of the Detroit News, the first commercial autogiro sold in United States, seen over downtown Detroit.

SPEEDING TO NEWS EVENT

Wasp-powered Lockheed Vega of the Detroit News speeding over downtown Detroit to scene of news story as viewed from the News' autogiro.

came that the First National Bank had been robbed by an armed band. An hour and a half later, Bennett was taking pictures and getting his story in Hastings. They appeared on the Journal's front page that night. Two weeks later six gangsters accused of a $2,500,000 Nebraska bank robbery at Lincoln in 1930 were apprehended in a spectacular raid at East St. Louis, Ill. Nebraska officials and witnesses left Lincoln quietly to meet Illinois police "some place between East St. Louis and Chicago." Reporter-photographer Bennett was off in a chartered plane, landed at Moline, learned that the bandits were taken to Morrison, Ill., flew on to Morrison, talked to the suspects four hours before officers and witnesses who had a ten hour head start could arrive at the scene. Photographs and stories were rushed to Lincoln and another page one scoop. Bennett had earned a private pilot's license before the close of the year, the first flying reporter in Nebraska.

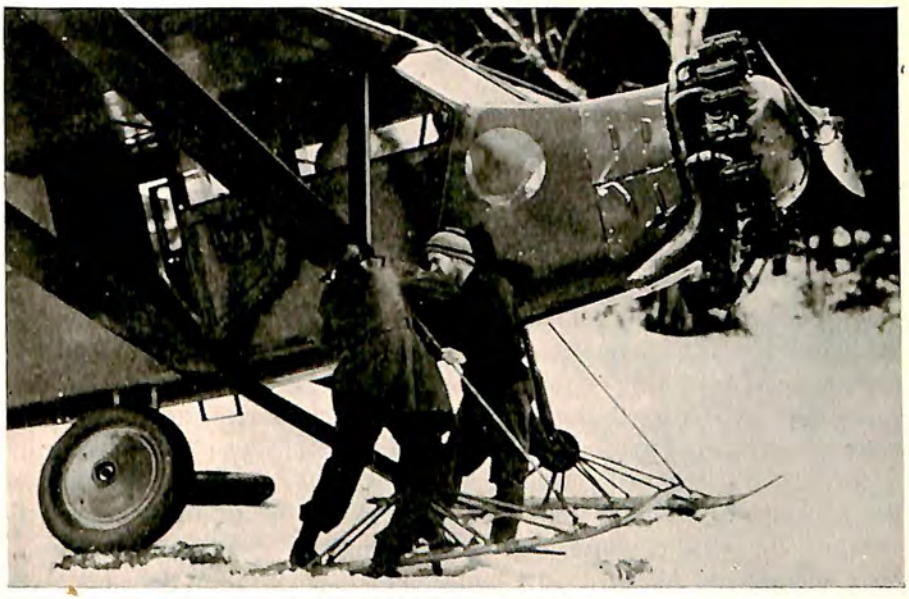
In New Jersey, the Newark Evening News chased the "Akron" in a chartered plane when it suddenly headed toward Newark on its first eastern flight, obtained air views for local consumption. The enterprising News also served Jersey coast resorts with "airplane edition" newspapers during the summer.

In New York, the New York Times sped its editions by plane to Montreal, Palm Beach, Rutland, Vt., Lake Placid and Ottawa, chartered a special midnight-express to rush newspapers to the National capital for early breakfast readers. When fishermen became stranded on an ice floe, in Lake Erie, the Buffalo Times scored a national scoop by chartering a plane, carrying food, taking pictures of the marooned party as it wrote a pathetic call for "Help" and "Eats" in the snow of the ice floe. Again when Niagara's brink sagged, the Times rushed pictures of the change in the nationally known wonder of nature.

Sports Editor Flies to Fight

In North Carolina, "Observer Sports Editor Covers Stribling-Schmelling Fight" written across the side of a chartered plane of the Charlotte Observer told the story of another newspaper enterprise as the plane took off to speed its sports editor to the fight and home again. The streamer was changed often throughout the year as the Observer exploited other stories of the hour.

In Ohio, Akron's Beacon Journal was alert to the interest of its readers in the product of the community, the U.S.S. "Akron," on its maiden flight, photographing the giant airship from an accompanying blimp. For years, editors of the Akron Times-Press were annoyed by the fact that its news picture mats arrived from New York by regular mail 10 minutes late for the first edition. Air mail service to Akron in 1931 put the same mats on the editor's desk three hours and a half before edition time. The Toledo



SKIS FOR NEWS EXPEDITION

Skis replacing wheels on the plane used by the Grand Rapids Press and Booth Newspapers, Inc., for its news expedition to Isle Royale.

ON BANK ROBBERY NEWS STORY

Rain failed to stop M. A. Bell, pilot, and Richard O. Bennett, reporter, of the Lincoln Nebraska State Journal in $2,500,000 bank robbery case.

Blade had action pictures of the dedication of the Harding Memorial at Marion, O., and the American Legion convention at Detroit in its home editions within 90 minutes after the events took place, by chartering planes for reporters and cameramen.

In Oklahoma, the managing editor of The Daily Oklahoman said "air service has become so great a faculty in daily newspaper work that I wonder how we got along without it" as The Oklahoman and the Oklahoma City Times used aviation to produce spot news pictures 500 miles from the city within 12 hours after the news broke.

In Pennsylvania, the Philadelphia Public Ledger covered the arrival of "Old Ironsides" at the mouth of the Delaware with an autogiro that raced pictures back to waiting editions. The Philadelphia Record sped its papers to seashore by chartered planes, sent its reporters into the drought-stricken areas to get bird's-eye views of the situation by airplane.

In Virginia, when the Richmond News Leader faced the problem of getting pictures from isolated Yorktown, hemmed in by heavy traffic columns, during the sesqui-centennial celebration, it used an airplane to place pictures on its front page within three hours after they had been snapped.

In Washington, the Seattle Post-Intelligencer frequently sent planes to meet incoming Pacific steamers and obtain news pictures from the Orient 10 to 12 hours before their usual time of arrival at Seattle, especially on the occasion of the visit of Siam's King and Queen.

In Wisconsin, Milwaukee's Journal had a noon deadline. It dispatched a plane five hours earlier to get pictures of forest and lumber yard fires at Menominee, Mich., 160 miles away. Smoke surrounded the plane, forced it to fly low. Suddenly the fire panorama opened before the flying reporter-photographer—burning slashings, smouldering barns, columns of smoke. Snap went the shutter. Fifteen minutes before the deadline, the exclusive pictures were ready for the edition.

These are but a few of the untold and unsung sagas of daily newspaper routine in which aviation joined hands with the press to aid in promoting their common interest in speed and more speed. Several leading newspapers recognized in the airplane a vehicle important enough to be included as a part of their privately owned transportation equipment, as necessary as fast staff cars and circulation trucks in getting the story of the day or in transporting pictures or newsmen.

Newspapers Buy New Aircraft

The Detroit News added a Pitcairn PCA-2 (Wright Whirlwind) autogiro—the first commercial autogiro sold in the United States—to aid its Lockheed Vega (Pratt and Whitney Wasp) monoplane in getting stories in word and pictures. The Lockheed covered the Gar Wood-Kaye Don

motorboat race, made a remarkable "shot" of Detroit "from River Rouge to Lake Huron" from 20,000 feet, and took thousands of other pictures for pictorial or news purposes during 1931. The autogiro covered the dedication of the Harding Memorial and other events to which its unique characteristics were especially adapted.

The Bloomington (Ill.) Pantagraph purchased its third airplane in 1931, a Stinson Junior (Lycoming) monoplane, to keep pace with its needs for circulation promotion and the gathering of news over a wide area in Illinois. The Pantagraph's general manager, Davis Merwin, was a transport pilot with 500 hours solo time. The Fort Wayne (Ind.) News Sentinel continued to use its Ryan monoplane to speed reporters and photographers to important news events; and the Cleveland (Ohio) News found its Sikorsky (2 Pratt and Whitney Wasps) amphibion invaluable for special news events and to transport executives. Col. R. R. McCormick of the Chicago Tribune kept a Sikorsky (2 Pratt and Whitney Wasps) amphibion groomed for his personal use, while the flying publisher of the Wichita (Kans.) Eagle, M. M. Murdock, flew his personal plane on frequent business trips.

The Des Moines (Ia.) Register and Tribune added a Pitcairn PCA-2 (Wright Whirlwind) autogiro "Good News III" to its equipment to supplement its Stinson Detroiter (Pratt and Whitney Wasp) monoplane "Good News II" during 1931. When a ten-cent sparkler started a fire in Spencer, Ia., which caused $2,500,000 damages and destroyed the business district the "Good News II," with the Register and Tribune chief pilot, Charles Gatschet, at the controls, was quickly dispatched to the scene, brought back pictures showing the flames at their destructive work. Gatschet visited 79 Iowa towns in three months on good-will flights with the autogiro, making 2,052 flights and carrying 1,663 persons.

Aviation Lays Problems Before Editors

Aviation—as a new and, in some of its phases, rather spectacular industry—was the subject of columns of news in the daily press. Some of the news was of a constructive nature which would aid the industry in its steady and normal growth. Much of it was the ballyhoo of certain publicity-seekers who found that they could ride to fame and front-page stories on the wings of this new mode of transportation. Some of it was destructive, because it deterred millions from utilizing the safe, speedy comfortable services of the scheduled air transport lines by over-dramatizing and sensationalizing the reckless, audacious and dangerous exploits of a relatively few individuals who were not representative of the organized industry.

The aviation industry, as represented through the Aeronautical Chamber of Commerce, had given considerable thought to this important prob-

lem. It realized that reporting the every-day news events of a new industry—which brought a whole new vocabulary of technical terms with it—was necessarily difficult. Most newspapers cooperated closely with the industry in the desire of both to "get the story right," and the industry was grateful to these leaders. A few editors, however, were presenting an erroneous picture of the status of aviation, and particularly the air transport lines—with their remarkable safety record—by playing up accidents to student fliers, experimental planes and "barnyard aviators" to confuse the minds of readers.

Faced with this serious problem, the Air Transport Section of the Aeronautical Chamber of Commerce laid the facts of air transport and the principal problems of the growing industry before newspaper editors and publishers through six full-page advertisements in the most widely read newspaper trade journal, Editor and Publisher.

Folders containing copies of the advertisements were mailed to outstanding editors and publishers. All of the messages invited editors to express their opinions in letter to the Aeronautical Chamber of Commerce. More than 200 letters from important newspapers were received, commenting favorably on the campaign and hailing it as "an important step in clearing up a distorted picture of aviation in the minds of some editors." An air tour into the middle west, south and east by a representative of the Chamber, visiting the editors or publishers of 47 newspapers in 14 principal cities, brought further commendation of the industry's message and suggestions for carrying it on. At the close of the year, the Chamber was keeping a close check on the treatment of aircraft accident news in the newspapers of 70 principal cities in the United States to further study the relations of the press and the aviation industry on this important problem.

CHAPTER XIII

FEDERAL PROMOTION OF AIR COMMERCE

Department of Commerce Expands Federal Airway System—Regulatory Activities Increased—Close Liaison with Industry Maintained—Weather Bureau Aids—N.A.C.A. Starts Seaplane Research

BRANCHES and divisions of the federal government charged with the promotion and regulation of air commerce as an aid to domestic and foreign trade carried out an extensive program during 1931, designed to protect the interests of the public in the safe, efficient operation of aircraft and aid the industry in building a comprehensive air transport network.

Under the leadership of Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics, the Aeronautics Branch of the Department of Commerce continued to pursue a policy of allowing the new industry a wide measure of self-regulation through its accredited representatives. Close cooperation with the industry was maintained on all questions of regulation arising, and a constructive liaison was fostered between the Aeronautics Branch and the industry's trade association, the Aeronautical Chamber of Commerce of America. Similar cooperation was afforded the industry through the Aeronautics Trade Division of the Bureau of Foreign and Domestic Commerce, headed by Leighton W. Rogers, who directed the carrying out of a program for the expansion of American aircraft markets at home and, particularly, abroad. The Chamber cooperated with the division in the publication regularly of the Export Trade News, containing trade information for the aeronautical exporter.

Outstanding in the program of the Aeronautics Branch was the expansion of the federal airways system designed to provide 25,000 miles of domestic airways fully equipped with aids to air navigation for the safe operation of aircraft both day and night. In 1931, 17,500 miles of airways had been lighted or were under construction with complete radio direction and communication facilities and weather reporting services. Including the 2,000 miles of lighted airways authorized for 1932, the airway program embraced 19,500 miles. In addition to this lighted and well-equipped system, there were 1,123 miles of airways which had been provided with air navigation facilities for day operations. Portions of this mileage were

to be lighted during 1932. The system was the most extensive for night and day operations under a single flag any place in the world.

There were 48 airways radio communication stations in operation for the broadcast of weather information to planes in flight at frequent intervals, an increase of 13 stations during the year. Ten additional stations were under construction. With the increased importance of directional radio range beacons to scheduled air transport operations, 51 of these beacons were in operation and 13 others were under construction.

The end of 1931 saw 9,500 miles of automatic telegraph-typewriter circuits for the collection and transmission of weather reports along the airways in operation, an increase of 3,850 miles over the preceding fiscal year. The federal airway system was built on three transcontinental trunk routes; the one from New York to San Francisco was in operation on day and night schedules; the midcontinental from New York to Los Angeles and the southern transcontinental from New York via Atlanta to Los Angeles were completed for day operations and the major portion of the routes was available for night operations. The year 1932 was to see the three systems completed for 24-hour operation.

With the aid of commercial companies in the industry and under the direction of research engineers of the Department of Commerce, an extensive program was undertaken during 1931 to investigate various aids to navigation, including a device for the simultaneous transmission of radio telephone weather broadcasts and visual type radio range beacon signals on the same frequency; a system of radio aids to facilitate blind landings of aircraft; a new improved type visual radio beacon course indicator; a simple direction finder for aircraft; and a deviometer which permits a pilot to follow any chosen fixed radio beacon course within 15 degrees on either side. Other research problems were directed at the reduction of noise from airplane engine exhausts by the use of mufflers; the development of crash-proof tanks; the control of airplanes at low speeds by means of conventional ailerons; a study of welded aircraft joints; and research into various phases of aeronautical lighting.

The Aeronautics Branch continued the development of its inspection procedure under the regulations governing the scheduled operations of interstate passenger air lines, designed to standardize the practices of the various lines in the interests of safe and efficient operations. A conference of scheduled passenger air line operators was called in Washington late in July, at which time the Air Transport Section Committee of the Aeronautical Chamber of Commerce presented a series of recommendations for changes and additions to the regulations governing scheduled air lines. The Committee's program aided in crystallizing the opinions of all operators and made possible the settlement of all questions to the mutual satisfaction of the operators and the Department of Commerce.

The aircraft and engine manufacturers, meeting with officials of the

Aeronautics Branch for the third year in an annual conference of the Department of Commerce and the Aircraft Manufacturing Section of the Aeronautical Chamber of Commerce, recommended certain changes in the regulations governing airworthiness after an extensive study by a group of engineers from the commercial industry and engineers of the Department. The recommendations were adopted with minor changes made by mutual agreement.

The Airport Section of the Aeronautical Chamber of Commerce repre-

BYRD HONORED BY WRIGHT WORKMEN

Committee of employees of Wright Aeronautical Corp. presenting a sun dial to Rear Admiral Richard E. Byrd commemorating his flights.

sented the industry in another conference called by the Department of Commerce as a result of a protest of the National Electric Light Association and other public utility trade associations against the regulations governing marking of power lines and other obstructions to air navigation. The result was a clarification of the language of the regulations and an assurance that the interests of safety in air navigation would be protected in the proper lighting of all important obstructions. The Chamber's Airport Section also was represented on committees of the Aeronautics Branch appointed to study aeronautic radio research, airport zoning and eminent domain, and airport traffic control.

The inspection service of the Aeronautics Branch, one of its most important divisions, employed 88 inspectors in 1931, 75 of whom were pilot aeronautical inspectors and 13 factory airplane inspectors. There were nine district supervisors, eight aeronautical engineering inspectors, nine aeronautical school inspectors, six air line inspectors, 40 aeronautical inspectors, and 13 airplane inspectors, two of whom were assigned to air line maintenance inspection. Three officials directing the work of this service were located in Washington.

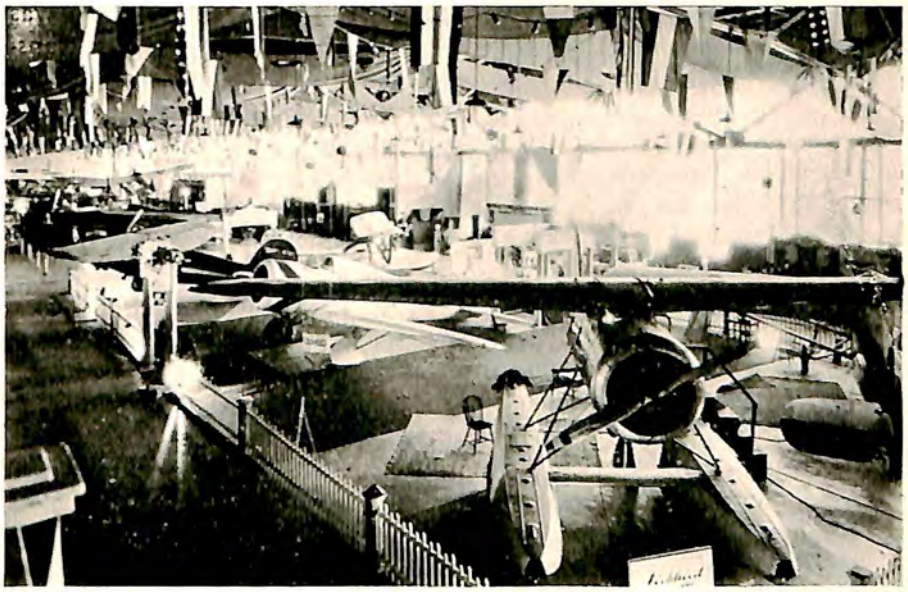
The medical section experienced a decrease of 10.2 per cent. in the number of medical examinations handled during the fiscal year, due largely to the reduction in the number of students trained during 1931. While students fell off 32.7 per cent. from the previous year, the number of renewal examinations for licenses increased 25 per cent. There were 798 medical examiners in 1931 as compared with 816 in 1930.

The registration section handled 44,206 licenses, renewals of licenses, transfers of title, and export certificates during the fiscal year 1931. The total volume of work decreased about four per cent. from the high mark of the previous year. The enforcement section, charged with investigation of violations of the Air Commerce Regulations and Air Traffic Rules, handled 1,168 offenses during the year, 224 for acrobatics, 212 for low flying, 102 unlicensed pilots flying licensed planes, 17 without navigation lights, 13 without identification numbers, and 600 miscellaneous offenses. Penalties were assessed in 268 cases; reprimands in 173; suspensions in 314, and license revocations in 63. Eighteen denied the charges and 306 cases were dismissed.

The engineering section issued 98 approved type certificates for airplanes during the fiscal year 1931, 19 for engines, 39 for parachute—a new classification—and 235 for propellers. In addition, 132 types of airplanes, one glider, and 17 propellers were examined and approved for license without being granted approved type certificates. There were also numerous approvals for such components as pontoons, skis, flares, wheels, tail-wheel shock absorbers, shock-absorbing struts, navigation lights, and autogiro rotor hubs. During the year, tests were undertaken on 27 engines, and of this number 14 passed, 10 failed, 2 were withdrawn and one was undergoing tests.

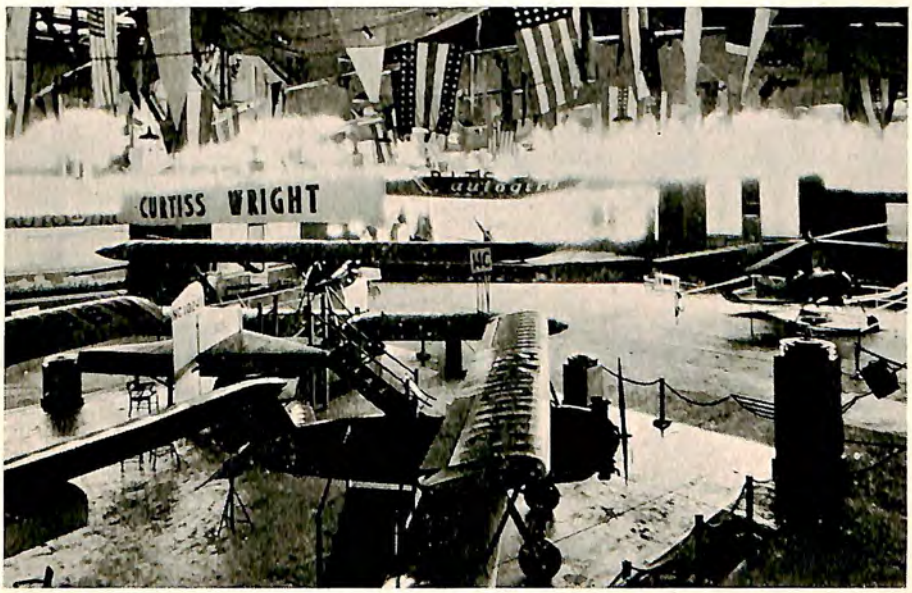
The aeronautical development service assisted communities in the selection and development of airports, the rating of airports, the promotion and correlation of aeronautic research, and the publication and dissemination of aeronautic information. Twenty-one aeronautics bulletins and three other publications were written or revised during the fiscal year.

The Department of Commerce undertook elaborate studies of the causes of aircraft accidents and kept detailed statistics on accidents in several classifications, including scheduled air line operations, student instruction, aerial service operations, experimental flying, etc. The statistics showed an



NEW PLANES AT NATIONAL SHOW

Section of National Aircraft Show sponsored by Aeronautical Chamber of Commerce in Detroit, showing new Lockheed models in foreground.



AUTOGIRO MAKES DEBUT

National Aircraft Show at Detroit was the occasion for the commercial debut of the autogiro shown directly behind Curtiss-Wright section.

improvement in the safe operation of aircraft during the year, which was particularly marked in the operation of planes on the scheduled air transport lines. Tables giving this information in detail will be found in Part IV of this volume devoted to Flying Facts and Figures for 1931.

Just as the Department of Commerce enjoyed the close cooperation of the Bureau of Standards on its engineering and research projects, so it received the closest cooperation of the United States Weather Bureau, which extended its weather reporting system to make possible the frequent collection of information on both sides of principal airways for hourly broadcast to planes in the air equipped with radio. The importance of the work of the Weather Bureau in this field of developing accurate and adequate weather reports for flying could not be overemphasized.

The National Advisory Committee for Aeronautics, created by Congress in 1915 and equipped with one of the best research laboratories in the world, continued to work with the several departments of the federal government and with the commercial industry upon fundamental problems of flight. In May, the committee held its Sixth Annual Aircraft Engineering Research Conference at Langley Field.

Two hundred engineers and government officials who attended the conference saw a new wind tunnel, the largest in the world, in which a full-sized airplane might be tested in an air flow of 115 miles an hour; a new seaplane testing channel one-half mile long, capable of testing hulls or pontoons by dragging them through the water at 60 miles an hour; and a "non-stalling" attachment which prevents the pilot of a plane from pulling his control stick back far enough to cause a stall. Details of the 1932 research program of the committee were discussed and suggestions obtained from the commercial industry for further study.

Several governmental boards, formed to coordinate the work of various departments and bureaus of the federal government, continued their programs during the year. The Aeronautical Patents and Design Board, created to inquire into the value and possible use of aeronautical inventions by the government, considered several hundred designs passed on to it by the National Advisory Committee for Aeronautics. The Helium Board acted as the coordinating and advisory board of the Army, Navy and Bureau of Mines departments interested in the non-inflammable lifting gas used in lighter-than-air craft. Actual control and production of helium remained in the hands of the Bureau of Mines, which maintained a huge plant at Amarillo, Texas.

Duplication of effort in the Army Air Corps and Navy Bureau of Aeronautics came under the scrutiny of the Aeronautical Board. The Board of Surveys and Maps similarly brought together the various departments in the government interested in and concerned with the development of maps. The boards were of real value in cutting expenses of the federal government through elimination of waste effort.

CHAPTER XIV

STATE AERONAUTIC LEGISLATION

Nearly Five Hundred Bills Affecting Aviation Before Legislatures in 1931 —New Regulatory Acts—Few Appropriation Bills—Gasoline Tax, Liability and Insurance Bills Considered

WITH the legislatures of every state in the Union in session—with the exception of Kentucky, Louisiana and Virginia—1931 witnessed an unprecedented amount of activity in aeronautical legislation. The legislatures met at least once, and in some instances two or three times in special session.

The Legal and Legislative Bulletins of the Aeronautical Chamber of Commerce, part of the regular bulletin service to members developed by its Legal and Legislative Research Service, carried reports on 476 bills introduced in state legislatures concerning aviation and on 118 new laws enacted. The mere number of bills and laws manifested the interest and attention being given to aviation by the country's law-makers.

It would be imposible to review, within the bounds of this chapter, either the bills introduced or the laws enacted. However, it should be interesting to consider some of the most important or significant of the new laws, with respect to subject matter, and to indicate the nature of the legislation attempted in certain instances. Tables giving succinct information on the status of state laws affecting important subjects in aviation and providing a statistical analysis of the year's activity in the 45 state legislatures will be found in convenient form in Part IV, Flying Facts and Figures For 1931, in this volume. The information there supplements that discussed in this chapter.

Speaking generally, the laws enacted might fairly be considered favorable to aeronautics. For the most part, legislation definitely inimical to aeronautics failed of passage.

The licensing of aircraft and airmen was again one of the most important subjects for consideration by the states. At the beginning of the legislative year, six states—Alabama, Georgia, Louisiana, Oklahoma, Tennessee and Utah—had no license laws in effect. During 1931, Alabama passed a law requiring federal licenses for all aircraft and airmen. Georgia considered, but failed to pass, a bill authorizing the Highway Department

to regulate the licensing of aircraft and airmen and to make the law uniform. Tennessee enacted a law requiring either a state or a federal license for all civil aircraft and for all airmen serving in connection with civil aircraft; and Utah enacted a law requiring a federal license for all aircraft except military aircraft of the United States or of a state or territory and aircraft licensed by a foreign country having a reciprocal agreement with the United States, and further requiring a federal license for all persons operating any aircraft in the state. Accordingly, 1932 found only two states without licensing laws: Georgia and Louisiana.

The present status of the licensing laws of the various states has been tersely tabulated for ready reference in Part IV of this volume. In all, 17 states enacted new licensing laws in 1931 and there were 18 such laws put into effect. Nine other states considered licensing legislation but failed to pass it. Of the 43 bills introduced on the subject, 25 failed of passage.

New Airport Enabling Acts

Airport enabling acts, which have as their principal object the giving of authority to governmental divisions in the state for the acquisition, operation, maintenance and control of airports and landing fields, were considered by the legislatures of 28 states, and 17 states enacted 24 new laws of which only six were directed to particular airports as distinguished from general enabling acts. The results of activity in this field were certain to be gratifying to the industry. There was a total of 55 such bills considered, 31 being unsuccessful.

In this study, legislation closely related to the giving of authority for airports—such as bills and laws granting power of condemnation for airports—has been included. The constantly increasing authority given to governmental divisions for airport acquisition and control was taken as a favorable indication of the developing realization that such powers were a very important factor in aeronautical progress.

Regulation and Promotion of Aeronautics

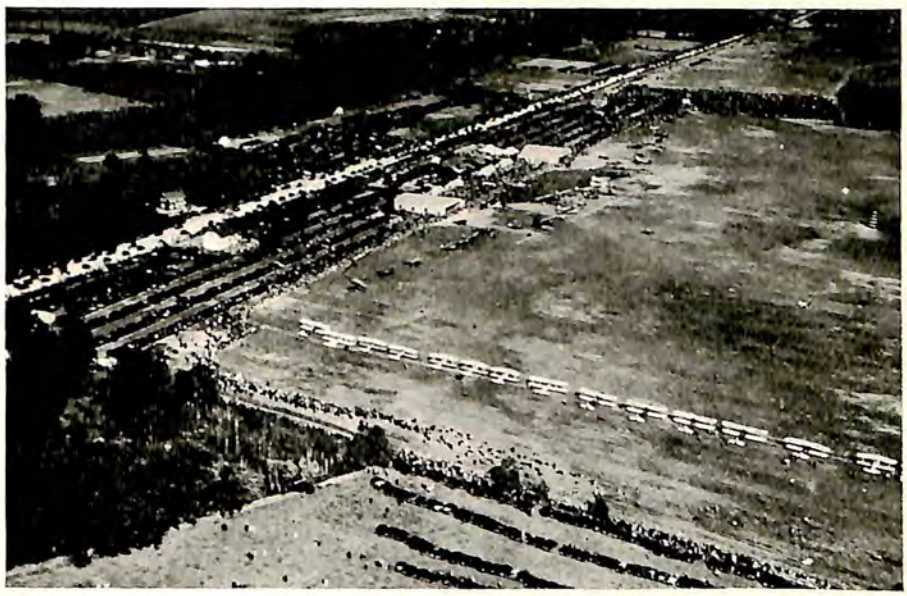
On such subjects as the regulation of aeronautics, air traffic rules, aeronautical boards and commissions, and aids to air navigation, the legislatures of 35 states considered 138 bills of which 39 became new laws. It should be interesting to refer briefly to some of these laws and bills.

In Arkansas, a new law established a Department of Aeronautics; while New Jersey placed the power to regulate aeronautics in the state in a State Aviation Commission. Michigan provided for certain aids to navigation and aeronautics. In Minnesota, a law was enacted providing for the establishment and protection of air rights over areas near airports and the

marking of obstructions in such areas, and another law provided for the lease, acquisition and use of air rights.

Illinois passed a new law setting out extensive provisions for the regulation of state aeronautics. In Maryland, new provision was made for the air marking of cities and towns, while Michigan passed one law providing for the marking of air hazards and the elimination of air hazards near airports, and another providing for the registration of aircraft according to its useful pound load and for the inspection of aircraft and parachutes.

New York extended the tenure of its temporary State Aviation Com-



FIRST STATE-OWNED AIRPORT

Rhode Island State Airport at Providence, R. I., during dedication ceremonies of first airport constructed by a state.

mission to April 1, 1932; and Oregon enacted legislation providing for a State Inspector of Aeronautics. A new Ohio law adopted the Federal Air Traffic Rules; and Tennessee provided for its state regulations to coincide with the federal rules. In West Virginia, power to regulate aeronautics was placed in a Board of Aeronautics.

Unsuccessful legislative attempts on these subjects were numerous. Some of these measures—enough to provide a cross-section of this attempted legislation—should be interesting to review.

In California, a bill to create an aeronautical commission, a bill regulating aviation generally, a bill creating a state division of airways, and

another bill defining the duties of such a division, together with a concurrent resolution creating a joint committee of the Senate and Assembly to investigate state aviation conditions all failed.

Georgia's legislature turned down a bill creating a Board of Aeronautics and a Director of Aeronautics and providing also for the licensing of aircraft, airmen, airports, the promulgation of regulations for the control of aviation, and the acquisition of land for public airports. Bills failed in Illinois which would have authorized the appointment of a planning commission to submit plans for the development of resources helpful to aviation and would have required aircraft transporting persons for hire to carry two licensed pilots and provide parachutes and instructions to each passenger so requesting.

In Iowa, a bill creating a board to license all aircraft mechanics, a bill setting up a commission to fix reasonable rates for services by air transportation companies, and a bill providing for the public utility regulation of air transportation companies in the state all failed.

Kansas turned down bills regulating the location of telegraph and telephone power lines adjacent to airports and creating a Board of Automotive Mechanic Examiners. Bills creating a temporary commission to study aviation problems and making air transportation companies public utilities failed in Maine. In Massachusetts, a bill providing for the appointment of a Commissioner of aircraft pilots failed of passage.

In Minnesota, a bill amending the law relating to the licensing of aircraft and airmen and air traffic rules and providing for a Commission and Director of Aeronautics, and a bill relating to the lease, acquisition and use of air rights were unsuccessful. A bill regulating the use of aircraft and providing for a Bureau of Aeronautics in Missouri was not enacted. In Nevada, bills failed which would have provided for the licensing of aircraft and airmen, for air traffic rules, for placing power in the Public Service Commission, and conformity with the federal rules.

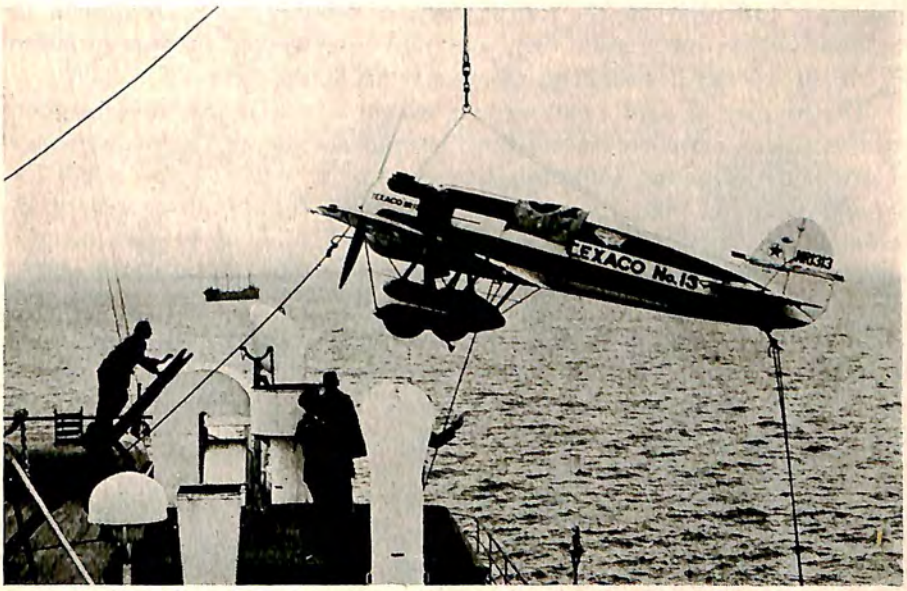
In New Hampshire, a bill was introduced providing for the regulation of aviation and for the powers of the Public Service Commission over aeronautics. New York's legislature saw bills introduced requiring licenses for flying schools, making certain aircraft common carriers subject to the Public Service Commission, authorizing the Public Service Commission to relocate electrical transmission lines located within one thousand feet of airports, requiring emergency exits for cabin aircraft, and parachutes for passengers.

In Oklahoma, a bill providing for the regulation of aeronautics was unsuccessful. Oregon, similarly, failed to pass a bill authorizing the State Board of Aeronautics to regulate airports, air schools and aircraft, and another bill providing for registration fees on state aircraft.

Bills were introduced in Pennsylvania authorizing the State Aeronautical

HAWKS HURDLES ALPS

Capt. Frank M. Hawks took time to snap this view of the Alps on his London-Rome-London one-day flight in a Travel Air (Wright Whirlwind) Mystery Ship.



HAWKS INVADES EUROPE

"Texaco 13," Capt. Frank M. Hawks' low-wing monoplane, is hoisted to the deck of the S.S. "Europa" in preparation for fast air tour.

Commission to establish navigation facilities along civil airways, legalizing the operation of aircraft on Sundays, and requiring passenger aircraft to carry parachutes. A bill was unsuccessful in Tennessee which would have provided an annual tax of $20 on each aircraft carrying passengers or freight for hire. Texas failed to pass a bill providing for the licensing and registration of aircraft mechanics.

Unsuccessful bills were introduced in Washington providing for control by the Department of Public Works of commercial aircraft over a fixed route, requiring certificates of public convenience and necessity; authorizing the Highway Police to enforce the aeronautical laws of the state; regulating the height of flights; and prohibiting acrobatics. In Wisconsin, a bill providing for a Commission of Aeronautics with power to regulate aircraft and airmen and the licensing of both was unsuccessful.

Few Aeronautic Appropriations

There was comparatively little appropriations legislation for aeronautics introduced during the 1931 sessions. Of 35 bills having such appropriations as their principal subject matter, only nine were successful.

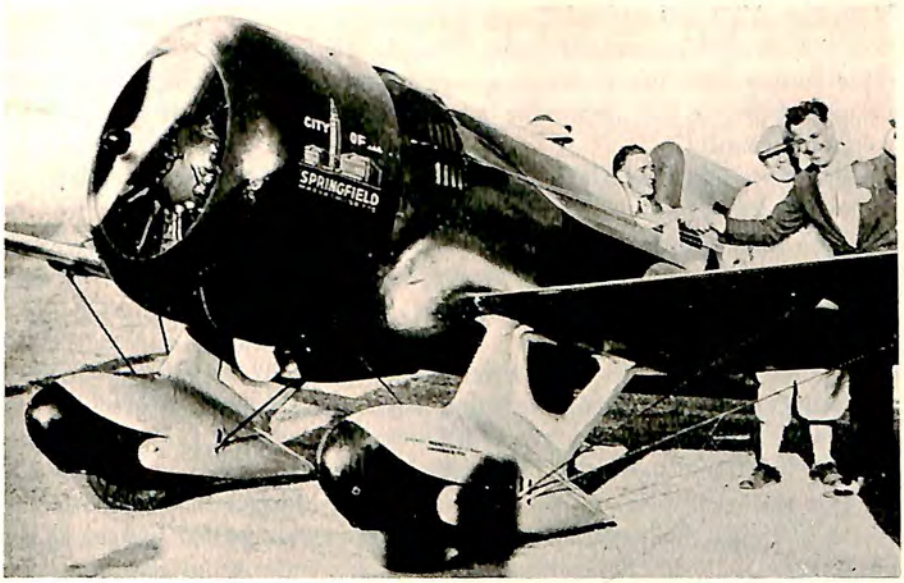
Idaho appropriated funds for the Aeronautical Division of the Department of Public Works. Maine passed a law providing for the allocation of the unrefunded aircraft fuel tax to the promotion of aeronautics. Michigan made provision for the transfer to the Aeronautical Commission of the gasoline tax on aircraft fuel; and in Pennsylvania, an appropriation was made for the development of aeronautics in the state.

The number of appropriations bills which failed were far more numerous. Alabama considered a bill for an appropriation for the maintenance of municipal airports. California heard a similar bill and also a bill for an appropriation from the motor vehicle fund for the development of aeronautics. Connecticut considered an appropriation of $34,900 for the use of the Airport Commission and a bill giving state aid to quasi public airports.

In Georgia, a bill provided for the authorizing of expenditure of funds for illuminating highways in aid of aviation. Maine's legislature had a bill before it which would allocate the gasoline tax revenue from aircraft fuel to aeronautical purposes. Maryland failed to pass a bill authorizing $34,000 for an airport at Fredericksburg.

In Massachusetts, an unsuccessful bill called for appropriation of $250,000 for aviation units of the National Guard. Bills containing an appropriation for the aerial photographing of the state and appropriating $10,000 annually for the 107th Observation Squadron failed in Michigan.

Two bills containing appropriations for aeronautics in Minnesota were unsuccessful. In New York, two bills appropriating $25,000 for the Curtiss



WINS RACE AT 236 MILE AVERAGE

Lowell Bayles in his Gee Bee (Pratt and Whitney Wasp, Jr.) racer which won the Thompson Trophy Race at 236 miles an hour average.

BAYLES RECEIVES TROPHY

Charles E. Thompson (left), donor of Thompson Trophy, congratulates Lowell Bayles, winner, and Z. B. Granville, designer, at presentation.

Memorial Air Field and a bill appropriating $150,000 for a course in aviation at Cornell University were introduced. In Pennsylvania, bills authorizing county commissioners to appropriate money for airports and appropriating $500,000 for improving airports and landing fields in the state were unsuccessful.

Two bills failed in Rhode Island relating to appropriations for land at the state airport, and in Tennessee, a bill containing an appropriation of $100,000 for airports and parks in the city of Sevierville was unsuccessful.

Thirty-two Tax Laws Passed

The subject of taxation as affecting aeronautics in one way or another received considerable attention during 1931. In 42 states, 211 bills were introduced and 32 were successful in becoming laws.

Most of the tax legislation, successful and otherwise, concerned the gasoline tax. In seven states—Arizona, Maine, Massachusetts, Mississippi, North Dakota, Oklahoma, and Tennessee—laws were passed increasing the gasoline tax. In Arkansas and Oregon, the new laws removed the former provision allowing a refund on fuel used in aircraft; and in New Jersey, New Mexico and North Dakota, provisions allowing a refund on aircraft fuel were either inserted or made more definite than heretofore. In Connecticut the statute was amended so as specifically to exempt fuel used in aircraft.

In 22 states, 45 different bills attempted to increase the gasoline tax. In three states, bills aimed at the removal of refund provisions were defeated; and in six states, bills attempting to provide a refund on aircraft fuel were defeated. Some of the other subjects of taxation as provided in new laws are worth considering.

Connecticut passed a law providing new fees for aircraft and pilots. In Illinois, a tax levy for the purchase of airports was authorized when such a levy was approved by the voters. Maryland provided tax exemption for certain aircraft. Massachusetts made provision for fees for the registration of gliders and licenses for glider pilots.

In New Hampshire, certain fees relating to aeronautics were provided for, while North Carolina included "flying machines" in the general property tax law. Vermont made provision for a $20 fee for a non-resident aircraft operator's license; and Wyoming amended its gasoline tax law to provide for revenue to support airports and air fields.

There was no indication from the 1931 legislation that the aviation industry was to be penalized by special taxation. Most of the attempts to obtain tax revenues from sources which affect the aviation industry had to do directly and exclusively with the gasoline tax. There was no substantial change in the general status of aircraft fuel as exempt or not exempt from

taxation since prior to the 1930 legislative year. Further data on the gasoline tax laws of the various states prepared for ready reference will be found in a table in Part IV, Flying Facts and Figures for 1931, of this volume.

Consider Six Liability Bills

The very difficult question of liability to persons or property on the ground was one of extreme importance to the industry as a whole. There were only six bills directed at the subject during 1931, only one of which succeeded in passing.

In Maryland, the new law concerned the development of American air transport services in interstate and foreign commerce and the incorporation, operation and development in the state of Maryland of air transportation companies. The law contained extensive provisions relating to liability of the master and owner of an airship or aircraft engaged in interstate or foreign commerce, the issuance of bills of lading covering property shipped in such aircraft, the total exemption of liability to the owner of such aircraft in certain instances and a limited liability in other instances; and other provisions, mostly analogous to certain federal statutes relating to the transportation of goods and property by water.

In Illinois, a bill providing for a uniform law governing aeronautics and containing the absolute liability clause failed. A bill was unsuccessful in Maryland calling for an amendment to the current law by substituting the type of law approved by the committee of the American Bar Association for the absolute liability law.

New Mexico failed to pass a bill providing for the liability of aircraft owners for damages caused by forced landings and falling objects, while New York had an unsuccessful bill before it providing for the owners, proprietors, lessees and operators of airports and aircraft to be liable only for negligence.

The comparative dearth of legislation in 1931 on this subject of liability of owners of aircraft was believed attributable in part to the widespread differences of opinion held by many people on the subject. In many of the states there were laws on the statute books making the owner and sometimes the operator of an aircraft absolutely liable for injuries to persons or property on the ground irrespective of the actual cause of the accident resulting in the injury. The Standing Committee of the American Bar Association on Aeronautical Law in its report to the Association pointed out that the declaration of absolute liability was erroneous and that the correct rule should be that proof of injury should be prima facie evidence of negligence on the part of the operator of the aircraft, which would place the burden upon such an operator of showing freedom from negligence but

would still leave open to him the common law defenses which were available in such accidents as happen on land.

Five New Insurance Laws

On the subject of insurance, 11 bills were introduced in seven states and five of these bills were successful.

Idaho passed a law eliminating pilots and other persons having to do with the actual navigation of aircraft from the Workmen's Compensation Act unless the employer complies with certain provisions of the law. In Massachusetts, one new law authorized insurance against loss caused by aircraft and another authorized insurance against loss caused by the termination of a conditional vendee's or mortgagee's interest in aircraft.

Montana authorized insurance on property transported by air or disability or death resulting from air travel; and in Pennsylvania, authority was given for insurance against loss by perils of owning aircraft.

Examples of unsuccessful legislation: in Massachusetts, two bills concerning workmen's compensation awards; in New Hampshire, a bill providing for the writing of insurance against loss of aircraft by wind storm; in New Jersey, a bill providing authority for insurance against damage by aircraft or, loss of damage to aircraft; in New York, a bill related to unemployment insurance; and in Pennsylvania, a bill providing for the writing of insurance upon loss caused by aircraft.

Miscellaneous Laws and Bills

There were some laws and bills which did not readily fall into any of the foregoing classifications. There were so few such bills and laws during the 1931 legislative year that most of these laws and unsuccessful bills may be summarized briefly.

In Alabama, a law provided for the Air Service of the National Guard of the state, while in Michigan, a law provided for the inclusion of aircraft in the garage-keepers lien law. Pennsylvania passed a law expressly prohibiting the counterfeiting of commercial air vehicle tickets.

The unsuccessful legislation was introduced in California, Georgia and New Mexico. In California, three bills had to do with a tariff on oil and the export of motor vehicle fuel. In Georgia, the bill attempted to create an aviation branch in the State National Guard; and in New Mexico, the bill provided for a memorial to Congress on the subject of a tariff on petroleum.

Legal and Legislative Research

The Legal and Legislative Research Service undertaken by the Aeronautical Chamber of Commerce in 1929 was again incorporated into the

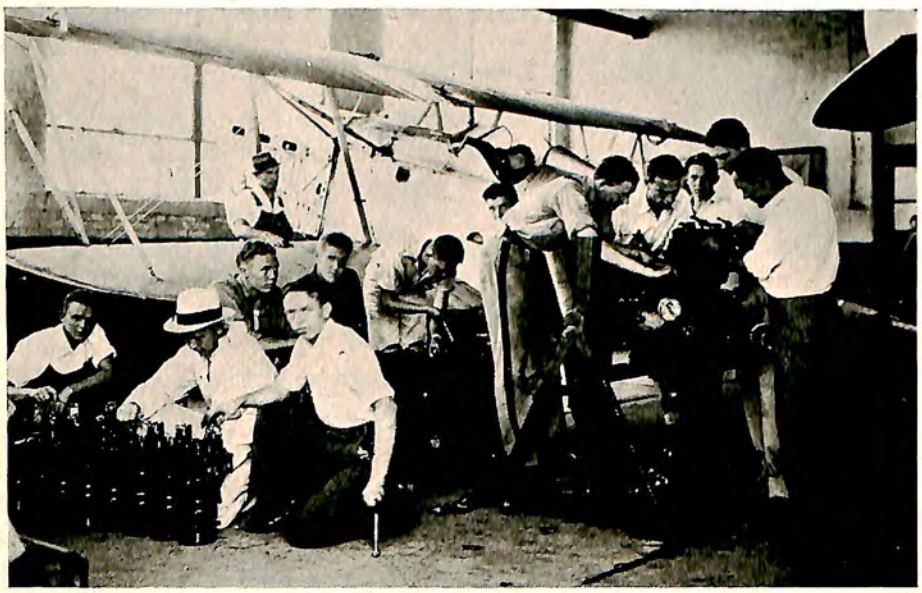
Chamber's program for 1932 due to the growing importance of a central clearing house for the collection and dissemination of information on aeronautical legislation and regulation. The work of this agency was responsible for the collection and compilation of the information presented as a special study in this chapter.

The special bulletins of the Chamber kept its members abreast of the trends in both national and state legislation and posted on important court decisions and judicial rulings, proving of great value to executives in the industry as well as interesting studies for attorneys, educators and legislators who were among the subscribers. Several special studies were made under direction of the Legal and Legislative Committee during the year, including a detailed analysis of the proposals contained in the Bratton Bill. Counsel for the Chamber prepared and filed an Amicus Curae brief with the United States Circuit Court of Appeals in the Curtiss-Swetland Airport case. The Executive Committee of the Chamber approved a code of principles to be followed in the carrying out of the industry's legal and legislative program.

The Chamber aided materially, by providing the necessary machinery, in calling the First National Conference of State Aviation Officials at Cleveland early in September, which resulted in the formation of a permanent organization. The second meeting of the group in East St. Louis, Ill., had delegates from more than 25 states in attendance to consider the chief problems of the states concerned with the proper promotion and regulation of aeronautics.

ALABAMA POLY STUDENTS

Students working at their drafting boards in a class in airplane design at the Alabama Polytechnic Institute, typical of many colleges.



STUDYING ENGINE OVERHAUL

Class studying problems of aircraft engine overhaul and installation in aeronautical laboratories of Alabama Polytechnic Institute.

CHAPTER XV

AERONAUTICS ON THE CAMPUS

Eighty-seven Institutions of Higher Education Offer Aeronautics Courses—Sixteen with Specialized Degrees—Enrollments Triple in Three Years—Aviation Law and Other New Courses

FROM kindergarten to graduate school aeronautics found a place in the nation's educational institutions during the 1931–32 academic year, but the science of aviation found its most fertile field for serious study and research on the college and university campus. Eighty-seven universities and colleges throughout the United States included courses of some kind on aeronautics in their curricula for 1932, a nation-wide survey made by the Aeronautical Chamber of Commerce of America for The Aircraft Year Book disclosed.

This survey, the third annual study of its kind to be made for The Aircraft Year Book, served as an indicator to the industry and to the academic institutions alike of the progress being made from year to year in the development of a satisfactory program of aeronautical education in the leading universities and colleges. It showed definitely that the present scarcity of attractive positions in the engineering departments, sales forces and executives' offices of the principal manufacturing and operating companies had not deterred college and university students from turning toward aeronautics as a career in great numbers.

Enrollments in the 87 universities' and colleges' aeronautical courses increased from 5,179 during the calendar year 1930 to 7,020 students in 1931. This was more than three times the number of students enrolled in the courses offered during 1929, the year of the first survey, when 2,243 students were registered. The number of universities and colleges reporting aeronautical courses also has risen steadily during the three year period. There were 61 in 1929; 74 in 1930; and 87 in 1931. The information was collected each year through questionnaires sent to every university and college in the United States, regardless of size; a detailed form in 1930 and 1931 to institutions reporting courses in 1929 and a simplified form to those indicating that they offered no courses in any phase of aeronautics.

The increased enrollments brought an increase in the number of part

time and full time instructors required to teach them and, in some cases, presented a problem in obtaining well qualified personnel. In 1929, 40 full time and 150 part time instructors and professors devoted their attention to teaching these courses. In 1930, 63 were teaching full time and 215 part time; while in 1931, 86 were devoting their full time to teaching aeronautical courses and 247 were engaged part time in this work, often spending the remainder of their time in teaching other engineering or economics subjects.

New Courses in Aviation Law

Law entered into the wide range of subjects being taught in universities and colleges as a part of their educational programs when the School of Law of New York University introduced two advanced courses in aviation law as electives for law students in the academic year 1931–32. "Related Problems: Admiralty and Aviation" and "Aviation Law" were the subjects of the two new courses.

New York University already had instituted a unique program in its School of Education to train teachers for elementary and secondary public schools and ground schools, inaugurating a series of courses in 1928 at the instigation of the Daniel Guggenheim Fund Committee on Elementary and Secondary Aeronautical Education. The first school within New York University to offer aeronautical training, the Daniel Guggenheim School of Aeronautics, made several significant changes during the year in courses leading to degrees in aeronautics with the introduction of an option in Air Transport as well as Aeronautical Engineering. New courses, including "Maintenance of Airplanes and Engines" and "Airplanes, Engines and Installations" were added for the Air Transport option, making a total of 29 aeronautics courses offered leading to a Bachelor of Science in Mechanical Engineering degree for undergraduate work and an aeronautical engineer's degree for graduate study. The School was completely equipped and housed in a building constructed especially to meet its requirements.

Sixteen universities and colleges in widely scattered sections of the country offered full four-year aeronautical courses in 1931–32 leading to degrees of Bachelor of Science in Aeronautical Engineering, Bachelor of Science in Air Transportation, Master of Science in Aeronautical Engineering or Doctor of Philosophy. These institutions, almost invariably, outlined curricula for students from their freshman year until graduation, providing thorough engineering training in the first two or three years and specialized work in aeronautics in the junior and senior years.

Those offering advanced training for specialized aeronautic degrees were: University of Alabama, California Institute of Technology, Carnegie Institute of Technology, University of Cincinnati, University of Detroit,

NEW COURSE IN AIR MAPPING

Students in Syracuse University using specialized instruments developed to aid the scientific study of aerial photo mapping problems.

WIND TUNNEL DEMONSTRATION

Students in the Curtiss-Wright Aeronautical University at Chicago watching a wind tunnel demonstration of the principles of flight.

Georgia School of Technology, Massachusetts Institute of Technology, University of Michigan, University of Minnesota, New York University, University of Pittsburgh, University of Southern California, Stanford University, University of Washington, Municipal University of Wichita, and Worcester Polytechnic Institute. The University of Texas, also reporting such a curriculum in 1930, failed to report in 1931.

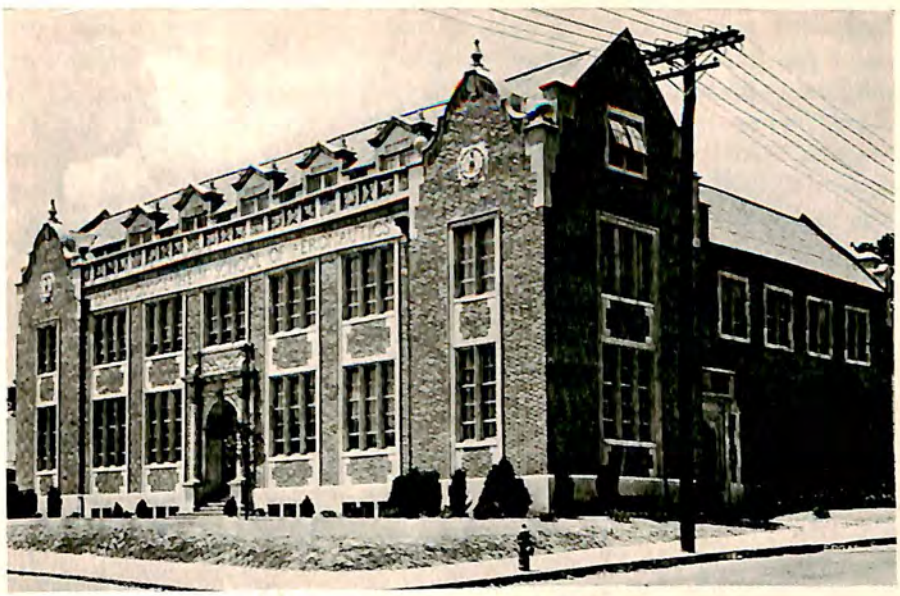
Engineering Enrollments Increased

The combined enrollments of these leading institutions alone, in courses leading to aeronautical degrees was 3,278, almost half that of the registration in aeronautics courses of the 87 universities offering such work. It increased from 1,165 in 1929 to 2,698 in 1930 and 3,278 in 1931–32. The University of Detroit, offering courses leading to a degree of Bachelor of Aeronautical Engineering since 1921 under the institution's cooperative education plan which alternate four-week periods of class room study and practical application in Detroit aviation plants, reported the year's highest registration figures, 588 students. The next five leaders in enrollment for 1931–32 in the order of their size were: University of Michigan, University of Minnesota, Massachusetts Institute of Technology, University of Alabama, and the University of Washington.

Perhaps a dozen universities other than those listed in the first group of 16 offered courses leading in aeronautical degrees offered thoroughgoing four year courses in engineering with aeronautical engineering options in the junior or senior year, but did not award a specialized degree. Several of them followed the policy of Iowa State College which offered a course in aeronautics as extensive as those of many universities awarding degrees in aeronautical engineering, but gave the graduate the degree of Bachelor of Science in Mechanical Engineering.

Several colleges and universities of high standing assumed the attitude best exemplified by the policy of Yale University which held that aeronautical engineering is a highly specialized branch which very few men are qualified to enter, and, if so qualified, should enter it only after a rigorous and thorough training in the fundamentals of physics, mechanics and mathematics. Yale, therefore, did not offer an undergraduate course specializing in aeronautics, but encouraged such students to take fundamental preparatory courses and then specialize in post-graduate years in institutions best fitted for such work. There was an evident trend of thought in this direction among educators and executives in the aircraft industry throughout the country, indicating that the 16 institutions already specializing in this field were adequate to care for the industry's needs.

The College of William and Mary at Williamsburg, Va., introduced an innovation into its curriculum for the 1931–32 academic year which may



NEW GEORGIA AIR LABORATORY

New aeronautical engineering building completed in 1931 for the Daniel Guggenheim School of Aeronautics at Georgia Tech.

LOS ANGELES FLYING STUDENTS

Capt. Peyton Gibson giving final instructions to students at Curtiss-Wright school, housed in mission style building on Los Angeles port.

lead other universities to offer similar training. The college inaugurated flight and ground school courses as a part of its curriculum in September, purchasing planes and equipment for the new courses and obtaining a new airport constructed by the city of Williamsburg a short distance from the campus. Ground school instruction, including thorough courses in aerodynamics, theory of flight, navigation, shop work on aircraft and engines, was offered with college credit granted by the physics department without additional cost to the student. Flight training was offered at a cost less than one-fourth that of a similar course in a recognized commercial flying school. By December, nine of the flight students had soloed, one of the first being a co-ed.

Flight Training with Academic Credit

Universities and colleges generally appeared to be looking more favorably upon flight training for students on or near the campus. This was indicated by the fact that 22 of the 87 universities offering courses in aeronautics answered that the faculty's attitude toward flight training for students during college courses was favorable, several indicating that students were urged to learn to fly while in school or in vacation periods. Only two universities had taken a definitely unfavorable stand against flight training for students, Marquette University and the University of Utah. Several indicated that no faculty action had been taken on the matter. The others either had not been asked the question or did not reply.

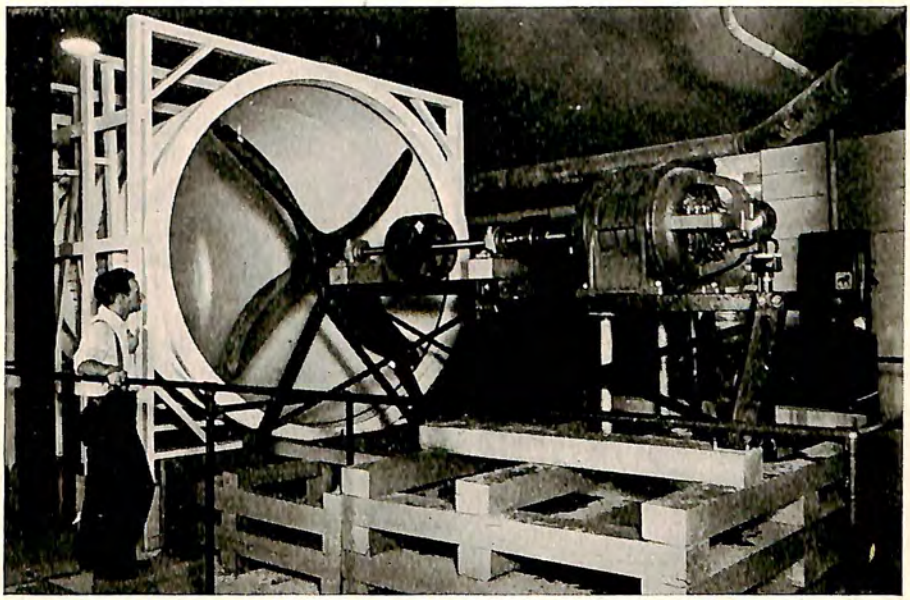
Purdue Gets Airport

Purdue University was one of the leaders in developing a cooperative arrangement between the university and a private corporation to give flight instruction to a selected group of advanced students in aeronautical engineering. Two summer flying instruction courses were carried out with results characterized by the university as "more profitable to the students because of the nature of the special work prepared for them than the regular curriculum." Purdue added courses in navigation and meteorology to its curriculum in 1931 and appropriated land on the campus for an airport, which was under construction late in the year.

Georgia School of Technology moved its Daniel Guggenheim School of Aeronautics into a new building especially constructed on the Atlanta campus to accommodate it, with two wind tunnels and a completely equipped drafting room included. Flight training was offered by private corporations at Candler Field, and while Georgia Tech. encouraged students to take such training, they did so at their own expense and on their own responsibility. Practically every institution reporting in the third

PURDUE UNIVERSITY HAS AIRPORT

President Edward C. Elliot of Purdue (third from left) with Prof. G. A. Young receiving information from Prof. G. W. Haskins about Travel Air plane.



WICHITA UNIVERSITY TUNNEL

Exit of the University of Wichita School of Aeronautics' wind tunnel, showing propeller and motor equipment.

annual survey indicated that new equipment had been added to its aeronautics shops and laboratories, or that new courses had been added or expansion programs were planned. It is possible to record only a few of the year's changes here.

Alabama Polytechnic Institute added courses in aerodynamics, commercial aviation, airplane engine design, aerial propellers, air transportation, airplane structures, aircraft instruments, and placed its student flying clubs under faculty supervision using licensed planes and pilots for instruction. An aeronautical laboratory building with a modern wind tunnel and four engine dynamometer stands were planned. University of Alabama, offering a four-year course leading to the degree of Bachelor of Science in Aeronautical Engineering, added courses for a new option in commercial aviation.

More New Courses

Boston University entered the field with a course called "Aviation in Industry," emphasizing the economic rather than the technical aspects of transport aviation. California Institute of Technology added a course on turbulence. Connecticut Agricultural College sponsored a glider club in its engineering department having 15 members. Cornell University added a course in aerodynamic problems, requiring the student to make drawings and calculations necessary for government approval of a new airplane design and to study progress as shown at the National Aircraft Show.

The University of Florida added a new course in aerodynamics and a two-hour credit course in aeronautics. Lake Forest College, offering recognized Naval and Marine reserve training, added courses in hydrodynamics, airplane parts and airplane maintenance. Lehigh University incorporated a three-hour aerodynamics course for graduate students. Marquette University was planning new advanced courses. Massachusetts Institute of Technology, one of the outstanding schools in the field, offered new summer courses in aircraft production methods and airplane shop work.

The University of Miami was preparing to set up its own steel hangar on a new field near the university to be prepared by the students. The University of Michigan added courses in the spinning of airplanes and helicopters and autogiros. The University of Minnesota added courses primarily for graduate students in advanced stresses, radio in aircraft use, and research in aeronautical engineering. Special concessions were offered to Minnesota seniors of aeronautical engineering who desired flight training by a commercial school. Flight training was encouraged at North Carolina State College where an approved Curtiss-Wright Flying School was near by. Oregon University established a practice of bringing in the outside lecturers on traffic, weather, construction, airport management and other allied problems.

Oregon State College introduced an advanced course in airplane design. Rutgers University offered courses in aerodynamics and airplane stress analysis and design for the first time. University of Southern California continued to develop its unique curriculum in commercial aviation, including courses in aviation insurance, elements of aeronautical engineering, air transport management, and airport management. Syracuse University found students attracted by its new specialized courses in aerial photo surveying and mapping.

The United States Naval Academy at Annapolis required all midshipmen to study aeronautical courses as a part of their senior year work, introducing a new course in aerology during the year. The State College of Washington, whose president is chairman of the Committee on Aeronautics of the Association of Land Grant Colleges, added a new course in aerodynamics.

Aeronautics in Public Schools

In the elementary and secondary school field, superintendents of public school systems in all parts of the country were showing increased interest in the problem of incorporating helpful aviation courses in the elementary and high school grades. The Daniel Guggenheim Fund Committee on Elementary and Secondary Aeronautical Education, whose aeronautical specialist was also chairman of the Education Committee of the Aeronautical Chamber of Commerce, was an important force in directing the efforts of interested superintendents by making available the results of research in this field during the last four years.

New York's public school system undertook an intensive study of aeronautical subjects for its curricula to prepare intelligently for the teaching of aeronautics in the schools. More than 500 school systems had extra curricular courses through school clubs, while 50 school systems incorporated courses into their curricula designed to fit the student for a job. Boston, ever a leader in educational movements, had in the Boston Trade School an elaborate training school for expert mechanics. Aeronautics also had an important place in the Burgard Vocational High School curriculum in Buffalo, being taught in both day and evening schools. Erie, Pa., had its school of aeronautics, established through the cooperation of the Board of School Directors. California was continuing with the development of its public school aviation courses, introduced in 1925.

The Aeronautical Chamber of Commerce and the Daniel Guggenheim Fund Committee joined hands in sponsoring the Second National Conference on Aeronautical Education coincident with the National Aircraft Show in Detroit in April. Papers presented by leaders in the several fields, together with the discussion of them by delegates from universities, colleges

and public school systems, were printed in a bound booklet of the proceedings.

Many other interesting facts on aeronautical education in universities and colleges, obtained from the Chamber's third annual study of this field, can be obtained from the tabulated results of the survey printed in Part IV of this volume, Flying Facts and Figures for 1931. The table lists all institutions offering aeronautical courses, the number of full and part time instructors, and the comparative enrollments for 1929–30, 1930–31, and 1931–32.

CHAPTER XVI

WORLD AVIATION IN 1931

World Air Routes Exceed 190,000 Miles—United States Holds Lead In Every Field of Aeronautic Activity—Netherlands, U.S.S.R., China Extend Air Lines—Progress in Europe, Asia, Africa Reviewed

AVIATION was playing an important rôle in the international economic and political affairs of the nations of the world as history ushered in the year 1932. World air routes were hurdling international barriers to link nations and continents during a period when relations between nations had become a primary consideration in the economic and social welfare of all peoples.

Statesmen had learned that they could remove the barriers of time and distance in carrying on important negotiations between nations by utilizing air transport to bring them face to face with each other for a more personal understanding of each other's problems during the world crisis. It removed the opportunities for misunderstanding and protracted delay on major economic and political decisions which would have been impossible had not air transport made it possible for these world leaders to turn days of travel time into hours. Prime Minister MacDonald, Secretary of State Stimson, Reichsbank President Luther, and other diplomatic and financial leaders of France, Germany and Italy used planes many times during 1931 to speed to important conferences which had a direct bearing on world affairs. President Hoover placed a fleet of planes at the disposal of Congressional leaders when he called a conference at the White House to obtain support for a proposal of international import. Only those close to the negotiations knew the part that air mail was silently playing in speeding international messages between world capitals.

This use of air transport by world statesmen during the international crisis typified, in a spectacular way, the important rôle aviation was playing in the business affairs of all nations. Nearly two score countries in the Western Hemisphere from Alaska to Argentina were as close to New York in 1932 as California and the Pacific Northwest had been a few decades earlier. India, Australia and South Africa were days and weeks nearer the capitals of Europe. To the exporter and importer, this meant a general quickening of the tempo of world business, the opening of new mar-

kets, and a much needed stimulus to a naturally laggard period in world trade.

Maps of Europe and Asia accompanying this chapter indicate the extent of the regularly flown air transport lines in that hemisphere, just as the maps of Central and South America in an earlier chapter provide a picture of the fast growing international routes in the Western Hemisphere. The total length of air transport routes regularly flown throughout the world at the opening of 1932 reached 190,000 miles, an increase of 37,000 miles over the previous year. Routes flown under the flags of all European nations totaled 85,000 miles, exclusive of Soviet Russia. The U.S.S.R., Japan, Siam and South Africa had routes regularly flown totaling 40,000 miles. Routes flown under the American flag alone exceeded 51,000 miles, while Latin American routes, including those under American or European flags, totaled 37,000 miles. Australia had an additional 7,000 miles of air routes, and Canada had 6,300 miles including more than 1,000 miles flown by ships carrying the American flag. Air routes in Australia, Canada and Latin America showed a decrease in length during 1931, while those in all other sections of the world showed increases. More frequent service, however, provided more intensive operation of the routes retained. Aéropostale's difficulties in South America, described in an earlier chapter, accounted wholly for the decrease in the length of Latin American routes.

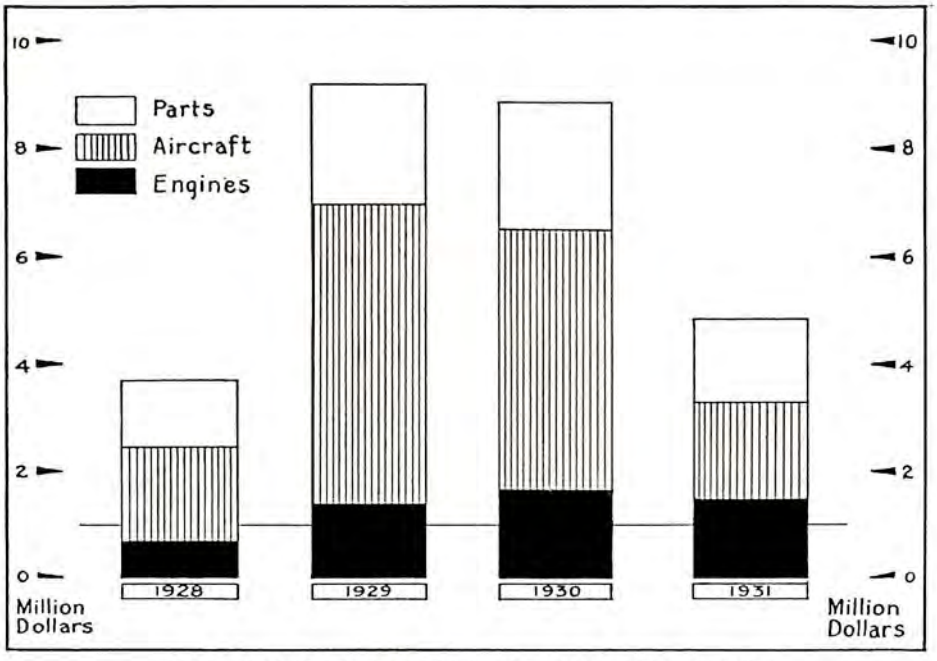
The leadership of the United States in every field of aeronautical activity —air transport, aerial service, private flying, and manufacturing—was maintained throughout 1931 by wide margins over the next nearest nations. There was no question, however, of the superiority in strength and numbers of the military air establishments maintained by France, Great Britain and Italy over the Army and Navy air forces of the United States.

Despite the world depression, Great Britain, Germany, France and Italy made substantial increases in their appropriations and subsidies to aid the development of civil and military aviation. Great Britain, France, Italy, Czechoslovakia and Poland concentrated particularly on military production during 1931, while all nations showed a sharp decrease in the commercial production of aircraft and engines. Aircraft and engine exports of all nations showed a decrease of between 25 and 30 per cent. from 1930 levels.

The development and extension of air transport lines, particularly in the United States, the U.S.S.R., Netherlands, China, Siam and France, accounted for the greatest measure of world progress in aviation during 1931. Other nations, notably Germany, Great Britain and Italy, as well as dozens of smaller countries, proceeded with a normal development of their transport services, practically all showing increases in traffic volume during 1931. There was a universal increase in total mileage flown during the year and in the volume of freight and mail carried, while some nations reported a decrease in passenger business.

As has been seen in an earlier chapter, lighter-than-air development came into a more prominent position during the year with America taking a definite leadership in the development of super-airships. The U.S.S. "Akron," world's largest airship, was in service, with a sistership, the "ZRS-5," rapidly taking form in Ohio, while Germany was developing a new air giant as a running mate to the veteran world traveller, "Graf Zeppelin." World airship routes between continents and across seas were certain to take a definite place in international air transport.

The strides made in the development of aviation in the Western Hemisphere during the year by American and foreign capital in nearly two score



AERONAUTICAL EXPORTS FROM UNITED STATES

nations from Alaska to Argentina has been reviewed in an earlier chapter. It should be interesting now to take an armchair journey through Europe, Asia and Africa to examine the extent of aviation progress in that section of the world. The activities of two score countries, listed in alphabetical order for convenience in future reference, pass before you in review.

Australia

Subsidized air lines in Australia continued extensive services throughout the Commonwealth during 1931, while the principal unsubsidized line —Australian National Airways, Ltd.,—discontinued its services when the

government refused to grant an application for subsidy in June. Approximately 1,700 miles of new regular subsidized air lines were added in Australia, while some 850 miles were discontinued, making a net gain of 850 miles for the national network. More than 250 planes were used in the subsidized and unsubsidized services combined.

Western Australian Airways, Ltd., continued its weekly services between Perth and Derby, 1,476 miles; Derby and Wyndham, 600 miles; and Perth and Adelaide, 1,453 miles. Queensland and Northern Territories Aerial Services, Ltd., provided weekly services between Brisbane and Camooweal, and Brisbane and Normanton, totaling 1,484 miles of airways. Both of these lines received heavy operating subsidies from the government.

Australian National Airways, Ltd., discontinued service in June between Brisbane and Sydney, and Brisbane and Melbourne, totaling 980 miles of airways, when the government refused to grant a subsidy to the company to continue its daily service. Guinea Airways, Ltd., reported a profit on its 80 mile operation on daily schedule from Port of Salamaua to the Ede Creek gold fields, although it received no subsidy. Aircrafts Proprietary, Ltd., continued its unsubsidized service from Brisbane to Toowoomba, 75 miles, on a five times a week schedule.

Operation of six major light airplane clubs continued throughout 1931, each club being given £20 for each student trained on government-owned planes and £50 for students soloed on club-owned planes. The clubs were looked upon as an excellent method of building up a reserve of military pilots, but the aircraft manufacturers attested to the fact that few who were trained bought planes and became private fliers. Manufacture of arciraft was confined principally to the activities of the De Havilland Company, which operated an assembly plant at Sydney using English parts and engines.

Australia had more than 109 airports and 150 emergency landing fields throughout the country in 1931. Of the larger airports, 21 were in Western Australia, 22 in New South Wales, 24 in Queensland, 5 in Northern Australia, 11 in Victoria, and 15 in South Australia. Considerable work remained to be done to place these fields in shape to qualify as first-class airports under the American conception of such ports.

Austria

Aviation in Austria centered in the operation of national and international air lines radiating from the capital, Vienna, to neighboring countries and providing through service to all parts of Europe. Less than five airplanes were produced during 1931 by the only two aircraft companies in Austria, the Oesterreichische Phoenix Flugzeugwerk at Woellersdorf, Lower Austria, and Theodor Hopfner at Vienna. Due to the small purchasing capacity of the Austrian population in general, the mountainous character

of the country and the small number of airports, there was virtually no private flying in Austria, not more than five planes being owned by individuals. Associations, groups of students and individuals owned gliders or "segelflugzeuge," as they are called by the Austrians, operating them on the excellent mountain terrain. In compliance with the peace treaty of Saint Germain there was no military aviation in Austria.

The Oesterreichische Luftverkehrs, A.G., (Austrian Air Traffic Company) was aided by a cash government subsidy based on the number of kilometers flown and its airports at Vienna, Graz and Klagenfurt were government operated. The subsidy amounted to 1,750,000 Austrian schillings ($250,000) in 1929; 2,250,000 schillings ($321,430) in 1930; and about 2,000,000 schillings ($285,700) in 1931, indicating a decrease in the number of miles flown in 1931 as compared with 1930. In 1930, the Austrian company—exclusive of operations of foreign air lines cooperating with it—flew 452,217 miles, as compared with 421,611 miles in 1929, 399,553 miles in 1928, and 242,319 miles in 1927. It carried 7,869 passengers in 1930 in addition to 39,090 pounds of mail, 225,010 pounds of freight and 198,164 pounds of luggage. Fares during the latter part of 1930 and 1931 were the lowest in the company's history, amounting to reductions of from 7 to 20 per cent. from former passenger tariffs.

The Austrian Air Traffic Company operated three routes of its own during the summer months, Vienna-Salzburg-Innesbruck, Vienna-Graz-Klagenfurt, and Innesbruck-Salzburg-Klagenfurt, and cooperated with foreign air lines to operate seven other routes. It joined hands with the Deutsche Luft Hansa and Czechoslovak Luftverkehrsgesellschaft in the operation of year 'round service on the Vienna-Prague-Dresden-Berlin route and summer service on the Budapest-Vienna-Berlin Express. In cooperation with Italian interests, the Transadriatica Societa Anonima Italiana di Navigazione Aerea, the Austrian Air Traffic Company, linked Vienna-Graz-Klagenfurt-Venice during the winter months and Vienna and Venice during the summer months. With another Italian line, the Aviolinee Italiana, service was maintained thrice weekly throughout the year on the Munich-Innesbruck-Bolzano-Trento-Milano route; while daily summer service was operated jointly by the Austrian company and the Société de Navigation Aérienne Jugoslave on the Vienna-Graz-Zagreb-Belgrade line. In cooperation with the Hungarian interests, Ungarische Luftverkehrs, and the Deutsche Luft Hansa, the Austrians maintained daily summer service between Vienna and Budapest.

Seven other lines serving Austria were operated exclusively by foreign companies. Deutsche Luft Hansa maintained summer service on the Munich-Salzburg-Bad Reichenhall and Vienna-Munich-Cologne routes, and with "Swissair" operated the Vienna-Munich-Zurich-Geneva line. The Deutsche Luft Hansa in cooperation with the French interests, Lignes

Farman, served Vienna, Munich, Stuttgart, Saarbruecken, and Paris; while another French company, Compagnie Internationale de Navigation Aérienne, served Vienna on its Paris-Bucharest-Istanbul route. Polish interests, the Polski Linje Lotnicze "Lot," operated two services through Austria: Vienna-Brno-Katovice-Krakow-Warsaw and Vienna-Krakow-Warsaw. All of these services carried passengers and were operated only during the summer months. In addition, Deutsche Luft Hansa maintanied a special freight and mail service between Breslau, Vienna, Budapest and Istanbul daily during the summer.

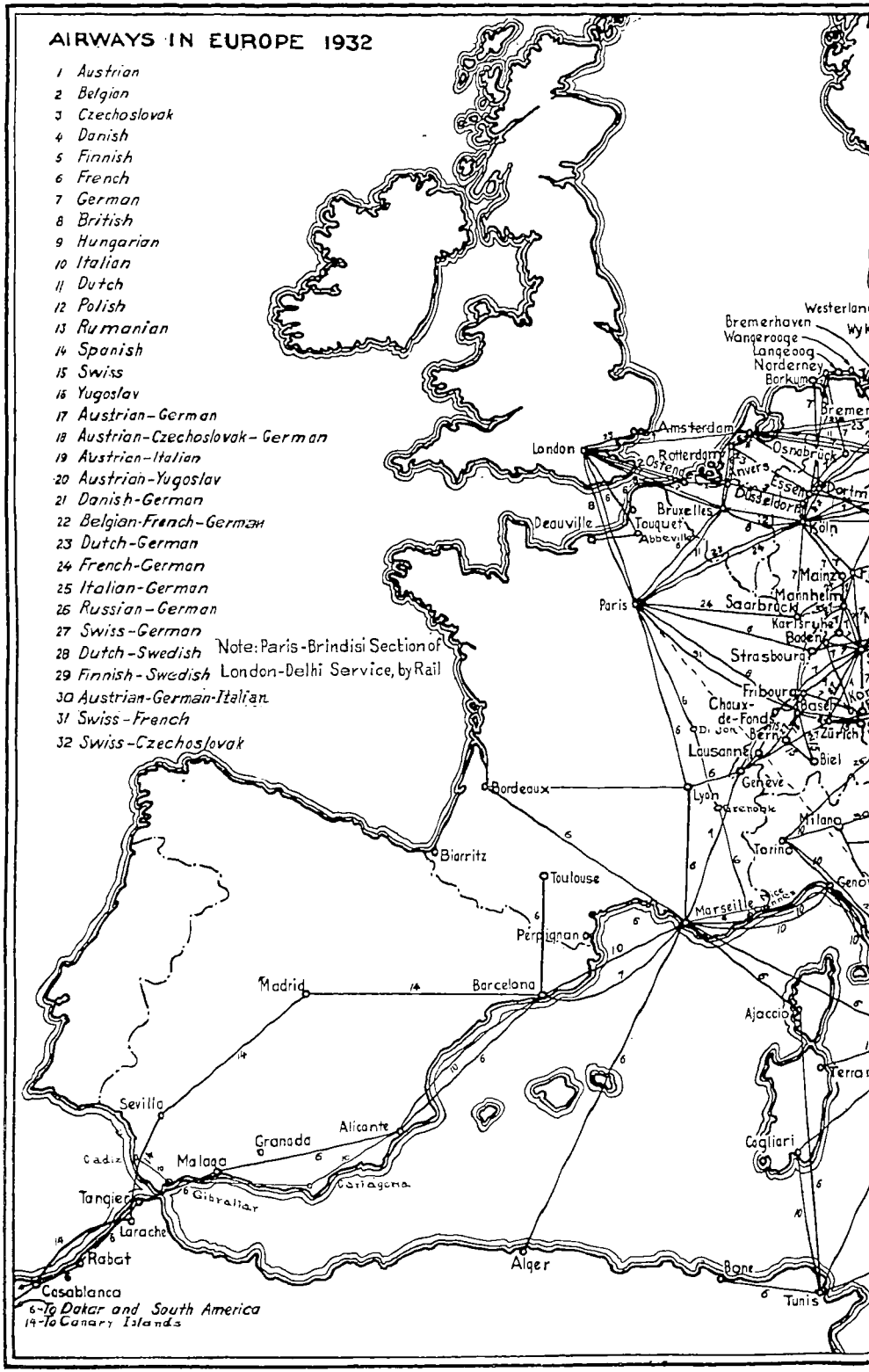
The Federal Ministry for Commerce, Trade and Traffic reported 1930 air traffic of the Austrian and foreign companies between Austrian points and the nearest foreign airport plus the Austrian company's traffic in foreign companies to be 2,064,858 kilometers, 21,869 passengers and 2,098,-951 pounds of mail, freight and luggage. Two pilots and three passengers were killed during that period.

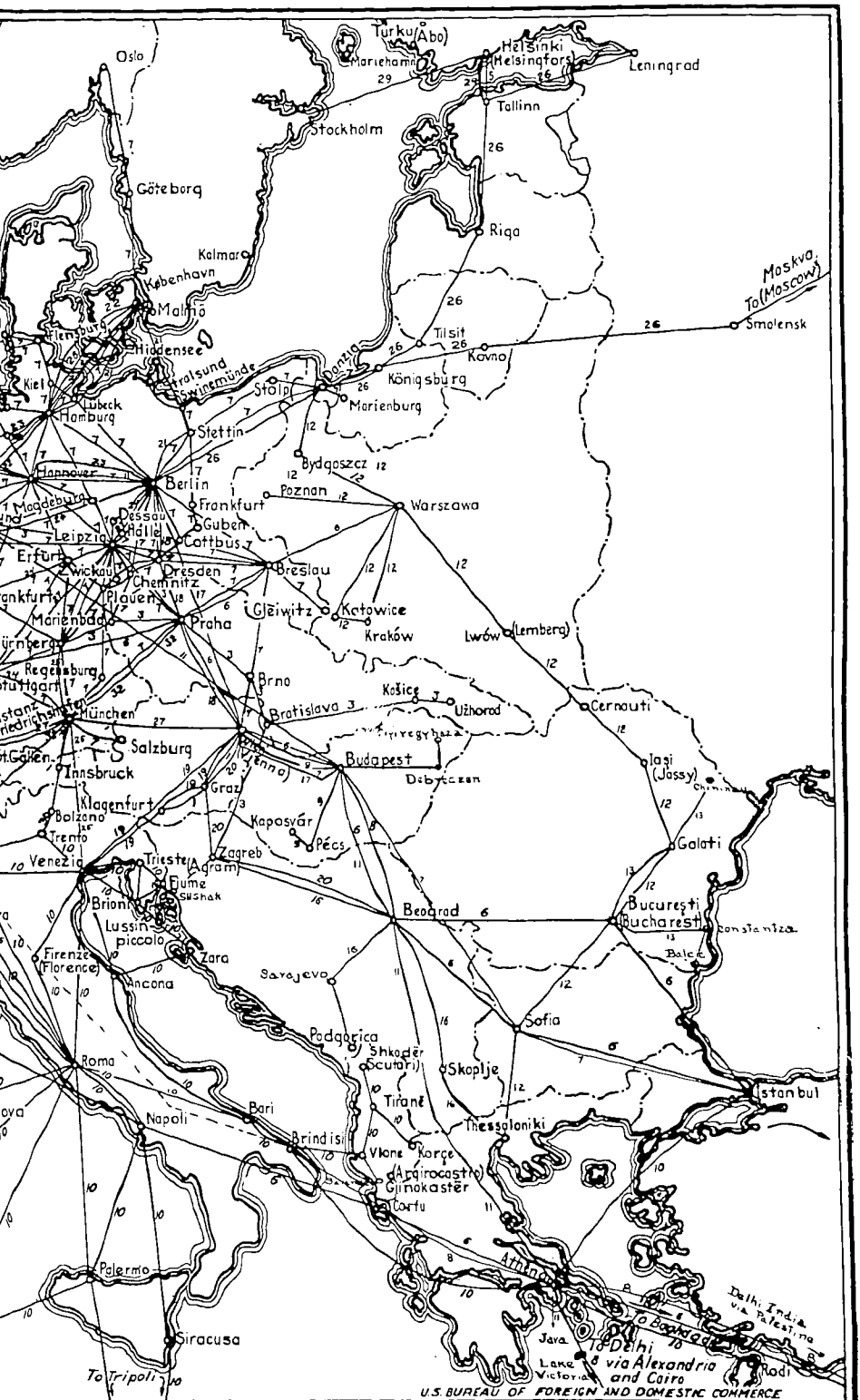
Belgium

Completing its second year under the supervision of an aeronautical division of the Ministry of Transportation, aviation in Belgium centered in the extensive air line operations of the Société Anonyme Belge d'Exploitation de la Navigation Aérienne ("Sabena") and several aircraft manufacturing plants, all of which were heavily subsidized by the government. A credit of 29,488,000 Belgian francs was provided in the 1931 aviation budget as a subsidy for the "Sabena" company alone.

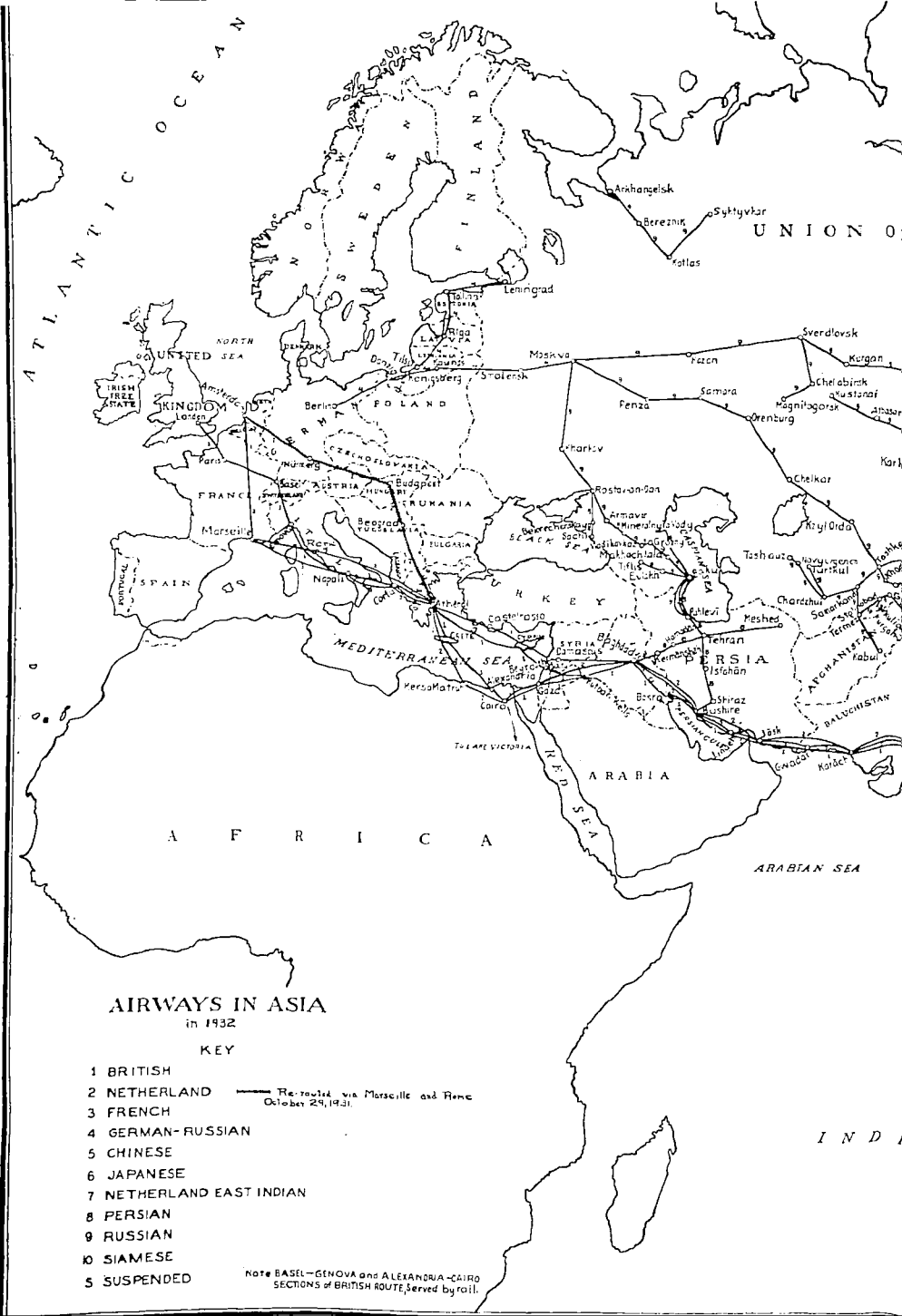
During the first nine months of 1931, 57 planes valued at 11,032,000 Belgian francs were produced in the country's ten active aircraft manufacturing plants as compared with 102 planes valued at 34,179,000 Belgian francs during the 12 months of 1930. The active manufacturers in 1931 were: the Belgian Aeronautic Construction Company ("Sabca") at Brussels; the Société d'Enterprises Générales d'Aéronautique ("Sega") at Gosselies; Stampe and Vertongen at Antwerp; Orta at St. Hubert; Dassy at Brussels; Guldentops at Evere; Wielemans at Brussels; Herrmann at Brussels; G. Renard at Brussels; and Renard Aircraft and Engines at Brussels. The latter together with "Sabca" were the only engine manufacturers, producing 32 engines valued at 1,900,000 Belgian francs during the first nine months of 1931, as compared with 123 engines valued at 14,400,000 Belgian francs during all of 1930.

The "Sabena" company maintained the same services in 1931 which it established in 1930, except that the interior line connecting Brussels and Liége, Liége and Antwerp, and Brussels and Ostend were discontinued and the London-Antwerp-Dusseldorf-Essen-Hamburg line was extended to Copenhagen, Denmark, and Malmo, Sweden. In the Belgian Congo,


AIRWAYS IN EUROPE 1932
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 Belgian-French-German
23 Dutch-German
24 French-German
25 Italian-German
26 Russian-German
27 Swiss-German
28 Dutch-Swedish
29 Finnish-Swedish
30 Austrian-German-Italian
31 Swiss-French
32 Swiss-Czechoslovak
Note: Paris-Brindisi Section of London-Delhi Service, by Rail
Westerland
Bremerhaven
Wangerooge
Langeoog
Norderney
Borkum
Amsterdam
London
Rotterdam
Ostende
Anvers
Osnabrück
Essen
Düsseldorf
Bruxelles
Deauville
Touquet
Abbeville
Köln
Mainz
Mannheim
Paris
Saarbrück
Karlsruhe
Baden
Strasbourg
Fribourg
Basel
Chaux-de-Fonds
Bern
Zürich
Lausanne
Biel
Genève
Lyon
Grenoble
Milano
Torino
Bordeaux
Biarritz
Toulouse
Perpignan
Marseille
Nice
Madrid
Barcelona
Ajaccio
Cagliari
Sevilla
Granada
Alicante
Cadiz
Malaga
Cartagena
Tangier
Gibraltar
Larache
Rabat
Casablanca
Alger
Bone
Tunis
6-To Dakar and South America
14-To Canary Islands



To Bandoeng Java



AIRWAYS IN ASIA
in 1932

KEY

1 BRITISH
2 NETHERLAND
3 FRENCH
4 GERMAN-RUSSIAN
5 CHINESE
6 JAPANESE
7 NETHERLAND EAST INDIAN
8 PERSIAN
9 RUSSIAN
10 SIAMESE
S SUSPENDED

——— Re-routed via Marseille and Rome October 29, 1931.

Note BASEL—GENOVA and ALEXANDRIA—CAIRO SECTIONS of BRITISH ROUTE, served by rail.


F SOVIET SOCIALIST REPUBLICS
Omsk
Novosibirsk
Shcheglovsk
Kuznetsk
Krasnoyarsk
Vitim
Olekminsk
Kirensk
Ust Kut
Verkholensk
Irkutsk
Verkhneudinsk
Altan Bulak
Ulan Bator
Akmolinsk
Semipalatinsk
Sergiopol
Balkhash
Taldy Kurgan
Dzharkent
Alma Ata
Frunze
Andizhan
Osk
Fergana
Khorog
MONGOLIA
MANCHURIA
SEA OF OKHOTSK
KAMCHATKA
Okha
Nikolaevsk
Alexandrovsk
Khabarovsk
SAKHALIN (U.S.S.R.)
KARAFUTO (JAP)
SEA OF JAPAN
Dairen
Tientsin
Peiping
Tsinan
Nanking
Shanghai
Ichang
Shasi
Hankow
Kiukang
CHINA
TIBET
YELLOW SEA
Fusan
Fukuoka
Osaka
Tokyo
Shimoda
HONSHU
JAPAN
Delhi
NEPAL
BHUTAN
Allahabad
Jodhpur
INDIA
Calcutta
BURMA
FRENCH
Akyab
Rangoon
Tavoy
Mergui
Bangkok
Saigon
INDO CHINA
TAIWAN (FORMOSA)
PACIFIC OCEAN
BAY OF BENGAL
CEYLON
SOUTH CHINA SEA
PHILIPPINE IS.
Victoria Point
Alor Star
FEDERATED MALAY STATES
Medan
Singapore
SARAWAK
BORNEO
NETH. EAST INDIES
Pekanbaru
Palembang
Batavia
Semarang
Soerabaja
Bandoeng
JAVA
PAPUA (NEW GUINEA)
AN OCEAN
AUSTRALIA
U.S. BUREAU OF FOREIGN AND DOMESTIC COMMERCE

where "Sabena" was carrying out an enterprising colonial program, lines were established linking Leopoldville, Coquilhatville and Stanleyville, and Leopoldville, Port Franqui and Luluabourg. Two new services also were established connecting Brussels and Antwerp with London and with Rotterdam and Amsterdam. Night mail service between Brussels and London, established in 1930, proved popular during 1931.

Traffic statistics furnished by the Ministry of Transportation for "Sabena" showed European operations of 951,300 kilometers with 6,634 passengers, 42,619 kilograms of mail, and 255,950 kilograms of express with one accident in the first nine months of 1931, as compared with 1,150,000 kilometers flown with 9,445 passengers, 38,750 kilograms of mail, and 236,368 kilograms of express with a single accident in the 12 months of 1930. African operations of the company in the Belgian Congo totaled 183,700 kilometers flown with 978 passengers and 33,992 kilograms of mail without an accident during the first eight months of 1931, as compared with 239,000 kilometers, 1,577 passengers and 44,535 kilograms of mail without an accident in 1930. Twenty-nine planes, principally Fokkers with some Handley Pages and Westlands, were employed in Europe by "Sabena," while 16 ships were used in Africa. Sixteen pilots and 12 mechanics manned the European lines, while 6 pilots and 8 mechanics were employed in Africa.

Foreign air lines operating through Belgium during 1931 included: Farman on two routes, Paris-Brussels-Rotterdam-Amsterdam and Paris-Cologne-Berlin; Imperial Airways from London to Brussels and Cologne; K.L.M. on three routes, Paris-Rotterdam, London-Rotterdam, and Rotterdam-Brussels-Paris; and Deutsche Luft Hansa on three routes, Amsterdam-London, London-Cologne night line, and Paris-Cologne-Berlin.

There were 47 privately owned planes in Belgium in 1931, which flew an estimated distance of 140,000 kilometers during the year. Two hundred and twenty private pilots were licensed. The Ministry of National Defense, controlling the Belgian Air Force, subsidized three schools for training pilots and added a squadron of new Fairey Firefly fighting planes to its equipment during the year.

Bulgaria

An official organization for the promotion of aeronautics and the purchase of aircraft, the Direction of Aeronautics at Sofia, controlled the country's sole aviation school at Kazanlik, the airport at Bojurishte, near Sofia, and the seaplane base at Varna. Hampered by lack of funds, its activities were limited to the training of pilots in 24 Bulgarian airplanes, fabricated in the only factory at Bojurishte and powered with imported engines. No planes were owned or operated for military purposes, in accordance with the Treaty of Neuilly.

Five planes were maintained permanently in Bulgaria by the Deutsche Luft Hansa in connection with its operation of the Berlin-Prague-Belgrade-Sofia-Istanbul service, which traversed Bulgaria. The French line, Compagnie Internationale de Navigation Aérienne kept 17 planes in Bulgaria for its service from Belgrade to Istanbul by way of Sofia. However, none of the planes was registered in Bulgaria, the former being of German registery and the latter French. There was no private flying in the country, except for itinerant tourists who made occasional landings at Bojurishte.

China

American aircraft saw service in China during 1931 in military and civil pursuits, commercial air lines in the northern provinces being expanded during the year while military activities halted commercial services in South China. With all aviation under control of the military authorities, China's officials were convinced of the value of aircraft for commercial and military purposes and laid out an extensive program for the promotion of aviation over a five-year period, designed to provide new air lines and build up the air force.

Air mail and passenger service with Keystone-Loening (Wright Whirlwind) amphibians were continued on daily schedule during 1931 between Shanghai and Hankow, 500 miles, by the Chinese National Aviation Company, a joint Sino Curtiss-Wright enterprise with American pilots and Chinese co-pilots. The company's service was extended in 1931 on a new mail route between Nanking and Peiping, with stops at Hsuchowfu, Tsinan and Tientsin, using Stinson cabin monoplanes.

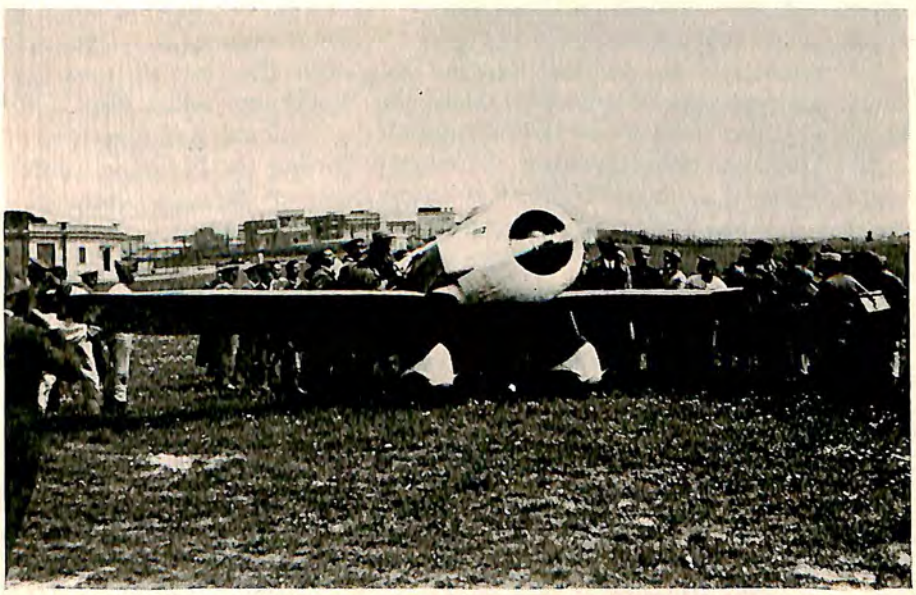
One of the most ambitious projects of the year was undertaken with the departure, May 31, of the first plane from Shanghai to Manchuli with mail destined for Moscow and Berlin. The first ship met with difficulties, however, when it was seized by natives in Manchuria and the crew held captive for several days. German pilots and planes were used on the service inaugurated by the Eurasian Aviation Corp., which was organized by the Chinese Ministry of Communications and the Deutsche Luft Hansa. Mail was flown to Manchuli, trained from there to Irkutsk, where Soviet planes carried it to Moscow for transfer to Berlin-bound ships of the Deutsche Luft Hansa. It was planned to extend the air line to bridge the gap between Manchuli and Irkutsk.

The Japanese Air Transport Company continued daily service from Tokyo to Darien in Manchuria, with stops at Heijo, Keijo, Urusan, Fukuoka and Osaka on the 1,310 mile airway.

The Canton Aviation Bureau in South China inaugurated air mail and passenger services with government-owned American planes, manned by members of the Canton Air Force, between Canton and Wuchow in

HAWKS CAPTURES EUROPE

With a broad grin and his speedy Travel Air (Wright Whirlwind) Mystery Ship, Capt. Frank M. Hawks won acclaim in the capitals of Europe.



LONDON TO ROME RECORD

Capt. Frank M. Hawks landing his "Texaco 13" monoplane at the Littorio, Rome, after a flight of four hours and 38 minutes from London.

Kwangsi Province. The service was continued until May, 1931, when the schism between the Canton and Nanking regimes brought a halt in the commercial air line operations and the planes were pressed into military service. During the six months of operation, the new line flew 22,800 miles, carrying 875 passengers, 100 pounds of mail and 30 pounds of express. The daily round trip schedule over the 224 mile route was to be reestablished as soon as political disturbances ceased. Other routes in Kwangtung Province were under consideration early in 1931, including Canton-Chungshan Port, 70 miles; Canton-Swatow, 223 miles; and Canton-Hoihow, 300 miles, but political disturbances postponed fulfilment of the plans, as they did those calling for an air mail and passenger service between Canton and Nanking under the auspices of the Chinese National Bureau of Aviation.

The Nanking Government had between 60 and 70 serviceable airplanes of modern type for military use, more than 20 of which were American planes imported and used during the 1930 civil war. Eighty-three flying students were graduated in March, 1931, from the Nanking Government flying school.

The Manchurian Air Force had about 40 serviceable airplanes, principally of French manufacture. The Canton Aviation Bureau had between 45 and 50 planes in its service, 22 of which were of American manufacture. Additional planes were on order at the close of 1931, but the schism between Canton and Nanking made it impossible to effect delivery of them.

The status of the Canton Aviation Bureau at the close of 1931 was somewhat uncertain because General Chang Wei-chang, called the "Lindbergh of China" and formerly in charge of the National Aviation Bureau at Nanking, set up headquarters at Canton following the Nanking-Canton schism under the title of "National Aviation Bureau." Nanking authorities insisted that the Chinese Air Force headquarters remained at Nanking. General Chang, himself a Cantonese, was reported by Hongkong and Canton newspapers to have taken the best planes and pilots with him to Canton and hoped to reestablish the National Aviation Bureau at Nanking, with himself as commander-in-chief, as soon as differences between Canton and Nanking had been composed.

Fifty students were under instruction in the aviation school of the Canton Aviation Bureau at the close of 1931, 100 having been graduated in 1930 and 50 during the first six months of 1931. While most planes used in China were imported from the United States, Germany or Great Britain, three factories were in operation in China during 1931, one in Shanghai, one in Canton and one at Pagoda Anchorage, Amoy, Fukien province. The Canton factory turned out six planes in 1930 and three during the first six months of 1931. All were for observation and bombing purposes.

Engines were imported for them, chiefly from the United States. China imported 51 planes valued at $1,210,000 from the United States during 1930, and placed substantial orders during 1931, as will be seen from the table of American aeronautic exports in Part IV, Flying Facts and Figures for 1931, of this volume.

Czechoslovakia

Two Czechoslovak air lines, one government-owned and the other privately-owned, continued to operate the principal air routes in that country during 1931, and through agreements with French, Austrian and German lines extended air service from Czechoslovakia to all parts of Europe. Subsidies were paid by the government to the two national lines and the French company.

The Czechoslovak Air Traffic Company, a private enterprise controlled by Skoda Works and aided by government subsidy, provided international service to Germany, Holland, Austria and Switzerland. Under a new agreement with Germany, it operated an independent service on its Prague-Halle-Maulhausen-Rotterdam-Amsterdam and Marienbad-Leipzig routes during 1931. It cooperated with the Deutsche Luft Hansa and Austrian Air Traffic Company in the operation of the Prague-Dresden-Berlin section of the Vienna-Berlin route, and joined the Swiss "Ad Astra" in flying the Prague-Munich-Zurich-Basle service. In 1930, the Czechoslovak Air Traffic Company flew 220,393 miles with 2,658 passengers and 36,345 pounds of mail, a considerable decrease from 1929 figures, but above the level of 1928 operations. Nevertheless, the company's subsidy was increased from 7,000,000 crowns ($207,200) in 1930 to 9,000,000 crowns ($266,400) in 1931. Eight planes were used in the services.

The Czechoslovak State Air Lines was a government undertaking under the jurisdiction of the Ministry of Public Works. Of the 50,000,000 crowns ($1,480,000) appropriated for civil aeronautics in 1931, 5,500,000 crowns ($162,800) were set aside for the State Air Lines or "Statni" as they were commonly called. It maintained service on six routes during 1931; Prague-Marienbad-Karlsbad, 112 miles; Marienbad-Karlsbad, 25 miles; Prague-Brno-Bratislava, 198 miles; Bratislava-Zagreb, 199 miles; Bratislava-Kosice-Uzhorod, 249 miles; and Brno-Moravska-Opava. The line became an international carrier in 1931 with the inauguration of its Bratislava-Zagreb service, which was to be extended in 1932 through the establishment of a line from Uzhorod to the Rumanian cities of Cluj and Bucharest. Its operation figures topped those of the Czechoslovak Air Traffic Company for the first time when 345,857 miles were flown with 8,763 passengers, 5,794 pounds of mail and 117 pounds of express in 1930. Twenty-eight planes were used in the services.

The Compagnie Internationale de Navigation Aérienne, receiving sub-

sidies from both the French and Czechoslovakian governments, used Fokker planes on its Paris-Prague-Warsaw and Paris-Prague-Istanbul routes. The French company received an annual subsidy of 3,500,000 crowns ($133,200) from the Czechoslovak government.

The first sport airplane of Czechoslovak manufacture was produced during 1931. It was a single-place sport monoplane with an "Orion" two-cylinder air-cooled engine, valued complete at $1,776. Four aircraft manufacturing plants and five engine plants were maintained in the country, producing principally transport equipment for the air lines under foreign patents. An official aviation school for pilots was operated in connection

DENMARK'S AIR CENTER

Single-engined Fokker transport of the Danish Air Transport line lands at the Kastrup Lufthavn at Copenhagen, Denmark.

with the Prague Aeroklub. Six well-equipped airports were maintained by the government. The Ministry of Public Works licensed aircraft and pilots, but there were no regulations for mechanics.

Denmark

Denmark made no extension of its commercial air lines, but increased the volume of its operations and traffic during 1931 and inaugurated night flying for the first time.

Det Danske Luftfartselskab, A.S., (The Danish Air Traffic Company, Ltd.) flew 190,170 kilometers in its day services and 18,980 kilometers at night during 1931 as compared with 181,183 kilometers in 1930. Traffic

ACROSS THE MEDITERRANEAN

Short Kent (4 Bristol Jupiters) flying boat "Scipio" of Imperial Airways, Ltd., in a typical tropical setting of the Mediterranean.

in 1931 totaled 2,885 passengers, 12,159 kilograms of mail, 19,738 kilograms of freight and 26,241 kilograms of luggage as compared with 2,071 passengers, 6,722 kilograms of mail, and 40,675 kilograms of freight and luggage in 1930. There were no accidents on the lines in either year.

The Danish Air Traffic Company used four Fokker (Bristol Jupiter) monoplanes to maintain its daily round trip service between Malmo, Copenhagen and Hamburg, and, with the cooperation of the Deutsche Luft Hansa, between Copenhagen and Berlin. The services were operated only during the spring and summer months, the kilometers flown daily varying from 750 in March and April to 2,300 during the peak of the season. The company received 250,000 kroner ($66,666) in subsidies from the Danish government and 100,000 kroner ($26,600) from the City of Copenhagen. The government financed lighting of the route from Copenhagen to Rodby, 105 kilometers, and maintained the country's finest airport, the Kastrup Lufthavn, at Copenhagen. Plans were completed during 1931 for enlarging this port from 218 to 382 acres during a three-year development program.

The Danish Air Traffic Company carried 105 passengers on charter flights and 1,894 passengers on short pleasure hops, using a new plane, a Desoutter (Gipsy), to inaugurate the air taxi service in 1931. Five planes were privately owned in Denmark, flying approximately 20,000 kilometers during the year. Fifty-five licenses had been issued to private fliers. The only aircraft factories in Denmark were the Naval Aircraft Factory at the Royal Dock Yard and that of the Army Flying Corps, both of which produced military planes exclusively, with imported engines. There were more than 60 planes in the military services.

Egypt

Imperial Airways, Ltd., linked Egypt with other countries of Asia, Africa and Europe through its weekly services: Alexandria-Genoa, a part of the London-Cairo-India air line; Cairo-Delhi; and Cairo-Mwanza. Three planes, six pilots and 22 mechanics were employed in Egypt to maintain this service during 1931. Traffic on the Alexandria-Genoa route alone, in 1930, totaled 75,451 kilometers with 491 passengers, 100,020 pounds of mail and 13,464 pounds of express. There were no fatalities during the period.

The Egyptian Government purchased five airplanes from Great Britain in 1931, which were to be flown to Egypt by Egyptian officers to form a nucleus for an Egyptian Air Force. The planes were bought by Ferik Spinks Pasha, Inspector General of Egyptian troops. Except for occasional visits of itinerant fliers and the flight of the "Graf Zeppelin" over the country in 1931, Egyptians saw no other aircraft.

Estonia

With the foundation for Estonia's private flying laid in 1930 through formation of the Air Defense Association in Tallinn, similar associations were formed in 1931 in four provincial cities. The associations were to develop propaganda for private flying and to train private pilots, maintaining a close contact with the Estonian Civic Guard (National Militia) and thereby providing means from private sources for defense of the state. The management of the association included outstanding Estonian officials from the Ministry of Communications, Ministry of War, and Estonian Civic Guard. The association owned four airplanes, one of which was flown on a 5,900 kilometer tour of Europe in 1931 by a military pilot.

Estonian military aviation was concentrated in one unit, called the Air Defense (Ohukaitse). All of its planes were light single-engined ships, mostly of British origin, to be used for scouting and light bombing. The Ministry of Communications laid plans late in 1931 for construction of a modern airport on the lake at Tallinn, the present terminal of the Tallinn-Helsingfors commercial line. A combined land and seaplane base was to be constructed at a total cost of about $61,000.

Estonia had not been served by a national air line since the Estonian air transport company, A.S. Aeronaut, suspended operations in 1927, but was linked with the European air net work in 1931 through the services of the Finnish Air Service Company (Tallinn-Helsingfors) and those of the German-Russian company, "Deruluft," (Tallinn-Leningrad-Riga). Both companies received money from Estonian air mail contracts. During the first nine months of 1931 (representing 95 per cent. of the year's operations), they flew 245,550 kilometers with 2,904 passengers, 9,419 kilograms of mail and 40,584 kilograms of freight and luggage as compared with 292,516 kilometers, 2,416 passengers, 9,545 kilograms of mail and 30,950 kilograms of freight and baggage in 1930. There were no fatalities during either year.

Finland

The Aero Osakeyhtiö (Finnish Air Service Company) of Helsingfors maintained service in 1931 in cooperation with the Swedish Air Transport Company on the Stockholm-Åbo-Helsingfors line and independently on the Helsingfors-Tallinn line. During 1931, the Finnish company flew 260,000 kilometers of which 80,000 kilometers were flown at "night"—although there was light during the 24 hour day to make landings on the water easy. Traffic on the Stockholm-Helsingfors line during 1931 totaled 1,858 passengers, 19,000 kilograms of mail, 10,354 kilograms of freight and 26,-

153 kilograms of baggage. The Helsingfors-Tallinn traffic totaled 2,605 passengers, 29,129 kilograms of baggage, 3,042 kilograms of freight, and 5,500 kilograms of mail, a marked increase over 1930 figures. There were no accidents in either year.

The Osakeyhtiö Sääski manufactured eight planes of the Moth type during the 18 months ending June 30, 1931, importing engines to complete them. The Defense Department maintained an aircraft factory at Sveaborg, but no information on production of the government's military planes was available. The Sääski company carried 532 passengers on short hops during 1931, had 22 students in training in its school, and graduated 10 pilots.

The Air Defense League of Finland owned two Moth planes; the Wasa Air Defense Club, one Sääski plane; the Viborg Air Defense Club, a Moth plane; the Satakunta Air Defense Club, a Gipsy Moth; the Keljo Air Club, a Moth and a Tiira plane; and the Kymmene Air Defense Club, a Sääski plane. There were no other private planes in Finland. With no airports completed for land planes, all operations were on pontoons in summer and on skis in winter. A new water-airport at Helsingfors was to be completed in 1932.

France

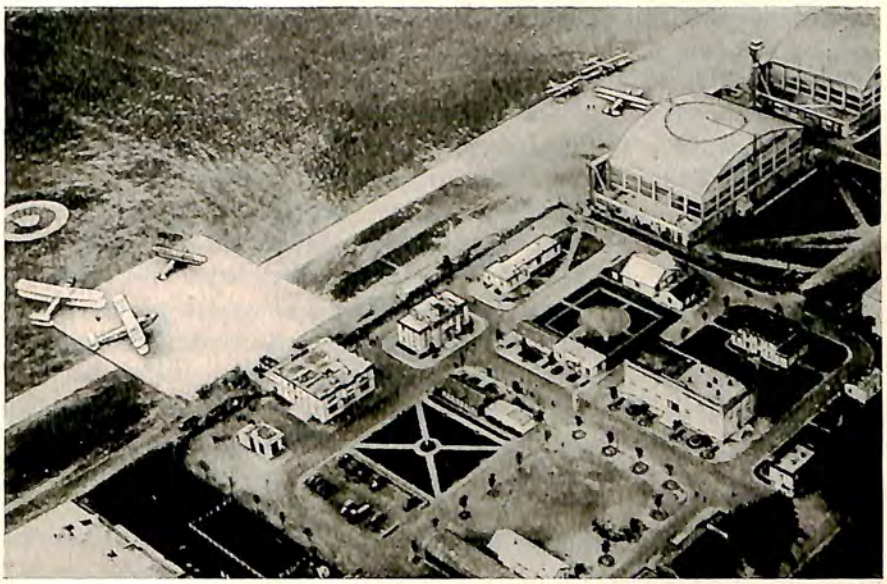
France was one of the few countries other than the United States which developed aviation in all of its many-sided branches, including air lines, aerial service, private flying, aircraft and engine manufacturing, and military aviation. The year 1931 saw some slacking of activity in French aviation due to the uncertainty of the world economic situation, although the period was marked by considerable progress.

Unlike American aviation, however, every branch of French aviation was granted cash subsidies by the government. The French air budget for 1931-32 totaled $86,428,000, an increase of $7,000,000 over the previous year. Air transport lines were assured the same cash subsidies they received in 1930-31, approximately $7,685,000, of which $3,371,200 was provided for the biggest operator, the Compagnie Générale Aéropostale. A sum four times as large as that provided in 1930-31 was included in the 1931-32 budget to encourage private flying, approximately 20,000,000 francs ($784,000). This was to be used to purchase planes and instruction courses for private individuals desiring to fly, to improve fields for private flying, to develop aviation schools and organize touring competitions. The budget included 600,000,000 francs ($23,313,895) for planes for the French Air Force.

Private fliers owned 276 planes on June 30, 1931, and clubs and societies were in possession of 102 planes on the same date. During the first ten months of 1931, 391 planes were put into service for public transport, touring or instruction. The growth of private aviation under the plan for

subvention could be measured by the fact that 151 private pilots' licenses were issued between January 1 and October 15, 1931. Twenty-four manufacturers of aircraft and engines were reported to have manufactured 700 planes in France during 1930, practically all of the factories receiving cash subsidies. The principal manufacturers had not changed from the list printed in The Aircraft Year Book for 1930.

Aéropóstale, the principal French air transport company, continued the operation of its far-flung routes with the exception of those discontinued in South America, described in an earlier chapter, "Alaska to Argentina By



FRANCE'S GREATEST AIR CENTER

Imperial Airways and Air Union planes seen on the loading apron of the Le Bourget Airport serving Paris.

Air." Its principal routes were: Marseilles-Perpignan-Palma-Algier; Paris-Bordeaux-Madrid; and Toulouse-Dakar-Natal-Buenos Aires. Between November 1, 1930, and October 1, 1931, the company carried 2,603,642 letters between France and South America, of which 990,297 were southbound and 1,613,642 were northbound. The average southbound trip took eight days, with the record in six days, 19 hours. The return journey averaged nine days, with the record in seven days, 12 hours. Four fast patrol boats were added in 1931 to speed the mail from Dakar to Natal across the South Atlantic water-gap which was to be closed as soon as practicable.

Air-Union continued to bid for traffic between Paris and London, adver-

tising its 120 mile an hour service as the "world's fastest air line" because its competitor on the route, Imperial Airways, had an admittedly lower speed. Other lines of the company were: Antibes-Tunis; Paris-Marseilles; and Lyons-Geneva.

Air Orient, operating in 1931 as an independent company although formerly a subsidiary of Air-Union, began an all-French service March 4, 1931, between Indo-China and France on a bi-weekly schedule. Primarily established for mail, although plans included passenger service later, the new route required from 10 to 12 days and followed a route from Marseilles to Naples, Corfu, Athens, Castelloroso, Beirut, Damascus, Baghdad, Basra, Jask, Karachi, Jobhpur, Allahabad, Calcutta, Akyab, Rangoon, Bangkok and Saigon.

Compagnie Internationale de Navigation Aérienne, commonly called "Cidna," maintained its service from Paris to Prague and Warsaw, with a branch from Prague to Belgrade and Istanbul. The company received subsidies from France, Czechoslovakia, Rumania, Yugoslavia and Poland.

Société Générale de Transports Aériens, better known as the "Sgta" or Farman lines, joined the Deutsche Luft Hansa, K.L.M., and Aktb. Aerotransport in operating services to Germany, the Netherlands, and the Scandinavian peninsula, respectively. Its principal cooperative routes were: Paris-Copenhagen-Malmo; Paris-Cologne-Berlin; Paris-Saarbruecken-Frankfurt-Berlin; and Paris-Brussels-Antwerp-Rotterdam.

The Compagnie Transafricaine d'Aviation cooperated with the Belgian "Sabena" in the establishment of routes in the Belgian Congo with plans to extend the services to Madagascar.

The Compagnie Transatlantique Aérienne continued its postal service between Paris and Cherbourg and other points to meet trans-Atlantic steamships carrying mails.

Star, a new unsubsidized service between Paris and Cannes by way of Dijon and Grenoble, was organized and began operations during 1931.

French air lines operating under government subsidies totaled 32,992 kilometers in 1931. They flew 4,382,000 kilometers in the first six months of 1931; 9,193,305 kilometers in 1930; and 7,206,000 kilometers in 1929. During 1930, 27,454 passengers, 179,359 kilograms of mail, and 1,579,728 kilograms of express were carried. It was interesting to note that one-third of the gold imported by the Bank of France during 1931 was transported by air.

Non-subsidized French air lines flew 202,646 kilometers in 1930, with 1,481 passengers, 20,411 kilograms of mail and 85,726 kilograms of express. Reports for 1931 indicated an increase in every branch of traffic on these lines over 1930.

French air transport accident statistics for the 18-month period, January 1, 1930 to July 1, 1931, showed one passenger death in every 2,330,000

passenger-kilometers flown. There were seven fatal accidents in 1930 in which nine pilots and ten passengers were killed, while in the first six months of 1931, there were two fatal accidents, each involving a pilot. The total passenger-kilometers flown during the 18-month period were 23,300,000.

While there were 440 planes and 170 pilots reported in the services of the regular air transport lines under the French flag in 1930, this number decreased to 389 planes and there was a corresponding drop in pilots by the end of June, 1931. Excluding 87 military airports and seven for military seaplanes, there were 68 airports in France and Algeria in 1931. The most important were at Paris (Le Bourget), Lyons, Marseilles and Strasbourg. A typical day's traffic at Le Bourget (October 15, 1931) was reported as follows: Paris-London, 95 passengers, 6,573 kilograms of express, and 145 kilograms of mail; Paris-Lyons-Marseilles, 16 passengers, 866 kilograms of express, and 47 kilograms of mail; Paris-Brussels-Amsterdam, 11 passengers, 2,337 kilograms of express; and three kilograms of mail; Paris-Basle-Zurich, 8 passengers, 639 kilograms of express and 41 kilograms of mail; Paris-Hamburg-Copenhagen-Malmo, 1 passenger and 28 kilograms of express; Paris-Saarbruecken-Cologne-Berlin, 6 passengers, 604 kilograms of express and 15 kilograms of mail. The total for the day was 137 passengers, 10,547 kilograms of express and 252 kilograms of mail.

There were 18 firms engaged in taxi, short hops and school services during 1931, using 417 planes for this work. There were 237 civilian students under instruction in June, 1931.

Although no comparative statistics with any valued authority on the air armaments of the major world powers were available, it was conceded that France had the world's largest Army and Navy air services. Its planes were of French manufacture developed through the aid of heavy government subsidies, granted to keep factories at a high degree of production efficiency to meet needs for expansion in an emergency.

Germany

In Germany as in France, heavy cash subsidies from the government played an important part in stimulating the development of aviation during 1931. The German Reich provided subsidies totaling 43,100,000 marks ($10,227,630) during 1931 as compared with 45,777,550 marks ($10,863,013) during 1930. Under terms of the Treaty of Versailles, Germany was not permitted to have military or naval air forces or to construct military airplanes of any kind. The lack of military and naval orders from the government in Germany was perceptibly offset by an intensive subsidy disbursed by the Federal Traffic Ministry, which filtered its way through German aeronautics from the airplane and engine manufacturer and the

air transport operator, right through to the purchaser of small planes for private use, and even embraced publishers of aeronautical journals. In addition to federal funds, state and municipal subsidies were granted.

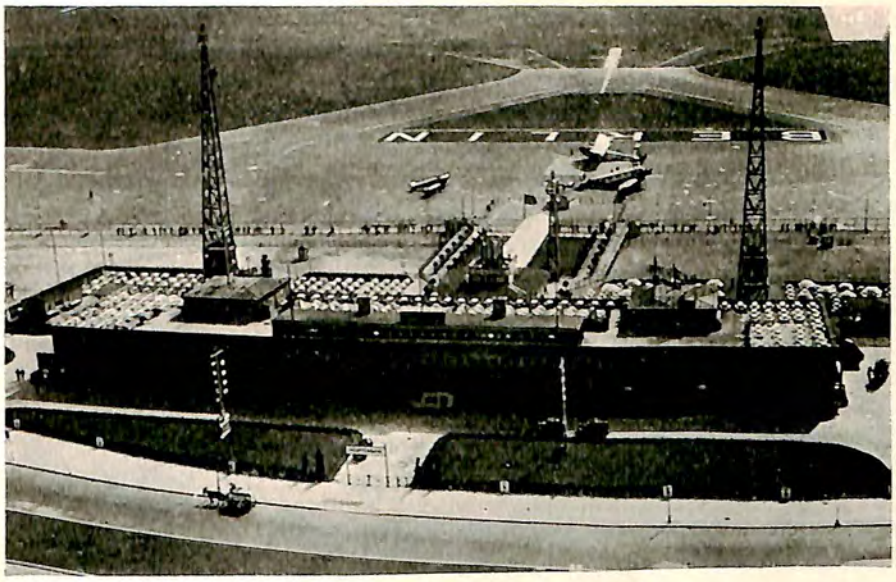
During 1931, there were 14 firms actually manufacturing airplanes in Germany. The principal concerns and their addresses had not varied from the list published in The Aircraft Year Book for 1930. The German aircraft industry produced 297 planes in 1930, 139 of which were intended for export and 115 of which were actually exported during 1930. German production for 1931 was estimated to be under 1930 figures. During the

TWO GIANTS OF THE AIR

"Graf Zeppelin" in flight over the Junkers G-38, world's largest land plane, at the Tempelhof Airdrome in Berlin.

first eight months of 1931, 80 planes were exported as compared with 93 in the same period in 1930. Six firms were engaged in the manufacture of engines, principally for export, which ranged from 35 to 70 per cent. of total production. In 1930, 550 engines valued at 11,600,000 marks ($2,752,680) were exported, while figures for the first eight months of 1931 showed only 150 units valued at 2,500,000 marks ($593,250).

There were 10 fairly important firms and 40 smaller concerns engaged in aerial service operations, excluding flying schools. There were 12 aviation schools operated by eight different concerns. During 1930, 204 planes were used by these schools which employed 38 instructors, flew 20,721 hours and made 10,936 flights. During that year, 332 students passed Class A



GERMANY'S GREATEST AIRPORT

Tempelhof Airdrome at Berlin, showing main terminal building and runways which serve 25 scheduled transports daily during summer.

RECEIVING AIR TELEGRAM

Passenger receives a private telegram while in flight aboard Deutsche Luft Hansa plane, broadcast from great radio towers of Tempelhof.

examinations, 73 passed stunt flying requirements, 195 passed Class B examinations, and 39 passed Class C tests. It was difficult to learn the exact number of planes flown by private fliers in 1931. However, it was certain that there were not more than 1,000 planes in the country, including those owned by transport operators, aerial service operators, flying schools, private firms and individuals, flying clubs and associations, experimental institutes and airplane factories.

The Federal Traffic Ministry reported 902 pilots licensed in Germany on July 1, 1931, of which 160 were employed by Deutsche Luft Hansa, the Deutsche Verkehrsflug and "Deruluft." There were 31 first-class airports in Germany, 66 second-class airports, 23 first-class emergency landing places, and 110 second-class emergency landing places.

Germany continued to hold an important place in world airship development, continuing the construction during 1931 of a new ship larger than the "Graf Zeppelin" for trans-Atlantic service. The flights of the "Graf" to South America, the Arctic and Palestine are described in an earlier chapter, "History-Making Flights of 1931."

Germany's chief aviation interests were concentrated in the vast network of air lines maintained by its principal air transport company, Deutsche Luft Hansa, and two affiliated companies, Deutsche Verkehrsflug and "Deruluft." The lines of the Deutsche Luft Hansa linked 80 cities, 52 within Germany and 28 outside the country in the summer of 1931. In addition, 11 ports were served with special newspaper air service. The company received 14 million marks ($3,322,200) in 1931 from the Reich and 4 million marks ($949,200) from the German State and City governments.

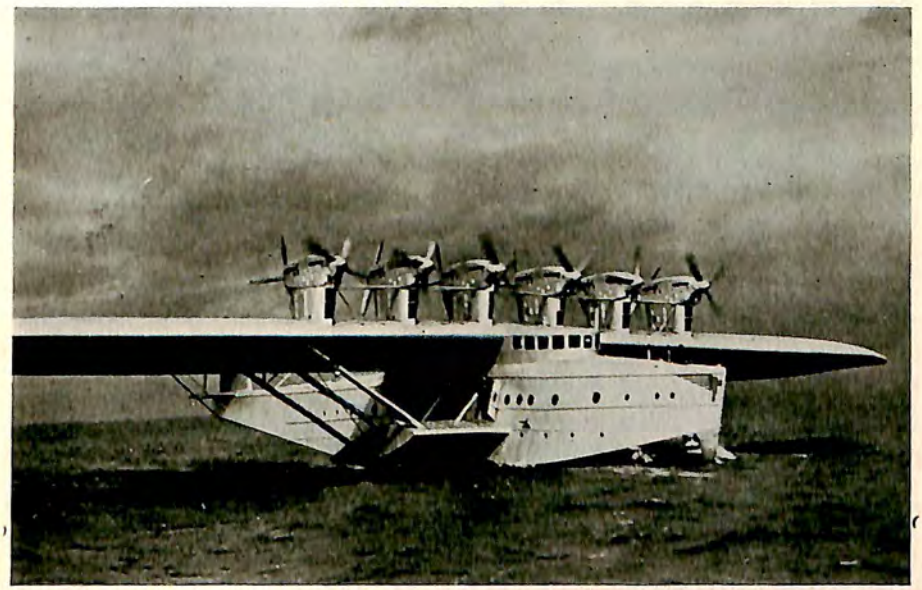
As compared with 1930, new cities reached for the first time by the Deutsche Luft Hansa were Friedrichschafen, Görlitz, Aix-la-Chapelle, Rome, Venice, and Berne, while direct service was discontinued to Marienburg, Villingen, Kalmar, Stockholm and Rotterdam. With the exception of Belgium, Portugal, Poland and Rumania, Luft Hansa lines extended into every European country during 1931. Estonia, Latvia, Lithuania and Russia were reached by its sister company, the "Deruluft."

The Luft Hansa's daily maximum scheduled performance reached 41,277 kilometers in the summer of 1931 on lines with passengers, mail and freight; and 9,661 kilometers on special mail and freight lines. This could be compared with a total maximum of 54,000 kilometers daily in the summer of 1930. The elimination of poorly patronized lines in 1931 accounted for the reduction in daily kilometers flown at the peak of the season.

The length of the Luft Hansa airway network reached a maximum of 25,709 kilometers on passenger, mail and express routes, and 4,803 kilometers on special mail and freight routes, in the summer of 1931. Of this,

9,258 kilometers were maintained in cooperation with foreign air lines which "pooled" their equipment with the German company. Aircraft required to operate the lines included 36 large transports, 47 medium-sized planes and 61 small machines. Personnel, due to economies adopted in 1930, was reduced to 1,800 workmen and employees, including 250 pilots, stewards and radio operators. Among the "flying captains" or first pilots, 49 had completed 500,000 kilometers of service. The topnotchers were due to reach the 1,000,000 kilometer mark in the spring of 1932.

The trans-Alpine route from Munich to Milan, inaugurated in 1930,



SECOND GIANT DO-X

Do-X II starting on a test flight on Lake Constance before flying over the Alps for delivery in Italy.

was extended to Rome in 1931 under a joint arrangement with an Italian company, Avio Linee Italiane. A second trans-Alpine line was opened in 1931 between Munich and Venice, and the line to Basle was continued as far as Berne. In the German domestic service, an "Aero Bus" fashioned after the Ludington Lines was inaugurated between Cologne and Frankfurt with seven trips daily each way, fares corresponding to second class rail rates, and a flying time of one hour as compared with four on the railroad. The venture was not as successful as its American counterpart, although Luft Hansa officials considered experimenting with the service again in 1932.

Considerable attention was concentrated on increasing the efficiency of

mail and express services during the year. Night air mail service, which proved valuable from Berlin to London and Paris was extended in 1931 to Hanover, Copenhagen, Oslo and Stockholm for the summer months. Foreign air lines cooperated with the Luft Hansa in the Scandinavian service. On the routes to Spain and Turkey, German railways and the Luft Hansa worked together so that night express trains carried the mail to Gleiwitz or Stuttgart, where planes flew the cargoes to Istanbul or Barcelona.

Fares were reduced considerably during the year. Rates on the domestic routes approximated second class railway tariffs, while students and government employees were given the benefits of special reductions. As a result passenger traffic in 1931 showed an increase of about 15 per cent. and freight also gained in volume, in spite of the economic depression which brought great reductions in the volume of German railway and bus traffic. The Luft Hansa figures for 1930 were: 9,446,958 kilometers flown; 76,894 passengers in planes also carrying mail and express; 30,474 passengers in planes devoted exclusively to that service; 639,922 kilograms of baggage; 1,326,237 kilograms of freight; and 437,898 kilograms of mail. There were seven airmen and ten passengers killed during the year.

In 1931, the giant Junkers G-38, the largest land plane in the world, was placed in service between Berlin and London during the summer months. All aircraft of the Luft Hansa had been equipped with radio telegraph and proper navigation instruments by the close of 1931. The line was experimenting with a Junkers crude oil engine which it planned to place in mail and freight service during 1932.

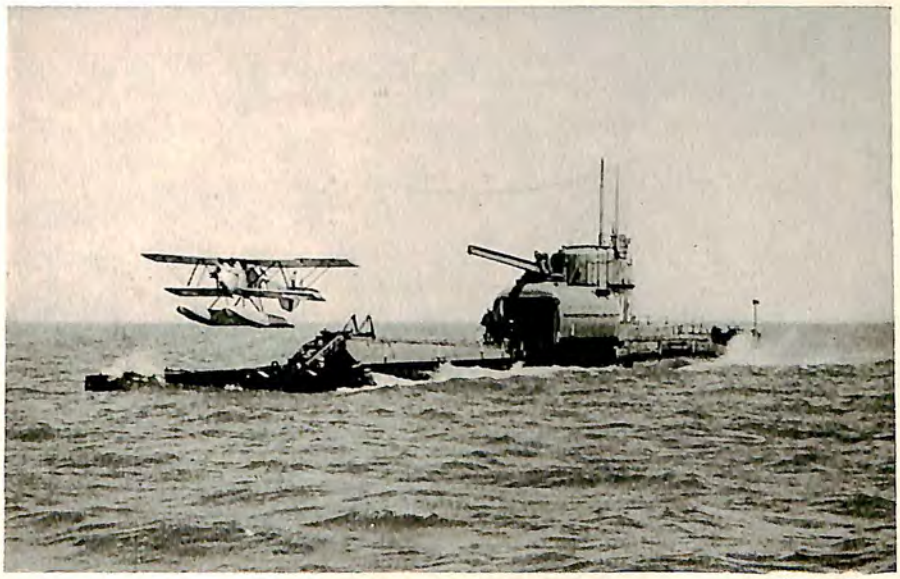
The objectives of Luft Hansa outside Germany were being pushed systematically. For the North Atlantic, the catapult flying service of the steamers "Bremen" and "Europa" was developed further. Catapult flights were carried out over a distance of 1,200 kilometers with an intermediate landing in Nova Scotia. It brought the mail to New York from 24 to 36 hours ahead of regular delivery. On the South American route, Luft Hansa worked with both steamers of the Hamburg-South American Steamship Company and the "Graf Zeppelin." German mail planes flew to the Canary Islands to be met by fast steamships which carried the mails to the island of Fernando Noronha off the coast of Brazil. Here planes of a sister company, the Condor Syndicate, met the steamships and flew the mails to South American points. A special feeder line to Friedrichshafen carried Berlin mail to the "Graf Zeppelin," which turned it over to the Condor Syndicate in South America. Through these arrangements, it was possible to achieve a record of six days for the transport of mail, passengers, and express between Berlin and Buenos Aires.

In addition to the transoceanic services being developed to North and South America, the Luft Hansa continued a service into the Far East. On

May 31, 1931, the German-Chinese Air Transport Company "Eurasia," in which the Luft Hansa had an interest, opened service between Shanghai and Manchurian points, where the mail was sped by train to Irkutsk and carried by planes of the Russian Central Air Navigation Company "Woga" to Moscow. Luft Hansa planes placed the mail in Berlin from seven to eight days after it left Shanghai, a time saving of more than a week.

Great Britain

Just as the Luft Hansa stood for Germany's major activity in civil aviation, so Imperial Airways, Ltd., represented Great Britain. Like Ger-



"Flight"

FROM UNDER THE SEA

Parnall Peto folding-wing seaplane being catapulted from H. M. Submarine "M-2" a few minutes after British submarine reaches surface.

many and France, Great Britain's government provided cash subsidies for practically every branch of civil aviation, and, in addition, assured the continuity of research and aircraft development through large contracts for military planes to be supplied to the Royal Air Force, considered one of the largest military air establishments in the world.

The 1930-31 civil aviation votes provided an item of £525,500, an increase of nearly £100,000 over the previous year. The increase was due, mainly, to the inclusion of subsidy payments to Imperial Airways, Ltd., for the opening of its new Egypt-South Africa service. The colonies and

dominions were to make contributions toward this subsidy of approximately £20,000. The votes provided £408,000 for Imperial Airways, Ltd.; £15,000 for light airplane clubs; and £5,000 for capitation payments to the National Flying Services, Ltd.

Imperial Airways, Ltd., the only air transport company in Great Britain operating on regular schedule, continued its European services: London-Paris, London-Paris-Basle-Zurich; London-Brussels-Cologne; and extended its long empire routes to India and Africa. As another step in the fulfillment of its program for direct air service from London to Capetown, South

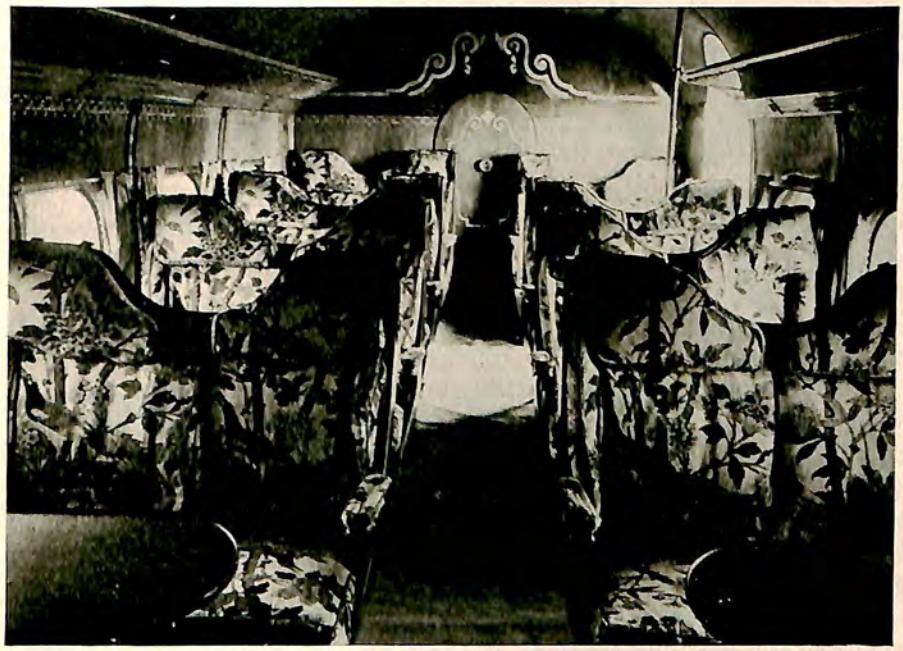
WALES FLIES IN AMERICAN PLANE

The Prince of Wales and his brother, Prince George, about to board a Wasp-powered Ford transport of Pan American Airways in Panama.

Africa, Imperial Airways inaugurated air mail service from London to Central Africa, February 28, 1931. From Cairo, one time terminus of the London-Egypt service, the mails were flown by land plane to Khartoum and by flying boat to Mwanza on Lake Victoria, in Tanganyika Territory, temporary terminus of the Central African section of the route to the Cape. The flight of 5,114 miles was effected in 10 days as compared with 20 days by the fastest transports previously available. The service was interrupted later in the year due to unforeseen technical difficulties. The plan called for opening the southern section of the route in 1932, providing London to Capetown service, 8,000 miles, in 11 days.

Imperial Airways had a plan under consideration at the close of 1931 for weekly air mail service to Australia through the extension of its London-India route from Calcutta to Port Darwin, Australia. Completion of the route, which awaited a subsidy to insure its being undertaken, would place London mail in Australia within 11 or 12 days. The company also had plans under consideration for the opening of trans-Atlantic service, in cooperation with foreign lines, routed by way of the Azores and Bermuda.

Express and freight service was expedited considerably in 1931 through the signing of agreements between Imperial Airways and the principal rail-



"Flight"

LONDON-PARIS AIR LINER

Handley Page "Hannibal" 42 of Imperial Airways, Ltd., showing luxurious aft cabin of 40-passenger liner in London-Paris service.

way and steamship companies, making possible a combined air-rail service between 140 railway stations in Great Britain and any of Imperial Airways stations in Europe, Egypt, Iraq, India or Central Africa. The rates were made attractive; a 14 pound parcel could be shipped from Leeds to Cologne by air and rail for nine shillings, six pence; and two days would be saved in transit. Agreements with Cunard and White Star steamship companies made available air-and-ocean parcel service from New York to Baghdad in 11 days and from New York to India in 14 days.

Traffic statistics for all of Imperial Airways services in 1930 totaled: 7,595 flights, 1,437,000 miles flown, 25,094 passengers carried, 731.8 tons of freight and 116 tons of mail transported. This record compared with 6,938 flights, 1,388,000 miles flown, 29,327 passengers carried, 839.7 tons of freight and 99.2 tons of mail transported in 1929. It will be noted that 1930 showed increases in all branches except passengers and freight, which fell off. While figures for 1931 were not complete, it was reported that mail would show a decided increase over 1930, while passengers would be under the previous year's figure.

Great Britain's civil aviation experienced 53 accidents in 1930, 38 of which were minor and 15 major, 13 of them resulting in fatalities. The air transport line had but one fatal accident during the year. Most of the accidents were in private flying or in the light airplane clubs, 11 of 27 accidents in these two classes proving fatal to those involved.

Flying clubs, sponsored by government subsidy, continued to account for a major portion of civil flying outside the transport field. Thirteen light airplane clubs were active, with total memberships of about 6,000 in 1931. Early in 1931, 43 gliding clubs in the British Isles had become associated with the British Gliding Association, and 50 or 60 others were in various stages of organization.

The most significant advance of the year in private flying, judged from American standards, was the improvement of Heston Air Park, a privately operated airport near London catering to wealthy private fliers in a manner similar to that of the Aviation Country Club movement in America. More than 60 privately owned planes were stored in the hangars at Heston during 1931. National Flying Services, Ltd., aided by government subsidy, carried on a program for encouraging municipal airports and private flying fields and operated five flying clubs during the year. It also carried on a general taxi and aerial service business.

There were only eight licensed municipal airdromes in Great Britain in 1931, but this was an increase of four over the previous year. There were, however, 121 airdromes of all classes for civil aviation, including 29 for public use, 21 for private use, and 71 qualified to permit only short hops. The British Civil Aircraft Register showed 846 civil planes registered in Great Britain in 1931, of which 615 were certified airworthy. They were divided as follows: 35 in regular air transport; 148 in aerial service work; 98 in schools and R. A. F. training; 68 in clubs; 130 in demonstration, experimental and racing; 333 in private flying; and 34 held by agents for resale. Pilots licensed on January 1, 1931, were divided as follows: 1,708 Class A; 252 Class B; 56 navigators. It must be noted, however, that 30 per cent. of the pilots holding "B" certificates also held "A" certificates, causing duplication. It was safe to say that there were less than 2,000 licensed pilots on the British register at the close of 1931. Since British

aircraft manufacturers do not make public their production figures, it was impossible to obtain an accurate gauge of the activities in nearly a score of factories. The list had not changed from that published in The Aircraft Year Book for 1930.

It was needless to say that the manufacturers were kept busy with orders from transport and military services. Imperial Airways spent a considerable amount of its subsidy in the purchase of new equipment including flying boats of the Short "Kent" type for the Mediterranean service and super-airliners of the Handley Page "Hannibal" type, seating 30 to 40 passengers, for the European and Indian services. The Royal Air Force was supplied with new squadrons of Hawker "Fury" single-seater fighters, with rated high speeds of 223 miles an hour at 13,000 feet, and Hawker "Hart" two-seater planes with rated high speeds of 218 miles an hour at a similar altitude.

Greece

The naval air service cooperation divisions were furnished with their first submarine plane, an aircraft with folding wings housed in a hangar built into the new Submarine M-2, making possible operations under the sea, on the surface, or in the air. A photograph of the plane being catapulted from the M-2 is reproduced in this volume through the courtesy of "Flight." While not conceded to have an air force as large as France, Great Britain was known to have one of the largest air establishments in the world—considerably larger than the combined Army-Navy air forces of the United States. Comparative aircraft carrier tonnage of the United States and Great Britain has been discussed in an earlier chapter, "Wings for the Fleet."

Greece was served for the first time in 1931 by its own national air transport company, "Icaros," which began operation July 10 between Athens and Saloniki, and Athens and Jannina with the aid of a government subsidy. Previously, Greece has been served only by an Italian air transport company, Societa Anonima Aero-Espresso Italiana, with the three services: Athens-Patras-Brindisi, Athens-Istanbul, and Athens-Syria-Rhodes Island. The Italian line flew 184,340 miles in 1930 with 1,075 passengers, 6,028 pounds of mail and 92,990 pounds of express.

The government renewed the contract of the Blackburn Company, supported by British capital, to continue the fabrication of airplanes in Greece. A proposal was made during 1931 to authorize the Air Ministry to spend $2,000,000, including $1,170,000 for construction of civil airports, purchase of airplanes for flying clubs, and air marking and lighting. The remainder would be spent for military airports and flying schools. British and French aircraft, ordered in 1930 for the establishment of an air force, were delivered during the year.

Hawaii

Inter-Island Airways and the United States Army and Navy squadrons stationed in Hawaii formed the nucleus of activity in the mid-Pacific American territory.

Using two Sikorsky S-38 (Pratt and Whitney Wasps) amphibions and a Bellanca (Wright Whirlwind) Pacemaker to maintain schedules calling for 5,000 miles of flying weekly, Inter-Island Airways flew 260,000 miles during 1931 and carried 9,500 passengers, a decrease of about 10 per cent. from 1930 figures. Every effort was being made by business men in Hawaii to obtain regular mail service through the facilities of the line. The company's routes were: Honolulu-Hilo and Honolulu-Maui, six times weekly; and Honolulu-Kauai, three times weekly. The company celebrated its second anniversary November 11, 1931.

Hawaiian Airways, Ltd., an aerial service operator, discontinued operations during the year. The United States Army Air Corps bases at Wheeler Field and Luke Field, near Honolulu, and the Naval Air Station at Pearl Harbor, 10 miles away, were continued in operation with new equipment added during the year. Eighteen of 50 Curtiss attack (Curtiss D-12) planes under construction at Buffalo, N. Y., in the summer of 1931 were destined for Hawaii to constitute the Army's first attack squadron in the islands.

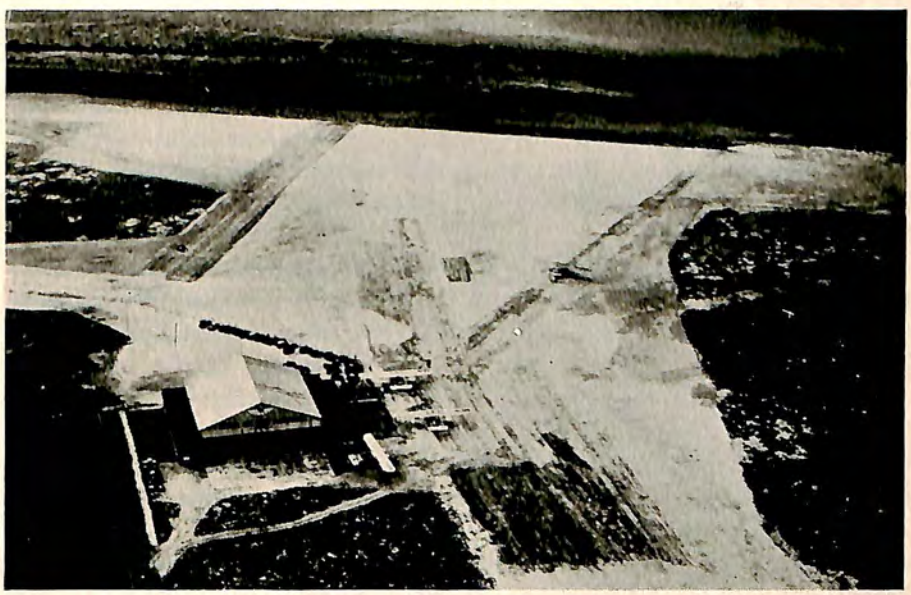
Hungary

The Hungarian Air Traffic Company (Magyar Legiforgalmi R. T.), Deutsche Luft Hansa and a French line, Compagnie Internationale de Navigation Aérienne, served Hungary in 1931, with some extension of services. The three organizations operated 1,400 kilometers of routes in 1931. Regular services were maintained between Budapest and Vienna; Budapest, Klagenfurt, and Venice; Budapest and Belgrade; and Budapest, Pécs and Kaposvár. Service between Budapest and Graz was discontinued in 1931, while two new routes were added in the spring of the year: Budapest-Klagenfurt-Venice and Budapest-Pécs-Kaposvár.

The Royal Hungarian Central Statistical Bureau reported 887,494 kilometers flown in 1930, with 7,962 passengers, 127,839 kilograms of mail, and 259,244 kilograms of goods. There were no accidents in Hungary in 1930 or 1931. The Hungarian and French companies maintained five to seven planes in Hungary for their service, while the Luft Hansa stationed no planes in the country, since it merely operated over Hungarian territory. The Hungarian company received an annual subsidy of 200,000 pengö ($35,000) in 1931 and was to receive a similar sum in 1932. It offered planes for taxi hire as well as its scheduled services.

PURSUIT PLANES IN HAWAII

Formation of nine Wasp-powered Boeing pursuits flown by Army Air Corps officers near Waianae mountains in Hawaii.



AIR LINE IN HAWAII

Air view of the airport of Inter-Island Airways, Ltd., an American air line, on regular schedule in the Hawaiian Islands.

There were 15 privately owned planes in Hungary in 1931, four of which were owned by individuals and 11 by an association, Sportflying Association of the Joseph Technical College of Budapest, which maintained a flying school for its engineering students. There was but one first class airport in the country, Matyásföld, near Budapest.

The Manfred Weiss Airplane and Motor Manufacturing Company at Csepel, Hungary, was the only commercial manufacturer of airplanes and engines in the country, turning out planes and engines under patent rights of Fokker, Caproni, Heinkel aircraft designs and Gnome Jupiter and Siemens and Halske engines. Military aviation services were forbidden under terms of the Trianon Treaty of 1920, all civil activities being under the Royal Hungarian Ministry of Commerce.

Iceland

The Icelandic Air Transport purchased its third Junkers airplane to aid in maintaining winter air service in 1931-32 on a mail and passenger route between Reykjavik and the Vestmanna Islands, Isafjord, Siglufjord and Akureyri. It also provided ambulance service and used its planes to scout for herring during the fishing season.

India

Three international air lines linked India with the European continent. Imperial Airways, Ltd., receiving subsidies from the governments of Great Britain and India, maintained weekly service between London and Karachi, and another route from Karachi to Delhi, with a stop at Jodhpur, capital city of the native state by that name. Five transport planes, seven pilots, five mechanics and four radio operators were maintained in India for these services.

The French company, Air Orient, connected Paris with Saigon, but had no provisions for passengers in 1931. Farman and Fokker monoplanes were used in the service, manned by six pilots, three mechanics and four radio operators.

The Royal Dutch Air Lines, K. L. M., merely used Karachi as an airport on its route from Amsterdam to the Dutch East Indies. While passengers were accommodated on a "space-available" basis, there was seldom room for anything but the heavy cargoes of mail, spare parts and fuel.

Four planes were privately owned, and the Karachi Aero Club had issued 25 pilots licenses to private fliers during 1931. There were 57 airdromes in India, the principal ones being at Karachi and Calcutta. The British government maintained a military air force of 350 officers, 3,000 men and 350 airplanes in India. The British and Indian governments

jointly erected a mooring mast and hangar for dirigibles in anticipation of the Empire airship program, since abandoned.

Irish Free State

Although there were no regular air transport services in the Irish Free State, there was increased interest in civil aviation in 1931. The Iona National Airways, Ltd., licensed its private aerodrome near Dublin, and operated three Moth planes in charter work and passenger flying, "barnstorming" several centers with considerable success during the summer months. Another flying service carried newspapers by air to western and southern towns.

The Irish Aero Club increased its activities, a whole-time instructor was engaged and three new Moth planes purchased. In August, the club staged an air pageant, which attracted so much attention that another instructor was engaged. Six club members owned their own planes. The government granted the club an annual subsidy of $5,000.

The Irish Army Air Corps continued its training program at Baldonnel Aerodrome, near Dublin, and added a number of Vickers "Vespa" planes and a flight of Bristol fighters during the year. The corps embraced 24 officers, who were pilots, and 214 non-commissioned officers and enlisted men.

Italy

Italy was committed to an intensive program for the development of civil and military aviation, backed by the convictions of its Premier that the Facists should permit no nation to excel them in this important new field of transportation and armament.

Italy was conceded to have one of the largest air forces in the world, assembling more than 890 planes in the annual maneuvers during 1931—a division much larger than that assembled by the United States earlier in the year. Its air force promoted a constant program for research and development, undertaking several important missions during 1931, the most spectacular of which was the crossing of the South Atlantic by an entire squadron of huge flying boats in formation with Italo Balbo, the Italian Air Minister, at the head of the flight. This feat already has been described in an earlier chapter, "History-Making Flights of 1931." The Italian air budget was in excess of $40,000,000 in 1931, about 10 per cent. of which was spent for civil aviation.

Every effort was made to perfect Italian planes for use on the Italian air lines and in the military services, but the reliability and special features of foreign aircraft was not overlooked where it promised to be of greater value than domestic craft. The first of two giant Dornier flying boats of

the Do-X type was delivered to Italy during the year for air line service. The Italian Air Ministry, fascinated by the potential possibilities of a plane like that of Capt. Frank M. Hawks, bought a Curtiss-Wright Travel Air Mystery plane in 1931 similar to Hawks'. The plane had a high speed of 220 miles an hour and cruised at 185 miles an hour at sea level, with remarkable performance characteristics.

Service was inaugurated in 1931 in cooperation with the Deutsche Luft Hansa between Rome and Berlin on a thrice weekly schedule, connecting

BEARS ITALIAN COAT OF ARMS

Closeup of the Do-X II on Lake Constance, bearing the coat of arms of the Italian Air Force and named the "Umberto Maddalena."

with the regular daily service of the Societa Anonima Avio Linee Italiane between Milan and Rome. Daily services also were maintained by this company between Milan and Munich and Milan and Turin.

Fast mail service was inaugurated in May, 1931, from Trieste, Venice and Genoa in Italy, through Marseilles, France, to Barcelona, Cartagena, Gibraltar and Cadiz in Spain. The two huge flying boats of the Do-X type were to be used on this service to make possible passenger accommodations as well as mail and express service.

This service was operated by the principal Italian air line, Societa Anonima Navigazione Aerea, which held contracts with the Italian government for a continuing program of subsidies through July 1, 1939. It received $1.35 per mile flown with bi-engined seaplanes and $2.36 per

mile flown with four-engined planes. Its routes included: Rome-Genoa-Marseilles, 446 miles, twice a week; Rome-Genoa-Marseilles-Barcelona, 739 miles, twice a week; Syracuse-Tripoli, 342 miles, three times a week; Rome-Genoa, 261 miles, Rome-Naples-Palermo, 271 miles, and Rome-Naples-Syracuse, 421 miles, daily except Sundays and holidays.

The Societa Aera Mediterranea, with its base at Rome, extended its service from Rome-Naples-Brindisi to Istanbul, Turkey, by way of Athens in 1931, and inaugurated a special service from Athens to Rhodes. Other

AMERICAN ENGINES IN JAPAN

Tri-motored Fokker transport, powered with three Wright Whirlwind engines, in the service of Japan Air Transport in the Orient.

routes of the company were: Rome-Tunis, Cagliari-Tunis, and Rome-Palermo-Tunis.

The Societa Italiana Servisi Aerei ("Sisa") with its base near Trieste, operated seaplane service on five routes: Trieste-Lussino-Zara-Ancona, Trieste-Fiume-Lussino-Zara, Trieste-Fiume-Brioni-Venice, Trieste-Venice-Pavia-Genoa, and Turin-Pavia.

There was a definite movement in Italian air transport to consolidate the activities of the several lines and insure efficient operation of the main routes. Since 1926, when the air transport program was first undertaken, traffic on Italian air lines increased until in 1930 the total distance flown was eight times greater than in 1926 and the number of passengers carried was ten times larger than during the first year.

Private flying was being encouraged by the government through the development of light airplanes of the Breda type and through competitions such as the Second Annual Light Airplane Tour held in July, 1931.

Japan

With the Japanese government convinced of the importance of aviation for civil and military purposes, Japan pushed forward systematically during 1931 in the carrying out of its ambitious program. In the presence of Emperor Hirohito, an aeronautical institute costing nearly $2,000,000 and designed to be one of the best research establishments in the world was opened.

The Japan Air Transport Company (Nippon-Koku-Yuso-Kaisha), due to receive subsidies totaling $10,000,000 from the Japanese government over a period of eleven years, reported a net profit of $200,000 in 1930 and paid a five per cent. dividend. It had a 28 per cent. increase in passenger traffic during 1930, and was growing steadily throughout 1931. Equipped with Fokker (Wright Whirlwind) transports of American and Dutch manufacture, and with some Japanese planes, the company continued its daily passenger, mail and express service from Tokyo to Darien in Manchuria, and inaugurated service from Osaka to Fukuoka with plans to extend the line to Shanghai. Other routes operated in 1931 were: Osaka-Matsuyama, Tokyo-Niigata, and Tokyo-Shimitzu.

The Japanese Military Flying Corps, with 26 squadrons and more than 600 planes, was one of the largest military establishments in the world. Most of the planes were of American, German, British and French, as well as Japanese manufacture.

Latvia

Aircraft manufacturing in Latvia was confined principally to the assembly of imported parts for planes constructed to Latvian designs with imported engines to power them.

The country was served by the German-Russian air transport company, "Deruluft," which operated Junkers monoplanes during the summer months from Berlin to Riga with an extension to Tallinn, Estonia; Leningrad, Russia; and Helsingfors, Finland. During 1931, 11,825 pounds of mail, 29,610 pounds of express, and 122 passengers were carried into Latvia on the line.

The Latvian Aviation Society at Riga operated four privately owned planes and the Club of Former Fliers of the Latvian Republic maintained three obsolete military ships. The Latvian Army had 50 planes in service in 1931, and the Navy, devoted to coast defense, had 12 seaplanes in use.

The Royal Dutch Air Lines for the Netherlands and Colonies (Koninklijke Luchtvaart Maatschappij voor Nederland en Kolonien) or K.L.M.

continued to be the center of the ambitious Dutch program for linking the Netherlands and its colonies in 1931. Without doubt, K.L.M. was one of the first ranking air transport lines in the world.

Netherlands and Netherlands East Indies

On October 1, 1931, the Netherlands to Java service was increased from a fortnightly to a weekly departure in each direction. The route traversed on the long flight to the Netherlands East Indies was changed October 29, 1931, to follow a course from Amsterdam direct to Marseilles, then to Rome and Athens, instead of through Germany and central Europe. From Athens the route extended to Cairo, Baghdad, Bushir, Djask, Karachi,

ROYALTY ON DUTCH LINE

The Crown Prince of Belgium and Princess Astrid und Ingrid leaving a Fokker transport of the Royal Dutch Air Lines.

Jodhpur, Allahabad, Calcutta, Akyab, Rangoon, Bangkok, Sengora, Medan, Palembang, Bandoeng and Batavia. The passenger fare was reduced from $1,200 to $1,000, including all expenses at hotels enroute.

In Europe, K.L.M. operated several lines during 1931: Amsterdam-Rotterdam-London; Amsterdam-London; Amsterdam-Rotterdam-Paris; Amsterdam-Hamburg-Copenhagen-Malmo; and Amsterdam-Bremen-Hamburg. Two services operated in 1930: Brussels-Paris and Lympne-Ostende were discontinued in 1931. For the first time, however, internal lines in the Netherlands were established: Amsterdam-Eelde and Rotterdam-Haamstede, eliminating the necessity of a tedious rail and boat journey.

Traffic statistics of K.L.M. have grown steadily since 1920, when the

line carried 345 passengers, 6,516 pounds of mail and 48,318 pounds of goods. During the first eight months of 1931 alone, the line carried 16,163 passengers, 203,148 pounds of mail, and 1,522,006 pounds of goods. In the entire year 1930, 17,456 passengers, 208,744 pounds of mail, and 2,083,775 pounds of goods were transported. The distance flown in 1930 was 1,051,500 miles, while 766,000 miles were flown in the first eight months of 1931. The total daily mileage of the European service alone in the summer of 1931 was 4,745 miles and in the winter of 1931-32, 1,078 miles. There were no accidents on the line during 1931, its safety record in 11 years of operation being 7,500,000 miles flown with 11 persons killed and two injured.

Twenty-seven Fokker airplanes of various types, all of Dutch manufacture and some with American Pratt and Whitney Wasp and Hornet engines, were used on the scheduled lines. In 1931, its operating personnel increased from 18 to 24 pilots and from 430 to 474 other employees. All pilots were required to make at least three round trip journeys to Java each year. K.L.M. received an annual subsidy of about $400,000 and derived money from mail contracts as well. The route from Amsterdam to the German frontier, 94 miles, was lighted, and K.L.M. planned the lighting of two additional routes, Amsterdam-Rotterdam-London and Rotterdam-Paris. All planes in European and colonial services were equipped with radio, the latter having a special type transmitter and receiver designed especially to meet conditions encountered.

Four aircraft manufacturers, including the original Fokker plant, were active during 1931. "Aviolanda" constructed six Curtiss Hawks powered with Curtiss Conqueror engines for the Dutch East Indies Air Force under licenses of the American concern during 1931. It was the first time that American planes had been manufactured in Europe under license. Two Curtiss-Wright Juniors were shipped to "Aviolanda" from the United States during the year for sale in Holland. The Netheralnds exported most of the planes it manufactured, a total of 18 planes being shipped during the first eight months of 1931 to the Dutch East Indies, Switzerland, French Indo China, China, Spain, Syria, France and Australia. This was considerably less than during the same period in 1930, when 50 planes were exported, or during the 12 months of 1930 when 54 planes valued at $1,679,200 were sent outside the country on order. Engines were not manufactured in Holland, being imported chiefly from the United States, Great Britain and France.

The Netherlands Department of Defense Army Air Service had 132 planes in service in 1931, including three squadrons of pursuits, one squadron of bombardment, two squadrons of long distance reconnaissance, a group of 20 artillery spotters, 20 planes for reconnaissance service, 20 two-seater fighters, and 20 training planes. The Naval Air Service increased its force

from 43 airplanes to 48 ships during the year. The Dutch East Indian branch of the naval air service had 70 marine aircraft in service, including 30 armed flying boats, 18 reserve flying boats, a bombing and torpedo squadron of 12 planes, and reconnaissance planes aboard Dutch cruisers in Dutch East Indian waters. The Army Air Service in the Dutch East Indies had approximately 100 planes in service, principally fighters of the Curtiss Hawk or Fokker types.

The Rotterdam Aero Club had 200 members in 1931 and received a subsidy from the government. Eight members owned their own planes and 45 had private pilots' licenses. The planes, of Dutch manufacture, flew about 500,000 miles in 1931.

In the Netherlands East Indies, the K.N.I.L.M. (Koninklijk Nederlandsch-Indische Luchtvaart Maatschappij) or Royal Dutch Indian Air Line continued its service as an entirely separate enterprise from the K.L.M. Two new planes equipped with American Pratt and Whitney engines were added during 1931, and a new weekly line from Medan to Singapore established. The trip, requiring 36 hours by fast mail steamers, required four hours by air. Other lines continued in operation in 1931 were: Batavia-Bandoeng, Batavia-Surabaya, Batavia-Palembang, Batavia-Singapore, and Batavia-Medan. The fare on the Batavia-Sinapore line was reduced from $68 to $56. During 1930, the K.N.I.L.M. carried 18,248 passengers, 9,372 kilograms of mail and 119,927 kilograms of freight.

New Zealand

Ten commercial companies were engaged in taxi services during 1931 in New Zealand, 15 planes being used in this work. There were 54 civil planes in the Dominion during the year, including those used by nine light aeroplane clubs at Auckland, Hastings, New Plymouth, Wellington, Masterton, Blenheim, Christchurch, Dunedin and Invercargill. The government subsidized each of these clubs by loaning two De Havilland Moths and paying £25 for each member who qualified for an "A" license, with a limit of £500 to each club per year. Since the inception of the plan in 1929, 143 licenses were earned, 94 of them between March 31 and October 5, 1931. Ten military planes were maintained in the country.

Norway

Norway manufactured no airplanes or engines during the year, although the Navy Department was constructing a plant at Horten in 1931 for the production of aircraft engines. Planes for both the Army and Navy aviation services were imported from other countries.

The Norske Luftruter (Norwegian Air Transport Company) in cooperation with the Deutsche Luft Hansa continued the operation of passenger and express service between Oslo and Travemunde from May until

December. Operating without an assured subsidy, the Norwegian company was successful in 1928, 1929 and 1930 in obtaining grants from the government and the city of Oslo to cover operative deficits. The management of the company announced late in the year that service would be discontinued in 1932 if a subsidy was not assured.

The mail service operated during the summer of 1930 by Halle and Peterson was taken over in 1931 by the government, which maintained an experimental service with military planes between Oslo and Goteberg, Sweden. Army airplanes were used from May 15 to August 10 and Navy planes from August 11 to September 2. Because of the rugged character of the country, all landings were made on the water.

Persia

Air traffic in Persia showed a decided increase in 1930 and 1931 although the German operating company which held a monopoly on civil aviation opened no new routes. The Junkers Luftverkehr Persien, as the company was known, flew 701,426 kilometers in 1930 with 4,826 passengers, 27,847 kiolgrams of mail and 85,943 kilograms of freight. Its line linked Teheran with Baghdad in a six hour flight, compared with three and a half days by train and motor.

Imperial Airways, Ltd., was permitted to cross southern Persia from Baghdad to Karachi, but could not carry local passengers. The Persian Army continued its activities with six Junkers planes.

Poland

Four aircraft manufacturers in Poland produced 25 commercial planes valued at $112,000 during 1930 and the first six months of 1931. Three engine factories produced 43 Wright Whirlwind engines and 21 Louraine motors during 1930 and the first six months of 1931.

A new air line was inaugurated June 27, 1931, between Danzig, Sofia, and Saloniki under the auspices of the Polish Airways "Lot." Other services included: Warsaw-Danzig; Warsaw-Lwow; Warsaw-Poznan; Warsaw-Katowice-Krakow; Katowice-Brno and Brno-Vienna. Twenty-seven planes, manned by 20 pilots and 30 mechanics maintained the service in 1931. During the first six months of the year, the Polish Airways flew 470,709 kilometers with 4,590 passengers, 15,763 kilograms of mail and 101,542 kilograms of express and baggage. During 1930, the company flew 1,518,101 kilometers with 12,507 passengers, 75,509 kilograms of mail, and 412,962 kilograms of express and baggage. There were no accidents during the 18 months.

The air line was granted a subsidy of 6,200,000 zlotys ($695,640) in 1931. The French line, Compagnie Internationale de Navigation Aérienne,

continued to operate its Warsaw-Prague-Paris service, although it no longer received a subsidy from the Polish government.

There were eight flying clubs in Poland with 878 members, of which 123 held pilots' licenses and 144 were in training for licenses. Ninety-two pilots served the clubs as instructors. Only six members owned their own planes. The clubs owned nine planes.

The Portuguese government aircraft factory, established at Alverca in October, 1930, with plans to produce planes of French design for the Army and Navy, had 17 planes under construction in 1931, four of which were completed and flown. The Army aviation service had 75 airplanes and the Navy 30 planes.

Portugal

An exclusive concession was granted to the Sociedade Portuguesa de Estudos e Linhas Aereas, Ltd., and the Companhia Portuguesa de Aviação by the Portuguese government September 16, 1931. None of the projected lines was in operation at the close of the year. The Sociedade Portuguesa de Levantamentos Aereos, Ltd., purchased an airplane for aerial photographic work, but had not used it by the close of 1931.

The Aero Club of Portugal operated an aviation school at Lisbon, from which eight students were graduated in 1931, and another course was planned for eight or ten more students. Three airplanes were privately owned near Lisbon and eight private pilot's licenses were issued to private fliers during 1931.

Rumania

Three air transport lines served Rumania in 1931. The government line, "Lares," maintained service on two routes: Bucharest-Galati-Chisinau and Bucharest-Constantza-Balcic. The French company, Compagnie Internationale de Navigation Aérienne, operated two lines: Bucharest-Belgrade-Vienna-Paris and Bucharest-Istanbul; while the Polish line, "Lot," linked Bucharest, Iassy, Czernowitz and Warsaw.

The budget of the Rumanian civil aviation department for 1931 amounted to 35,814,032 lei ($214,884), a decrease for 1930 figures. There were two flying schools in the country, and the principal club, the Royal Rumanian Flying Club, had 600 members and obtained $18,000 in subsidies annually.

Siam

Services into the interior of Siam formerly maintained by the Siamese Army were taken over during 1931 by the Aerial Transport Company of Siam, Ltd., under supervision of the Ministry of Commerce and Com-

munications. Beginning in August, 1931, bi-weekly passenger and freight service was maintained over the route of the proposed railway between Korat-Ubon-Nakorn Panom.

Siam was linked with Europe and other parts of Asia by two international air lines. The Royal Dutch Air Lines increased its fortnightly service from Amsterdam to Batavia, with a stop at Bangkok, Siam, to weekly departures in each direction. The Compagnie Air Orient, the French company, had a fortnightly service through Siam from Saigon to Paris.

Spain

Spain was served with air lines totaling 2,359.3 miles on October 1, 1931. The principal operating company, Concesionaria de Lineas Aéreas Subvencionadas, S.A., or "Classa," received 3,000,000 pesetas annually from the government and held certain monopolistic rights. Allied with the corporation, although operating independently, were Unión Aérea and Jorge Loring.

Services in operation during 1931 included: Madrid-Barcelona and Madrid-Sevilla. The Madrid-Lisbon, Madrid-Barcelona, Madrid-Canary Islands, Sevilla-Larache, and Sevilla-Granada, operated in 1929 and 1930, were discontinued as unprofitable.

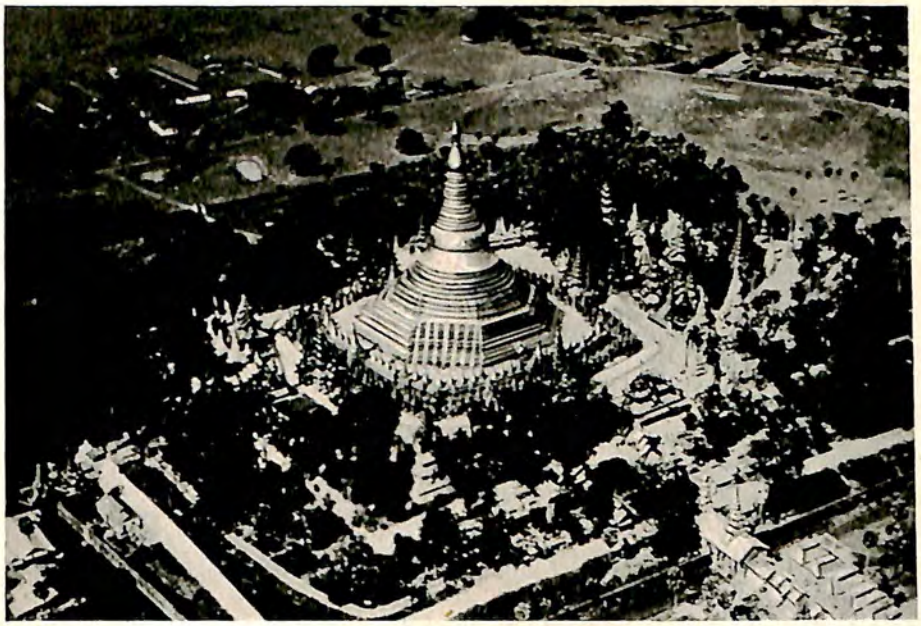
During 1930, 363,719 miles were flown on these lines, carrying 5,959 passengers, 2,500 pounds of mail and 137,113 pounds of freight. Spain continued to show considerable interest in lighter-than-air development, although it owned no airships. The airport at Sevilla was equipped with a mooring mast and became a port of call on the Europe-South America airship route of the "Graf Zeppelin."

Three aircraft manufacturers and four engine producers, most of whom operating under rights to foreign patents, were in production during 1931. During the preceding year, 218 complete planes and 17 seaplanes were manufactured in Spain. Aviation schools were operated in Madrid, Barcelona, Alcala de Henares, Guadalajara, Cartagena and Albacete. Private flying was confined principally to flights of visiting tourists from other countries. Spain maintained a military air force in its military establishment.

In addition to its own national air transport line, Spain was connected with other parts of Europe through cooperative arrangements with the Deutsche Luft Hansa and an Italian line, which provided through service to Berlin or Rome.

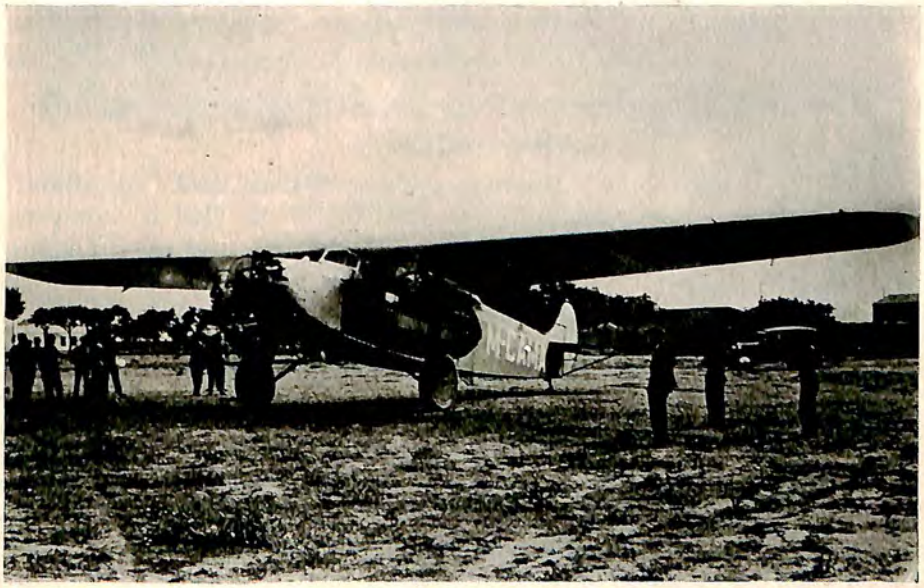
Straits Settlements

Service to the Straits Settlement was increased in 1931 with the inauguration, August 5, of the new weekly service of the Royal Dutch Indian Airways between Singapore and Medan with American-engined 16-passenger



AMERICAN "WASPS" IN SIAM

With a strange mingling of old and new, a golden pagoda in Bangkok, Siam, is seen from the Wasp-powered Fokker of K.L.M.



WHIRLWINDS IN SPAIN

Whirlwind-powered Fokker transport plane of the Spanish "C.L.A.S.S.A." Lines is seen warming up at Madrid, Spain, for flight.

Fokker planes. Thirty-two hours in transit time were saved by the four hour flight.

Service was continued on the Singapore-Batavia route inaugurated by the K.N.I.L.M. in 1930. From the time the line was opened, March 4, 1930, until the end of that year, 616 passengers, 6,314 kilograms of freight, and 668 kilograms of mail were carried on the Singapore-Batavia line.

The Singapore Flying Club added a Saro Cutty Sark flying boat to its three D. H. seaplanes in 1931. The Kuala Lampur Flying Club operated three D. H. land planes throughout the year. Forty men qualified for pilot's licenses in the two clubs during the year. Only one member, however, owned his own plane.

Sweden

The Aktiebolaget Aerotransport (Swedish Air Transportation Company or A.B.A.) received the largest subsidy in its history from the Swedish government in 1931, totaling 650,000 kroner ($174,200). However, revenues from passengers, mail and freight together with the subsidy were insufficient to meet operating expenses. The government was confident that the volume of air mail could be built up to make the service profitable.

In cooperation with Deutsche Luft Hansa, K.L.M., and the Finnish Air Service Company, A.B.A. maintained service in 1931 between Malmo-Hamburg-Berlin, Malmo-Amsterdam, and Stockholm-Helsingfors. During 1930, it flew 415,852 kilometers with 16,231 passengers, 27,904 kilograms of mail and 30,555 kilograms of freight as compared with 333,420 kilometers flown in 1929 with 5,350 passengers, 56,222 kilograms of mail, and 36,739 kilograms of freight.

Switzerland

The two largest Swiss aviation companies, "Balair" and "Ad Astra," were merged March 26, 1931, when stockholders of the "Balair" company approved the move, which had been previously approved by the stockholders of "Ad Astra." The merger was due largely to the desires of the Swiss government to effect a more efficient organization of international services for which subsidies were granted by it. The new company was known as Schweizerische Luftverkehrs, A.G., or "Swissair," and had a capital of 800,000 Swiss francs.

A net profit of 49,308 Swiss francs was declared for 1930, permitting a distribution of a five per cent. dividend to stockholders. Receipts from passenger and freight traffic totaled 257,971 Swiss francs; from mail traffic, 409,673 Swiss francs; and from federal subsidies, 367,910 Swiss francs. At the time of the merger, it was announced that the two companies had flown 1,988,000 miles since they began operations without a serious accident and without loss of a package or letter.

The new company owned 11 planes and employed 10 pilots, 8 mechanics, and 7 radio operators. It operated the route from Basle to Zurich, Munich and Prague independently, and cooperated with Imperial Airways, Ltd., on the Zurich-Basle-Paris-London route and with Deutsche Luft Hansa on the Geneva-Basle-Mannheim-Frankfurt-Berlin line. It joined Air Union and "Cidna" in speeding mails from Basle to Cherbourg to improve the service between the United States and Switzerland. No

BASLE AIRPORT AT NIGHT

Bathed in a flood of light, the Basle, Switzerland, Airport is ready to receive planes safely as the sun sinks behind the city.

additional charge was made for mail carried on the special steamship planes.

Imperial Airways routed its London-Indian service through Switzerland in 1931, and the Luft Hansa maintained an independent service on the Basle-Geneva-Marseille-Barcelona route. Sightseeing and taxi flights were made by the owners of the Basle airport, Aviatik beider Basel. The Basle airport was lighted for night flying. Six private planes were registered in the country, and 12 private pilots have been licensed, three of them during 1931.

Turkey

Civil aviation in Turkey during 1931 was represented by the operation of two air lines, one French and the other Italian. The French line,

kilograms of freight. The second six month period was generally heavier than the first. Strong support was assured the Yugoslav company through cash subsidies from the government.

Twenty students were under instruction in 1931 in the new school of the Association of Reserve Aviators of the Kingdom of Yugoslavia. There were no more than four privately owned planes in the country and four private pilots. The military air force was supplied with planes principally of French or Yugoslav manufacture.

Part II

Manufacturing and Engineering Progress

CHAPTER XVII

OUT OF THE ENGINEERING LABORATORY

Design Trends Toward Higher Speed in Military and Transport Planes—
Use of Metal Increases—Retractable Landing Gear Developed—
Power Plant Efficiency Improved—New Models Introduced

ENGINEERING progress in aeronautics during 1931 resulted from detailed refinements in aerodynamic and structural design rather than from any radical innovation or invention. The principal advance was made in the increased cruising speed of aircraft, both commercial and military. There also was a definite trend toward simplification of design made necessary by the realization that planes in the commercial field had to be designed to meet a price limit and standards of performance never before attained.

Greater values in both military and commercial aircraft were offered at the opening of 1932 than at any time in the history of the industry. Strict economies in design, which called for careful analyses of the cost of production and cost of maintenance, brought prices down and sent values upward. The commercial airplane for 1932 was being offered at about one-half the cost of a less advanced product of a few years before.

Although all of the major manufacturers carried on research programs looking toward fulfillment of the requirements of a future market when general business conditions should be improved, the 1931 market left a definite imprint on design. It was chiefly a military market—Army and Navy purchases accounting for nearly 60 per cent. of the production dollar value—and it was logical to find a major share of the year's engineering advances in this field. Secondly, the market held out certain promise in the transport field—the air transport lines purchasing nearly $5,000,000 worth of new equipment during the year—and some important detail refinements were achieved in transport planes. In the private commercial field, the market was essentially a low-priced one with the result that every effort was made to sell planes at the lowest dollar value possible. The only exception to this was the general trend toward self starters as standard equipment on all ships, except those in the very light, low horsepower class.

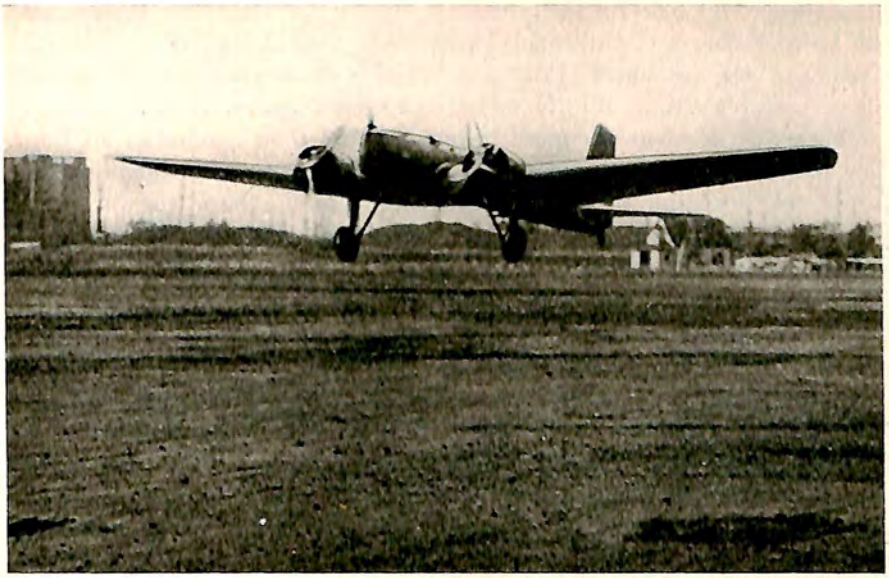
Speed and more speed was the note which dominated engineers in the

preparation of planes for the 1932 market. The importance of speed, emphasized in both military and transport aviation, had grown steadily since 1926. Perhaps the greatest advances were made in the field during 1931. Results of tests on new military types during the year indicated that pursuit planes with tactical squadrons would soon have speeds in excess of 225 miles an hour; attack and observation planes, speeds of 200 miles an hour; while bombardment, the slowest member of the air family, would push forward to speeds of more than 180 miles an hour.

Initial procurements were made during 1931 of pursuit types having a high speed of 214 miles an hour, as compared with 175 miles an hour for standard types in service. New observation planes were developed with speeds as high as 182 miles an hour, an increase of about 40 miles an hour over types generally in service. The most marked improvements were made, however, in the performance of bombardment and attack types. A new bombardment plane passed its experimental tests with a high speed of 188 miles an hour, representing an increase of 60 miles an hour over standard types and marking an advance in one year greater than that made during the entire period from the close of the World War to 1931. A new attack plane, which passed its tests and was being procured in sufficient quantities to equip one attack squadron, attained a high speed of 196 miles an hour, an increase of 55 miles an hour over types operated by other squadrons of the attack group. In obtaining these improved performances, none of the other essential characteristics required of military planes by the United States—such as high safety factor, maneuverability, and adequate armament—was sacrificed.

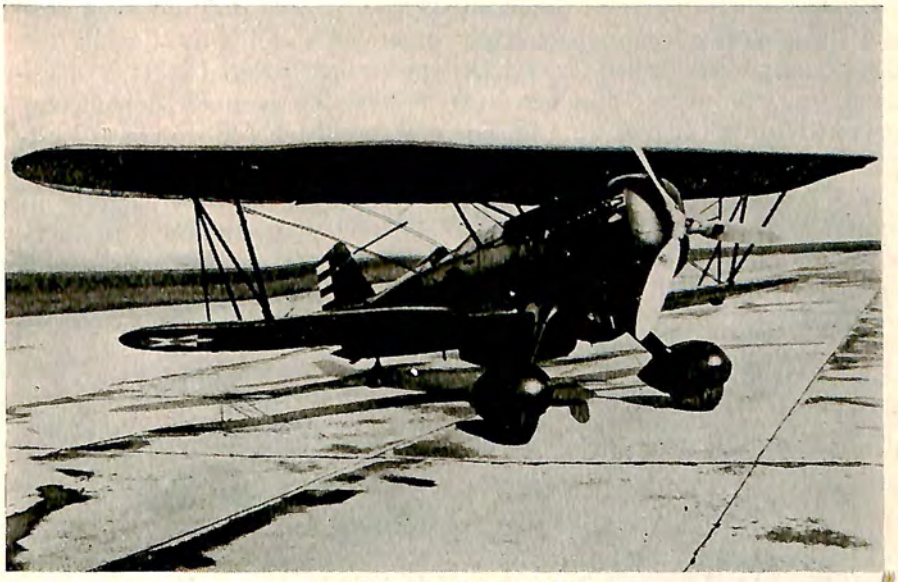
In the commercial field, it was fairly well established that 145 miles an hour could be expected as reasonable for both light and heavy transport. Several models for light transport had high speeds above 200 miles an hour and cruising speeds of from 170 to 180 miles an hour. This development of speed in transports pointed the way for future improvement. The increased speed was generally achieved by increase in engine power with a consequent increase in dead weight and decrease in pay load. Airplanes were flying faster with their cargoes, but were not capable of carrying as much cargo per horsepower as they did formerly. This might be called negative progress, but it was the immediate price of increased speed. The next step was to work out designs, presuming 145 miles an hour to be sufficient, which would be capable of carrying greater pay loads through reduction of structural weight of aircraft and the unit weight of engines. Several examples of reductions in all-metal structural weights for given loads, accomplished in 1931, pointed the way toward a solution of the problem by designers.

The supreme speed achievements of 1931 were to be found in the performances of such high speed racing planes as the Vickers Supermarine



NEW HIGH SPEED BOMBER

With the speed of former pursuit types, the new Boeing low-wing, all-metal, Hornet-powered bomber undergoes its tests.



LATEST CURTISS HAWK

New Curtiss P-6E, Army single-place pursuit, is powered with Curtiss Conqueror, chemically-cooled engine developing 700 horsepower.

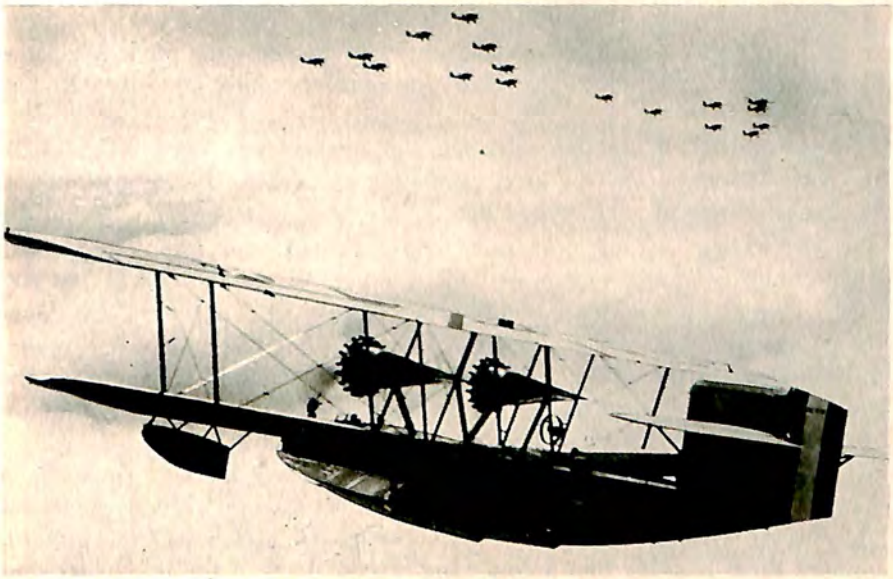
(Rolls Royce R) S-6B for the Schneider Trophy Race in Great Britain, and the Laird Solution (Pratt and Whitney Wasp), Lockheed Altair (Wright Cyclone), Gee Bee Racer (Pratt and Whitney Wasp, Jr.), and Travel Air Mystery Ship (Wright Whirlwind) in the United States. The British ship established a new world's speed record of more than 400 miles an hour. The four American ships spent the year in a series of record breaking performances, attaining speeds well over 225 miles an hour for prolonged flights. Major James H. Doolittle crossed the continent in the Laird Solution for a new record of 11 hours and 15 minutes.

The trend of design as indicated in an analysis of the Approved Type Certificates issued by the Department of Commerce during the first four years of its airworthiness inspection service, 1926-31, indicated a definite trend toward larger and faster planes with higher wing loadings, lower power loadings and pay loads less in proportion to gross weight. This analysis made by the Department in 1931 included 390 models receiving its approval, but made no attempt to give greater value to a good design capable of creating an attractive market than to a design which may have been abandoned by an experimental manufacturer after receiving an Approved Type Certificate. It was interesting, however, as a theoretical study of design trends.

In 1927, the analysis indicated that the average plane carried only about nine pounds to each square foot of wing area and 18.5 pounds to each horsepower. During 1930, the mean averages showed that the wing load had been increased to 19 pounds per square foot of lift area, while the number of pounds carried for each horsepower had reduced to 14.5. This trend was continued throughout 1931, so that the commercial plane for 1932 had a much higher wing loading and considerably lower power loading than in any previous year. The greater wing loadings were possible only through better and stronger construction with but little increase in weight, while the power loadings were reduced with minimum sacrifices of weight and fuel consumption. Pay loads during the four year period showed a slight decline, but the curve was flattened out considerably in 1930 and 1931, when designers in the transport field were giving special attention to the problem of increased pay loads.

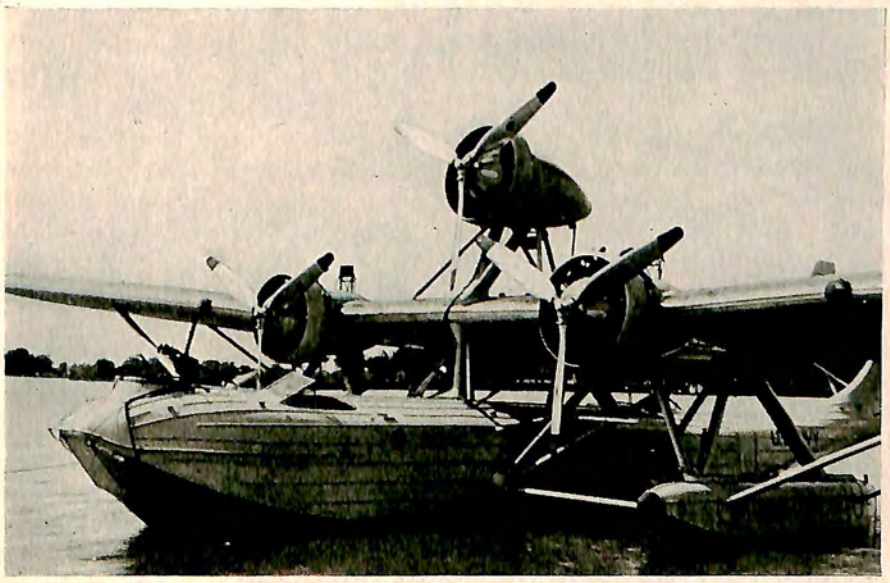
One of the interesting points brought out by the study was that recent designs showed marked increases in top speed without a proportionate increase in landing speed. The average top speed of designs approved during 1930 was 138 miles an hour, while the average landing speed was 64.75 miles an hour. In 1928, the ratio was 125 miles an hour top speed to 61.25 miles an hour landing speed.

Along with increased speeds, several designers were devoting their attention to increased size for planes in the transport field. Several large transport models in use on the transport lines made their bid for patronage



TORPEDO PLANES IN FORMATION

Navy torpedo plane squadron V-T-1 flying in formation with a Douglas (2 Wright Cyclones) patrol boat in the foreground.



NAVY'S LARGEST NEW PLANE

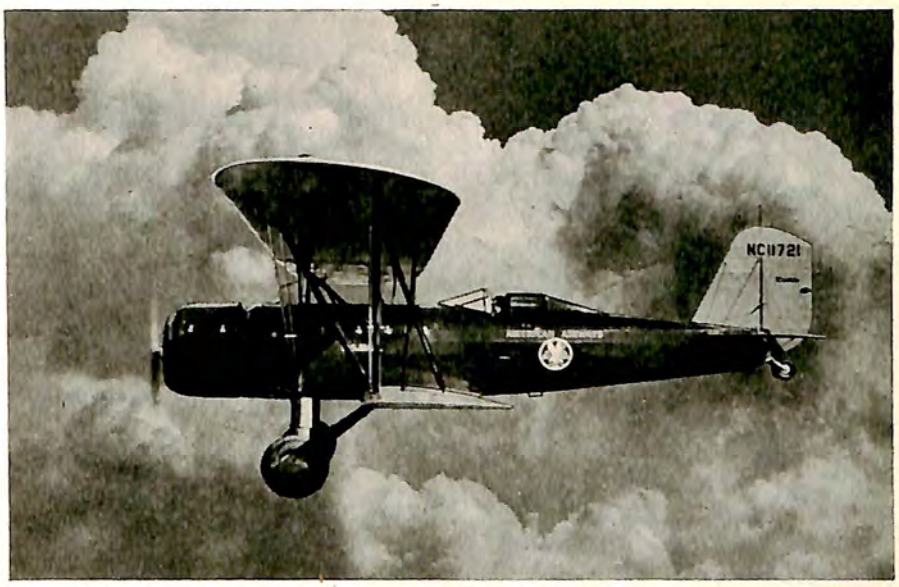
Martin XP2M-1 (3 Wright Cyclones) on river near Anacostia Naval Air Station ready to undergo its patrol-bomber tests.

on the basis of increased comfort and conveniences, and one type introduced during 1931 was actually wider than a Pullman car with plenty of room to move from cabin to cabin, with dining service and lounging accommodations.

Improvement in aerodynamic efficiency of airplanes, partly responsible for increased speeds during 1931, was a result of greater attention to the fairing of engine nacelles, wing fillets, strut intersections and landing gears. The retractable landing gear came into greater favor among designers during 1931, and many employed this method of achieving a major step in the improvement of the airplane's efficiency. Airplanes of the cantilever low-wing monocoque type were cleaned up further through the retraction of their undercarriages, while other and more conventional airplanes of the braced biplane type were refined by better wing cellule design, better streamline shapes and cleaner undercarriages.

Perhaps the outstanding aerodynamic achievement of the year was the successful use of automatic "slots" and "flaps" on a high speed airplane of high wing loading. The Curtiss Aeroplane and Motor Company incorporated these features into a low-wing attack airplane for the Army and received a production order for the new type. The use of automatic "slots" and "flaps" to improve the aerodynamic efficiency of airplanes had been successful previously only on airplanes of very light wing loadings. It was apparent that there was some relation between wing loading and general cleanness so that increasing the speed range through the use of automatic "slots" and "flaps" can be effected only on machines having a cleanness ratio which must be higher with machines having a heavier wing loading.

The trend toward the use of metal in place of wood and fabric continued to be dominant during 1931. Practically all of the new military and commercial models introduced utilized metal for fuselages and tail surfaces, while several were constructed entirely of metal. The stainless irons and steels were gradually broadening their uses and in 1931 were enlarged to include streamline tie rods and exhaust manifolds. The use of electrical spot welding of stainless steel for structures was expected to mark a further advance in the fabrication of airplanes. The first stainless steel, spot welded airplane was completed late in 1931 after several years of research by metallurgists and technicians of the Edward G. Budd Manufacturing Company. The ship, an American Savoia Marchetti (Kinner) amphibian, was constructed entirely of stainless steel with the use of the new process. The metallurgists reported that stainless steel had less bulk than duralumin, being 10 to 14 per cent. lighter than wood and 6 to 8 per cent. lighter than duralumin, and was much easier to weld. Previously, the applicability of spot welding to stainless steel was considered a very difficult process, because the high heat temperature to which the steel had to be submitted weakened



SPEEDS AMERICAN AIRWAYS MAIL

Stearman Junior Speed Mail (Wright Whirlwind) biplane of American Airways used on schedules carrying air mail exclusively.

NEW AMERICAN AIRWAYS TRANSPORT

Pilgrim 100-A (Pratt and Whitney Hornet) transport introduced in 1931 to carry mail, passengers and express for American Airways, Inc.

it considerably. As a result, corrosion set in wherever spot welding had been done, causing the steel to lose its physical characteristics and advantages.

Research and extensive tests overcame these difficulties by applying the electrical current for only a fraction of a second, sufficient to produce the required weld, and by concentrating it in very small diameters. Pliers, carrying the electrodes, were used without insulation, and, although the current, which had a high number of amperes, passed through the body of the individual operating the machine, the voltage was so low that the operator did not feel the electricity even if his hands were wet. The new machine could be operated by an unskilled laborer and without any danger. The spot weld was not only lighter than rivets, but was decidedly stronger and far more durable and reliable, insuring water tight fittings at even the most difficult joints.

The results of research of this character were looked upon as important steps toward the improvement of production methods, which was slow in most factories because it was not easy to make the change from the old steel tubing construction to the various types of all-metal construction successfully introduced.

There was considerable progress during the year in the design of small equipment and tools to facilitate operations which were formerly very slow and expensive. One of the most expensive operations generally employed in constructing metal aircraft had been riveting. Several riveting devices were put on the market in 1931 which greatly speeded up the process and also improved the quality of the work. One company designed a machine which punched the hole, clamped the sheets together, inserted the rivet and headed it over, all with one movement on the part of the operator of the machine. Many other tools of the pneumatic type were devised for the accomplishment of riveting speedily and efficiently. The operation of flanging sheet metal into structural shapes, such as tapered or curved channels and other members bent from flat sheet, was greatly improved by a machine which accomplished the task without forms or patterns.

The method of cellular construction introduced in the Northrop Alpha, whereby "U" channels were riveted one inside another in varying shapes to make a suitable wing curve or other structure, represented an important advance in the construction of airplanes. The method also was applied in the construction of the latest model in the Vought Corsair series, and was looked upon favorably by designers in other plants.

New Army and Navy Models

In the military field, there was a decided trend toward monoplanes and metal construction. Boeing, Curtiss, Detroit Aircraft, Douglas and General

Aviation all turned out military monoplanes of outstanding performance. The Boeing and Curtiss ships were entirely of metal with no cloth used. The first two-seater pursuit, powered with a Conqueror engine, was perfected for the Army during the year by the B/J Aircraft Corp., representing a departure in the tactical use of pursuit planes. The Army's first low-wing all-metal bomber, powered with two Hornets or two Conqueror engines, was completed by the Boeing Airplane Company.

Low-wing metal construction was incorporated into the new attack plane, equipped with "slots" and "flaps," for the Army by the Curtiss Aeroplane and Motor Company. General Aviation employed low-wing construction in its twin-engined, three-place, observation plane equipped with retractable landing gear and powered with two Conqueror engines faired into the monoplane wing.

The Army placed substantial orders during the year for the latest models of the Boeing P-12 and Curtiss Hawk P-6 pursuit types. The new Boeing model was known as the P-12E, and the latest Curtiss Hawk as the P-6E. Both showed marked improvement over previous models of the same basic design. The Boeing had an all-metal monocoque fuselage to distinguish it from previous models, while the new Curtiss Hawk substituted chrome molybdenum steel for carbon steel in its framework and was fully faired and streamlined with a Prestone-cooled Conqueror engine to power it. Curtiss also introduced two new Falcon models, the O-1G and O-39, two-place observation planes for the Army.

The Navy sought to extend the use of airplanes through the design of fighters to be housed within the hull of the new airship U.S.S. "Akron" and observation amphibians to ride beneath the surface of the seas on the backs of submarines. Navy planes were already at sea on the backs of the surface fleet, installed on battleships, cruisers and aircraft carriers. Now, the Navy proposed to have planes with its cruisers of the sky and its undersurface craft.

The housing of aircraft within the hull of an airship was entirely an American idea, the "Akron" being the first airship designed to carry fighting planes with her. The XF9C-1, a high speed, maneuverable, single-place fighter powered by a Wright Whirlwind engine and equipped for both carrier landings and hooking onto the special trapeze arrangement of the "Akron," was completed and tested during 1931 by the Curtiss Aeroplane and Motor Company. Five of these speedy fighters were to be housed within the envelope of the "Akron" in a special hangar entered from beneath the hull by means of a trapeze extended through a trap door.

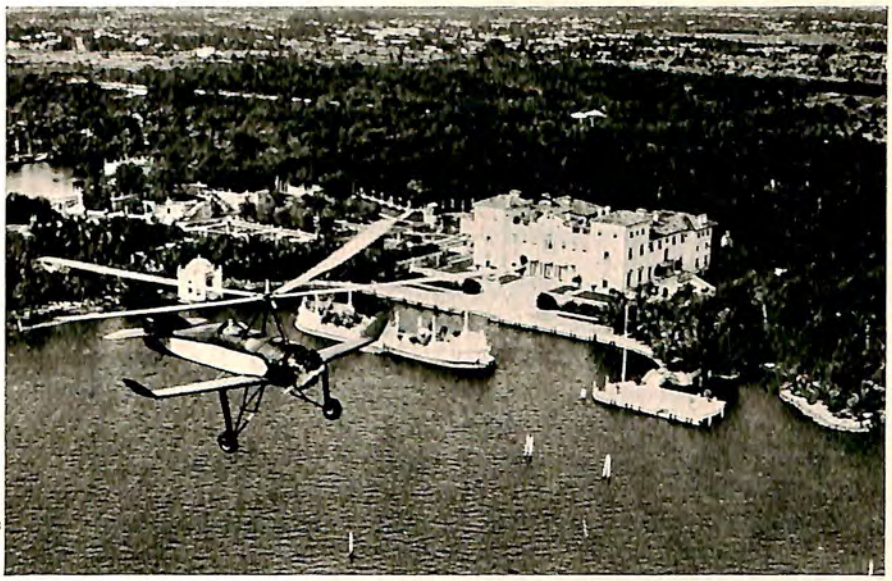
The use of aircraft aboard submarines was not a new idea, the British having built the Parnall Peto (Armstrong-Siddeley Mongoose), a light two-place observation seaplane, for catapult work from the H.M. Submarine "M-2" in 1928. The British submarine, the largest of Great Britain's

under-water craft which was completed at the close of the World War, housed the seaplane in a steel hangar improvised from an old gun turret. Ten men stood ready to slide the seaplane from its hangar on specially designed rails as the M-2 came to the surface, unfolding its wings as it moved onto the catapult to be hurled into the air by compressed air. The little plane kept in contact with its base by radio, reporting observations which it made on reconnaissance flights. Upon returning to the submarine, it was hoisted aboard by a derrick which placed it in position to have its wings folded and be snugly stowed into the hangar before submerging. Two years of practice made it possible for the hangar crew to have the plane in the air within a very few minutes, and to stow it away upon returning in a similarly short time. The submarine plane, while still considered experimental in Great Britain, offered great possibilities for aircraft to operate from bases in advance of the fleet, an advantage not offered by the vulnerable aircraft carrier which must remain under the protecting guns of other surface vessels. The British submarine-carrier is illustrated elsewhere in this volume.

The American submarine plane development was unique in that it was being concentrated on a light monoplane amphibian with folding wings, which could be stowed away in a small tube. The amphibian would have an advantage over the seaplane in that it could land on carriers and land bases as well as operate from the submarine or water. Photographs of the American submarine-plane the XSL-1, built by the Grover Loening Aircraft Company, had not been released and specifications were being closely guarded.

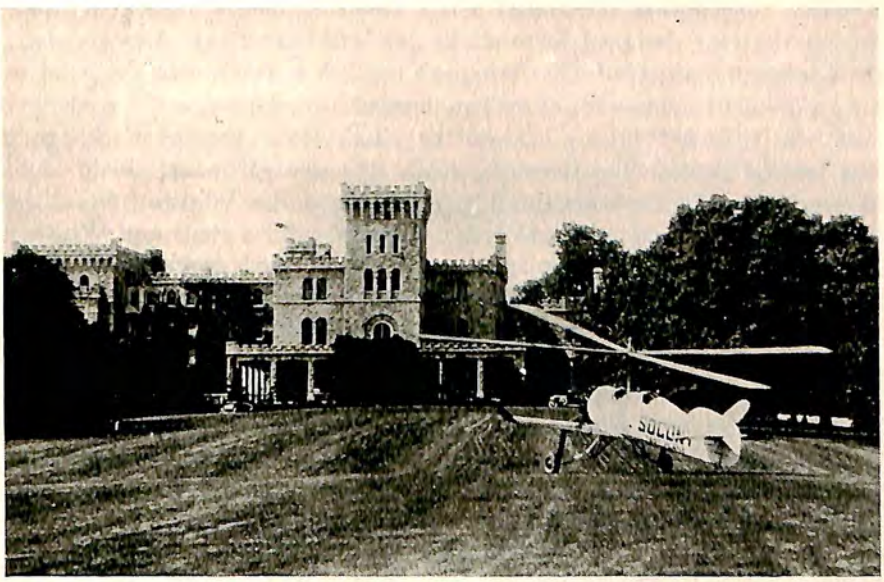
The Navy's latest production fighting plane was the F4B-3, a Boeing fighter, similar to the Boeing P-12E pursuit described earlier, except that it was equipped for carrier landings. B/J Aircraft Corp. completed a modified single-seater fighter with a metal monocoque fuselage for the Navy, as well as a new two-seater observation plane powered with a Pratt and Whitney Wasp, Jr., engine. Curtiss Aeroplane and Motor Company completed new models of the Curtiss Helldiver two-seater observation plane for the Navy, the O2C-1 and O2C-2. The Glenn L. Martin Company completed the largest flying boat designed for Naval aviation service in June, when the XP2M-1, an all-metal patrol-bomber with three Wright Cyclone engines, was started through its rigid tests. The Chance Vought Corp. completed and tested a new two-place all-metal observation plane with monocoque fuselage for the Navy in 1931, and incorporated a new wing cellule arrangement into the latest model of the Corsair series, the O3U-2, powered with a Pratt and Whitney Hornet instead of the Wasp used in earlier models.

In the commercial transport field, progress was due mainly to the benefits of another year of experience among air line operators who cooperated



AUTOGIRO GOES SOUTH

Pitcairn PCA-2 (Wright Whirlwind) autogiro enroute to Miami Beach, Fla., during 1931 All-American Air Races.



DEMONSTRATING TO ROYAL VISITOR

Pitcairn PCA-2 (Wright Whirlwind) autogiro of the Standard Oil Company of New York lands on estate used by King and Queen of Siam.

closely with manufacturers in suggesting changes and improvements in design, aimed principally at lower operation and maintenance costs. While there were few new models introduced during the year, those from previous years were very much refined in detail and their speeds increased considerably. This was done mostly through the increased use of engine rings, nacelle streamlining, relocation of engine nacelles, and similar devices, the perfection of which could not be credited to the year. Their value was recognized and their use increased.

Refinements in Transport Planes

With maintenance costs on most air lines amounting to from 50 to 60 per cent. of all expenditures, the problem of incorporating features in the original design of transport planes which would make their maintenance easy and less costly was given important consideration. The Operations and Maintenance Committees of the Air Transport Section of the Aeronautical Chamber of Commerce set up a system for constant interchange of maintenance information between the member air line operators and made direct suggestions to manufacturers to be incorporated in new transport designs. The air line operator's need was for an airplane with high speed, reasonable passenger comfort and low operating and maintenance cost.

The American Airplane and Engine Company, a division of The Aviation Corporation, introduced a new single-engined ten-place transport during the year designed to meet the needs of American Airways, Inc., the operating division of The Aviation Corp. A compartment designed to hold more than 400 pounds of mail and express, in addition to the passenger load, was included directly beneath the pilot's seat. Passenger's baggage was stowed beneath the passenger cabin in a compartment which could be reached easily from the outside. Known as the Pilgrim 100-A, the monoplane was of conventional design powered with a Pratt and Whitney Hornet engine. Boeing Airplane Company continued development work on its low-wing all-metal monoplane known as the Monomail and placed it in service with mail, passenger and express during 1931 to study its characteristics.

Detroit Aircraft Corp. introduced a new high speed seven-place low-wing transport with retractable landing gear, known as the Lockheed Orion. It was designed for air line operation on schedules of 180 miles an hour, and was placed in service on four routes during the year. It was powered with a Pratt and Whitney Wasp engine. Other single-engined transport planes, including the Bellanca Airbus, Consolidated Fleetster and Northrop Alpha underwent refinements during the year as will be noted from the performance tables printed directly preceding the design sections in a later chapter. Ford introduced a single-engined freight cargo plane

during 1931, known as the Ford 8-A, powered with a 725 horsepower Hispano-Suiza engine.

In the multi-motored transport field, no new land plane was introduced during the year, but the world's largest amphibion, which was also the largest plane ever built in the United States, was completed for service on the Latin American routes of Pan American Airways, Inc. Such multi-motored land planes as the Boeing 80-A, Curtiss Condor, Fokker F-32, Fokker F-10A, Ford 4-AT-F, Ford 5-D, Ford 5-AT-C, and Stinson T Airliner were continued in operation on the major air lines with modifications and refinements made through the cooperation of the operators and manufacturers. In the marine operation field, Conoslidated Commodore flying boats, Keystone Loening amphibians, and Sikorsky S-41 and S-32 amphibions were used for transport services.

Details of World's Largest Amphibion

Without doubt, the Sikorsky S-40—the world's largest amphibion—embodied some of the most interesting design problems faced by an engineer in the development of a new type. It was powered with four Pratt and Whitney Hornet engines which gave it 2,300 horsepower, more power than the average railway locomotive. It had a fuel load capacity of 6,830 pounds, which was more than the weigh tof some tri-motored transports in regular service. It was designed to carry 45 to 50 passengers and a ton of mail and baggage. It was 24 feet high; had a wing span of 114 feet; and an overall length of 76 feet 8 inches. Its gross weight was 34,000 pounds.

These 17 tons of steel and duralumin took off in 20 seconds and had a high speed in excess of 130 miles an hour, with a cruising speed of about 115 miles an hour. The interior of the cabin was built like a Pullman car. It was 18 inches wider than a Pullman, with compartments, wide aisles, eight-foot ceiling and large windows which gave an unobstructed view of the ground. With a full fuel load the range was estimated at 1,000 miles. The first two ships of this design were placed in service from the Miami marine base of Pan American Airways late in 1931 to obtain full data on the ships' performance. The construction of the giant amphibion, which could be converted into a flying boat with an additional 1,800 pounds of pay load available, was looked upon as an important step toward perfection of practical aircraft for trans-oceanic services.

A high wing monoplane of the same general type as its little brother S-41, the S-40 had a single Vee-bottom hull containing all accommodations for passengers and crew supported below the wing, with a pair of outboard wing floats—as big as the hulls of most amphibians—to lend stability on the water. Fully retracting landing wheels and tail wheel were provided for land base landings. On the basis of its gross weight of 34,000 pounds, its

wing load was 18.2 pounds per square foot and its power loading, 14.8 pounds per horsepower.

The problem of aileron control, one of the most important to be solved in the design, was met by the use of a cable from each aileron running in toward the center section just behind the rear spar. Within the center section, the cables were attached to a pair of yokes which in turn were connected by links to a large sheave. Control wires from the cockpit extended through the roof of the hull. Rotational movement of the sheave produced a rocking motion of the yokes, which was transmitted by the cables to the ailerons and provided a differential aileron control which operated easily.

A throttle of unique and ingenious design was developed to solve that problem of control in the big ship. It was extended from the cockpit roof between the two pilots and made it possible for either pilot, with one hand, to control all the engines singly or together, or in any combination which he might choose. The two lower handles were connected to the outboard engines, the two upper ones to the inboard engines, and by grasping the two sets of split handles in the center, all four could be throttled simultaneously. An adjustment made it possible to synchronize the throttle setting of all engines while the plane was in flight.

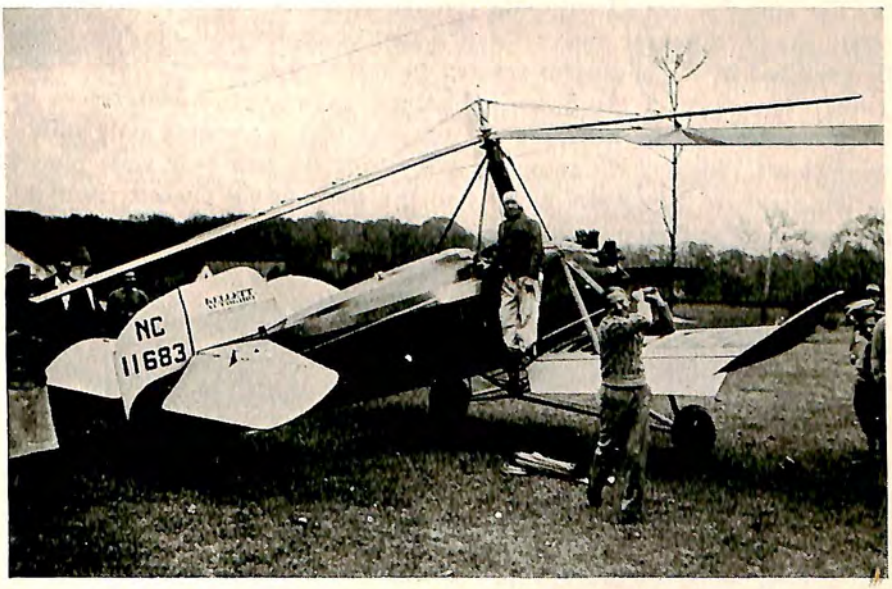
Other amphibians introduced during 1931 were the Loening Duckling, a two-place cabin monoplane with Warner Scarab engine mounted as a pusher; the Douglas amphibian, a twin-engined cabin monoplane with Pratt and Whitney Wasp engines; and the Privateer P-3 of Amphibions, Inc., a three-place cabin monoplane powered with a Continental A-70 or Wright Whirlwind 165 engine mounted as a pusher. Boeing Airplane Company, Ltd., of Canada, affiliated with the American company, developed a new metal monoplane flying boat with a Pratt and Whitney Wasp, Jr., engine, and called it the Totem.

Light Planes for Private Flying

Engineers watched with interest developments in the light plane field during 1931, since many companies felt that planes of this type would meet the needs of the low-price market offered. The result of design activity in this field, discussed in The Aircraft Year Book for 1931, was the offering of 13 different types of light airplanes to the public during the National Aircraft Show at Detroit. Only three of these models were placed into anything like large scale production, but the manufacturers of the successful types reported a fair market for their products which led them to continue development of their models and offer improved ships in 1932. One of the manufacturers withdrew from the field late in 1931, leaving the Curtiss-Wright Junior and the Aeronca Collegian, Cadet and Scout as the

AUTOGIRO FOR SPORT AND BUSINESS

Kellett K-2 (Continental 165) autogiro, providing side-by-side seating arrangement, embodies several new features in autogiro design.



GOLFING BY AUTOGIRO

Kellett K-2 (Continental 165) lands on the links of the Ashbourne Country Club with Norman Smith, pilot, and Raymond Brunswick, player.

most popular models in production. There was scattered production of more than half dozen other light planes in this category.

Alexander Aircraft Company entered the field late in the year with the Alexander Flyabout, the first two-place side-by-side cabin monoplane to pass the Department of Commerce tests in the light plane class of less than 1,000 pounds. It was powered with a Continental A-40 or Szekely 3-45 engine. The Aeronca Collegian was a two-place side-by-side open cockpit monoplane powered with an Aeronca engine of 40 horsepower. The Curtiss-Wright Junior was a two-place open cockpit monoplane with a Szekely engine mounted as a pusher. It was to be available in 1932 as an amphibian.

New private planes of greater weight and horsepower introduced during the year included: the Bird (Kinner K-5) five-place cabin monoplane; Curtiss-Wright (Gipsy) Sport Trainer, two-place open cockpit biplane; Curtiss-Wright (Kinner B-5) Light Sport, three-place open cockpit biplane; Curtiss-Wright (Whirlwind 240) Sportsman, three-place open cockpit biplane; Curtiss-Wright (Challenger) Sedan, four-place cabin monoplane; Detroit Lockheed (Wasp or Cyclone) Altair, two-place semi-cabin monoplane; and the Spartan C5 (Wasp, Jr., or Whirlwind), five-place cabin monoplane.

Autogiro and Other Developments

The autogiro was offered to the commercial market for the first time in 1931. Its development during the first year of commercial operation will be described in a later chapter devoted entirely to that subject, "The Autogiro: Newcomer of the Skies." Most of the important features of its design had been perfected prior to 1931, the year witnessing only minor refinements. Most of the autogiros sold during the first year were placed in the hands of advertisers anxious to use the unusual characteristics of its appearance to their own advantage in attracting public attention. Operation of the autogiro by private fliers remained a field for sales effort in 1932.

Refinements of accessories and component parts used by aircraft manufacturers in the fabrication of planes were achieved during the year, and aided considerably in the increased reliability and efficiency of the completed airplane. Some of the most important developments of the year in this field are to be considered in the next chapter, "Perfecting Component Parts for Airplanes." It is the first time that The Aircraft Year Book has given special treatment to this subject in a separate chapter.

Trends in Engine Design

The effect of refinements in engine design upon aircraft efficiency during the year will be considered in another chapter in this section, "Producing

American Engines." It should be interesting to note, however, that the major engine manufacturers made great strides during the year in increasing the horsepower of their standard models without materially increasing weight. This was achieved through continued "stepping up" or "boosting" of power through supercharging, operating at greater crankshaft speeds and using higher compression ratios. The use of improved fuels and lubricating oil also played an important part in realizing the greatest efficiency in these engines.

Packard Motor Car Company carried on further development of its Diesel Aircraft engine. The manner of throttling was changed by the introduction of a barrel valve in the cylinder air intake. This valve was given enough clearance to permit entrance of enough air into each cylinder to keep it firing, but at the same time the valve provided sufficient braking action on the engine to slow it down when idling in a glide or dive. The compression of the Packard 2500 gasoline engine was successfully carried up to 10 to 1 where the engine operated smoothly and efficiently with an output of 1,400 horsepower. With a supercharger, the Packard 2500, using a 6½ to 1 compression ratio, was made to deliver 1,600 horsepower.

Pratt and Whitney Aircraft Company did considerable work with superchargers, offering the Wasp, Jr.—normally a 300 horsepower engine at 2,000 r.p.m.—with a supercharger to develop 400 horsepower at 2,300 r.p.m. at sea level or 360 horsepower at 4,000 feet. The Series C Wasp also was supercharged from 420 horsepower to 450 horsepower. A supercharged Hornet B for military use was built with a rating of 575 horsepower at 1,950 r.p.m. at 8,000 feet. One of the most interesting developments of the year was a combination hotspot and oil regulator designed for installation between the carburetor and rear section of all type Pratt and Whitney engines. The regulator utilized the temperature drop caused by evaporation of gasoline to cool the oil and in the same unit provided means of heating the mixture from the engine exhaust in cold weather.

Szekely Aircraft and Engine Company developed a series of low horsepower engines to meet the needs of light airplane manufacturers during 1931. The performance of the little 35, 45, 55, 65, 75 and 90 horsepower engines was improved considerably through detail refinements.

Wright Aeronautical Corp. continued ground boosted endurance testing up to higher output. As improved cylinder head cooling designs permitted operation at increased compression ratios and manifold pressures, weaknesses in other parts of the engine appeared and corrections were successfully applied. Wright spark plug coolers, baffling systems and improved fin design continued to assist in reducing head temperatures and supercharger drives were improved to deal with the increased gear ratios. The Wright centrifugal wrapping band clutch was successful in suppressing overloads from torsional and other accelerations of the crankshaft. Many detailed

improvements developed in the high power endurance testing program were incorporated in production engines. As a result the Whirlwind, previously rated at 300 horsepower, passed its 50 hour test for a 400 horsepower approved rating. In a similar manner, other engines produced in the Wright factory were "stepped up" in horsepower during the year.

The interest of the military services in a high speed program, with the development of an engine capable of delivering between 2,000 and 3,000 horsepower as its basis, was evidenced during the year with the announcement by the Navy of plans for a high speed research program placed in the hands of a leading engine manufacturer—not named publicly—and in the statements of the Chief of the Navy's Bureau of Aeronautics and the Assistant Secretary of War for Aeronautics recommending such a program in their annual reports for 1931. It appeared certain that the heads of aviation in the Army and Navy felt that Congressional support for such a program would result in the perfection of a good service engine for tactical planes of from 1,200 to 1,500 horsepower. This was considered an important need for future development.

The Rolls Royce "R" engine developed for the Schneider Trophy Racer in 1931 demonstrated its ability to power the Vickers Supermarine S-6B at more than 400 miles an hour over a three-kilometer course and at 340 miles an hour for the entire Schneider course. The Schneider engine produced 2,300 b.h.p. at 3,200 r.p.m. and weighed 1,630 pounds. Engineers estimated that it gave close to 3,000 horsepower during its open throttle record tests. The power increase in the 1931 Schneider engine was 21 per cent. for a weight increase of 6½ per cent. over the engine used in 1929. It remained for the British engineers to apply the lessons learned in the development of this engine to every-day military and commercial operation.

The most interesting aircraft and engine designs in the United States developed or produced in 1931 are shown in three-view and two-view drawings immediately following the chapters in this section devoted to airplanes, autogiros and engines from a manufacturing point of view. Specifications and performance figures, guaranteed by the manufacturers within five per cent., are provided in tables preceding the design sections devoted to commercial models. No military performance figures are given.

CHAPTER XVIII

PERFECTING COMPONENT PARTS FOR AIRCRAFT

Fifty Industries Share Work of Developing New Accessories and Materials —Improve Instruments and Radio—New Airport Equipment— Introduce Rudder Floats—Test "Robot" Pilot

AVIATION—the outstanding product of creative genius in the twentieth century—stands at the pinnacle of a pyramid of industries which it has taken centuries to build, drawing upon knowledge and products of more than 50 industries and a score of trades to fabricate wings for man. The airplane, the autogiro, and the super-airship are unmistakably products of the twentieth century. Their inventors, had they been endowed with ever so much creative ability, could not have lived in the eighteenth, seventeenth, sixteenth or any earlier century. In fact, these new vehicles of transportation which use the air as their element represent but the pinnacle stone in a pyramid that has been built by older industries down through the centuries, since the earliest days of civilization. It is not unusual, therefore, to find nearly three score industries inextricably woven into the fabric of the aviation industry, all contributing vital component parts to aircraft or engines which have come to be called by such prosaic names as accessories, equipment and materials.

To many of the corporations in these allied industries, the needs of the aviation industry represent but a small part of their total business, yet all will testify that none is more exacting or meticulous in its demands for careful workmanship and perfect materials than the aviation industry. Many companies which have taken an active part in serving the automotive industry for a score of years have turned to aviation as a new field for the expansion of their activities and have established aeronautical research departments to measure up to the high standards of the aviation industry.

With the aircraft manufacturer rests the responsibility for designing, constructing and placing in production the airplane as a complete unit, but he can call upon specialists for the wheels, brakes, tires, struts, instruments, fittings and other component parts he needs. So, too, the manufacturer of aircraft engines must design and turn out a satisfactory power plant as a finished product, but he would not think of designing and con-

structing his own carburetors, magnetoes, starters, propellers and scores of other parts which have been standardized by specialists. Companies which supply metals, glass, rubber, leather, woods, fabrics, paints, dopes, lacquers, and dozens of other necessary materials have learned the necessity of furnishing the highest quality products for the aeronautical industry.

It should be interesting to get a few glimpses of advances that have been made during 1931 in some of their plants, with a brief review of new products introduced during the year. These are reported to the Aeronautical Chamber of Commerce through its Accessory and Material Section, which serves as a forum for the exchange of ideas and for the carrying out of an aviation promotion program for nearly 100 diversified manufacturers in its membership.

The Aluminum Company of America at Pittsburgh carried on an extensive development program during 1931, which resulted directly in the contribution of new information on spot welding of aluminum alloys and in the perfection of a new alloy with considerably higher mechanical properties than those commonly used, particularly suitable for airship construction. Summerill Tubing Company of Bridgeport, Pa., improved its plant facilities, furnished stainless steels to government specifications, and continued its research in the art of making seamless tubing for the aircraft industry.

Haskelite Manufacturing Company of Chicago, manufacturers of aircraft Plywood and Plymetl report the use of improved glue for both products giving higher, wet and dry sheer test values. Haskelite also developed a combination of Plywood, Balsa, and thin Stainless Steels for interior trim and wing covering as well as specially banded panels for floors.

The Thurston Cutting Corporation of New York, suppliers of airplane fabrics, developed a tape manufactured from balloon fabric designed to meet the special wing requirements of high speed ships. The MacWhyte Company, manufacturers of streamline and internal tie rods, added new equipment to its modern plant. Wellington Sears Company of New York brought out a special fabric designed for light weight airplanes along with a special glider fabric to supplement its line of Flightex fabric. The Electric Storage Battery Company of Philadelphia made exhaustive tests on a new aircraft storage battery designed to meet heavy discharges at high rates with a minimum loss in voltage.

The International Flare-Signal Company of Tippecanoe, O., perfected a three-minute, 500,000 candle power landing flare for electrical discharge, and signals of the meteor or parachute type, which when fired from a plane serve as landing lights and when fired from the ground act as signals to show location. Walter Kidde and Company of New York City introduced the Lux Airplane Extinguisher, designed to put out engine fires on the ground or in the air. It employed carbon dioxide gas as its ex-

tinguishing agent instead of liquid and made use of the slipstream to increase its effectiveness.

Components of Aircraft Engines

The Scintilla Magneto Company, Inc., of Sydney, N. Y., a division of Bendix Aviation Corporation, improved its small magnetos especially designed for use on small planes and introduced a reversible magneto which

PREVENTS ICE FORMATION

Applying Goodrich airplane de-icers to a Lockheed Vega plane of the B. F. Goodrich Rubber Company to prevent ice forming on wings.

provided ignition in either direction of rotation, particularly suitable for use on modern airship engines.

The Bendix Stromberg Carburetor Company of South Bend, Ind., another division of Bendix Aviation Corporation, placed a new carburetor in production of special design for engines of from 800 to 1,200 horsepower and perfected a small carburetor designed for engines between 25 and 65 horsepower.

The Breeze Corporation of Newark, N. J., supplying the increased demand for proper engine ignition shielding to permit the use of aircraft radio, perfected a suitable shielding which insured protection from moisture and oil as well as acting as a proper shielding for the ignition system.

The Curtiss Aeroplane and Motor Company, Inc., of Buffalo, com-

pleted and satisfactorily tested a series of controllable pitch propellers for airplanes, ranging from 200 to 800 horsepower for either geared or direct drive engines, and in both two and three bladed types. The propeller, electrically controlled, was very simple. The pilot adjusted the indicating instrument to the desired setting and a small electric motor in the hub of the propeller rotated the blades to the indicated position automatically. It was possible to use a storage battery, normally used for the running and landing lights, as a source of electric current.

Heretofore the main handicap in the construction of the controllable pitch propeller was in the mounting of the blades in the hub so that they would rotate freely and accurately while whirling, without increasing the weight of the propeller beyond practical purposes. Another item was the cost of building the controllable pitch propeller, as parts were extremely complicated and the cost of manufacturing exorbitant. Test flights indicated that with a controllable pitch propeller and an unsupercharged engine a relative increase in climb of 15 per cent. or more could be achieved by the use of the controllable features of the new Curtiss propeller. The improvement in climb when compared relatively was better in a heavily loaded cargo or passenger airplane than in the pursuit or sport type of ship. The improvement in climb in a heavily loaded ship was often as much as 28 per cent. The take-off characteristics of the airplane were improved by allowing the engine to produce its maximum power during the take-off. This increase was achieved by decreasing the pitch until the engine was running at the maximum power condition. The reduction in both time and distance of take-off was approximately 30 per cent.

The Hamilton Standard Propeller Company, a division of United Aircraft and Transport Corporation, through refinements in hub design and improvements in the forging processes involved in the manufacture of aluminum alloy blades bettered the quality of its standard line of adjustable pitch propellers. Extensive research also was conducted on an entirely new line of hollow steel propellers. In October, the factory was moved from West Homestead, Pa., to East Hartford, Conn., where facilities were available for flight testing and development in close cooperation with the engineers of United Aircraft Research Division.

The B. G. Corporation of New York introduced a special radio-shielded spark plug and rearranged its plant to permit more economic production of its regular line of spark plugs. Champion Spark Plug Company of Toledo, O., brought out a new radio-shielded aircraft spark plug embodying double insulation and an air-cooling and insulating phase, designed to be weather-proof with all exposed surfaces grounded. The Hurley-Townsend Corporation of New York, manufacturers of H-T "copper cooled" aviation spark plugs, completed development of new alloys for electrodes and

methods of welding them into the spark plug's shell to eliminate the necessity of servicing the plugs or adjusting the gaps between engine overhauls.

SKF Industries, Inc., of New York reported an increase during 1931 in the number of special precision ball and roller bearings manufactured for aircraft use as well as increased use of the cylindrical roller bearings. The company supplied more than 3,000 ball and roller bearings for the engine, drive, mooring spindle and other parts of the U.S.S. "Akron."

As electric starters replaced the old dangerous practice of swinging the

FLYING WITHOUT HUMAN PILOTS

Guided only by the mechanical hand of a Sperry Automatic Pilot, a Curtiss Condor of Eastern Air Transport flies over Newark.

prop, Sky Specialties Corporation of Detroit, Mich., introduced a new Heywood starter operated from the cockpit or instrument board by pulling or pushing a button. The company also introduced a rubber-covered tubing—aluminum or copper tubes covered and vulcanized with oil-proof rubber—to provide vibrationless tubing and eliminate trouble due to broken oil or gas lines.

Imperial Brass Manufacturing Company of Chicago, manufacturers of aircraft sanitary equipment, welding equipment, and vibration-proof fittings for copper and aluminum tubing, introduced new fittings in forged duralumin anodized to prevent corrosion. A new aircraft primer, patterned after the Imperial Auto Primer, was perfected for the market.

Solar Aircraft Company of San Diego, Cal., while primarily manufacturers of aircraft, made a specialty during 1931 in the manufacture of stainless steel streamline exhaust manifolds designed especially for use on Pratt and Whitney engines. It was said to be non-corrosive and made possible a great saving in weight.

Instruments and Lighting Equipment

The importance of navigational instruments in the development of air transport on regular schedules and as an aid to private flying has been stressed in earlier chapters. It is interesting to review here some of the outstanding advances of the year in this field.

The Pioneer Instrument Company of Brooklyn, a division of Bendix Aviation Corporation, developed and introduced during 1931 the Telepoint Compass, a new remote reading magnetic compass with all the good features of the earth inductor compass, but lighter, more compact and without any continuously rotating parts; a new Drift Indicator, which enabled drift angle readings to be taken quickly and conveniently by a simple optical device which reproduced in the cockpit an image of ground over which the ship flew; a new Octant, lighter, more compact, and more rigid than previous ones; and the Vibrograph, which quantitatively and qualitatively analyzed vibration.

The Elgin National Watch Company of Elgin, Ill., through its aircraft instrument division, developed and marketed a new compass, rigidly mounted to the instrument board and having as an added feature a spring-suspended card.

The General Electric Company of Schenectady, N. Y., suppliers of a wide range of equipment and materials to the aircraft industry, developed a successful Sonic Altimeter, which measured the distance a plane flew above the ground at all times by measuring the length of time that it required a sound made by a high-frequency motor-driven whistle mounted in a megaphone to reach the ground and be echoed into a megaphone mounted in the tail of the ship to receive it. A timing device mounted on the instrument board, with a rotating pointer and calibrated scale, indicated the exact height above the ground.

The Pyle National Company of Chicago developed a new built-in landing light for airplanes, reducing the head resistance and eliminating the necessity of having retractable lights.

The Sperry Gyroscope Company, Inc., of Brooklyn, a division of North American Aviation, Inc., obtained official sanction of the Department of Commerce for the use of its Automatic Airplane Pilots similar in mechanical detail to the "Iron Mikes" that guide steamships on their courses, on scheduled air transport planes. One of the robot pilots, a gyroscopic control which compensates for air currents or shifting weights that tend to

keep planes from flying in level position on their true courses, was successfully demonstrated on an 18 passenger Condor transport of Eastern Air Transport, Inc., the pilots leaving the controls to join passengers in the cabin while in flight.

Undercarriage Parts and Components

Brakes, struts, wheels, tires, floats and pontoons were the subject of development and manufacture by specialists devoting their attention

AIR WHEELS ON FLEET

Fleet of Hamilton (Pratt and Whitney Hornet) metal planes of Northwest Airways equipped with Goodyear Air Wheels.

specifically to these components. The Bendix Brake Company of South Bend, Ind., completed development of aircraft wheels using taper roller bearings; and also a line of wheels taking low-pressure tires, of 20 to 25 pounds air pressure. The wheels with low-pressure tires were in a complete range of sizes. Anti-friction bearings made it possible to maintain concentricity of brake drums and shoes during the life of the plane and also to reduce the length of take-off runs.

Edo Aircraft Corporation of College Point, N. Y., manufacturers of seaplane floats and flying boat hulls, introduced a new float design, having low drag characteristics and an extremely deep-vee bottom adaptable to high speed planes, in three models; and perfected an automatic water rudder

for seaplane floats permitting the ship to be maneuvered on the water similarly to a motor boat, yet hinged to permit the rudder to ride up over obstacles and facilitate handling on a runway. The new type floats with the special water rudders were installed on Col. Charles A. Lindbergh's Lockheed Sirius for its flight to the Orient.

The Cleveland Pneumatic Tool Company of Cleveland, manufacturers of pneumatic appliances, built the largest aerol shock-absorbing struts for use on American heavier-than-air craft. The struts were designed to support a new transport plane carrying 50 passengers or a maximum normal load of 25,000,000 pounds. The pneumatic principle involved in the operation of aerol shock-absorbing struts for airplanes was applied for the first time in lighter-than-air craft in the construction of the U.S.S. "Akron."

Thompson Products, Inc., of Cleveland developed, in addition to its regular line of engine parts, a one-piece adjustable streamline strut which was said to entirely eliminate the necessity of welding the ends of the strut.

Federal Aircraft Works of Minneapolis developed a new type of ski which could be attached to the landing gear without removing the wheels.

The Goodyear Tire and Rubber Company of Akron continued development of its air wheel tires and brakes. Although originally tested and used on small airplanes only, 1931 saw the extra low-pressure tires available for planes of all sizes and weights. Firestone Tire and Rubber Company of Akron, manufacturers of a complete line of airplane tires, developed the Accelerometer in 1931 to measure shocks and the impact of an airplane in landing and taking off.

The B. F. Goodrich Rubber Company of Akron, besides supplying tires to the industry in sizes from the very smallest to a set for the Sikorsky S-40, the world's largest amphibian, developed the Goodrich De-icer, an apron-like attachment with internal breather tubes to be fitted on the leading edges of wings and tail surfaces and prevent the formation of ice on them. The device, although still in an experimental stage, showed considerable promise. The United States Rubber Company of Detroit, manufacturers of a complete line of airplane tires and puncture sealing tires, reported a decided trend toward the use of low-pressure tires in 1931.

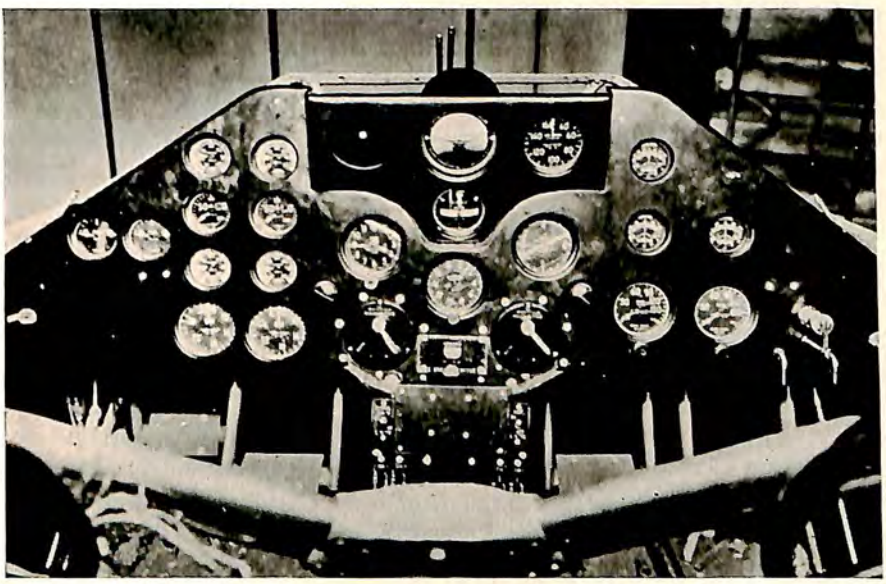
Communication and Radio Equipment

Radio, also a newcomer in the family of industries, has contributed in a major way to the development of air transport, and seemed destined to take an important place in private and industrial flying as well. Considerable progress was made during 1931 in the development of smaller, lighter and more powerful radio equipment for aircraft.

The Aircraft Radio Corporation of Boonton, N. J., the sales and engineering organization for equipment manufactured by the Stromberg-

Carlson Manufacturing Company of Rochester, N. Y., marketed equipment in 1931 which represented a 30 per cent. saving in weight over 1930 models without sacrificing efficiency and capable of receiving simultaneous voice and radio range beacon signals of the Department of Commerce airways stations.

The Western Electric Company of East Pittsburgh, Pa., carried on research in 1931 which was to result in the introduction during 1932 of a completely new type of two-way radio communication system for airplanes, embodying quick frequency shift control, and crystal-frequency control



CONDOR INSTRUMENT BOARD

Thirty instruments, each with a specific task, keep the pilots informed of operating conditions on board Curtiss Condor transports.

heterodyne receivers. Super-heterodyne receivers for ground use also were to be available for both remote and local control in 1932. Radiophone apparatus was designed by the Bell Telephone Laboratories.

The Radiomarine Corporation of New York developed a 15 watt master oscillator type all-wave telephone and telegraph transmitter weighing 35 pounds complete with dynamotor and all accessories for use on itinerant and transport aircraft. Radiomarine Corporation also designed and marketed a nine pound aircraft receiver for both beacon-weather and communication services.

The S. S. White Dental Manufacturing Company of New York manufactured special flexible shafting for use on remote tuning control of air-

craft radio receivers and molded ear pieces for radio receivers designed to fit the individual's ear and cut out extraneous noises from the eardrum. These were among the many articles and materials produced by the company for aircraft.

Parachutes

The Irving Air Chute Company of Buffalo, N. Y., reported that while the demand for parachutes in the domestic market was lower in 1931 than in the previous year, their production was maintained through increased foreign business. The company developed a new parachute to be used experimentally in lowering airplanes, and smaller ones for lowering merchandise, mail and express. The chief development of the year was a quick release harness, making it possible to dispense with the parachute and harness for emergency landings in water and high wind. A special shoulder pack was developed to meet the needs of aircraft which have the most available space for stowing a chute just behind the pilot's shoulders.

Airport Equipment Improved

The improvement of equipment for airports—the real terminals for air transport operation—was of particular importance and considerable advances were made through the close cooperation of the airport managers and engineers with the equipment manufacturers and designers. Just as the general accessory and material manufacturers had a forum for discussion through the Accessory and Material Section of the Aeronautical Chamber of Commerce, so the Airport Equipment Manufacturers, although a part of the accessory section, had their own executive committee and met during the National Airport Conference in Tulsa. They displayed their new equipment there in March and received the suggestions and criticisms of airport managers, engineers and designers from all parts of the country.

The American LaFrance and Foamite Corporation of Elmira, N. Y., manufacturers of a complete line of fire-fighting equipment, featured their Foamite Foam Generators, Models 10 and 11, designed for the production of firefoam in places where water supply was limited.

Curtis Lighting, Inc., of Chicago added to its regular line of flood lights and other airport equipment, a new lighting device, the Light Strip, which was an economical lighting channel that could be supplied in any length, and was particularly adaptable to shop work.

The Flexlume Corporation of Buffalo, with Westinghouse Manufacturing Corporation, developed and placed in production a Neon airplane guide and obstruction marker in two types, the "L.T." marker with a built-in transformer operating from 115 volt supply suitable for marking buildings, stacks and bridges where a low voltage supply was available, and the

"H.T." marker which had no transformer and was designed to operate in series with one or more suspension type capacitors with the voltage tapped from a transmission line of 22,000 volts or more.

The Westinghouse Electric and Manufacturing Company of East Pittsburgh, Pa., continued to be one of the largest purveyors of general aeronautical equipment, adding to its line the Westinghouse Airport Flood Light, Type T.A.G.25, with a commercial precision ground glass inflector of the searchlight type and a new series of convex spread lenses.

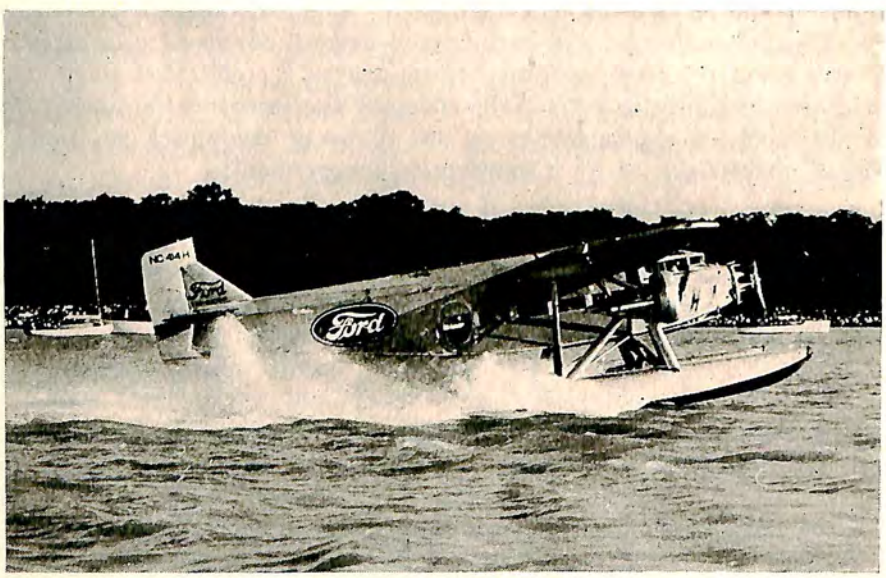
Julian P. Frieze and Sons, a division of Pioneer Instrument Company, marketed a new economical group of weather instruments especially designed for installation at airports. An indoor panel of three dial instruments contained one visual indicator for barometric pressure, another for outdoor temperature, and a third for wind direction. The whole group of instruments, including the indoor panel for wall mounting and the outdoor transmitters for wind, were called the "Weatherman." A new altitude barograph with a chart adapted for range of 26,000 feet with the drum making one revolution in each 24 hours also was introduced during the year.

Service Equipment

Air Reduction Sales Company of New York developed a special lightweight welding torch with tips giving a long, cone flame that facilitated servicing and repair work on planes. The Vellumoid Company of Worcester, Mass., manufacturers of packing and gaskets, developed a satisfactory gasket material for use with magnesium flanges, a problem on which they had been working for years. The company also introduced an innovation in the supplying of complete gasket sets put up in handy packages containing all gaskets needed for a complete engine overhaul.

NEW FLYING BOAT MODEL

Privateer P-2 powered with a Warner Scarab pusher engine introduced by Amphibions, Inc., to attract private flier.



NEW FORD SEAPLANE

Known as the Model 5-S, a Wasp-powered Ford tri-motored transport seaplane is seen about to take off after short run.

CHAPTER XIX

MANUFACTURING AMERICAN AIRPLANES

U. S. Aircraft Production Leads All Nations—Military and Air Transport Markets Are Dominant—Production Economies Effected—Glimpses of Two Score Factories

DESPITE the trimming of production schedules to prevent an oversupply of aircraft on the market, American airplane manufacturing plants were far more active in both production and engineering research than those of foreign nations. The remarkable record achieved by American airplanes in all parts of the world during 1931 stood as an indication of the high standards that were being maintained in the development and construction of commercial and military airplanes in the United States.

It was clearly evident that the production of military planes to aid in filling quotas under the Five-Year Programs of the Army and Navy supported a major share of activity in American manufacturing plants during the year. New planes to fulfill the growing needs of the air transport operators dominated the commercial field, with nearly $5,000,000 worth of new aircraft purchased by air lines during 1931. The analyses of production and sales statistics in Chapter II and the complete tables printed in Part IV, "Flying Facts and Figures," are worthy of detailed study to get a complete picture of the year's production and sales activities in the commercial and military markets.

It was particularly significant that the major manufacturers continued intensive research and engineering programs to develop new designs better adapted to the needs of each field, despite generally discouraging business propects caused by the world-wide depression. It was a tribute to the enterprise and initiative of the heads of the manufacturing industry. The Department of Commerce issued 67 Approved Type Certificates on new commercial models introduced during 1931, some of which were to be placed in production early in 1932, and approved many changes designed to improve the performance of units already in production.

The Department of Commerce listed 110 companies manufacturing aircraft in the United States in 1931, as compared with 215 companies in the

1930 directory. As was predicted in The Aircraft Year Book for 1931, there was a sharp reduction in the number of manufacturers due to the fact that many of the companies listed in 1930 obviously lacked the necessary engineering background and sound business management which would insure their success. Although 110 manufacturers were listed in the 1931 directory, not more than two score plants were really active during the year. This was made clear by the fact that the more substantial companies represented in the membership of the Aeronautical Chamber of Commerce produced 95.8 per cent. of the saleable airplanes manufactured during 1931. The remainder were engaged in experimental work or in small scale production.

Consolidations Effect Economies

The trend toward attaining a higher degree of engineering and production efficiency through the elimination of waste effort and consolidation of manufacturing units within the larger corporations continued during 1931, along the lines begun in 1929 and 1930. With new, modern plants to house the consolidated manufacturing companies, the industry was in a far better position to utilize new machinery and equipment added to cut down the number of skilled workmen required for each operation, with a resultant saving in operations costs.

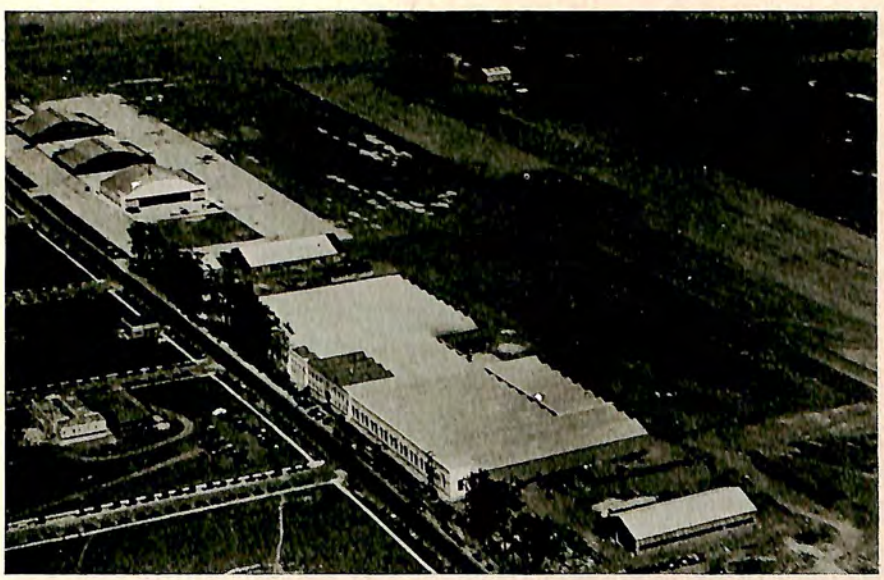
The Aviation Corporation organized the American Airplane and Engine Corporation during 1931 as its manufacturing division. The new division took over the facilities of the Fairchild Airplane and Engine Corp. at Farmingdale, N. Y., continued the production of two former Fairchild models under the new trade name of Pilgrim, and developed and produced a new single-engined ten-place cabin transport especially adapted to the uses of The Aviation Corporation's operating division, American Airways, Inc. Engine development, as described in a later chapter, also was continued.

The Curtiss-Wright Corporation continued its program for concentrating skilled designers and workmen in a few central plants. The Curtiss Aeroplane and Motor Company plant at Garden City, L. I., N. Y., was closed, military aircraft engineering and production being concentrated in its well-equipped factory at Buffalo, N. Y., while engine manufacturing was transferred to the Wright Aeronautical Corp. plant at Paterson, N. J., both the Wright and Curtiss engine lines being produced there. Commercial production was concentrated in the plant of the Curtiss-Wright Airplane Company at St. Louis, Mo., while amphibian and flying boat manufacturing was centered in the huge plant of Keystone Aircraft Corp. at Bristol, Pa., where the Curtiss-Wright line of bombers for the United States Army also was held in production.

Detroit Aircraft Corporation transferred its entire manufacturing division to Burbank, Cal., late in the year to concentrate on the development

MODERN AIRCRAFT PLANT

New Chance Vought Corp. factory at East Hartford, Conn., is illustrative of the up-to-date plants manufacturing American planes.



DOUGLAS PLANT BUSY

Air view of the Douglas Aircraft Corp. plant at Clover Field, Santa Monica, Cal., typical of West Coast aircraft factories.

and production of its high speed Lockheed series. Metal work had formerly been carried on in its Detroit plant. The Ryan unit factory at Anglum, Mo., was closed in 1930 as an early step in the consolidation program.

General Aviation Corporation, controlled by General Motors, absorbed the Pittsburgh Metal Airplane Company in 1931 after purchasing it from Pittsburgh Aviation Industries Corp. and set up a new manufacturing division known as the General Aviation Manufacturing Corp. All engineering and production work was concentrated late in the year at Dundalk, Md., the former plants of the Fokker Aircraft Corporation of America at Hasbrouck Heights, N. J., Passaic, N. J., and Wheeling, W. Va., being closed after General Motors turned its Fokker license rights back to the inventor.

United Aircraft and Transport Corporation closed its Northrop division factory at Burbank, Cal., to place the Northrop Alpha and Beta models in production in the well-equipped, modern plant of its Stearman Aircraft Company unit at Wichita. Manufacture of commercial models for business and sport flying and light transport, therefore, was concentrated in the Stearman plant, while the Boeing Airplane Company at Seattle centered its attention on heavy commercial transports, Army and Navy fighting planes, and high speed Army bombers. The Sikorsky Aviation Corp. unit at Bridgeport, Conn., devoted all of its efforts to the development and production of its amphibion line, while the Chance Vought Corp. unit at Hartford concentrated on a series of high performance Navy observation planes. Engine manufacturing was centered in the new plant of the Pratt and Whitney Aircraft Company unit, adjacent to the Vought factory, at Hartford.

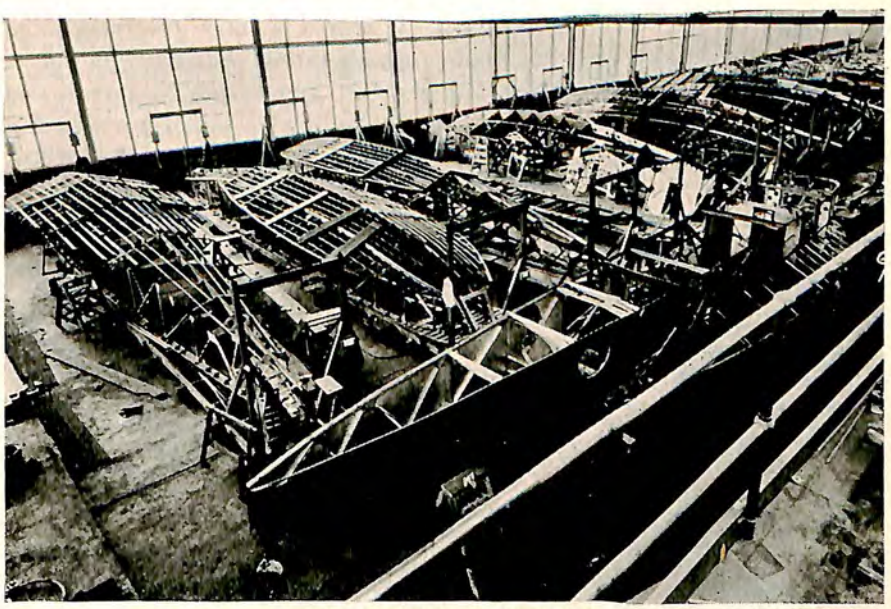
Airplane Manufacturing Section Active

The trend toward simplification of engineering standards required in the manufacture of aircraft without decreasing the margin of safety insured the buying public was continued in the light of new experiences crystallized through the annual conference of the Airplane Manufacturers' Section of the Aeronautical Chamber of Commerce with the Department of Commerce. The annual meeting, held under a Code of Procedure developed by the Chamber and the Department in 1929, was called for July 31 in 1931, almost two months ahead of the customary date for the conference. The earlier date was set upon request of the Chamber on behalf of manufacturers who desired to develop new models, in accord with any changes in the engineering requirements, in time to present them early in 1932.

The work of the conference was facilitated considerably through the appointment of an Engineering Committee of the Airplane Manufacturers' Section, which worked for several months in preparation of data for the July meeting in Washington. The result was that both the manufacturers and officials of the Department of Commerce had a better opportunity to

LATEST BOEING PURSUIT

Wasp-powered Boeing P-12E pursuit plane of the Army Air Corps, the latest model, piloted by Lieut. C. K. Robinson.



AMONG BUSIEST PLANTS

Interior of the Keystone Aircraft Corp. plant at Bristol, Pa., showing hull construction of PK Navy flying boats.

consider all factors concerned sufficiently in advance of the meeting to make possible mutual agreement on all points. The Engineering Committee prepared a proposed program of changes in the government's Airworthiness Requirements for aircraft which was discussed, point by point, in a three-day conference of all manufacturers prior to the federal meeting. So well had the preliminary work been carried out that, with but four exceptions, the manufacturers' proposals were accepted by the Department.

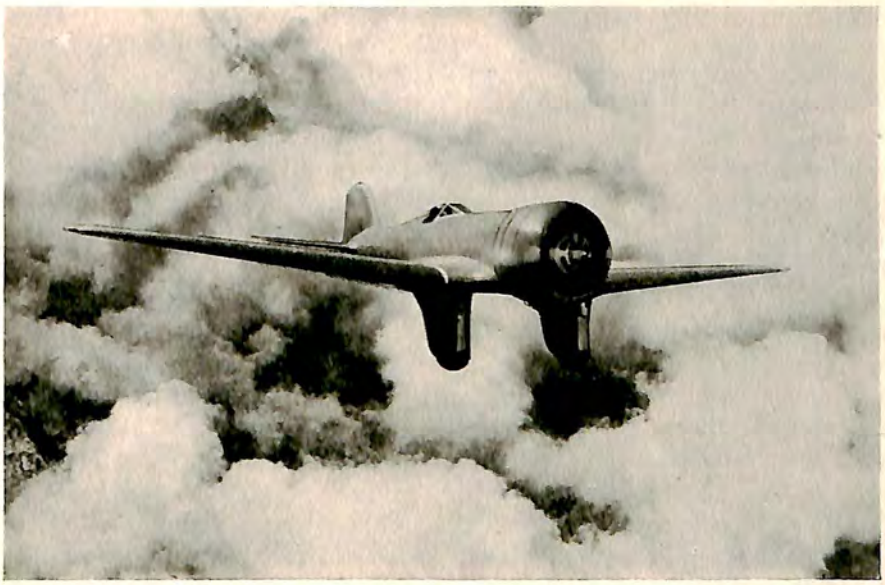
The Airplane Manufacturers' Section devoted considerable attention to the stimulation of sales both at home and abroad through Merchandising and Export Committees, moved toward a reclassification of freight rates affecting aircraft, and participated in practically every phase of the Chamber's many-sided program designed to promote the use of aircraft.

Glimpses of Two Score Factories

We have already considered some of outstanding engineering advances in the commercial and military fields in a preceding chapter. The carefully prepared specification and performance tables which immediately follow this chapter, keyed to the several score three-view drawings of the most interesting new models introduced in 1931 or in production during the year, provide an interesting picture of progress in the manufacturing field. For the first time, The Aircraft Year Book presents performance and specification data on outstanding models, guaranteed by the manufacturers within 5 per cent. of the figures listed. It should be interesting, too, to get a glimpse of the activity in the major manufacturing plants. While necessarily brief, the following résumés of the best known establishments, scattered throughout the country, are designed to provide a general picture of the range of activities and the types of products offered. The manufacturers are listed alphabetically for convenience in future reference.

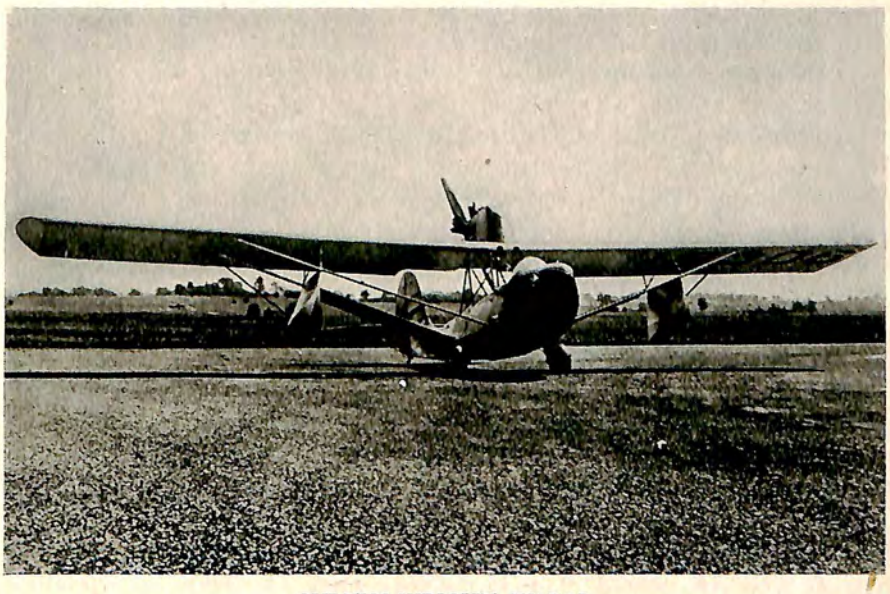
Aeronautical Corporation of America in Cincinnati, O., introduced three new models of light airplanes powered with engines of its own manufacture during 1931. While the new models—Collegian, Cadet and Scout—did not differ greatly in appearance from previous ships, several changes were made in structural design and increased aeronautical efficiency was sought. A newly designed Aeronca engine, the E-113 with 40 horsepower, was available in each of the new models. The Aeronca Collegian was a two-place side-by-side monoplane powered with the 40 horsepower engine; the Aeronca Scout, a single-place 30 horsepower monoplane; and the Aeronca Cadet, a single-place 40 horsepower monoplane with a shorter wing span and sufficient safety factor to permit severe stunting. All models were offered with float equipment, and experimental work was under way at the close of the year to provide the little ships with skis.

Alexander Aircraft Company of Colorado Springs, Colo., introduced the Flyabout, the first two-place side-by-side cabin monoplane in the light



SPEEDY NORTHROP BETA

Manufactured by Stearman Aircraft Company, the new Northrop Beta is powered with a Pratt and Whitney Wasp, Jr., engine.



CURTISS-WRIGHT JUNIOR

Two-place open cockpit monoplane powered with a Warner Scarab, Jr., or Lambert 90 pusher engine, the new Curtiss-Wright Junior Amphibian.

airplane class of less than 1,000 pounds, powered with a Continental A-40 or Szekely 3-45 engine. The Eaglerock line of three-place open cockpit biplanes was improved and continued in production.

American Aeronautical Corporation of Port Washington, N. Y., in cooperation with the Edward G. Budd Manufacturing Company of Philadelphia, produced experimentally a four-place open cockpit amphibian biplane constructed of spot-welded stainless steel, representing the result of several years research and development work by metallurgists and welding technicians of the Budd company.

American Airplane and Engine Corporation, organized in 1931 as the manufacturing division of The Aviation Corporation, took over the manufacturing facilities of the Fairchild Airplane and Engine Corp. at Farmingdale, N. Y., and continued production of several former Fairchild models under the trade name of Pilgrim, including the Pilgrim 71, a seven-place cabin monoplane powered with a Pratt and Whitney Wasp, and the Pilgrim KR-21 and KR-21B, two-place open cockpit biplanes powered with Kinner K5 and B5 engines, respectively. Major engineering and production activity, however, was concentrated on a new ten-place cabin transport monoplane, the Pilgrim 100-A, powered with a Pratt and Whitney Hornet and designed to meet the operating requirements of passenger, mail and express operators.

American Eagle-Lincoln Aircraft Company of Kansas City, Kan., was formed in 1931 to take over the manufacturing activities of the American Eagle Aircraft Company and the Lincoln Aircraft Company. Production of the new company was concentrated on the Eaglet, a light airplane powered with a Szekely engine.

Amphibions, Inc., of Garden City, N. Y., introduced the Privateer P-3, a three-place cabin monoplane amphibion powered with a Continental A-70 or Wright Whirlwind 165 engine mounted as a pusher, to supplement its Privateer P-2 model, a two-place open cockpit monoplane amphibion. The new model had considerably higher performance than its predecessor.

Arrow Aircraft and Motor Corporation of Havelock, Nebr., continued production of its two-place side-by-side open cockpit biplanes powered with Kinner engines.

B/J Aircraft Corporation of Baltimore, Md., a division of North American Aviation, Inc., confined its manufacturing activities to military production for the Army and Navy. Two-seater pursuits powered with Conqueror engines were supplied to the Army. For the Navy, a two-seater experimental observation plane powered with a Pratt and Whitney Wasp, Jr., engine and a modified single-seater fighter with metal monocoque fuselage were constructed. Late in the year, work was begun on a production order of two-seater observation planes for the Navy resulting from the design of the experimental plane.

"WEST POINT OF THE AIR"

Looking across the world's largest flying field center, the Army Air Corps' training school at Randolph Field, from the southwest.

AN AVIATION CITY

Randolph Field as seen from the entrance approach, showing the new administration building with two of the flying fields in background.

Bellanca Aircraft Corporation of New Castle, Del., continued production of its Skyrocket, Pacemaker and Airbus models and introduced a modification of the latter as a deluxe private ship known as the Aircruiser. The Airbus, designed as a passenger and mail transport, was offered as a 12 or 15 place cabin monoplane powered with a single engine, either Conqueror, Pratt and Whitney Hornet or Wright Cyclone. The Aircruiser, with deluxe furnishings, seated nine. The Skyrocket was a six-place cabin monoplane with a Pratt and Whitney Wasp, while the Pacemaker was a six-place cabin monoplane with Packard Diesel, Pratt and Whitney Wasp, Jr., or Wright Whirlwind 300 engine. The Skyrocket and Pacemaker models also were offered with float equipment. The company reported a 20 per cent. increase in sales in 1931 over 1930.

Bird Aircraft Corporation of Brooklyn, N. Y., designed and produced a new five-place cabin biplane powered with a Kinner B-5 engine to supplement its standard Bird three-place open cockpit biplanes powered with Kinner K-5 or B-5 engines. Designs were being completed late in the year on a model powered with a Packard Diesel engine.

Boeing Airplane Company of Seattle, Wash., a division of United Aircraft and Transport Corp., designed and constructed a twin-engined low-wing monoplane bomber entirely of metal construction for the Army. The experimental model was powered with Pratt and Whitney Hornet engines, while the first two ships to be delivered on a service order of seven planes were equipped with Prestone-cooled Conquerors to permit comparative tests. Early in 1931, extensive Army contracts for single-place Wasp-powered pursuit biplanes of the P-12C and P-12D types and a large order for Navy Wasp-powered single-seater fighters of the F4B-2 type were completed. Substantial contracts for new single-seater pursuits and fighters, differing from previous models in that their fuselages were of all-metal monocoque construction, were received from the Army (for P-12E) and the Navy (for F4B-3) in the summer of 1931. Construction on these contracts extended into 1932. Commercial plane construction centered around two models, the standard Boeing (Pratt and Whitney Hornet) 40-B4, four-passenger mail biplane, and the newly-developed Boeing (Pratt and Whitney Hornet) Monomail, a low-wing, all-metal, passenger-mail monoplane. To accommodate the large bomber production late in 1931, 12,500 feet of floor space was added to the factory in November, when the number of employees passed the 1,000 mark. Boeing Aircraft of Canada, Ltd., at Vancouver, B.C., affiliated with the Boeing Airplane Company, continued production of Wasp-powered Boeing six-place biplane flying boats and designed the Totem, a new metal monoplane flying boat powered with a Wasp, Jr.

Buhl Aircraft Corporation of Marysville, Mich., produced the Buhl Bull Pup, a single-place open cockpit light monoplane powered with a

Szekely engine, during the early part of 1931, but was concentrating attention on the development of an open cockpit pusher-type autogiro at the close of the year.

Cessna Aircraft Company of Wichita, Kan., produced several Cessna open cockpit single-place monoplanes during the year.

Consolidated Aircraft Corporation of Buffalo, N. Y., concentrated on military production during 1931, delivering its standard O19C all metal two-place observation biplanes to the Army Air Corps and its huge PY-type twin-engined patrol boats to the Navy. An allied company, Fleet Aircraft, Inc., continued production of the Standard Fleet, a two-place open cockpit biplane powered with a Kinner K-5, B-5 or Warner Scarab engine, for the commercial market.

Curtiss Aeroplane and Motor Company a division of Curtiss-Wright Corp., completed removal from its Garden City, N. Y., plant to its Buffalo, N. Y., factory, where a well-equipped building with complete engineering and research facilities, including the largest commercial wind tunnel in the country, was available. The company concentrated on military production, introducing two new Falcon two-place observation models, the O-1G and O-39, powered with Curtiss D-12 and Conqueror engines, respectively. The latest model Curtiss Hawk single-seater pursuit, the P-6E, was produced for the Army with a high compression chemically-cooled Conqueror engine. For the Navy, production was continued on the two-place carrier observation biplane, O2C-1 and O2C-2, powered with Pratt and Whitney Wasp and Wright Cyclone engines, respectively. The XF9C-1, a high speed, maneuverable, single-place fighter powered with a Wright Whirlwind engine and equipped for carrier landings and contacts with the U.S.S. "Akron" in flight, was delivered to the Navy.

Curtiss-Wright Airplane Company of St. Louis, Mo., also a division of the Curtiss-Wright Corp., introduced five new models during the National Aircraft Show at Detroit, including the Curtiss-Wright Junior, a two-place open cockpit pusher monoplane powered with a Szekely 3-45 engine; the Curtiss-Wright Sport Trainer, a two-place open cockpit biplane powered with a Warner Scarab or Wright Gipsy engine; the Light Sport, a three-place open cockpit biplane powered with Kinner B-5 or Warner Scarab engine; the Sportsman, a three-place open cockpit biplane with a Wright Whirlwind 240 engine; and the Curtiss-Wright Sedan, a four-place cabin monoplane with a Challenger, Kinner B-5 or Wright Whirlwind 240 engine. Production also was continued on the Travel Air six-place cabin monoplanes with Wright Whirlwind 300 engines and Travel Air Mystery Ships, one of which was delivered to the Italian Air Ministry in 1931. For mail and passenger transport, the Kingbird, an eight-place cabin monoplane with twin Wright Whirlwind 300 engines, was available along with the Condor, a 20-place cabin biplane with twin Conqueror engines.

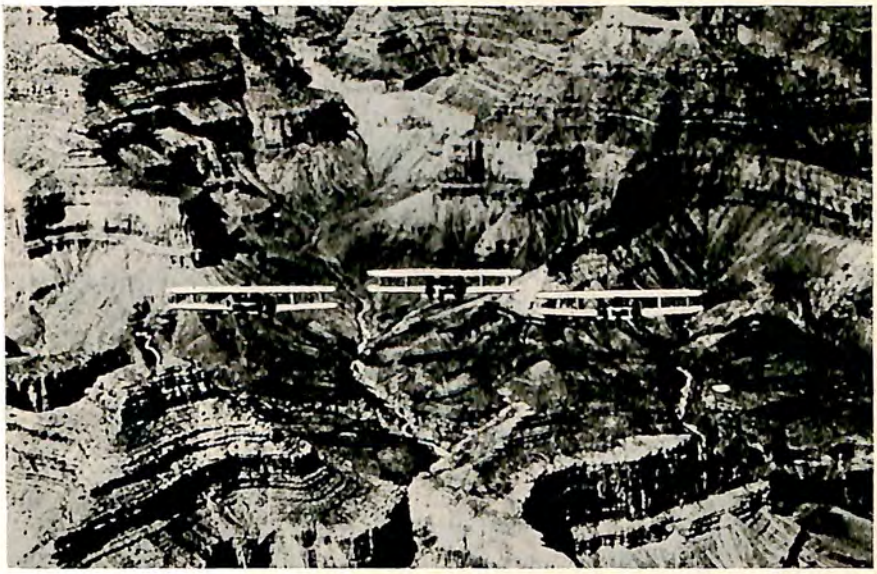
Davis Aircraft Corporation of Richmond, Ind., continued development of its two-place open cockpit monoplanes.

Detroit Aircraft Corporation of Detroit, Mich., concentrated its production facilities for metal work at the Detroit plant early in the year, but transferred all manufacturing to the Lockheed plant at Burbank, Cal., late in 1931. Two new low-wing high-speed models were introduced during the year, the Lockheed Orion, a seven-place cabin monoplane powered with a Pratt and Whitney Wasp, and the Lockheed Altair, a two-place semi-cabin monoplane powered with a Pratt and Whitney Wasp or Wright Cyclone engine. Both models were equipped with retractable landing gears. The Lockheed Hi-Speed Vega, equipped with a specially designed wire-braced landing gear, also was put on the market to supplement the older models continued in production with improvements, including the Lockheed Vega, a seven-place cabin high-wing monoplane with Pratt and Whitney Wasp or Wright Whirlwind 300 engines; the Lockheed Sirius, a two-place low-wing cabin monoplane powered with Pratt and Whitney Wasp; and the Ryan Foursome, a four-place cabin high-wing monoplane powered with Pratt and Whitney Wasp, Jr., or Wright Whirlwind 300.

Douglas Aircraft Company, Inc., of Santa Monica, Cal., departed from its long established practice of manufacturing military aircraft exclusively, with the introduction of a twin-engined cabin monoplane amphibian for the commercial market. Production was continued on adaptations of its O2, two-seater observation planes for the Army, and its flying boats for the Navy.

Ford Motor Company, through its Stout Metal Airplane Division, at Dearborn, Mich., continued production of its series of Ford tri-motored all-metal cabin monoplanes for transport use, introduced a new single-engined cargo plane, and carried engineering development forward on a giant 40-passenger land plane. The tri-motored models in current production were the 5-D, a 16-place ship powered with three Pratt and Whitney Wasps, and the 4-AT-F, a 13-place plane with three Pratt and Whitney Wasp, Jrs., or three Wright Whirlwind 300 engines. A retractable wing-tip mail and express compartment was introduced for both models, which were also available with luxuriously fitted club interiors for the private flier. The 5-D passed its tests satisfactorily equipped with floats as a seaplane. The 8-A, a cargo plane powered with a geared Hispano-Suiza 725 engine, was introduced during the National Aircraft Show, a departure in Ford transport design in that it was the first single-motored ship of the series.

General Aviation Manufacturing Company, organized as the manufacturing division of General Aviation Corporation, controlled by General Motors, established its plant at Dundalk, Md., and absorbed the Pittsburgh Metal Airplane Company during the year. Its first contract of all-purpose flying boats, powered with two Pratt and Whitney Wasp engines, for the



DWARFED BY GRAND CANYON

Nature dwarfs man's giant bombers as three Curtiss Condors (2 Conquerors) fly in formation over the Grand Canyon of the Colorado.

READY FOR DELIVERY

Douglas observation planes on the line at the Clover Field, Cal. plant ready for delivery to the Army Air Corps.

U. S. Coast Guard extended production into 1932. Experimental models of a new observation plane, the YO-27, powered with two Conqueror engines faired into the low monoplane wing were produced for Army service tests. Wheels on the new model were retractable. Commercial models, the F-32, a 32-place cabin monoplane powered with double-tandem Pratt and Whitney Hornet engines, and the F-10, a 14-place cabin monoplane powered with three Pratt and Whitney Wasps, were available.

Granville Brothers at Springfield, Mass., concentrated on the development of a high speed single-place racing plane of low-wing design powered with a Pratt and Whitney supercharged Wasp, Jr., or Pratt and Whitney Wasp engine.

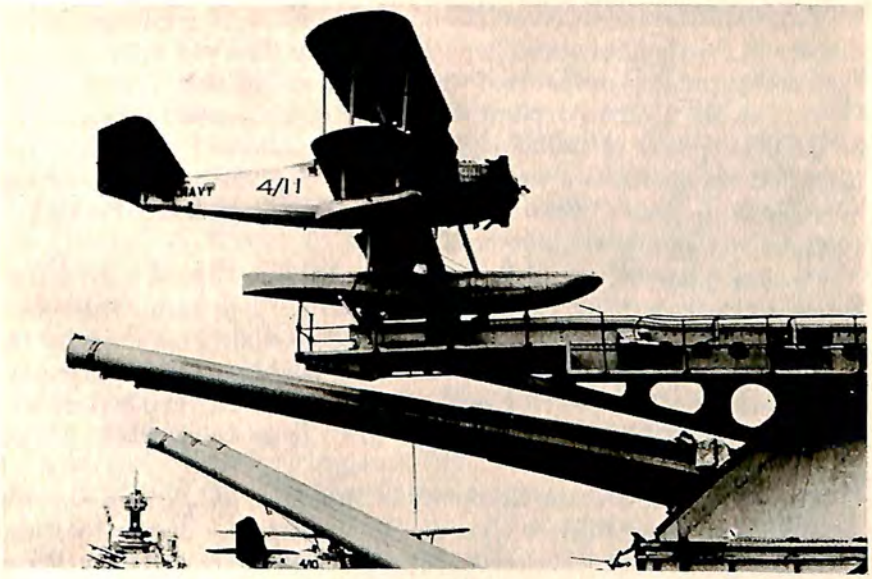
Great Lakes Aircraft Corporation of Cleveland, O., introduced two new models in the commercial field during the National Aircraft Show, the Sport Trainer 2T1-A, a two-place open cockpit biplane powered with an Upright American Cirrus engine, and the 2T1-E, a similar ship with a Hi-drive 95 horsepower American Cirrus engine. In the military field, contracts for three purpose bombing, torpedo and observation planes of the TG-2 type, single-engined three-place biplanes with folding wings for the Navy, kept the plant in production. Designs were completed late in the year for an experimental observation amphibian biplane with folding wings for the Navy, known as the XSG-1, which was to be placed in production in 1932.

Hall-Aluminum Aircraft Corporation of Buffalo, N. Y., completed the first of a production order of patrol-bomber flying boats for the Navy, designated as the PH-1. Construction of an experimental Navy flying boat, larger than any previously built for the service, was scheduled for completion in 1932. The company also produced standard aluminum alloy drawn sections and parts for other manufacturers.

Inland Aircraft Corporation of Kansas City, Kan., continued production of its two-place side-by-side parasol type monoplane.

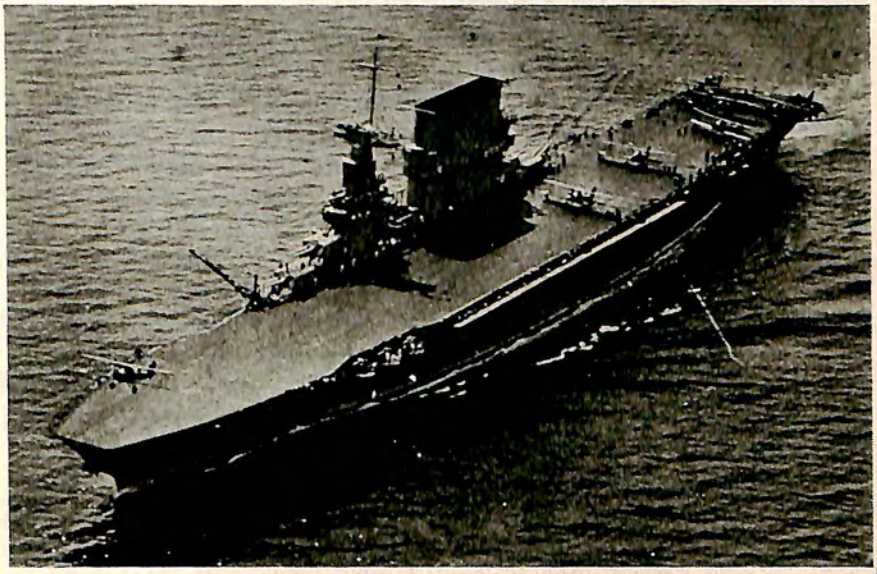
Kellett Aircraft Corporation of Philadelphia, Pa., concentrated on the development and production of autogiros described fully in the next chapter, "The Autogiro: Newcomer In The Skies."

Keystone Aircraft Corporation of Bristol, Pa., a division of the Curtiss-Wright Corp., had more than 1,800 employees during the peak of production during 1931 on Navy contracts for PK type patrol boats powered with twin Wright Cyclone engines and OL-9 type two-place observation amphibian biplanes powered with a Pratt and Whitney Wasp engine. Work on Army bombers of the B4-A and B6-A series also was concentrated in this plant. For the commercial market, the Keystone Air Yacht, K-85, an eight-place amphibian powered with a Wright Cyclone engine, and the Commuter, a four-place amphibian powered with a Wright Whirlwind 300 engine, were offered.



READY FOR RECONNAISSANCE

Vought Corsair (Pratt and Whitney Wasp) observation plane, with engine running, ready to be catapulted from battleship at sea.



TAKING-OFF FROM "LEXINGTON"

Hornet-powered Martin bomber taking-off from the carrier deck of the U.S.S. "Lexington" as the ship heads into the wind.

Kreider-Reisner Aircraft Company, Inc. of Hagerstown, Md., a division of Fairchild Aviation Corp., produced the Fairchild 22, a two-place open cockpit monoplane powered with a Hi-drive American Cirrus engine.

The E. M. Laird Airplane Company of Chicago, Ill., concentrated on the development of special designs to order, perfecting during the year the Laird Solution 400, a single-place biplane powered with a Pratt and Whitney Wasp engine, which was flown from Los Angeles to New York in 11 hours and 15 minutes, a record.

Grover Loening Aircraft Company, Inc., of Garden City, N. Y., developed the XSL-1 amphibian plane for the Navy to be carried aboard submarines and conducted experiments on other models designed for the military services. In the commercial field, the Duckling, a two-place cabin monoplane amphibian powered with a Warner Scarab engine mounted as a pusher, was developed and consideration given to its being placed in production in 1932.

The Glenn L. Martin Company of Baltimore, Md., engaged in the manufacture of four different types of military airplanes during 1931 and in the development of additional models. Navy flying boats of the PM-1, PM-2 and P3M-1 types were produced, tested and delivered, while Navy diving bombers of the BM-1 type were under construction late in the year for delivery in 1932. In June, an all-metal patrol-bomber flying boat known as the XP2M-1 powered with three Wright Cyclone engines—the largest plane to be built for Naval service—was completed. The private airport adjacent to the Martin factory, built on a 1,242 acre site, was improved during the year to complete the development of its modern plant.

Monocoupe Corporation of Robertson, Mo., took over the designs of the Mono Aircraft Corp., of Moline, Ill., during the year, including the Monocoach, a four-place cabin monoplane; the Monoprep, a semi-cabin monoplane; and the Monocoupe, a two-place cabin monoplane available with several different engine installations.

Nicholas Beazley Airplane Company, Inc., of Marshall, Mo., continued production of its NB-4, a three-place open cockpit low-wing monoplane, and supplemented the model with the introduction of the NB-8 Trainer, a two-place side-by-side open cockpit parasol type monoplane.

Pitcairn Aircraft, Inc., of Philadelphia, Pa., continued production of the PA-7, a single-place open cockpit mail plane or a three-place sport model biplane powered with a Wright Whirlwind 240 engine; the PA-8, a single-place open cockpit mail plane or a two-place biplane with a Wright Whirlwind 300 engine; and a series of autogiro models fully described in the next chapter, "The Autogiro; Newcomer of the Skies." Early in 1931, the company moved into its plant at Willow Grove, Pa., where 80,000 square feet of production floor space was available.

Rearwin Airplanes, Inc., of Kansas City, Kan., produced the Rear-

win, Jr., a light open cockpit parasol type monoplane, powered with a Szekely engine.

Sikorsky Aviation Corporation of Bridgeport, Conn., a division of United Aircraft and Transport Corp., constructed and delivered the world's largest amphibion, the S-40, an all-metal monoplane powered with four Pratt and Whitney Hornet engines mounted in line below the wing and licensed as a 38-place cabin amphibion. Two giant ships of this series were delivered to Pan American Airways, Inc., for its Caribbean service. Production was continued on three standard amphibion models, the S-39, a five-place cabin monoplane with Pratt and Whitney Wasp, Jr.; the S-38, a ten-place cabin sesquiplane with twin Pratt and Whitney Wasps; and the S-41, a 16-place cabin sesquiplane with twin Pratt and Whitney Hornets. The S-39 was supplemented with the S-39-C, a ship of similar specifications but equipped with a 400 horsepower Pratt and Whitney Wasp, Jr., engine.

Spartan Aircraft Company, Inc., of Tulsa, Okla., produced its C4 series of four-place cabin monoplanes and introduced the C2-60, a two-place side-by-side open cockpit low-wing monoplane powered with a Jacobs engine. The C4 series included: the C4-225, powered with a Wright Whirlwind 240; the C4-300, with a Wright Whirlwind 300; and the C4-301, with a Pratt and Whitney Wasp, Jr. Early in 1931, this series was supplemented with the C5-300 and C5-301, five-place cabin monoplanes powered with a Wright Whirlwind 300 and Pratt and Whitney Wasp, Jr., respectively. The older series of three-place open cockpit biplanes, known as the C3, and powered with either a Wright Whirlwind 240 or Wright Whirlwind 165, also was offered.

Stearman Aircraft Company of Wichita, Kan., a division of United Aircraft and Transport Corp., took over the manufacture of the Northrop Alpha and Beta models formerly produced by another United division, Northrop Aircraft Corp., at Burbank, Cal. The Alpha was an all-metal low-wing monoplane for six passengers in a cabin and a pilot in an open cockpit in the rear, while the Beta was a two-place open cockpit all-metal low-wing monoplane. The Alpha was powered with a Pratt and Whitney Wasp; the Beta, with a Menasco or Pratt and Whitney Wasp, Jr. The standard Stearman line, including the Cloudboy, Business Speedster, and Junior Speedmail series, was continued in production. The Cloudboy series of two-place cockpit biplanes included the Model 6A, powered with a Wright Whirlwind 165; the Model 6D, with a Pratt and Whitney Wasp, Jr.; and the Model 6F, with a Continental A-70. The three-place open cockpit Business Speedster biplane, C3R, was equipped with a Wright Whirlwind 240. The Junior Speedmail, designed as a three-place open cockpit biplane or single-place mail plane, was available in three models: the 4C, with Wright Whirlwind 300; the 4D, with Pratt and Whitney Wasp, Jr.; and the 4E, with a Pratt and Whitney Wasp.

Stinson Aircraft Corporation of Wayne, Mich., a division of the Cord Corporation and the largest producer of cabin airplanes for the commercial market in 1931, concentrated on three models: the Model T, an 11-place Stinson Airliner powered with three Lycoming engines and designed for transport use; the Model W, a four-place Stinson Junior powered with a Pratt and Whitney Wasp, Jr., engine; and the Model S, a four-place Stinson Junior powered with a Lycoming engine. The market for the Stinson Airliner was expanded with the opening of extensive air line operations by two other Cord subsidiaries, Century Air Lines, Inc., and Century Pacific Lines, Ltd. A new service hangar was built in 1931 adjacent to the company's modern 100,000 square foot factory which was expanded to care for an engineering department, motor division, and stock room.

Stout Engineering Laboratories, Inc., of Dearborn, Mich., introduced the Sky Car, a two-place cabin metal monoplane powered with a Rover engine mounted as a pusher, during the National Aircraft Show at Detroit.

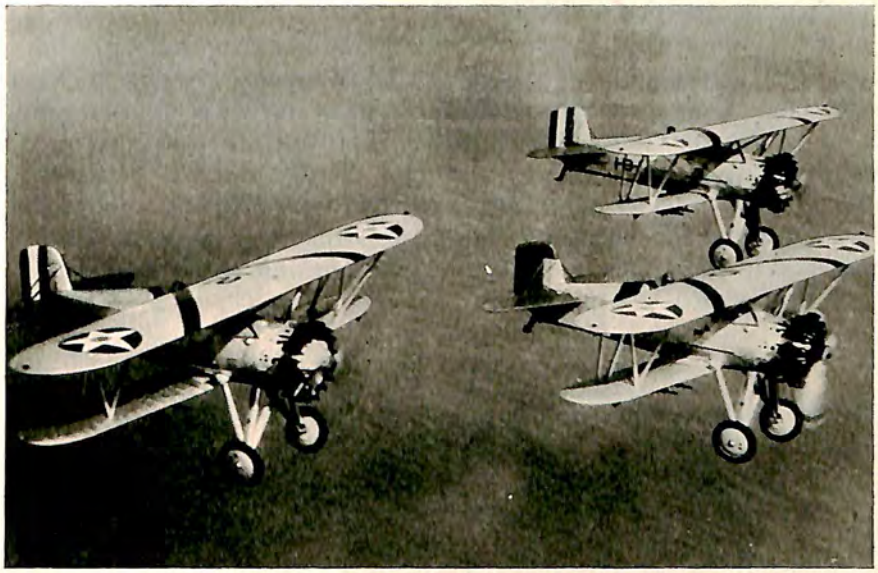
St. Louis Aircraft Corporation of St. Louis, Mo., continued production of its Cardinal series of two-place cabin monoplanes powered with either a Kinner K-5, Le Blond 90 or Le Blond 60 engine.

Viking Flying Boat Company of New Haven, Conn., continued production of the Kitty Hawk B-4, a three-place open cockpit biplane powered with a Kinner K-5, and supplemented this model in 1931 with the introduction of the Kitty Hawk B-8, powered with a Kinner B-5. The Viking V-2, a four-place open cockpit biplane flying boat powered with a Wright Whirlwind engine, also was available.

Chance Vought Corporation of Hartford, Conn., continued production of its Corsair series of Navy observation land planes, seaplanes and amphibians during 1931, the O3U-1 and O3U-2 models being in current production. The new O3U-2 model, perfected during the year, was of basic Corsair two-place biplane design but incorporated a new wing cellule arrangement, considerably greater speed and higher performance with a Pratt and Whitney Hornet engine substituted for the Wasp in earlier models. A new Vought two-place all-metal observation plane with monocoque fuselage of unusual design and arrangement was completed and tested.

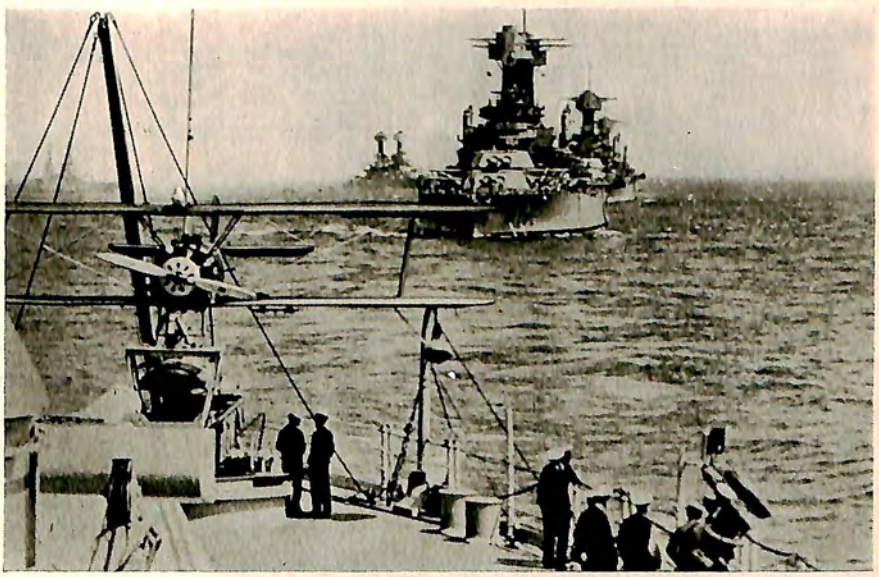
Waco Aircraft Company of Troy, O., continued production of its models INF and RNF, both three-place open cockpit biplanes powered with Kinner B-5 and Warner Scarab engines respectively, and introduced the Model QCF, a similar ship with a Continental A-70 engine. Another new model, the QDC, a four-place cabin biplane powered with a Continental A-70 engine, was introduced during the National Aircraft Show. The CSO, a three-place open cockpit biplane powered with a Wright Whirlwind 240 engine, also was available.

The designs reproduced in three-view drawings immediately following



FIGHTERS IN FORMATION

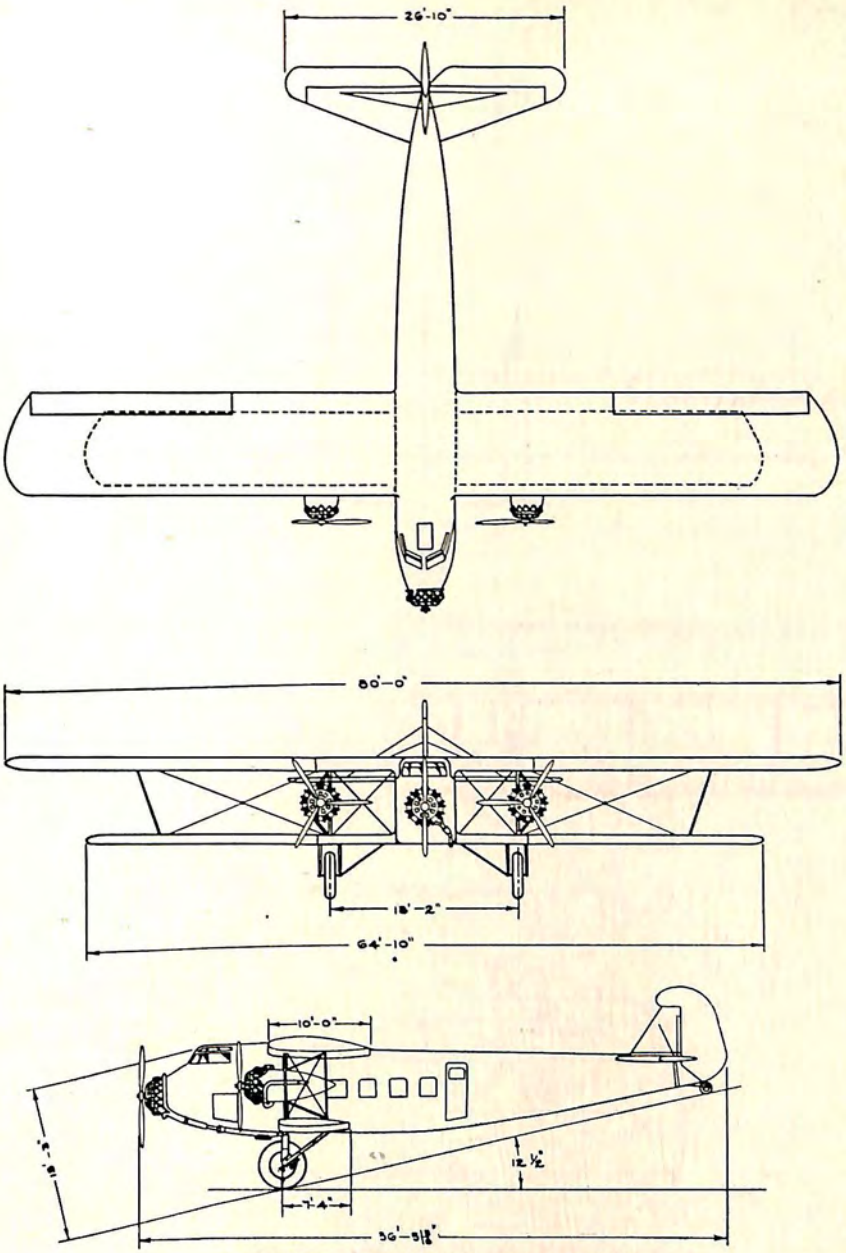
Boeing (Pratt and Whitney Wasp) fighters of the Fifth Navy Fighting Squadron in formation during fleet maneuvers off Panama.



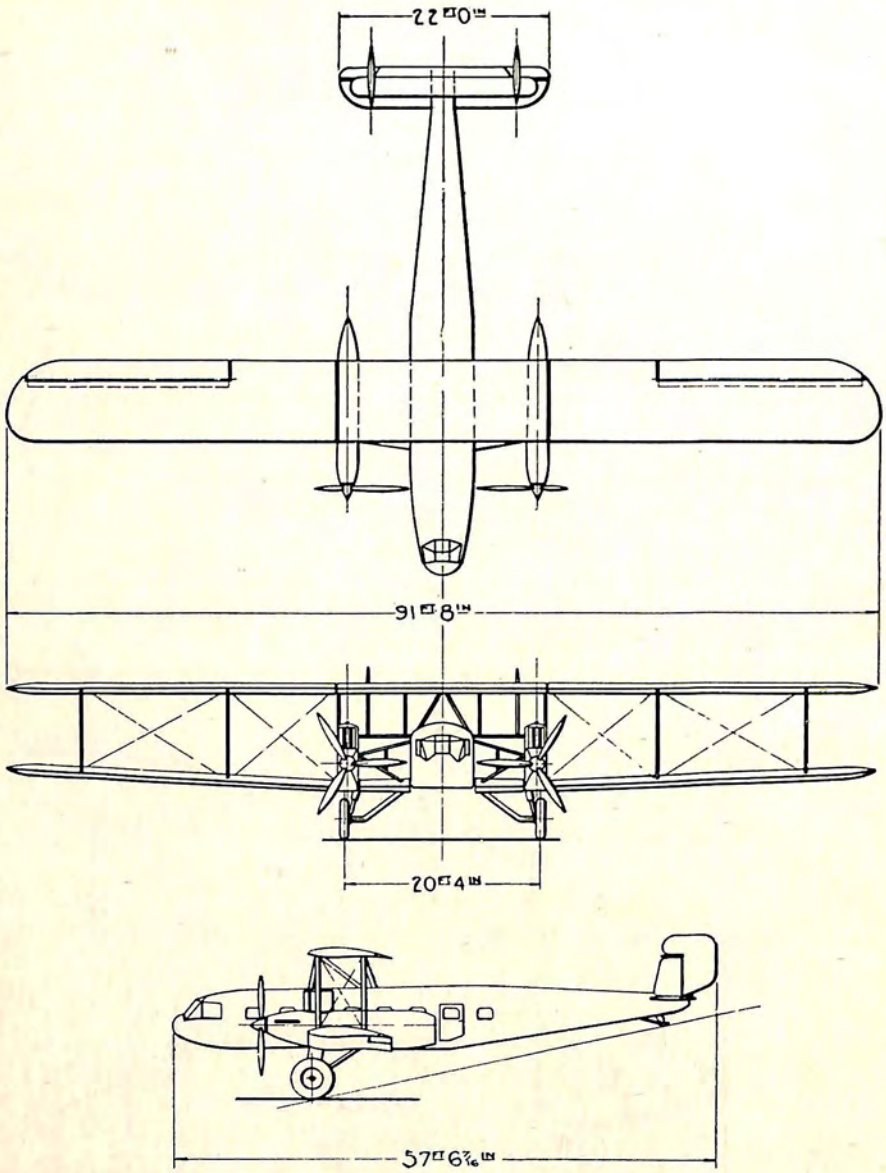
FLEET READY FOR ACTION

United States Battle Fleet steaming into position during the Panama maneuvers with a Wasp-powered Vought Corsair in evidence.

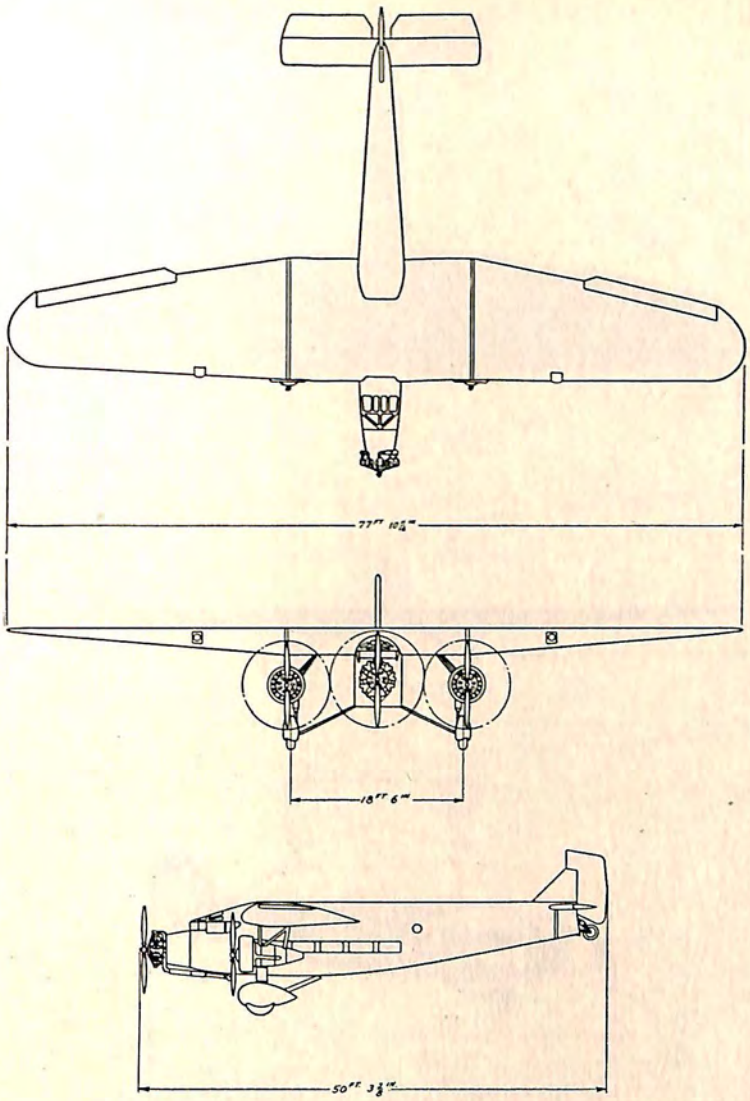
this chapter represent the most interesting models introduced or in production during the year. They have been arranged in several sections, Multi-motored Transports, Mail Transports, Light Transports, Private Operation and Aerial Service, and Military Planes, the most designs of each company being listed alphabetically in each section. Specifications on the drawings, together with information given below each drawing and the performance and specification tables immediately preceding each section of commercial planes, will provide the engineer and layman alike with complete data on each model. Sufficient information is given to permit simple computation of all data desired.



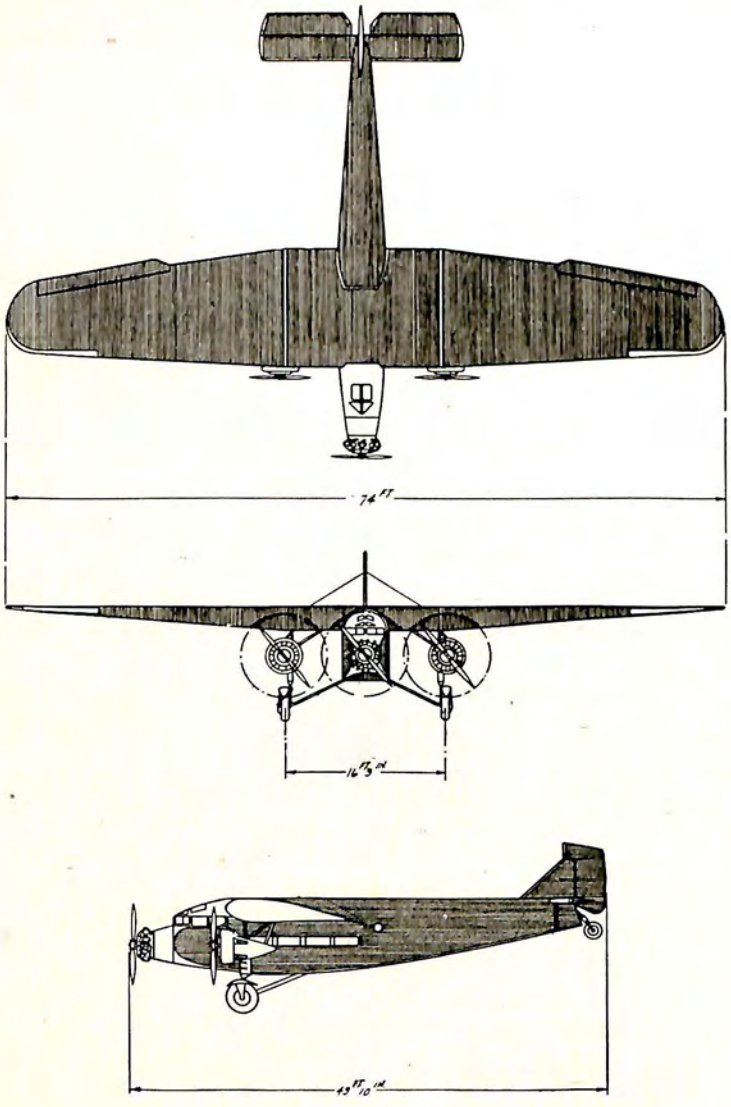
BOEING AIRPLANE COMPANY
Seattle, Wash.
MODEL 80-A — 20 PLACE
ENGINE: THREE PRATT & WHITNEY HORNETS



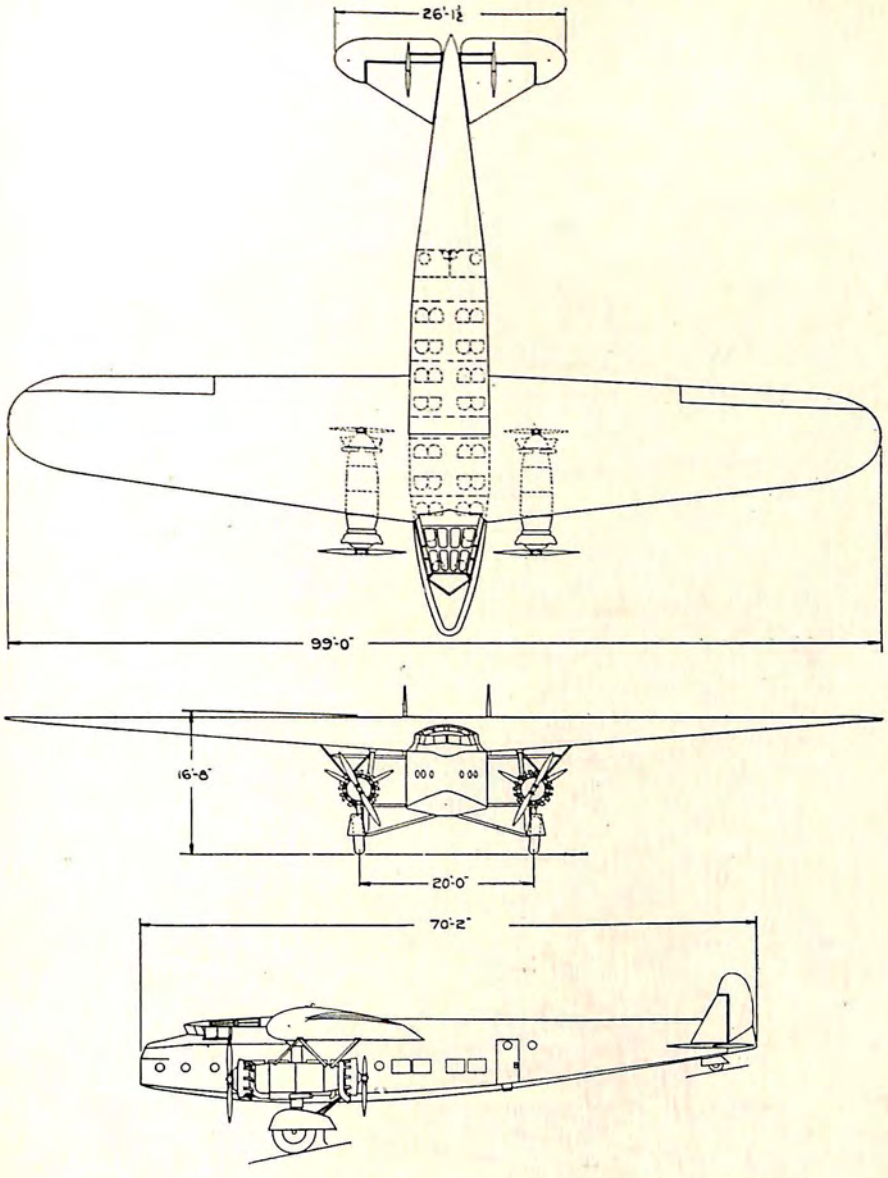
CURTISS AEROPLANE & MOTOR COMPANY
Buffalo, N. Y.
CONDOR — 20 PLACE
ENGINE: TWO CURTISS GEARED CONQUERORS



FORD MOTOR COMPANY
Stout Metal Airplane Division
Dearborn, Mich.
MODEL 5-D — 16 PLACE
ENGINE: THREE PRATT & WHITNEY WASPS



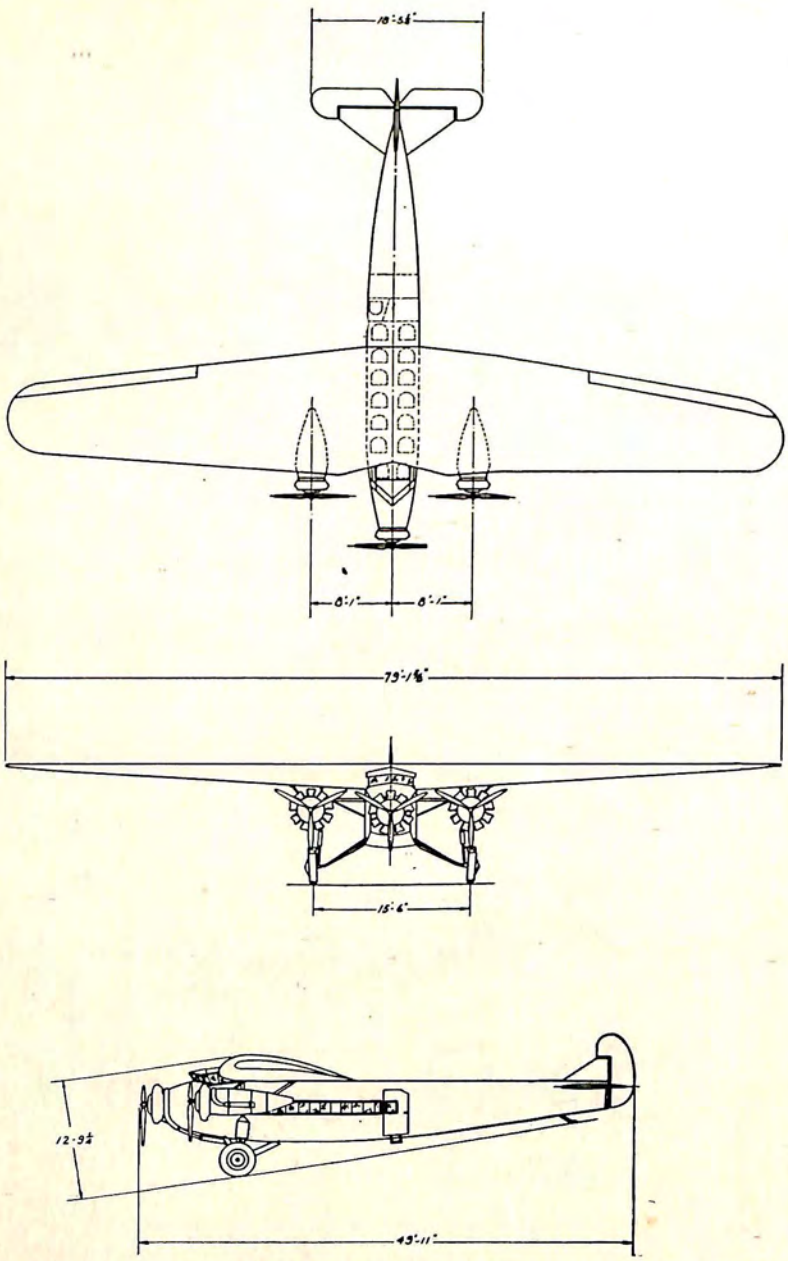
FORD MOTOR COMPANY
Stout Metal Airplane Division
Dearborn, Mich.
MODEL 4 AT–F — 13 PLACE
ENGINE: THREE PRATT & WHITNEY WASP, JRS.
THREE WRIGHT WHIRLWIND, 300.



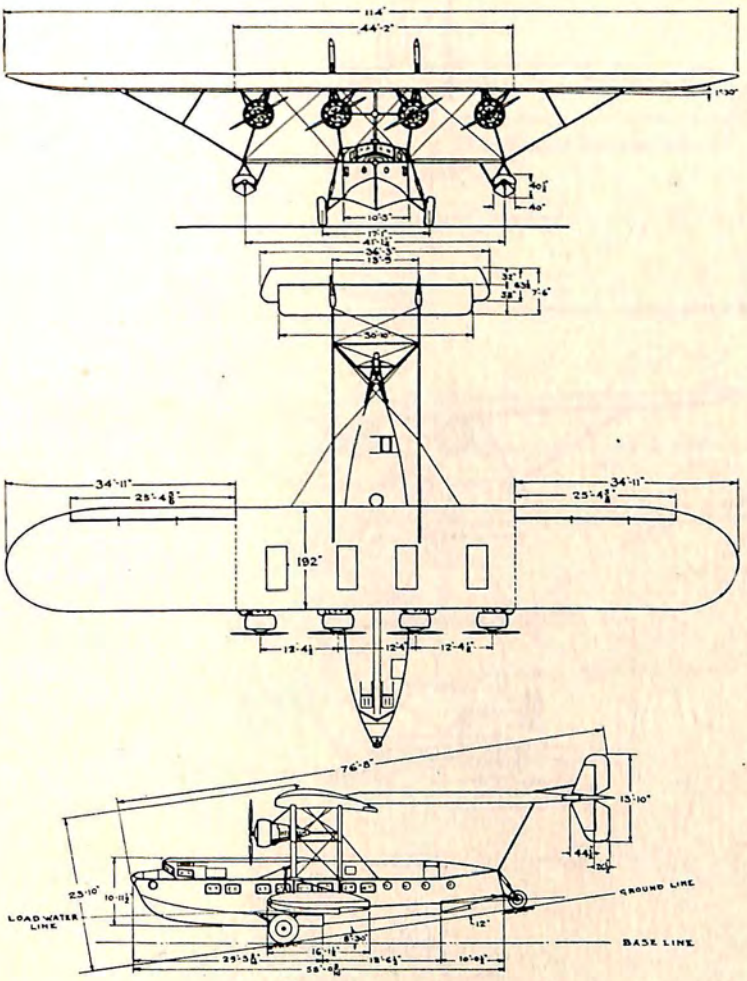
GENERAL AVIATION MANUFACTURING CORPORATION
Dundalk, Md.

MODEL F-32 — 32 PLACE

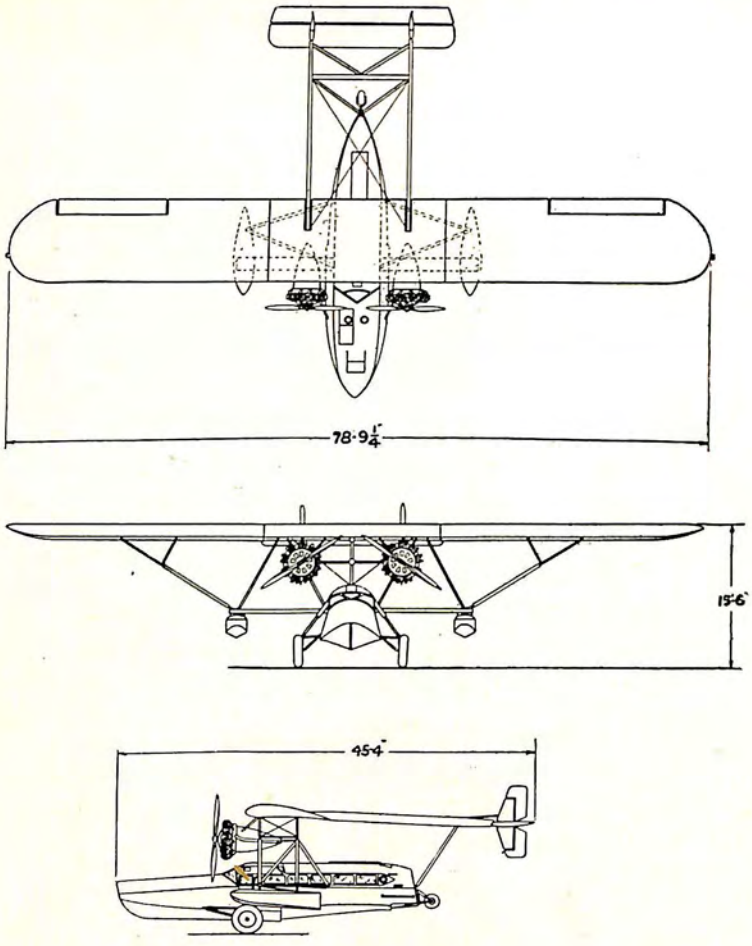
ENGINE: FOUR PRATT & WHITNEY HORNETS



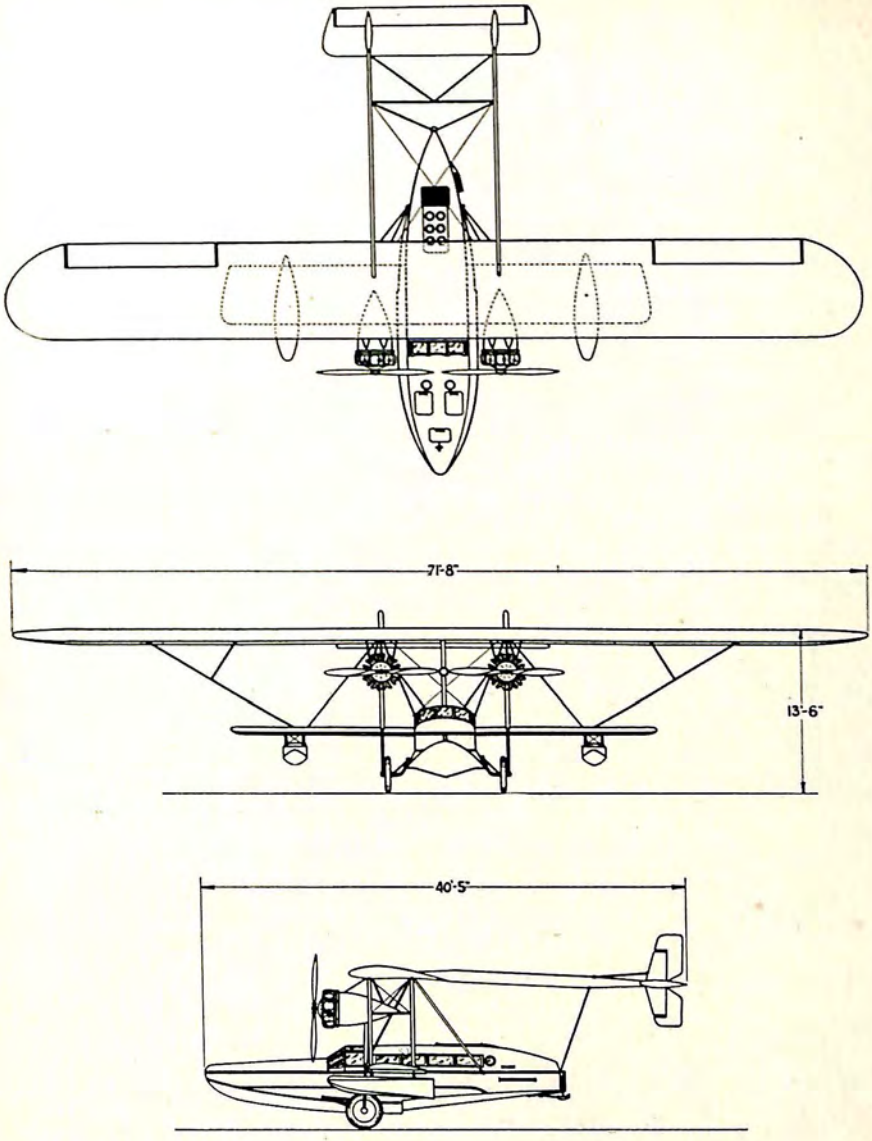
GENERAL AVIATION MANUFACTURING CORPORATION
Dundalk, Md.
MODEL F–10 — 14 PLACE
ENGINE: THREE PRATT & WHITNEY WASPS



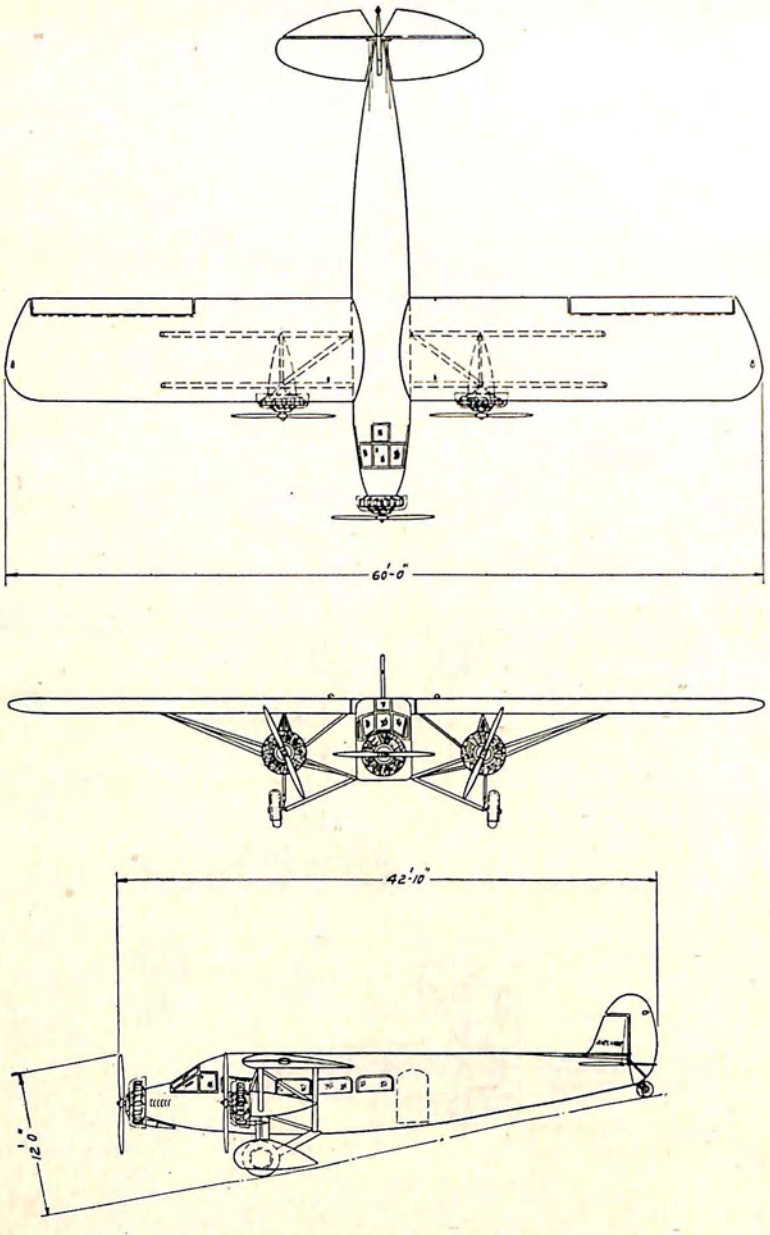
SIKORSKY AVIATION CORPORATION
Bridgeport, Conn.
AMPHIBION S–40 — 38 PLACE
ENGINE: FOUR PRATT & WHITNEY HORNETS



SIKORSKY AVIATION CORPORATION
Bridgeport, Conn.
AMPHIBION S–41 — 16 PLACE
ENGINE: TWO PRATT & WHITNEY HORNETS



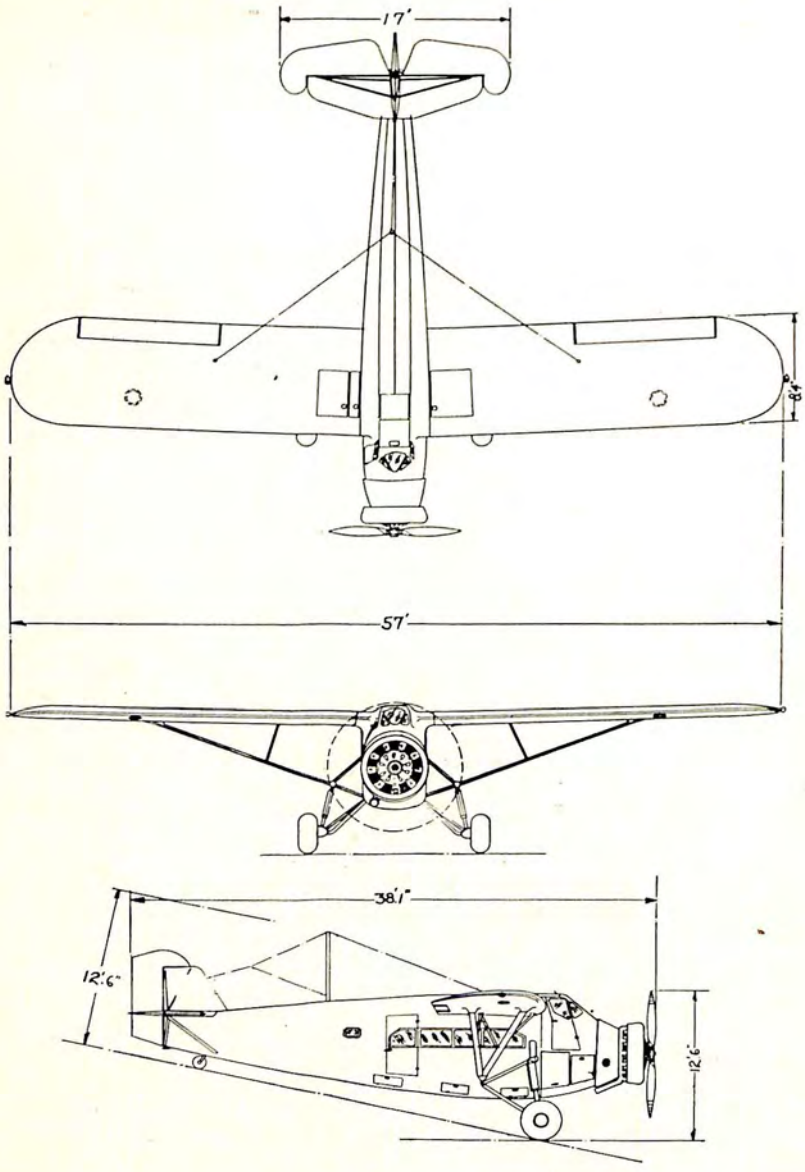
SIKORSKY AVIATION CORPORATION
Bridgeport, Conn.
AMPHIBION S–38 — 10–12 PLACE
ENGINE: TWO PRATT & WHITNEY WASPS



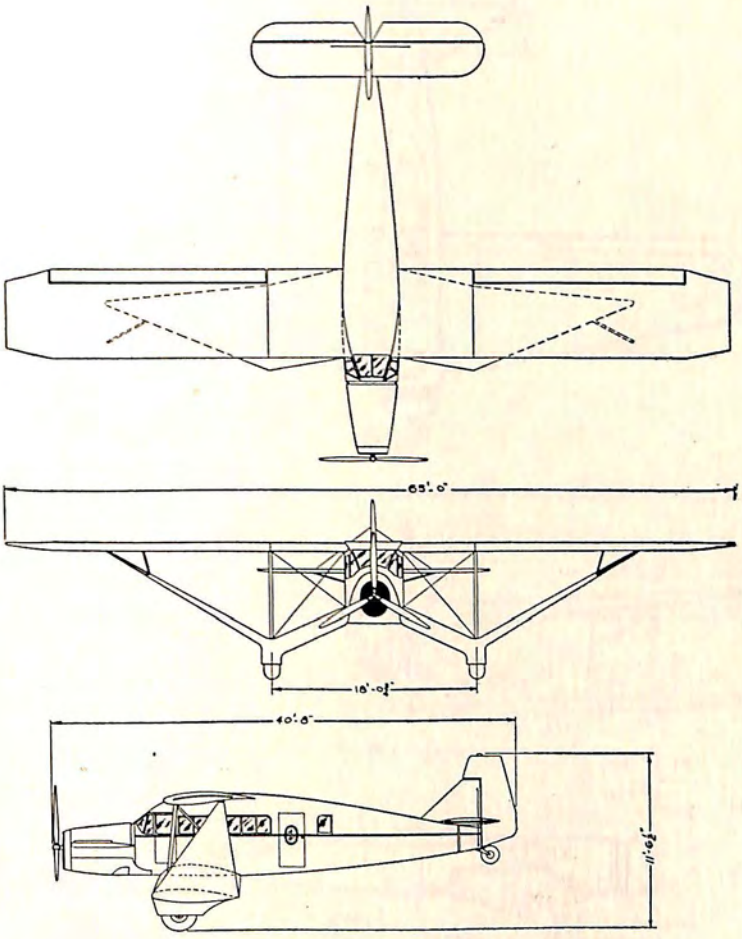
STINSON AIRCRAFT CORPORATION
Wayne, Mich.
MODEL T — 11 PLACE
ENGINE: THREE LYCOMINGS

MULTI-ENGINED TRANSPORTS

Name of Manufacturer	*Model*	*A.T.C. No.*	*Make of Engine*	*Total Rated H.P.*	*Wing Area, Sq. Ft.*	*Gross Weight, Lbs.*	*Pay Load, Lbs.*	*High Speed, M.P.H.*	*Cruising Speed, M.P.H.*	*Stalling Speed, M.P.H.*	*Service Ceiling, Ft.*	*Cruising Radius, Mi.*
Boeing	80-A	206	3 Pratt & Whitney Hornets	1,575	1,250	17,500	3,853	138	115	55	16,000	560
Curtiss A & M	Condor	193	2 Curtiss Conquerors (G)	1,200	1,510	17,900	3,600	139	118	49	17,000	810
Ford	5-D	409	3 Pratt & Whitney Wasps	1,260	835	13,500	3,840	150	120	64	18,500	600
Ford	5-D	409	3 Pratt & Whitney Wasps	1,260	835	14,000	3,780	150	120	65	17,500	600
Ford	4ATF	441	3 Whirlwind 300	900	785	11,000	2,580	138	113	59	16,300	565
Ford	4ATF	441	3 Pratt & Whitney Wasp Jr.	900	785	11,000	2,580	138	113	59	16,300	565
General Aviation	F-32	281	4 Pratt & Whitney Hornets	2,300	1,150	24,500	5,905	146	123	63	13,000	530
General Aviation	F-10	96	3 Pratt & Whitney Wasps	1,260	850	14,000	2,700	153	126	60	18,000	755
Sikorsky	S-40	454	4 Pratt & Whitney Hornets	2,300	1,875	34,010	5,902	135	113	65	12,000	875
Sikorsky	S-41	418	2 Pratt & Whitney Hornets	1,150	730	13,800	2,760	133	111	65	17,000	830
Sikorsky	S-38	126	2 Pratt & Whitney Wasps	840	720	10,480	2,000	125	110	55	18,000	600
Stinson	T	420	3 Lycomings	645	490	8,600	1,925	138	112	60	14,200	390



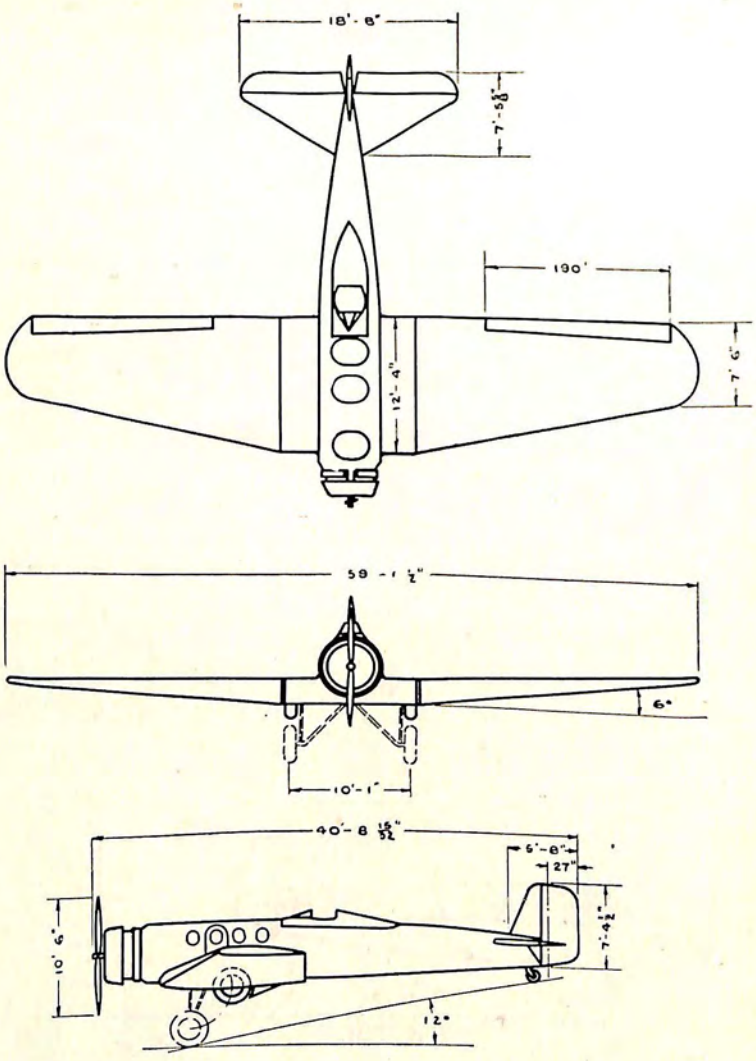
AMERICAN AIRPLANE & ENGINE CORPORATION
Farmingdale, L. I., N. Y.
PILGRIM 100–A — 10 PLACE
ENGINE: PRATT & WHITNEY HORNET



BELLANCA AIRCRAFT CORPORATION
New Castle, Del.

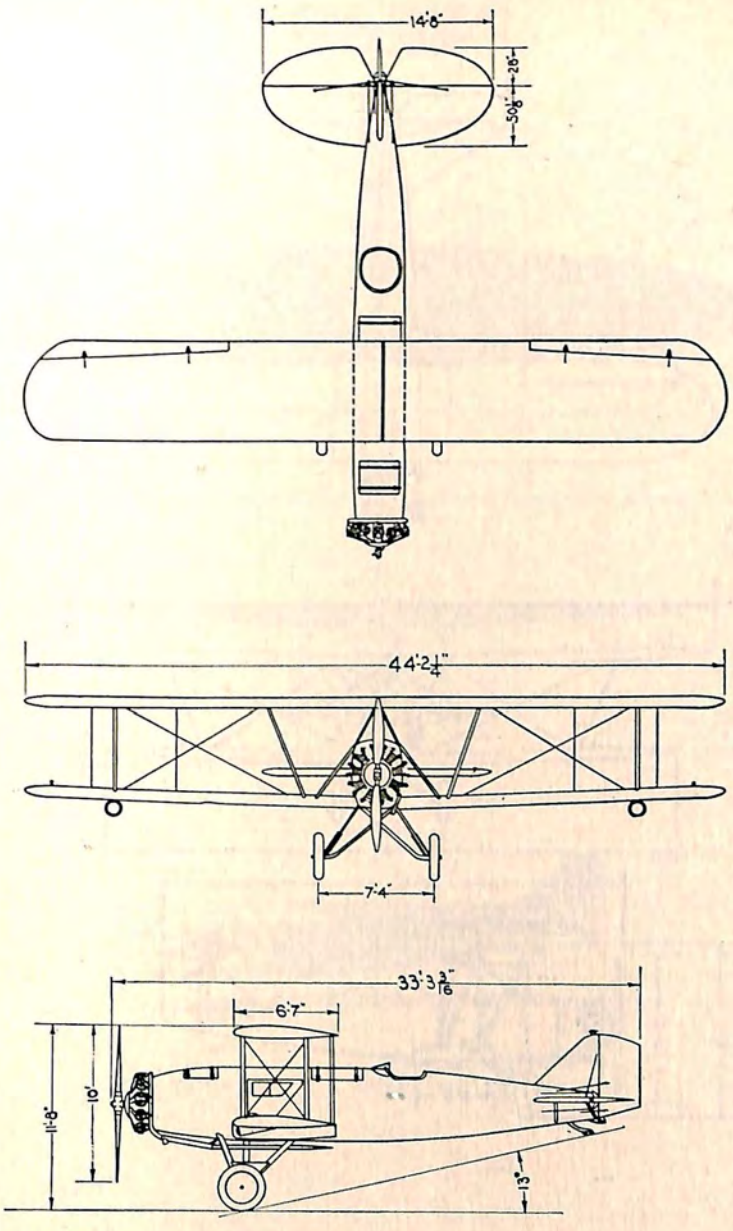
AIRBUS — 12–15 PLACE

ENGINE: CURTISS CONQUEROR
PRATT & WHITNEY HORNET
WRIGHT CYCLONE

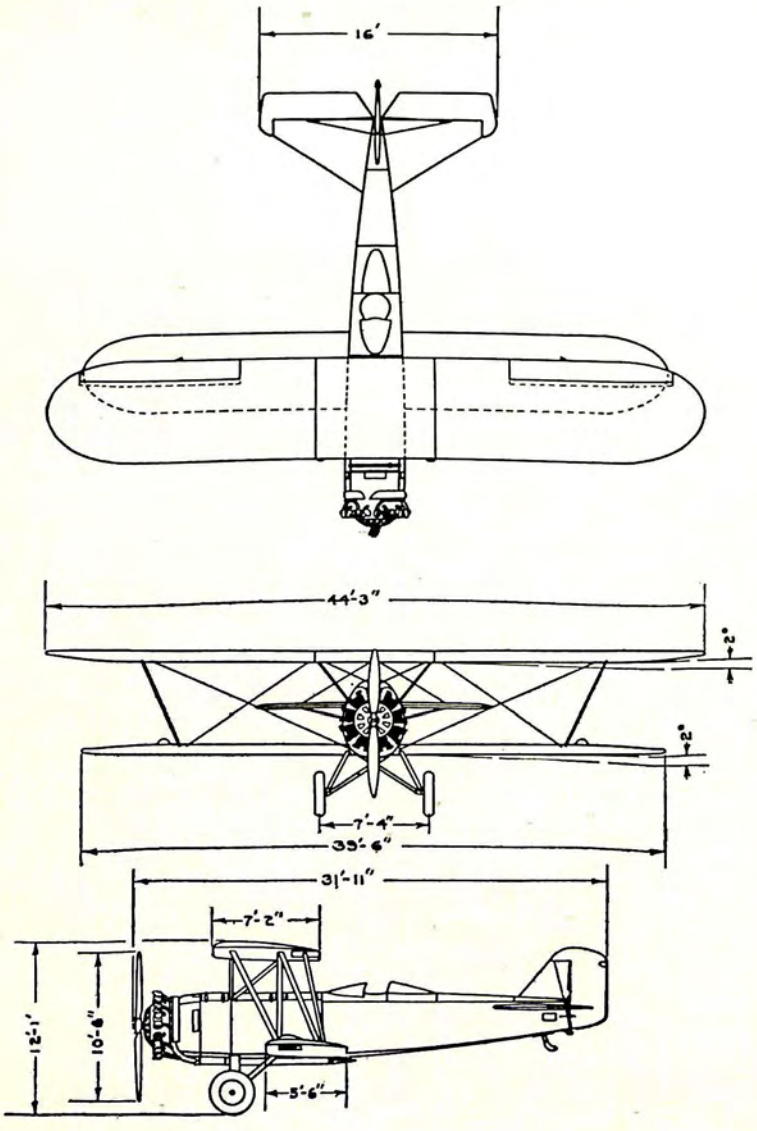


BOEING AIRPLANE COMPANY
Seattle, Wash.

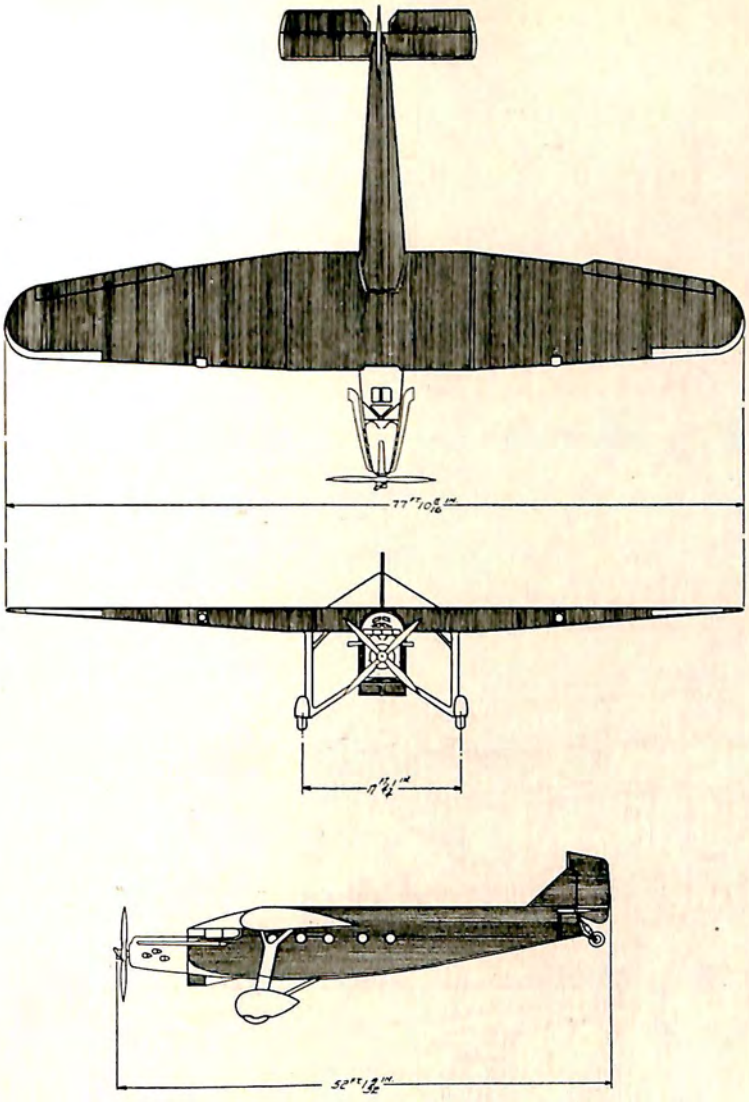
MONOMAIL 221 — 7–9 PLACE
ENGINE: PRATT & WHITNEY HORNET



BOEING AIRPLANE COMPANY
Seattle, Wash.
MODEL 40 B–4 — 5 PLACE
ENGINE: PRATT & WHITNEY HORNET

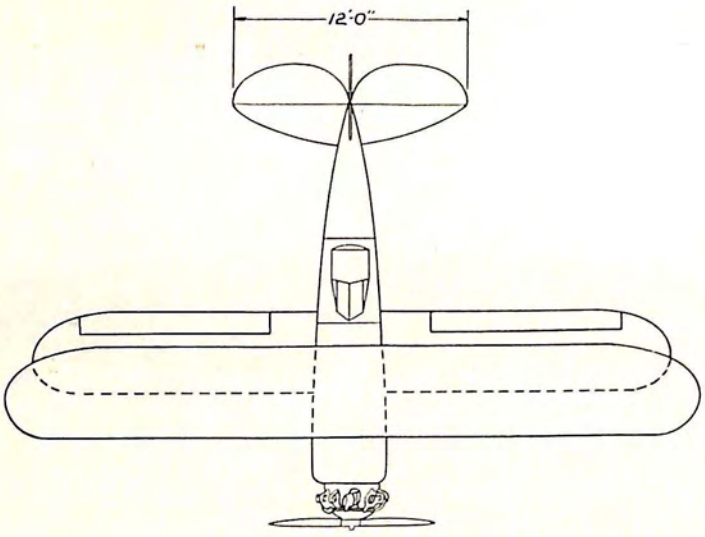


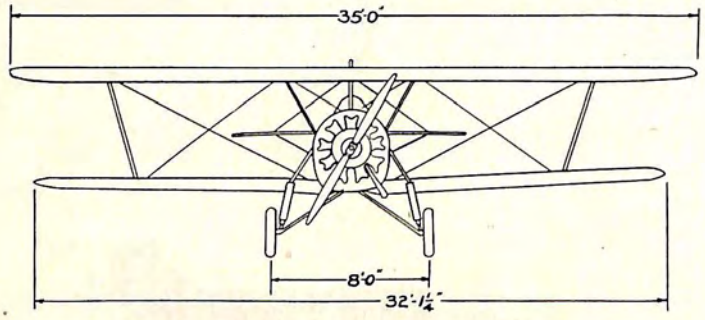
BOEING AIRPLANE COMPANY
Seattle, Wash.
MODEL 95 — 1 PLACE
ENGINE: PRATT & WHITNEY HORNET

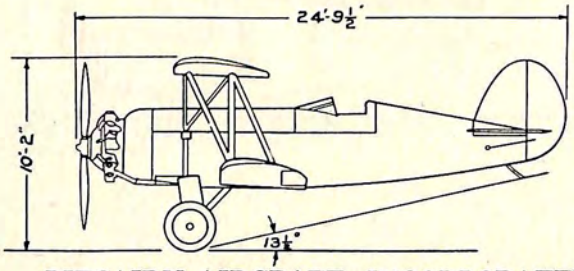


FORD MOTOR COMPANY
Stout Metal Airplane Division
Dearborn, Mich.

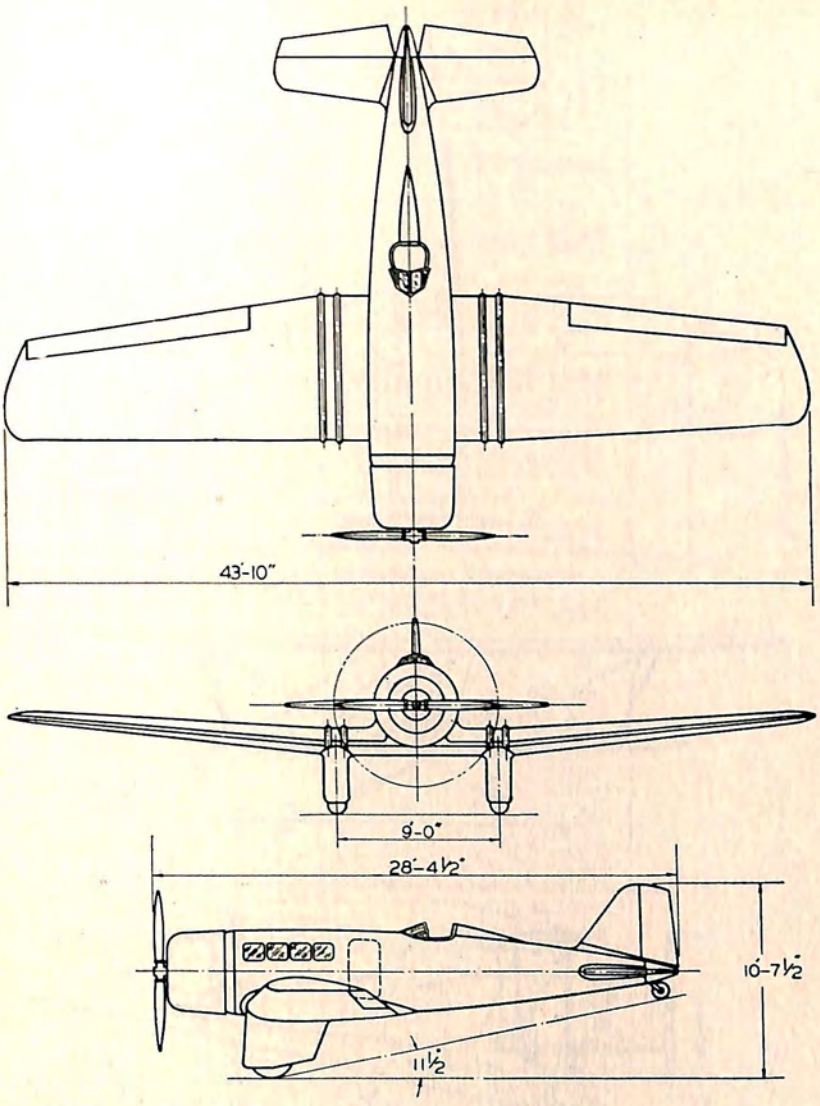
MODEL 8–A — 2 PLACE
ENGINE: HISPANO SUIZA, GEARED



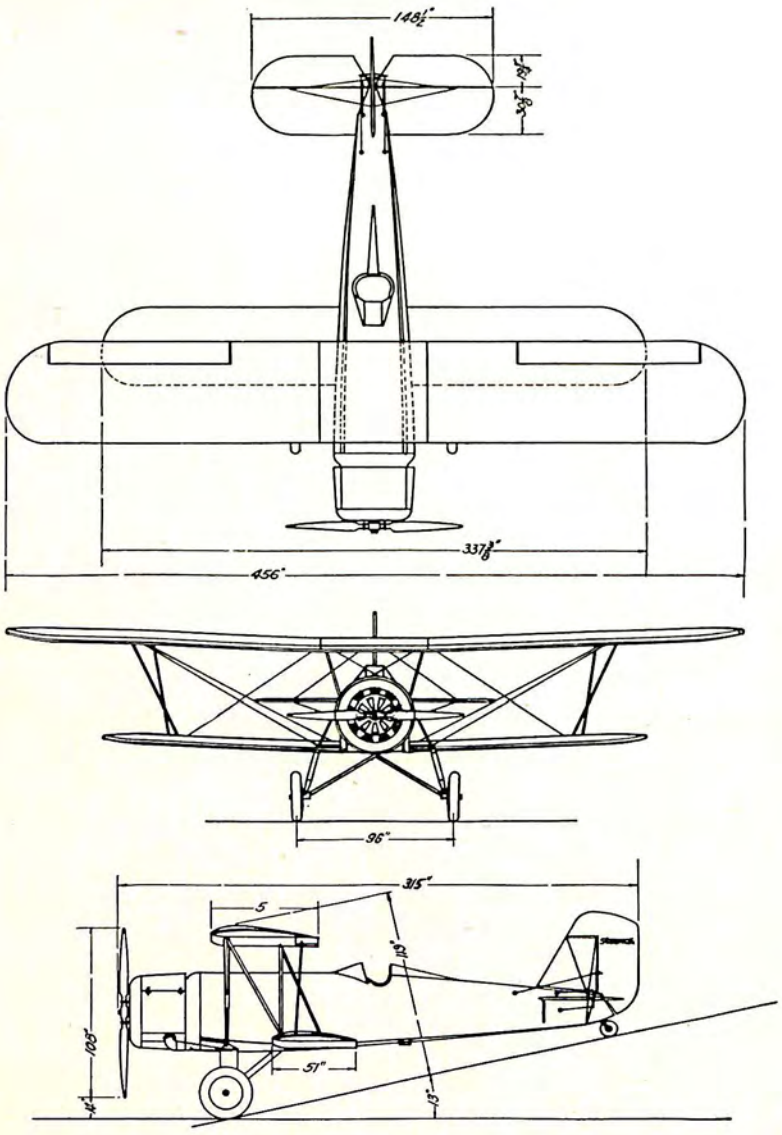




PITCAIRN AIRCRAFT, INCORPORATED
Philadelphia, Pa.
MODEL PA–8 MAILWING — 1–3 PLACE
ENGINE: PRATT & WHITNEY WASP, JR.
WRIGHT WHIRLWIND 300



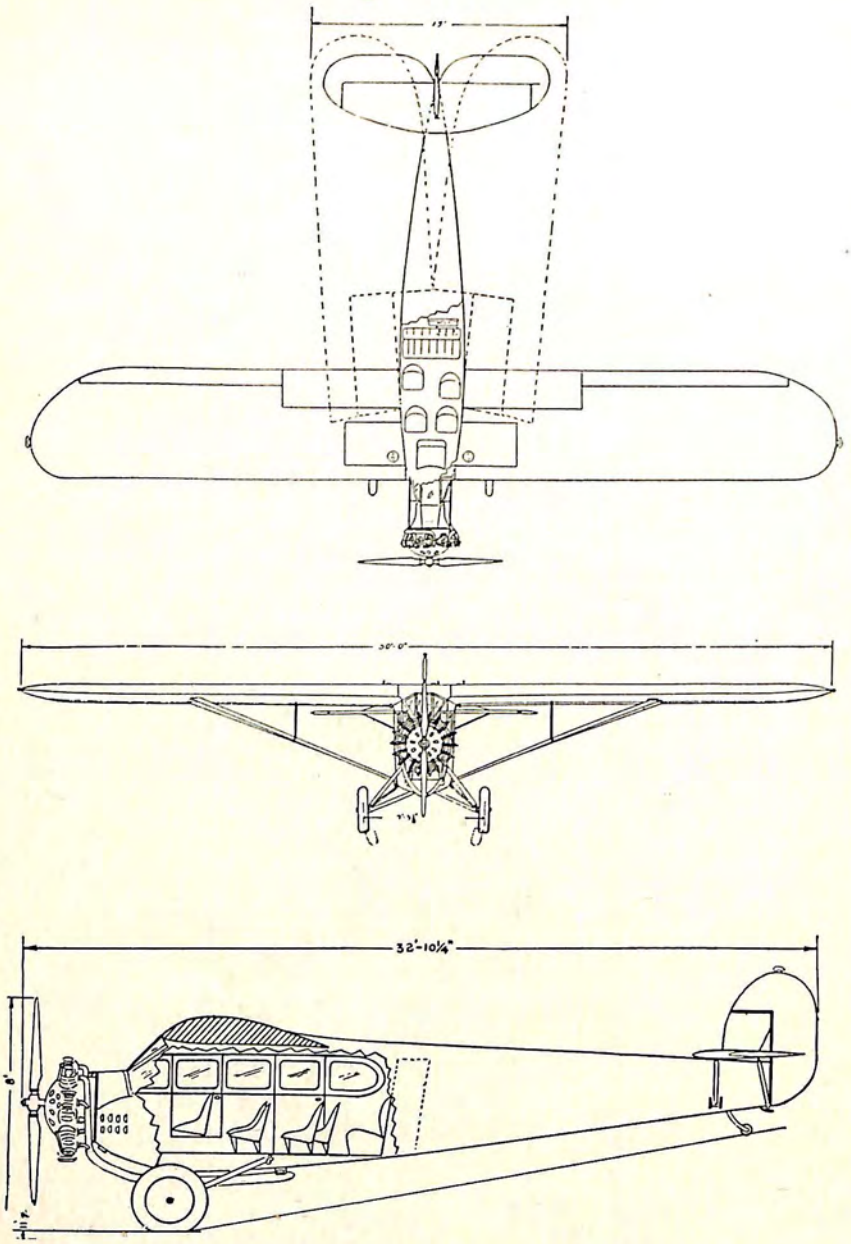
STEARMAN AIRCRAFT COMPANY
Wichita, Kan.
ALPHA — 5–7 PLACE
ENGINE: PRATT & WHITNEY WASP



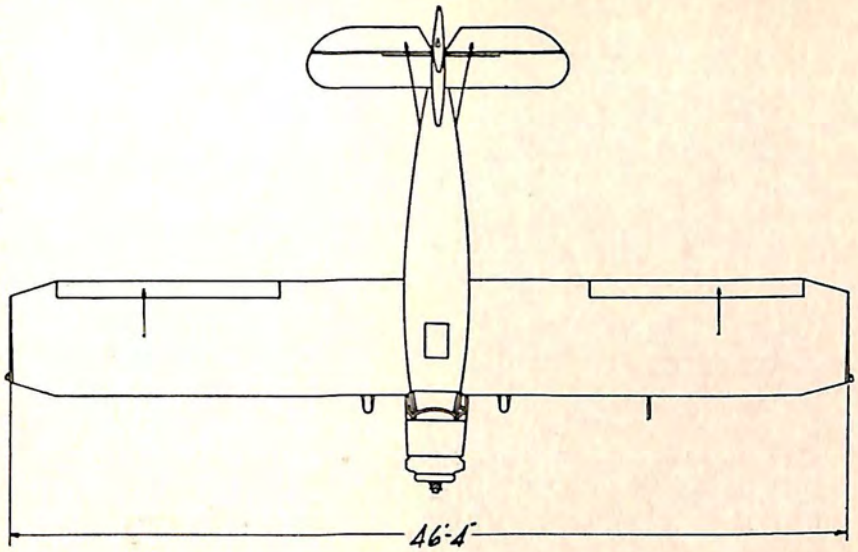
STEARMAN AIRCRAFT COMPANY
Wichita, Kan.
JUNIOR SPEEDMAIL — 1 PLACE
ENGINE: PRATT & WHITNEY WASP
PRATT & WHITNEY WASP, JR.
WRIGHT WHIRLWIND 300

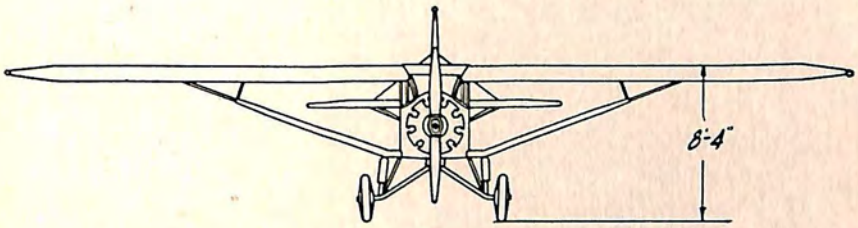
MAIL TRANSPORTS

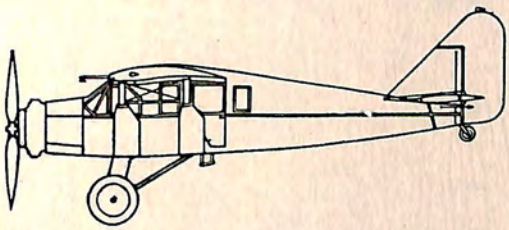
Name of Manufacturer	*Model*	*A.T.C. No.*	*Make of Engine*	*Total Rated H.P.*	*Wing Area, Sq. Ft.*	*Gross Weight, Lbs.*	*Pay Load, Lbs.*	*High Speed, M.P.H.*	*Cruising Speed, M.P.H.*	*Stalling Speed, M.P.H.*	*Service Ceiling, Ft.*	*Cruising Radius, Mi.*
American Airplane.....	Pilgrim 100-A	443	Pratt & Whitney Hornet	575	459	7,750	2,140	136	118	65	13,600	380
Bellanca.....	Airbus 12 Place	391	Pratt & Whitney Hornet	575	652	9,590	2,985	139	120	.....	13,000	750
Bellanca.....	Airbus 12 Place	391	Wright Cyclone	575	652	9,590	2,985	139	120	.....	13,000	750
Bellanca.....	Airbus 12 Place	391	Curtiss Conqueror	600	652	9,500	2,612	147	126	.....	16,000	750
Bellanca.....	Airbus 15 Place	391	Pratt & Whitney Hornet	575	652	9,590	2,880	140	122	.....	13,300	725
Bellanca.....	Airbus 15 Place	391	Wright Cyclone	575	652	9,590	2,880	140	122	.....	13,300	725
Boeing.....	Monomail 221	347	Pratt & Whitney Hornet	575	535	8,000	1,745	154	130	60	15,200	500
Boeing.....	40B-4	183	Pratt & Whitney Hornet	525	545	6,080	1,163	132	110	57	15,100	480
Boeing.....	95	106	Pratt & Whitney Hornet	525	490	5,840	1,600	142	120	56	16,000	600
Curtiss-Wright Airplane	Kingbird	348	2 Wright Whirlwind 300	600	405	6,360	1,400	135	115	65	16,200	420
Ford.....	8-A	Pending	Hispano-Suiza	725	835	11,000	3,596	138	110	55	14,700	550
Pitcairn.....	Pa-8 Mailwing	364	Wright Whirlwind 300	300	278	4,000	1,020	145	120	58		
Stearman.....	Alpha	451	Pratt & Whitney Wasp	420	312	4,856	.....	177	150	62	19,400	700
Stearman.....	Jr. Speedmail	292	Pratt & Whitney Wasp	420	307	3,936	629	158	128	53	18,000	645
Stearman.....	Jr. Speedmail	305	Pratt & Whitney Wasp, Jr.	300	307	3,800	622	143	115	50	15,000	815
Stearman.....	Jr. Speedmail	304	Wright Whirlwind 300	300	307	3,800	663	145	118	50	15,000	835



AMERICAN AIRPLANE & ENGINE CORPORATION
Farmingdale, L. I., N. Y.
PILGRIM 71 — 7 PLACE
ENGINE: PRATT & WHITNEY WASP



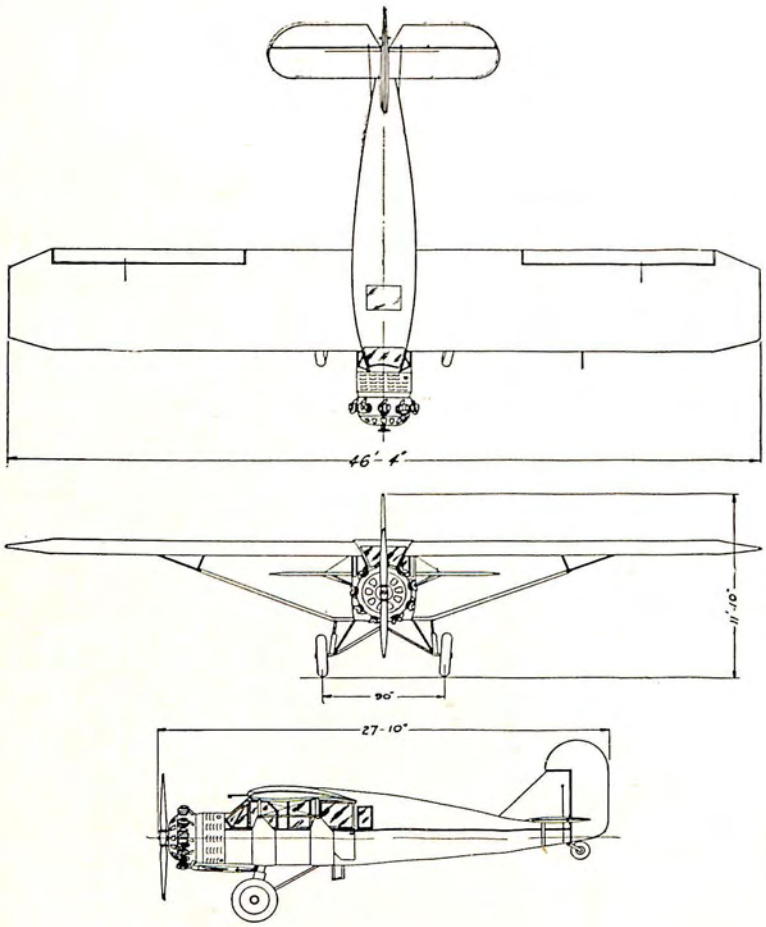




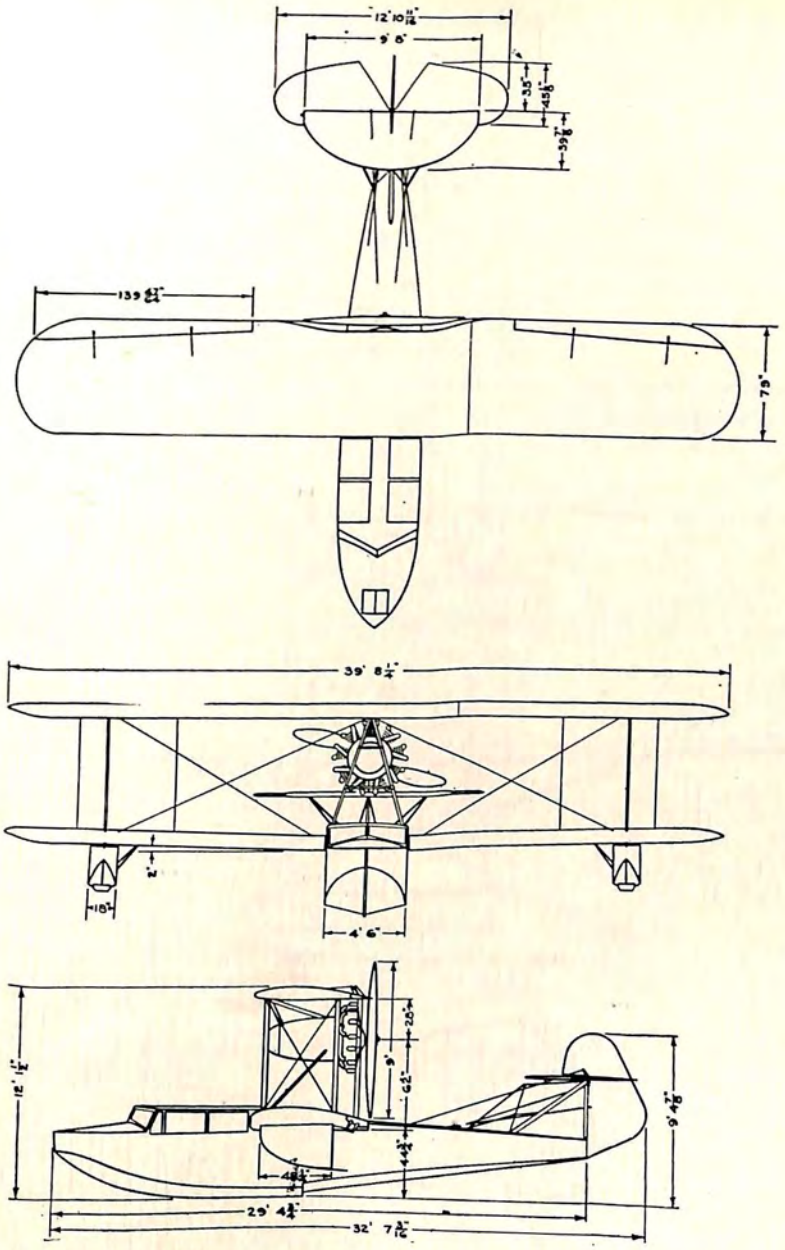
BELLANCA AIRCRAFT CORPORATION
New Castle, Del.

PACEMAKER — 6 PLACE

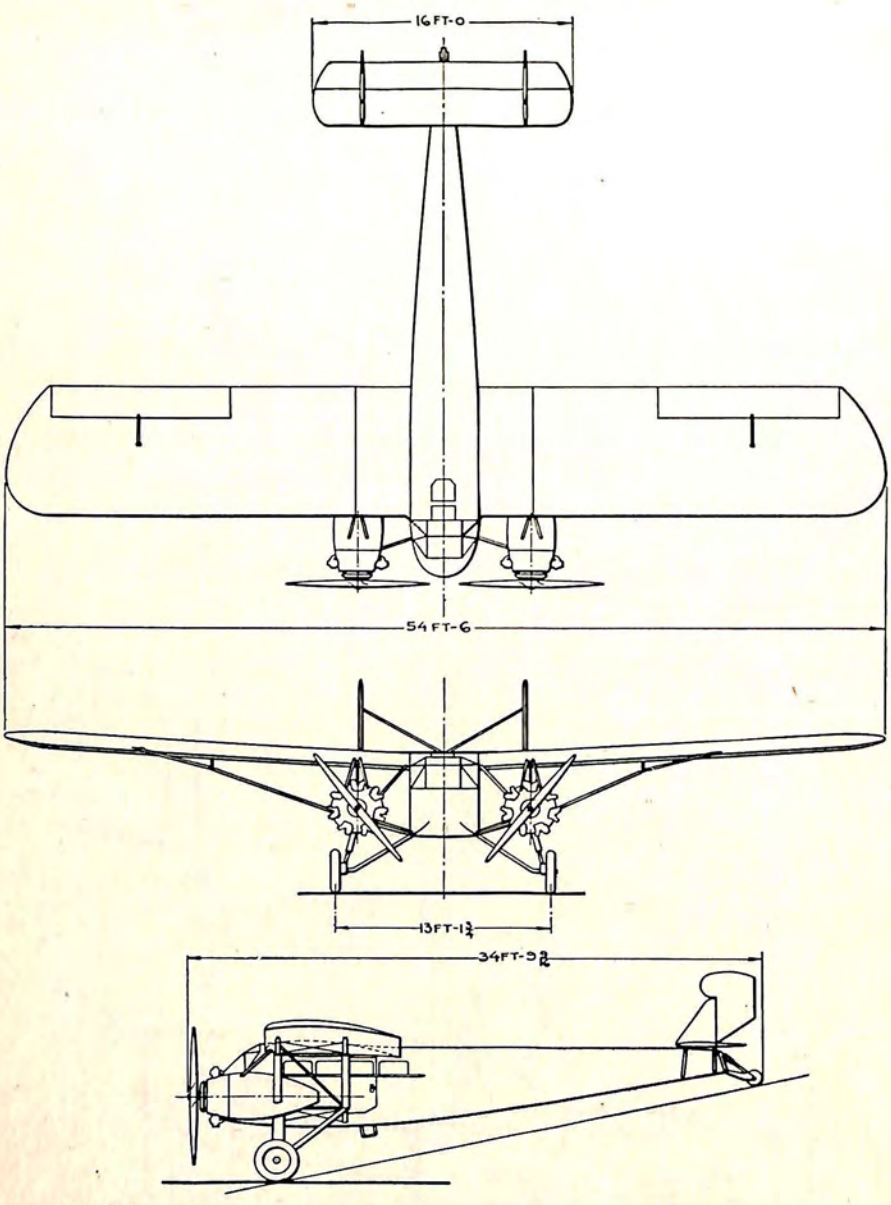
ENGINE: PACKARD DIESEL
PRATT & WHITNEY WASP, JR.
WRIGHT WHIRLWIND 300



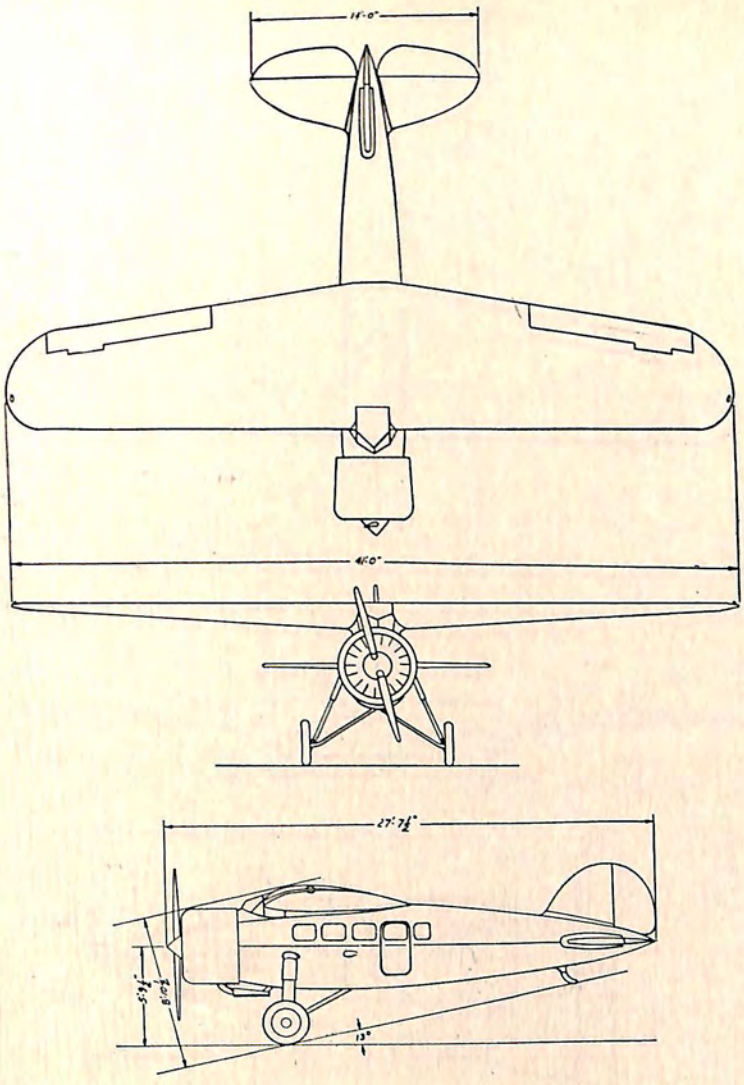
BELLANCA AIRCRAFT CORPORATION
New Castle, Del.
SKYROCKET — 6 PLACE
ENGINE: PRATT & WHITNEY WASP



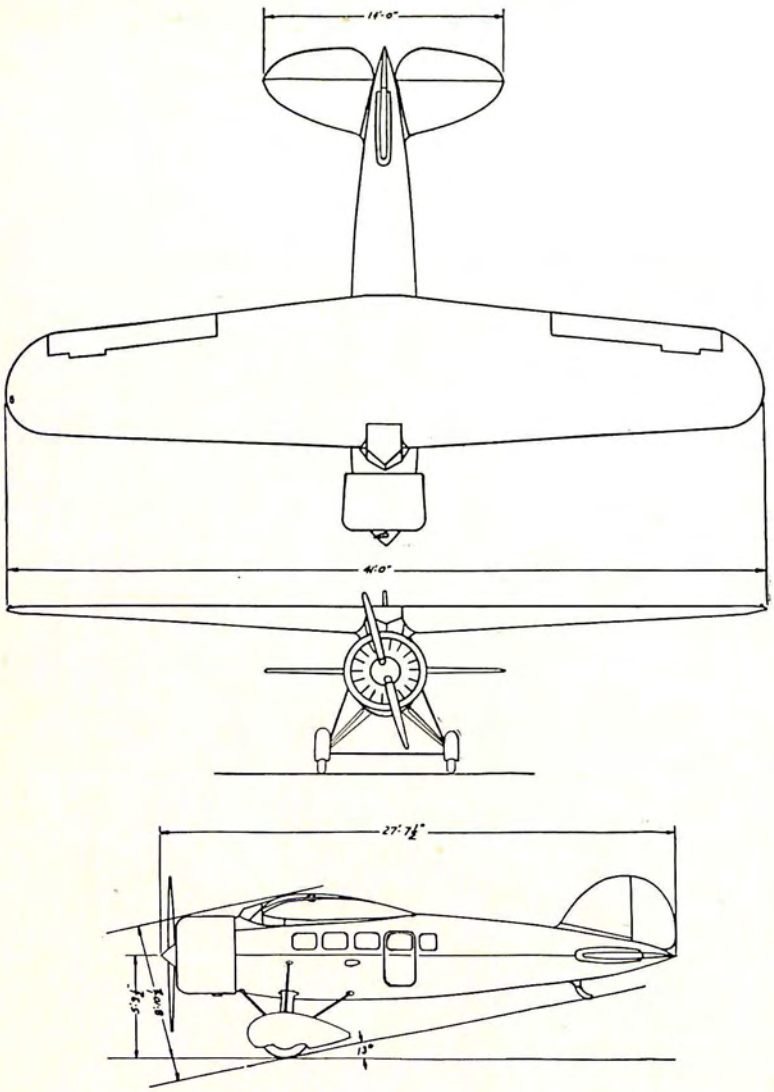
BOEING AIRPLANE COMPANY
Seattle, Wash.
MODEL 204 — 6 PLACE
ENGINE: PRATT & WHITNEY WASP



CURTISS-WRIGHT AIRPLANE COMPANY
St. Louis, Mo.
KING BIRD — 8 PLACE
ENGINE: TWO WRIGHT WHIRLWINDS 300



DETROIT AIRCRAFT CORPORATION
Detroit, Mich.
DETROIT LOCKHEED DL–1 — 7 PLACE
ENGINE: PRATT & WHITNEY WASP

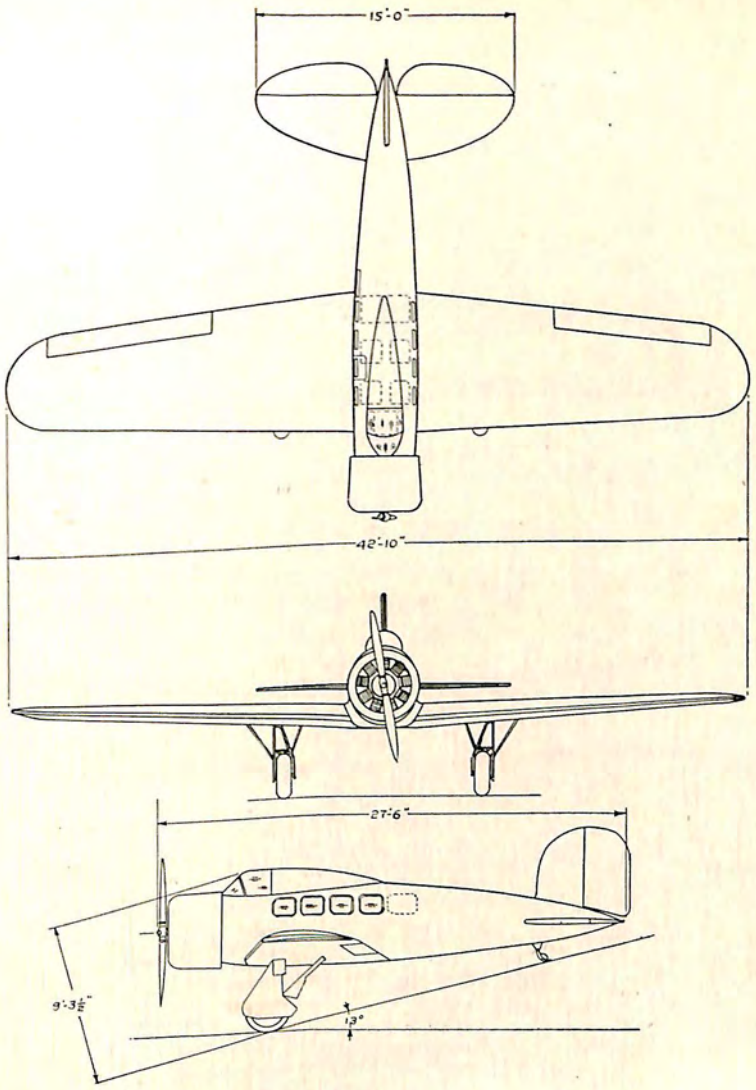


DETROIT AIRCRAFT CORPORATION

Detroit, Mich.

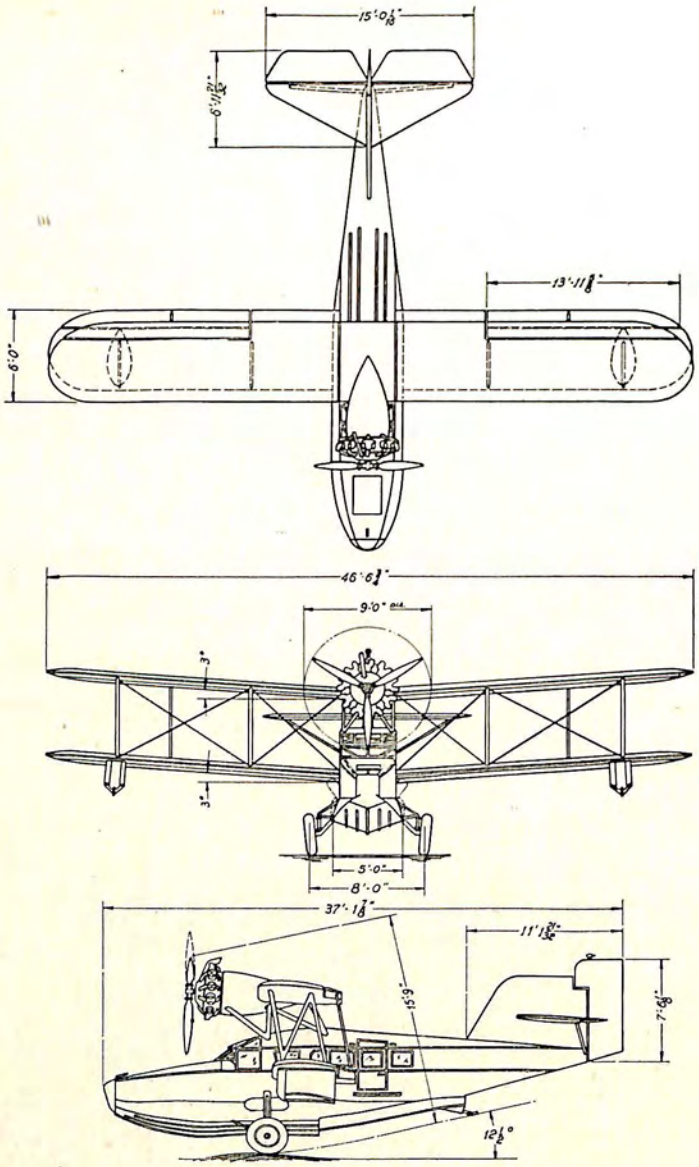
DETROIT LOCKHEED SPEED VEGA — 7 PLACE

ENGINE: PRATT & WHITNEY WASP



DETROIT AIRCRAFT CORPORATION
Detroit, Mich.

DETROIT LOCKHEED ORION — 7 PLACE
ENGINE: PRATT & WHITNEY WASP



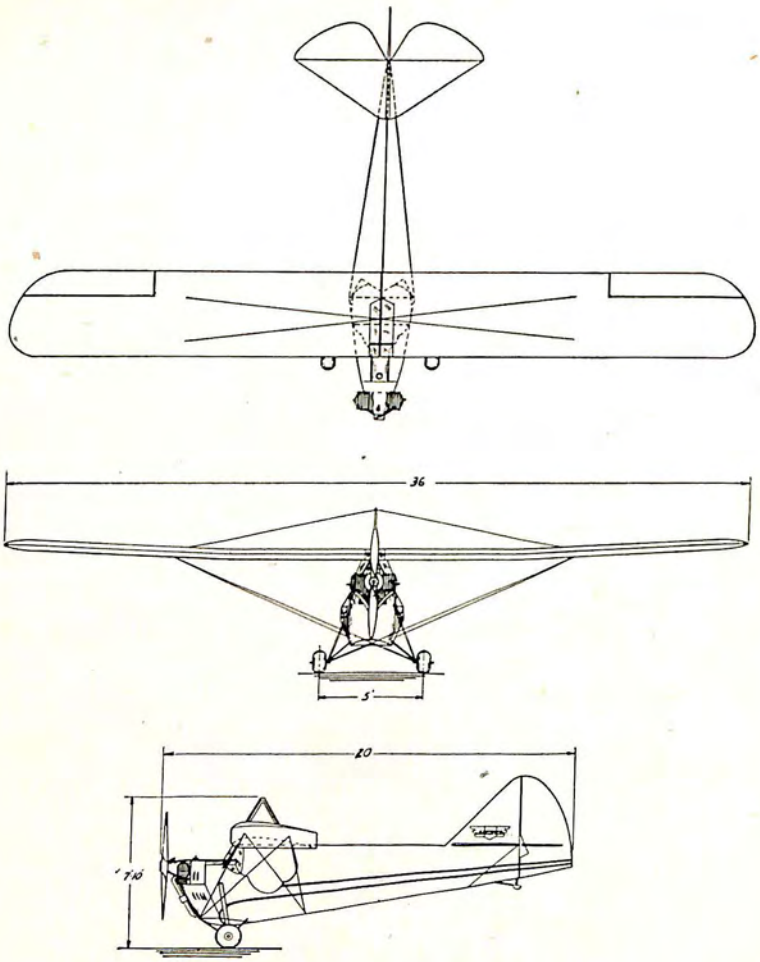
KEYSTONE AIRCRAFT CORPORATION
Bristol, Pa.

AIR YACHT K–85 — 8 PLACE

ENGINE: WRIGHT CYCLONE

LIGHT TRANSPORTS

Name of Manufacturer	*Model*	*A.T.C. No.*	*Make of Engine*	*Total Rated H.P.*	*Wing Area, Sq. Ft.*	*Gross Weight, Lbs.*	*Pay Load, Lbs.*	*High Speed, M.P.H.*	*Cruising Speed, M.P.H.*	*Stalling Speed, M.P.H.*	*Service Ceiling, Ft.*	*Cruising Radius, Mi.*
American Airplane.....	Pilgrim 71	89	Pratt & Whitney Wasp	420	332	5,500	1,237	132.5	112	63.8	14,150	625
Bellanca.....	Pacemaker	129	Packard Diesel	225	273	4,240	900	132	111	.....	17,000	1,000
Bellanca.....	Pacemaker	328	Pratt & Whitney Wasp Jr.	300	273	4,300	933	150	125	.....	17,000	850
Bellanca.....	Pacemaker Seaplane	328	Pratt & Whitney Wasp Jr	300	273	4,757	933	144	117	.....	15,000	800
Bellanca.....	Pacemaker	129	Wright Whirlwind 300	300	273	4,300	993	150	125	.....	17,000	850
Bellanca.....	Pacemaker Seaplane	129	Wright Whirlwind 300	300	273	4,835	993	141	117	.....	15,000	800
Bellanca.....	Pacemaker Freighter	245	Wright Whirlwind 300	300	273	4,600	1,570	150	124	.....	15,000	600
Bellanca.....	Skyrocket	319	Pratt & Whitney Wasp	420	273	4,600	1,025	155	130	.....	20,000	750
Bellanca.....	Skyrocket Seaplane	319	Pratt & Whitney Wasp	420	273	4,600	1,005	146	122	.....	18,000	700
Bellanca.....	Skyrocket DeLuxe	319	Pratt & Whitney Wasp Supercharged	450	273	4,600	1,005	174	148	.....	20,000	750
Boeing.....	204	157	Pratt & Whitney Wasp	420	470	5,000	913	133	115	59	14,000	520
Detroit.....	Lockheed Orion	421	Pratt & Whitney Wasp	420	275	5,200	1,170	204	171	64	19,800	580
Detroit.....	Lockheed Hi-Speed Vega	308	Pratt & Whitney Wasp	420	275	4,750	1,020	200	165	64	19,000	700
Detroit.....	Lockheed DL 1	308	Pratt & Whitney Wasp	420	275	4,750	1,120	180	150	60	19,750	700
Detroit.....	Lockheed DL 2	378	Pratt & Whitney Wasp	420	275	5,200	1,136	175	143	61	18,000	940
Keystone.....	Air Yacht K-85	395	Wright Cyclone	525	517	6,300	1,149	128	100	55	13,800	550

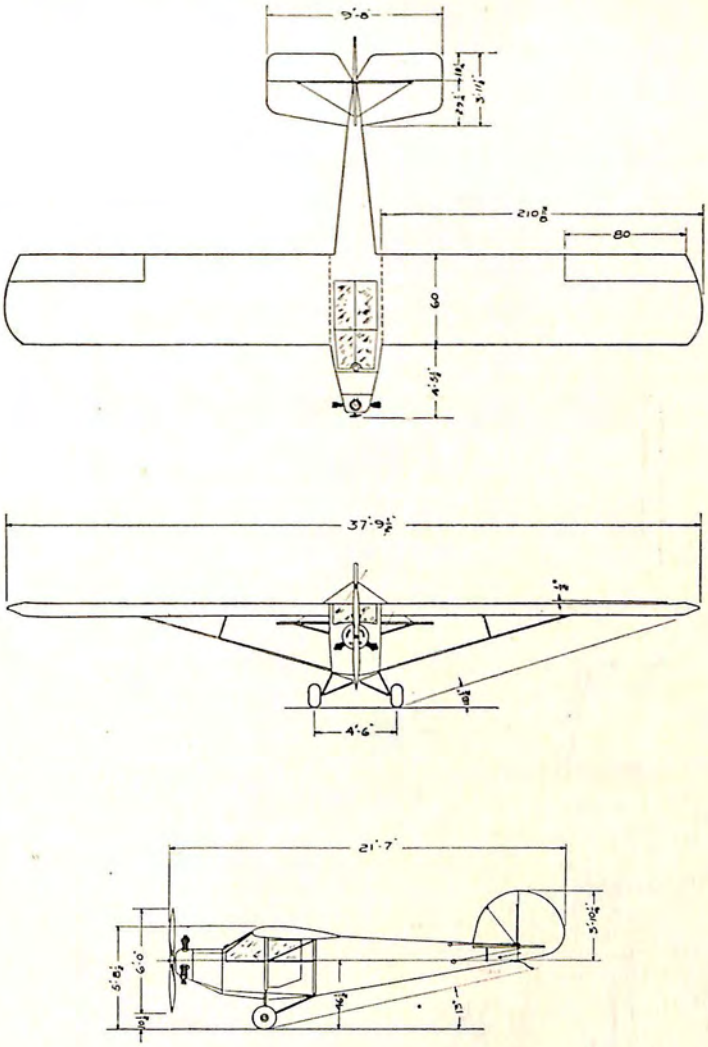


AERONAUTICAL CORPORATION OF AMERICA

Cincinnati, Ohio

AERONCA C–2, C–3 —— 1–2 PLACE

ENGINE: AERONCA E–107A
AERONCA E–113



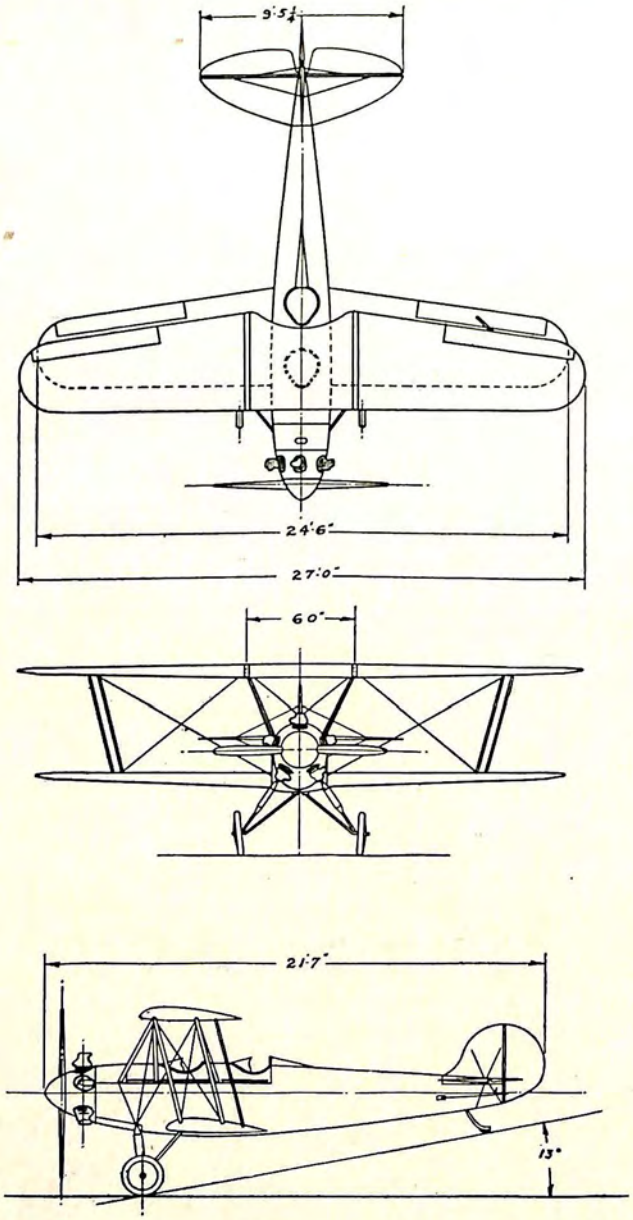
ALEXANDER AIRCRAFT CORPORATION

Colorado Springs, Colo.

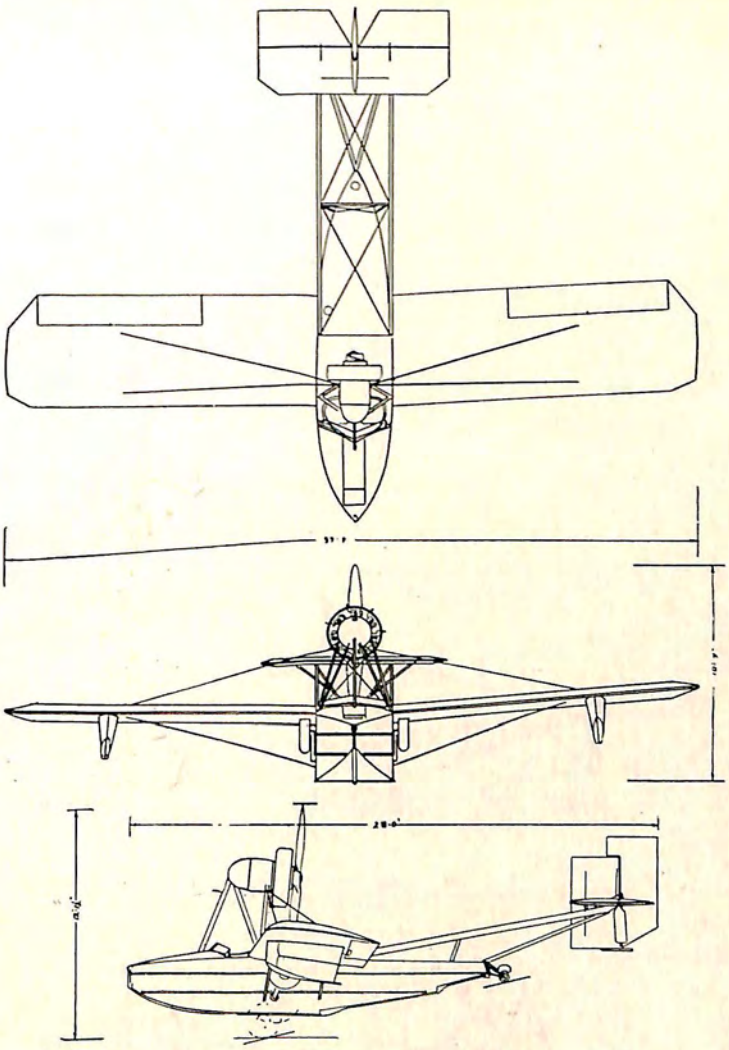
FLYABOUT D–1, D–2 —— 2 PLACE

ENGINE: CONTINENTAL A–40

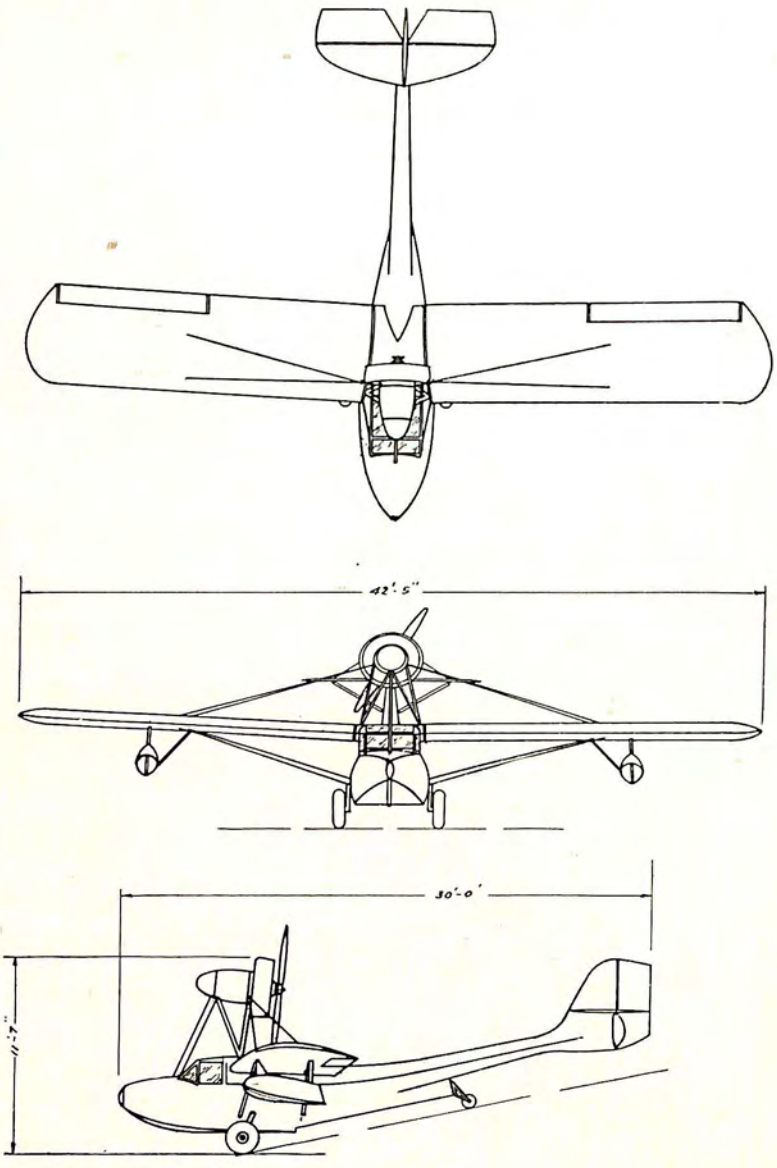
SZEKELY 3–45



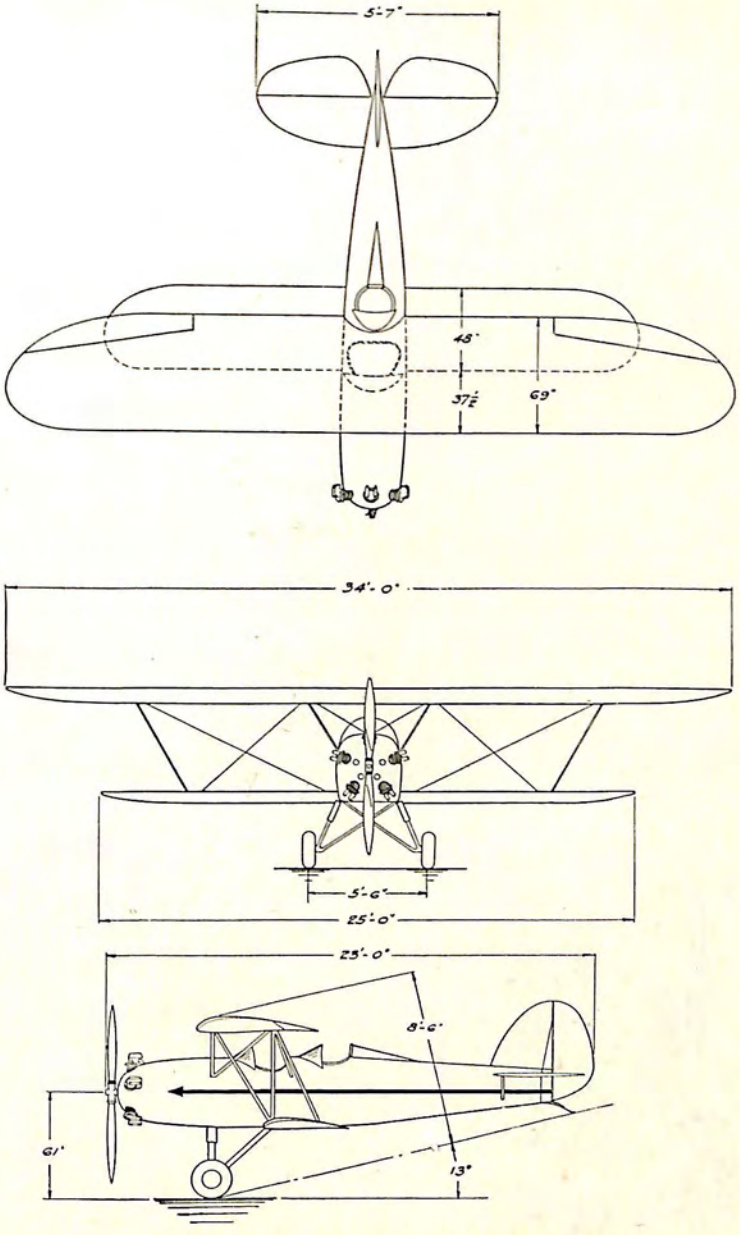
AMERICAN AIRPLANE & ENGINE CORPORATION
Farmingdale, L. I., N. Y.
PILGRIM KR 21, KR 21B — 2 PLACE
ENGINE: KINNER K–5
KINNER B–5



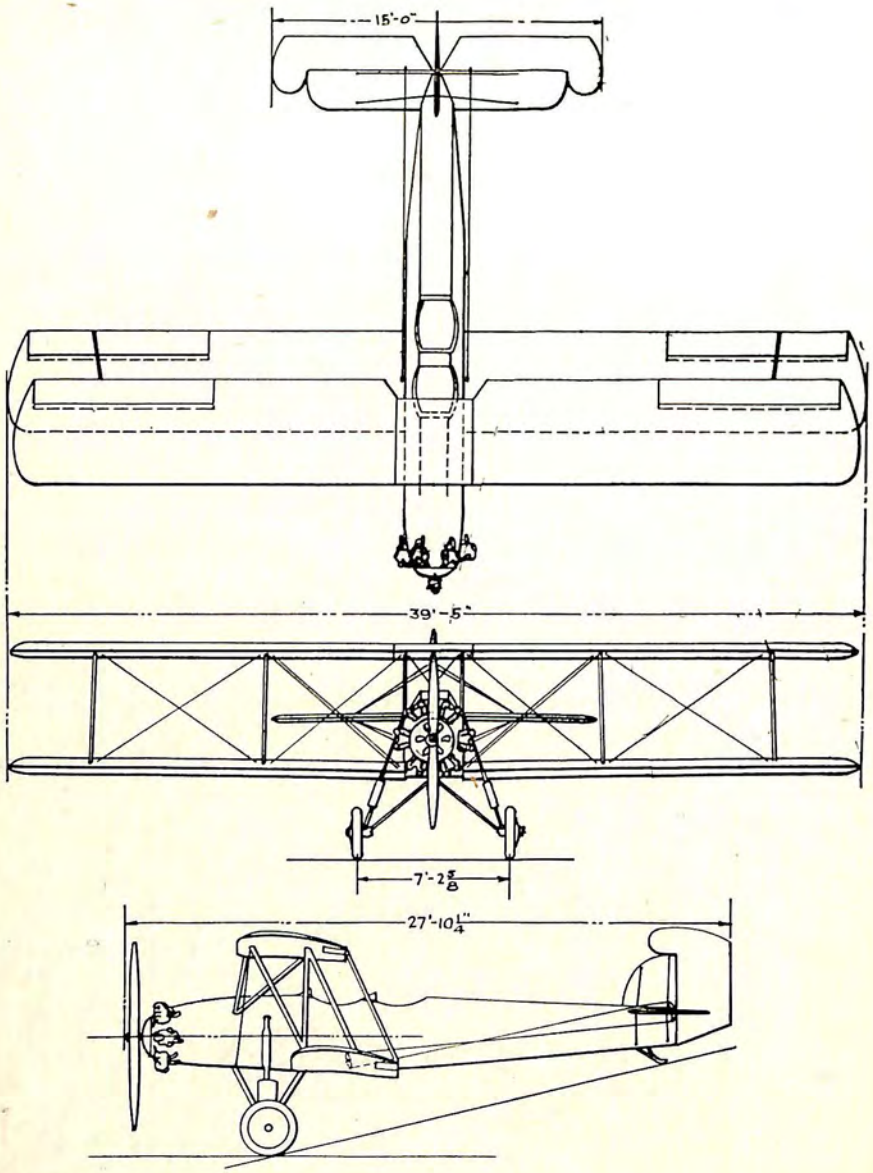
AMPHIBIONS, INCORPORATED
Garden City, L. I., N. Y.
PRIVATEER P–2 — 2 PLACE
ENGINE: WARNER SCARAB



AMPHIBIONS, INCORPORATED
Garden City, L. I., N. Y.
PRIVATEER P–3 — 3 PLACE
ENGINE: CONTINENTAL A–70
WRIGHT WHIRLWIND 165



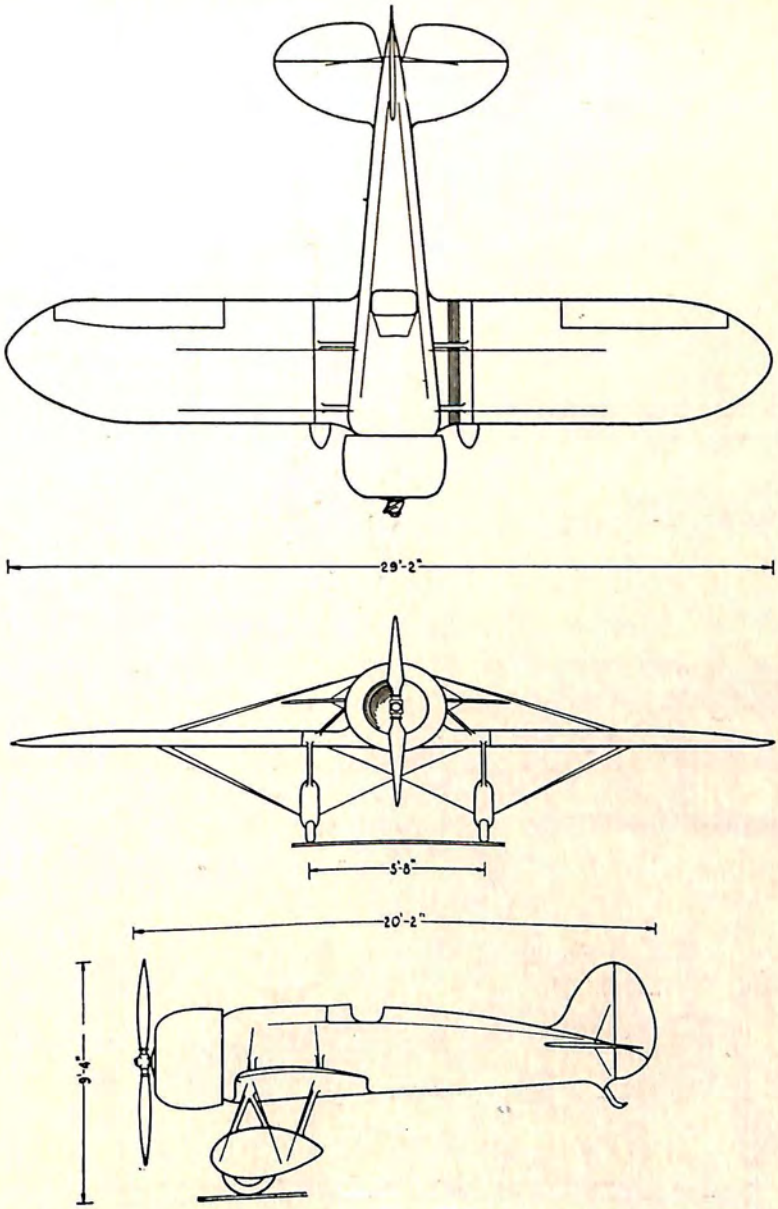
BIRD AIRCRAFT CORPORATION
Brooklyn, N. Y.
MODEL CK — 3 PLACE
ENGINE: KINNER B5



CURTISS AEROPLANE & MOTOR COMPANY
Buffalo, N. Y.

FLEDGLING — 2 PLACE

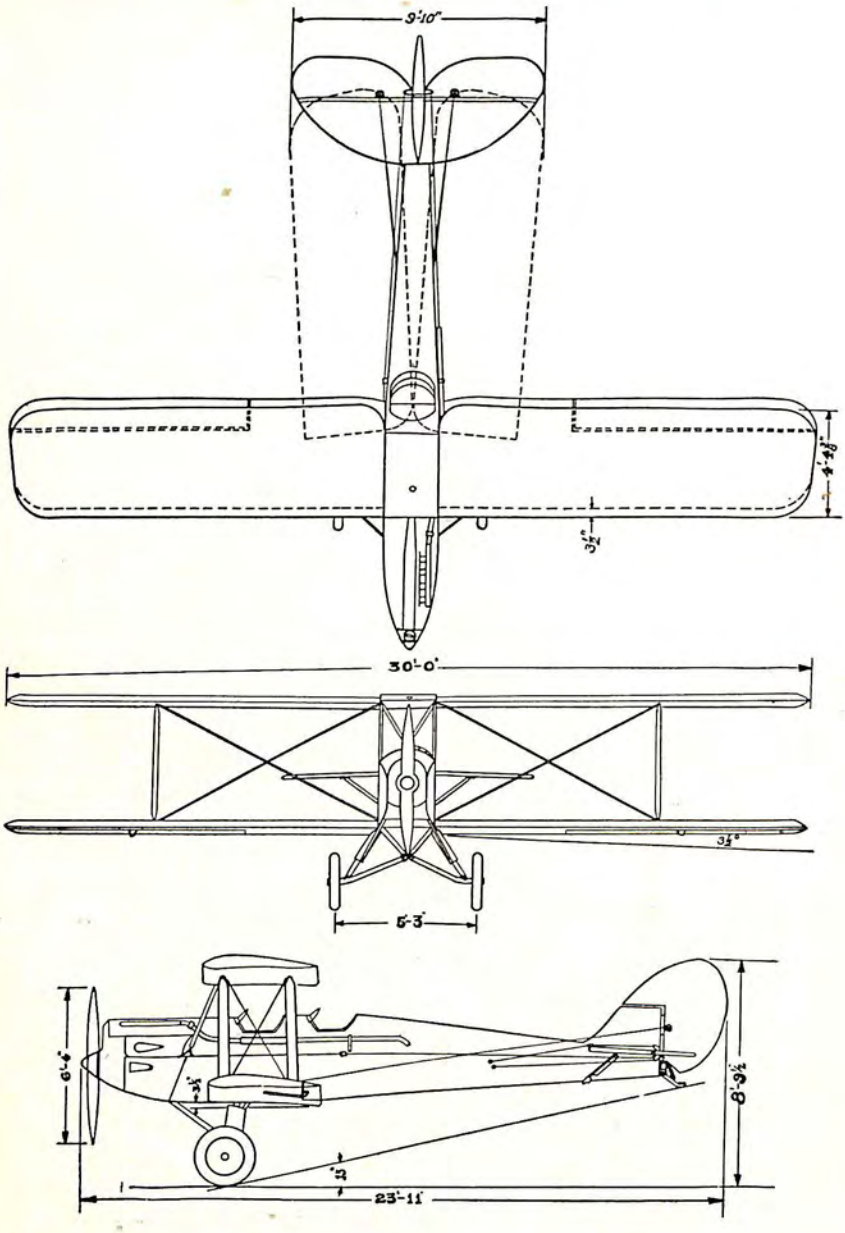
ENGINE: CURTISS CHALLENGER



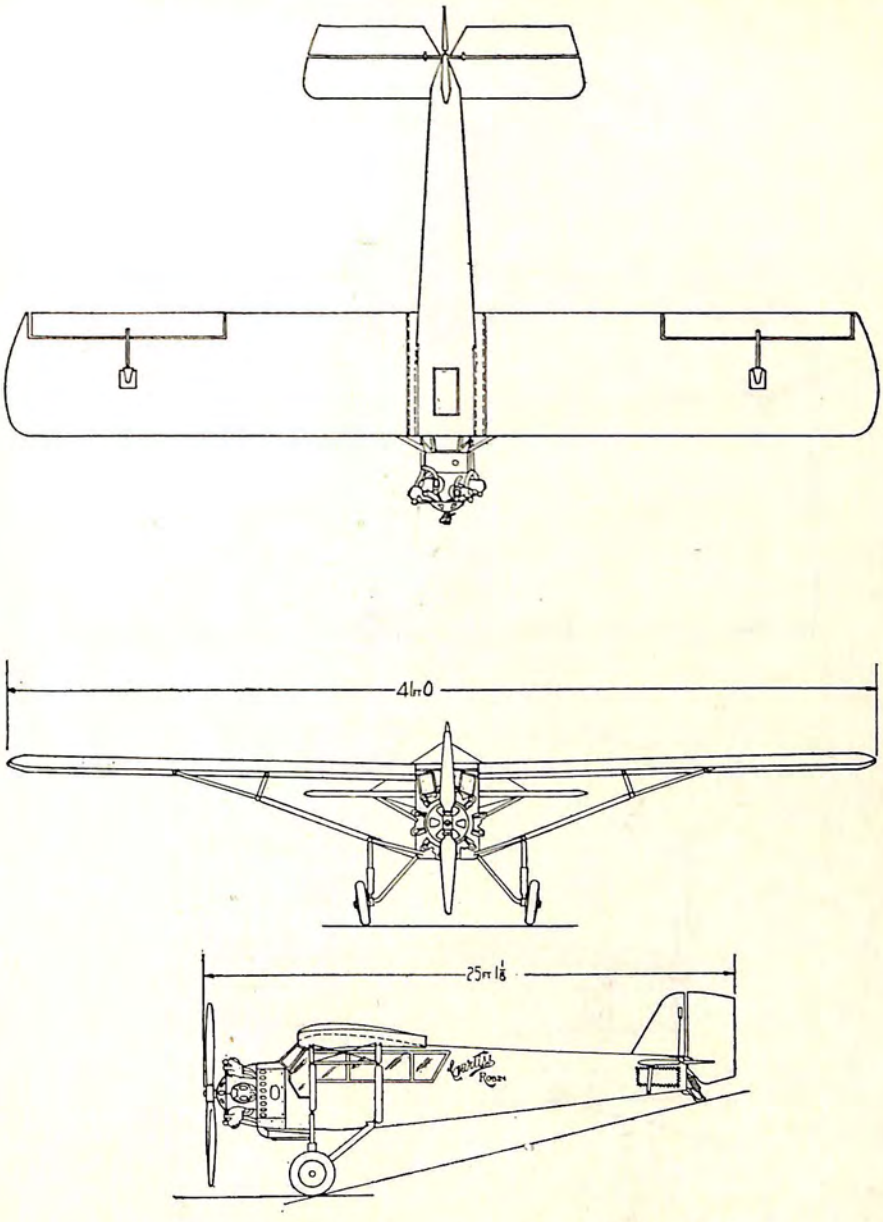
CURTISS-WRIGHT AIRPLANE COMPANY
Wichita, Kan.

MODEL MYSTERY S — 1 PLACE

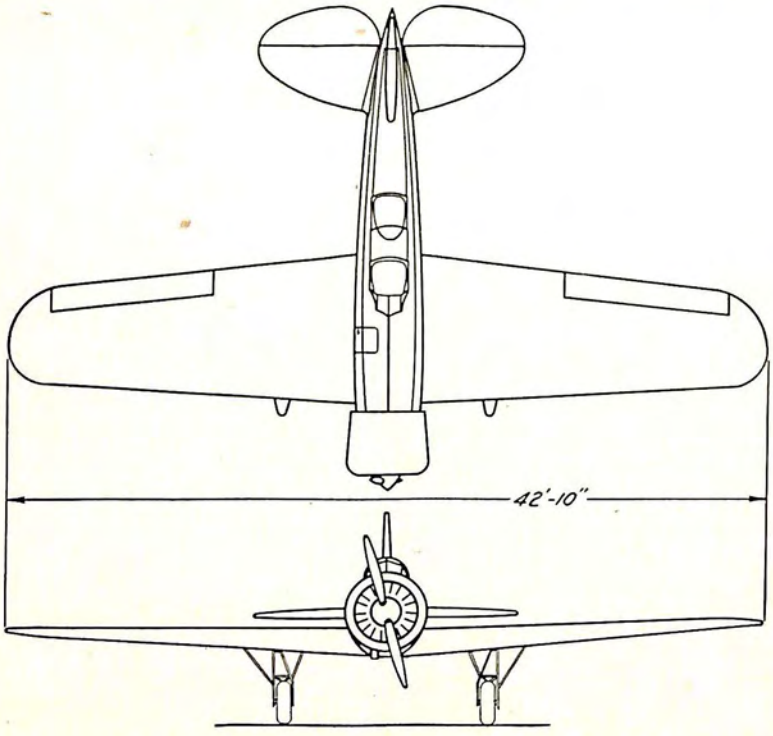
ENGINE: SUPERCHARGED WRIGHT WHIRLWIND 300

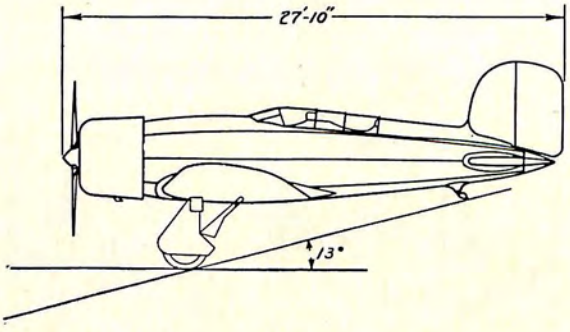


CURTISS–WRIGHT AIRPLANE COMPANY
St. Louis, Mo.
MOTH — 2 PLACE
ENGINE: WRIGHT GIPSY

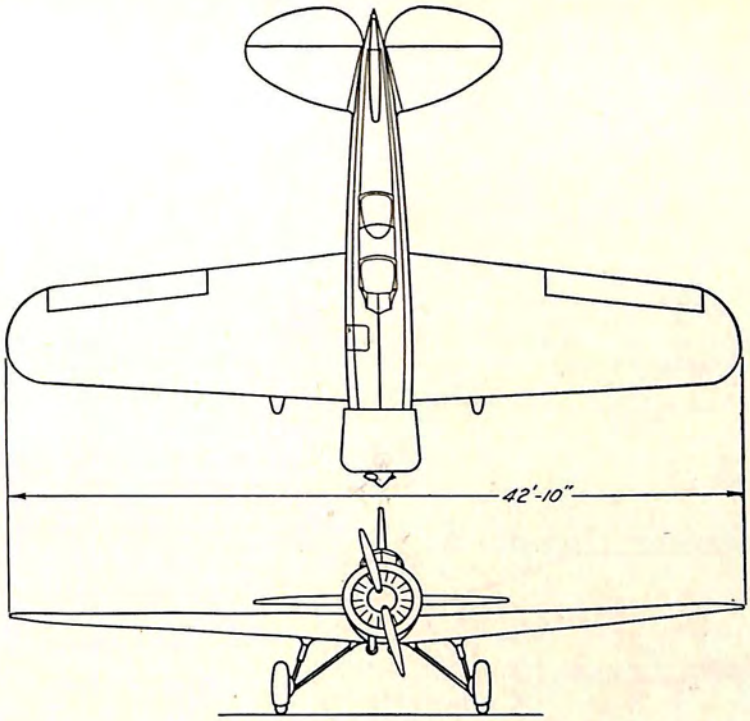


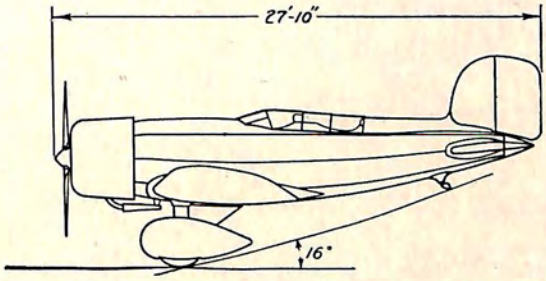
CURTISS-WRIGHT AIRPLANE COMPANY
St. Louis, Mo.
ROBIN C 1-C 2 — 3 PLACE
ENGINE: CURTISS CHALLENGER
WRIGHT WHIRLWIND 165



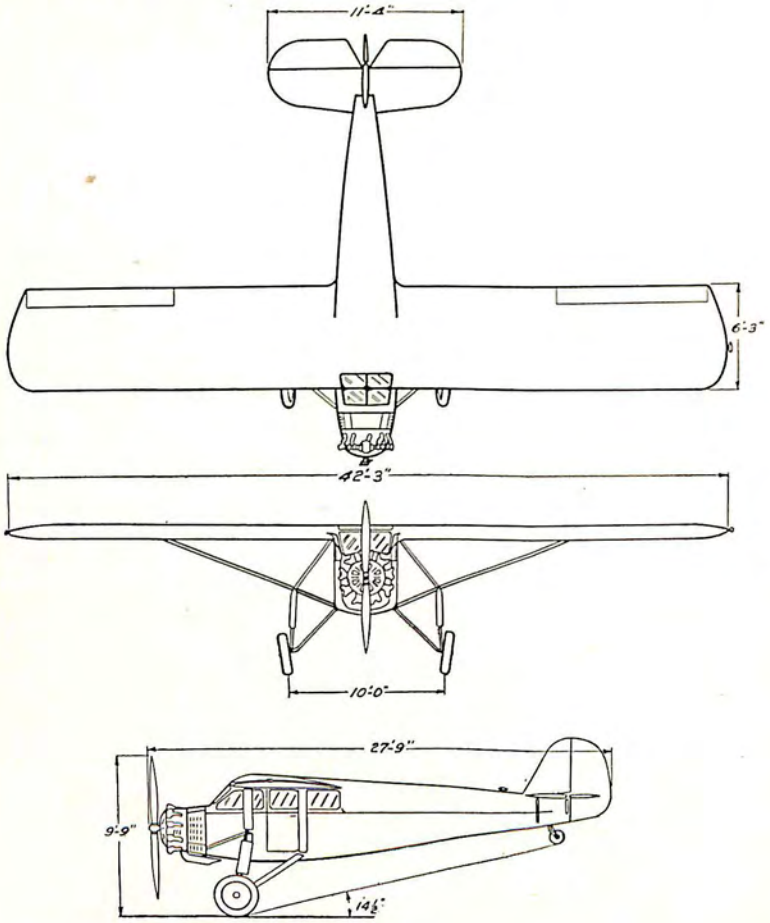


DETROIT AIRCRAFT CORPORATION
Detroit, Mich.
DETROIT LOCKHEED ALTAIR — 2 PLACE
ENGINE: PRATT & WHITNEY WASP
WRIGHT CYCLONE





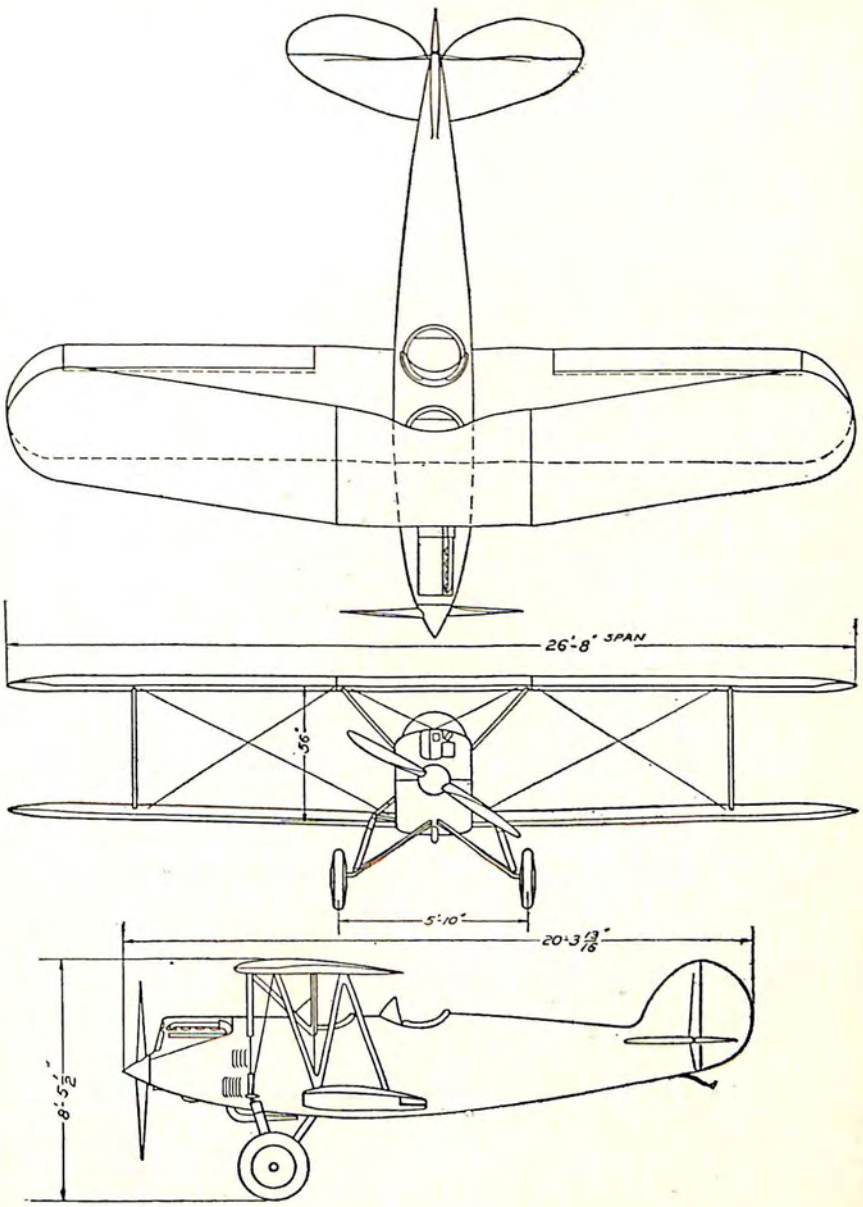
DETROIT AIRCRAFT CORPORATION
Detroit, Mich.
DETROIT LOCKHEED SIRIUS — 2 PLACE
ENGINE: PRATT & WHITNEY WASP



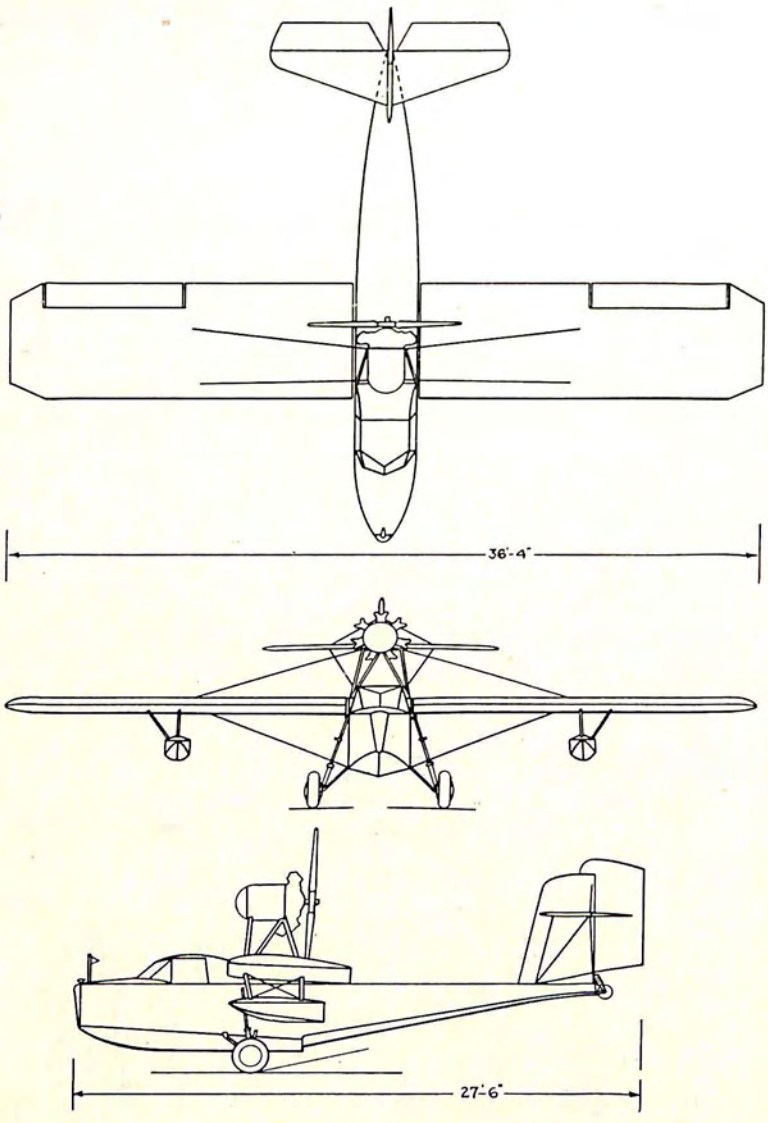
DETROIT AIRCRAFT CORPORATION
Detroit, Mich.

DETROIT RYAN C-1 — 4 PLACE

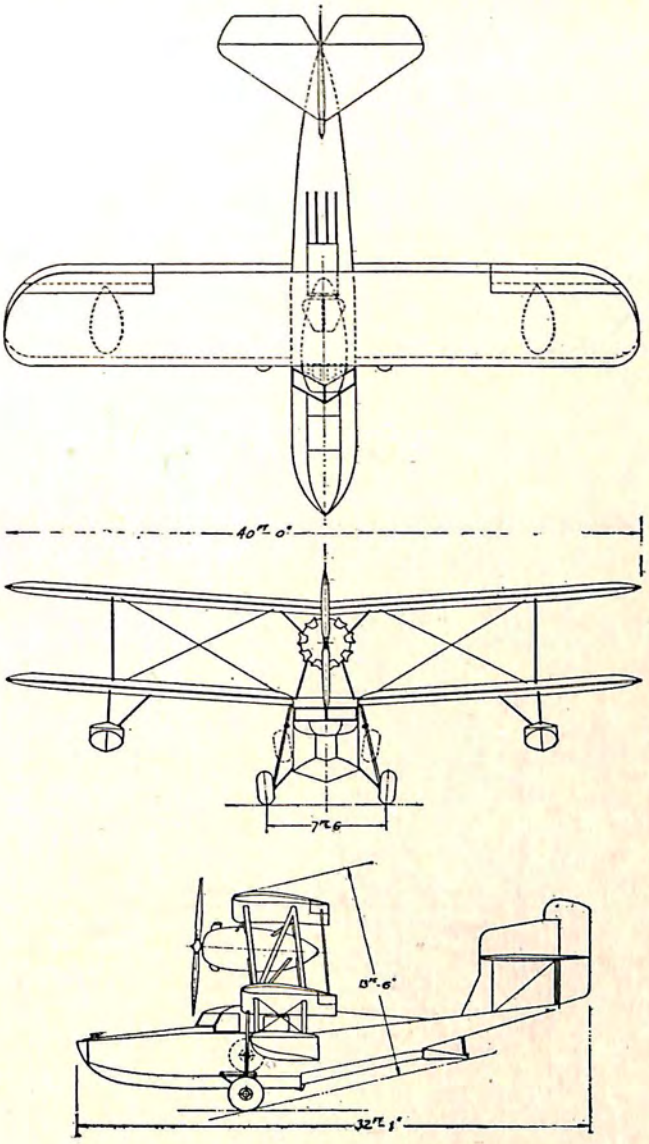
ENGINE: PACKARD DIESEL
PRATT & WHITNEY WASP, JR
WRIGHT WHIRLWIND 240



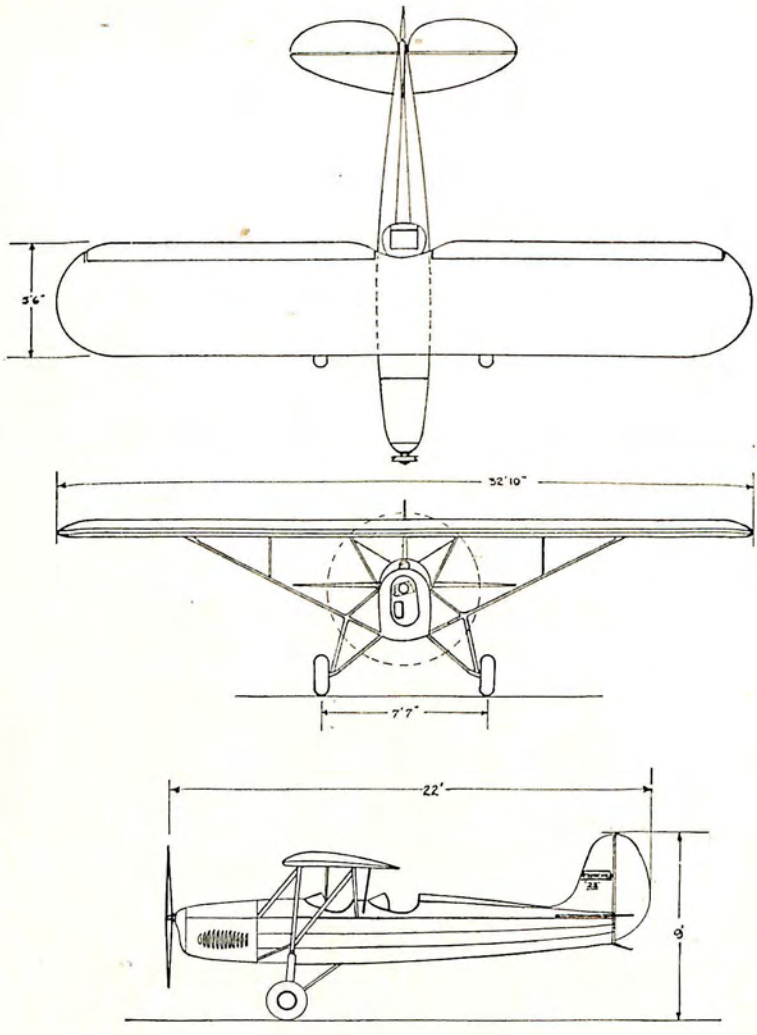
GREAT LAKES AIRCRAFT CORPORATION
Cleveland, Ohio
MODEL 2 T 1-A — 2 PLACE
ENGINE: AMERICAN CIRRUS



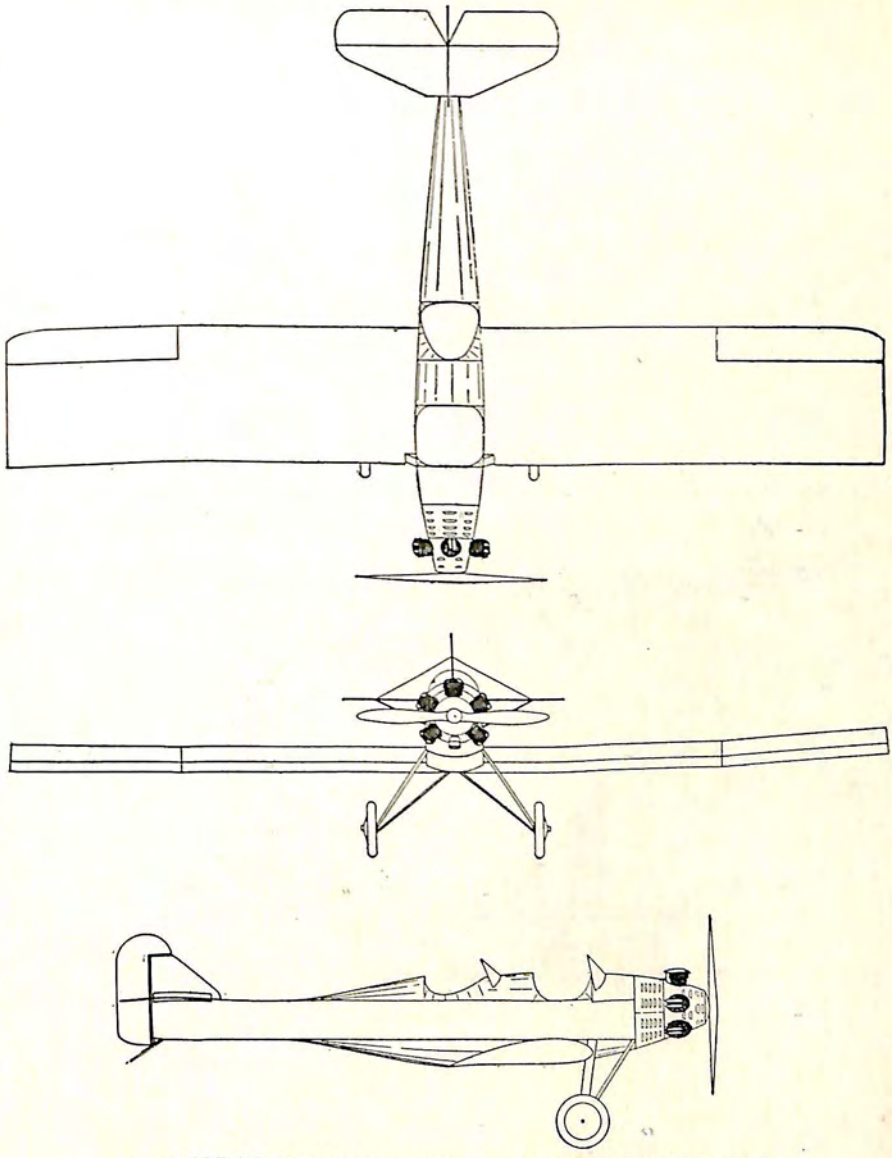
GROVER LOENING AIRCRAFT COMPANY, INC.
Garden City, L. I., N. Y.
DUCKLING — 2 PLACE
ENGINE: WARNER SCARAB



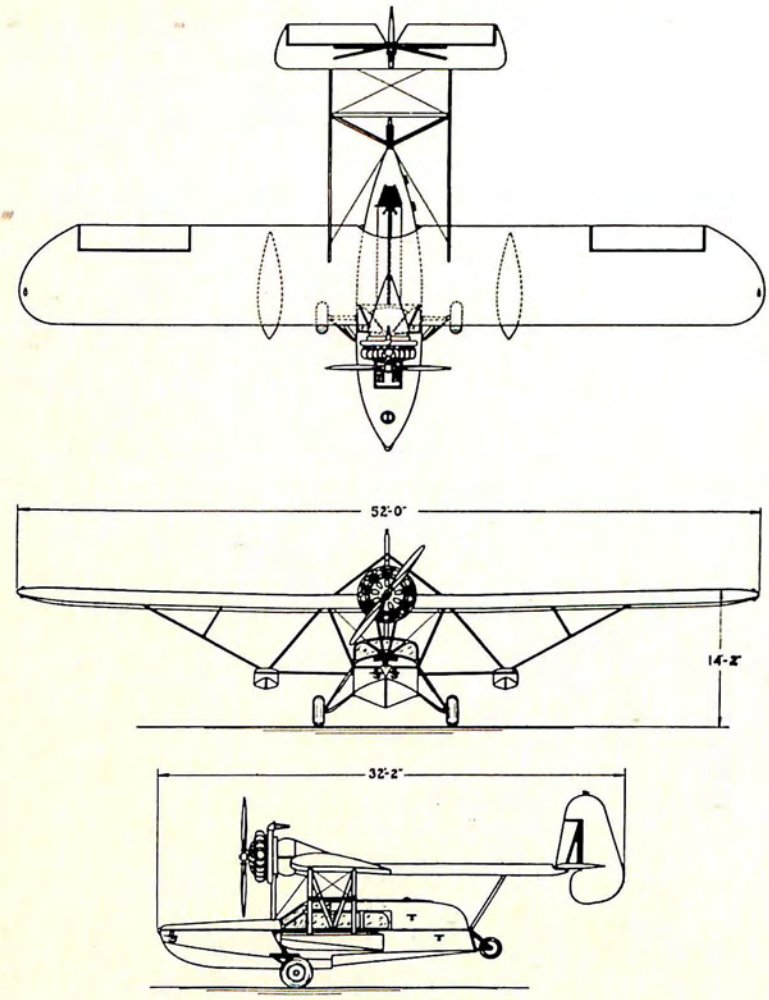
KEYSTONE AIRCRAFT CORPORATION
Bristol, Pa.
COMMUTER — 4 PLACE
ENGINE: WRIGHT WHIRLWIND 300



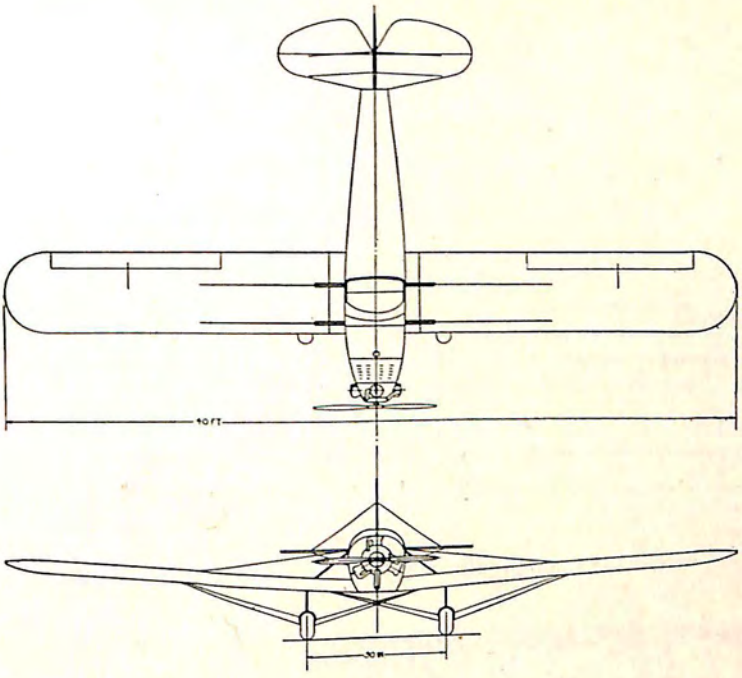
KREIDER–REISNER AIRCRAFT COMPANY, INC.
Hagerstown, Md.
FAIRCHILD 22 — 2 PLACE
ENGINE: AMERICAN CIRRUS HI-DRIVE
AMERICAN CIRRUS UPRIGHT

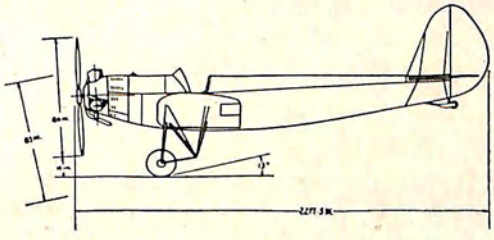


NICHOLAS-BEAZLEY AIRPLANE COMPANY, INC.
Marshall, Mo.
MODEL NB3-NB4 — 3 PLACE
ENGINE: GENET
LAMBERT
LE BLOND
WARNER SCARAB, JR.

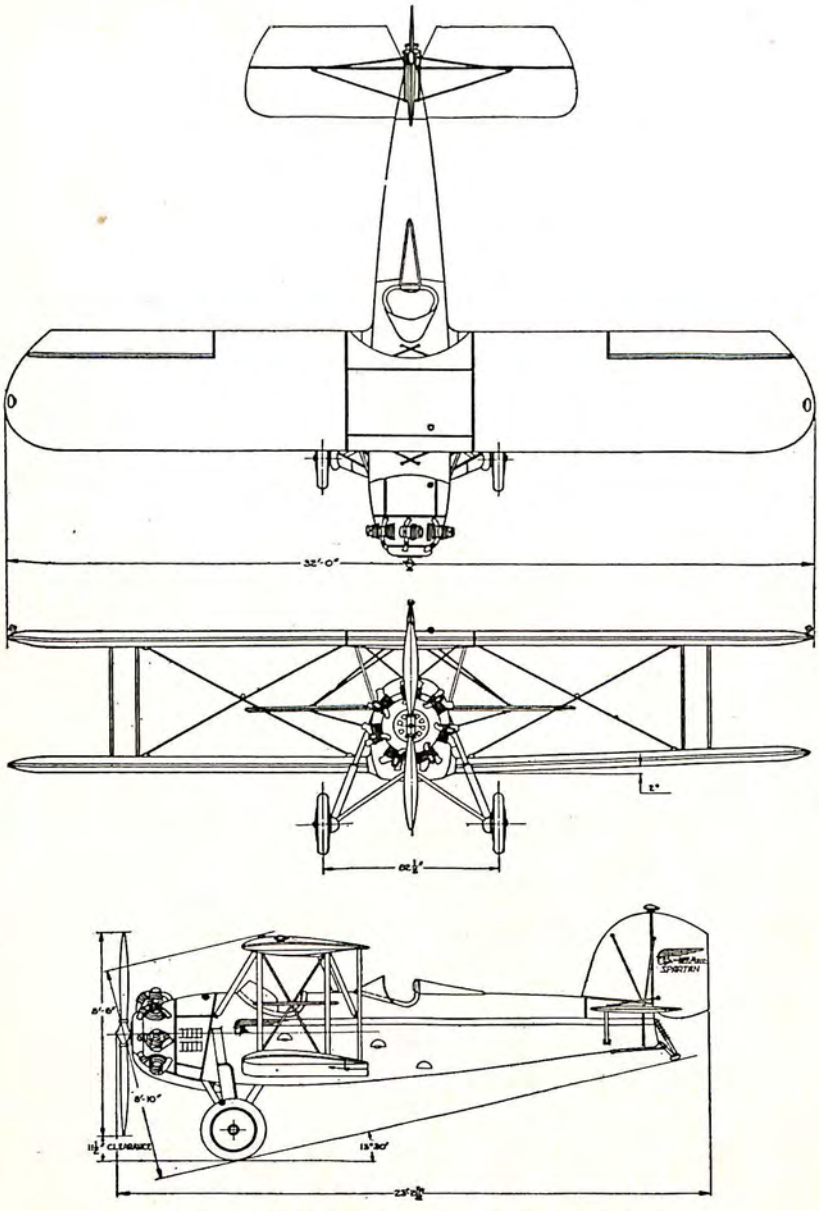


SIKORSKY AVIATION CORPORATION
Bridgeport, Conn.
AMPHIBION S-39 — 5 PLACE
ENGINE: PRATT & WHITNEY WASP, JR.





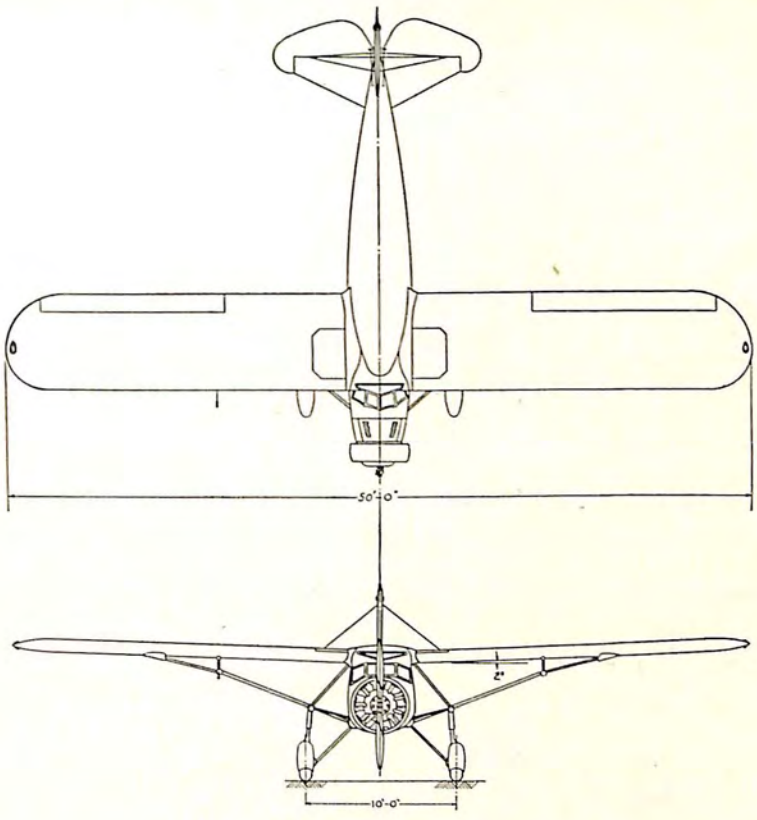
SPARTAN AIRCRAFT COMPANY, INC.
Tulsa, Okla.
MODEL C2–60 — 2 PLACE
ENGINE: JACOBS L–3

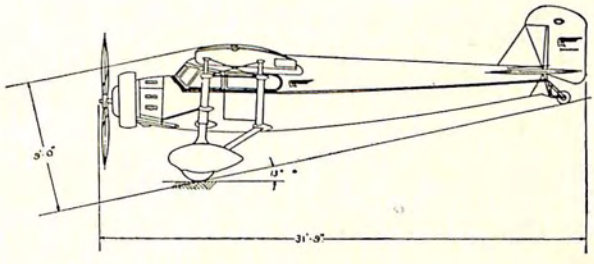


SPARTAN AIRCRAFT COMPANY, INC.
Tulsa, Okla.

MODEL C 3 — 3 PLACE

ENGINE: WRIGHT WHIRLWIND 165
WRIGHT WHIRLWIND 240

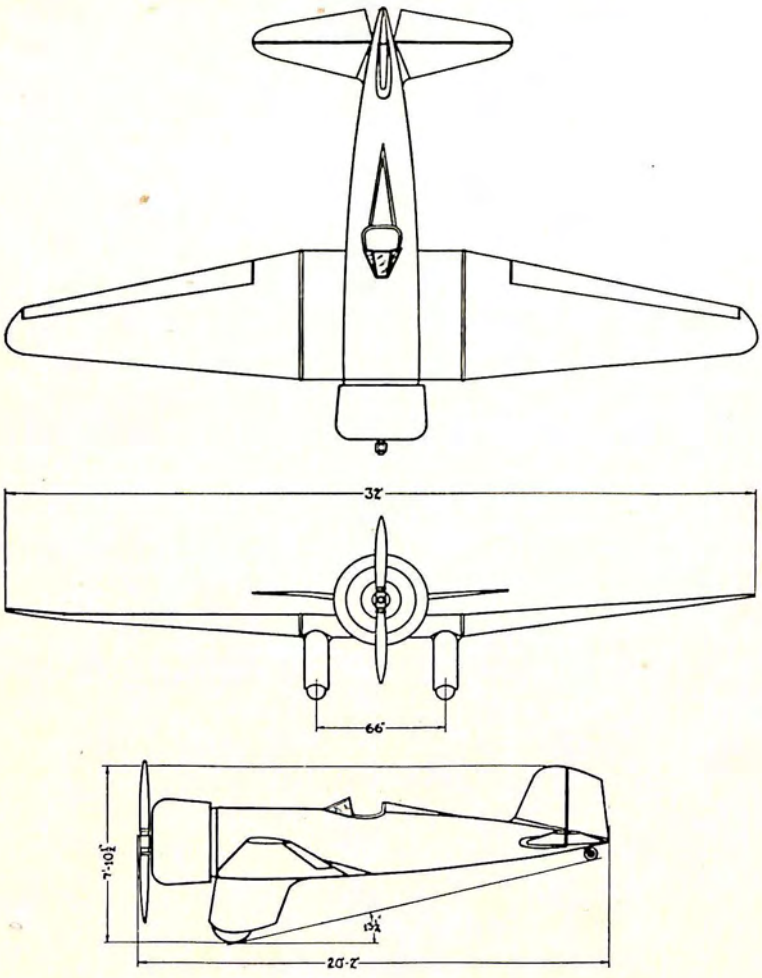




SPARTAN AIRCRAFT COMPANY, INC.
Tulsa, Okla.

MODEL C 4–C 5 — 4–5 PLACE

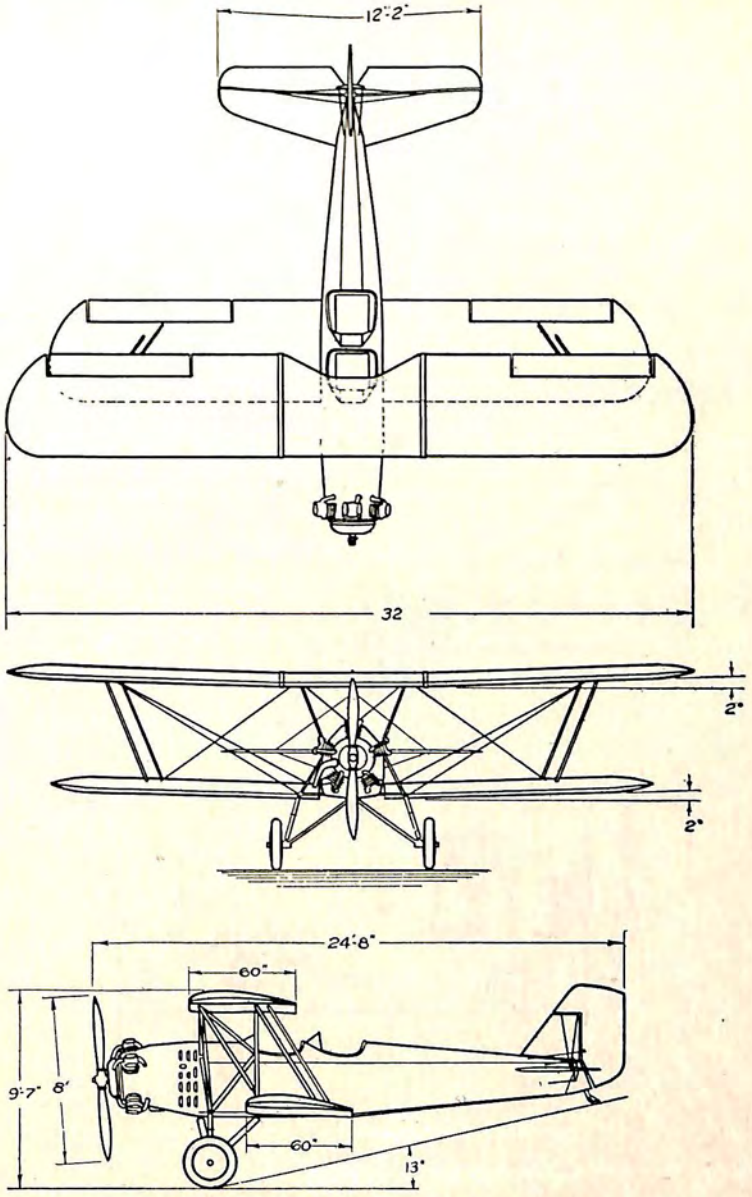
ENGINE: PRATT & WHITNEY WASP, JR.
WRIGHT WHIRLWIND 240
WRIGHT WHIRLWIND 300



STEARMAN AIRCRAFT COMPANY
Wichita, Kan.

BETA — 1 PLACE

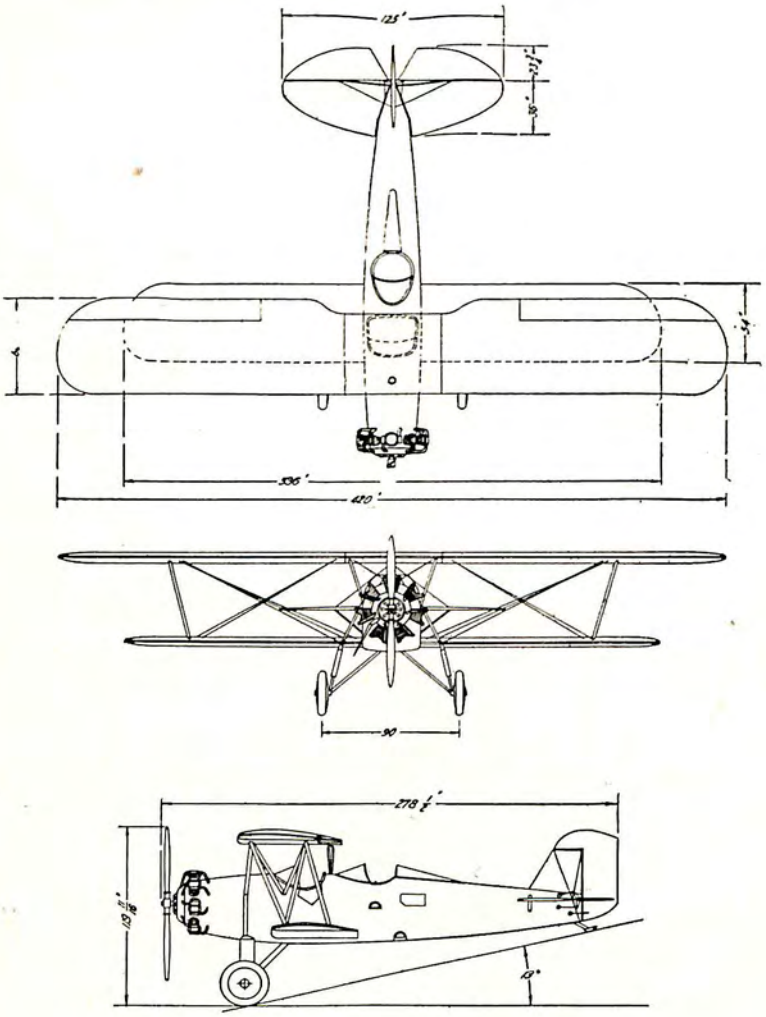
ENGINE: MENASCO
PRATT & WHITNEY WASP, JR.



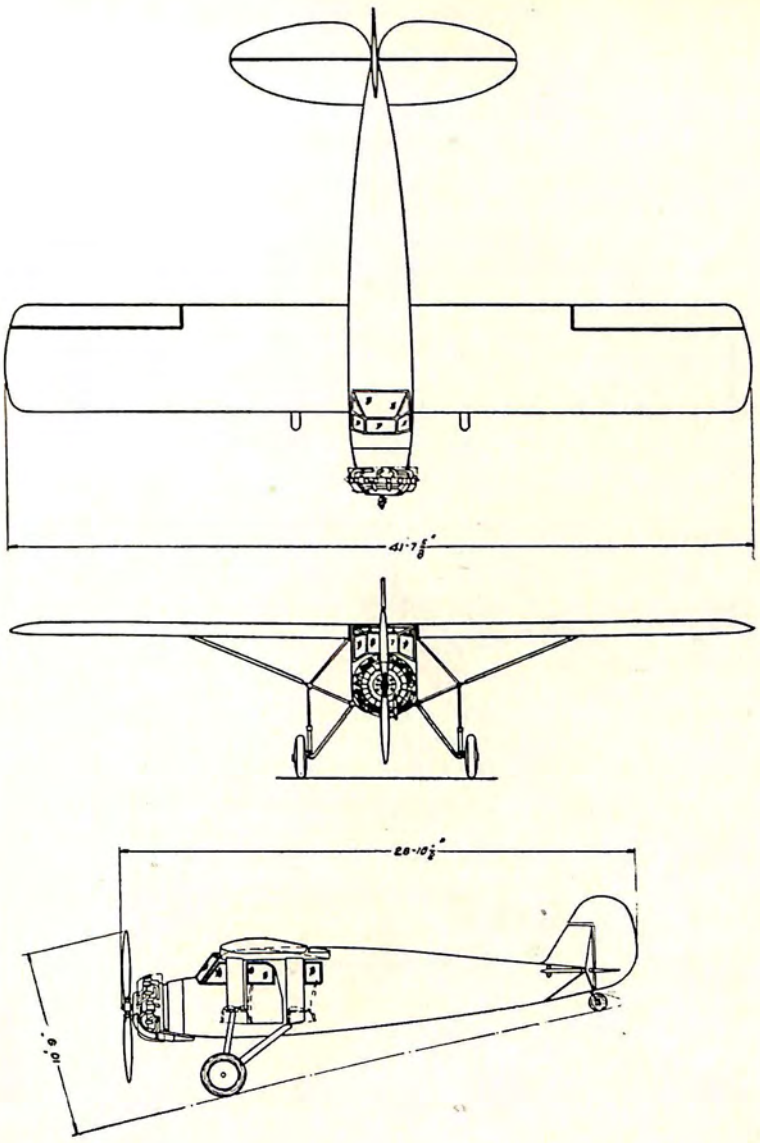
STEARMAN AIRCRAFT COMPANY
Wichita, Kan.

CLOUDBOY — 2 PLACE

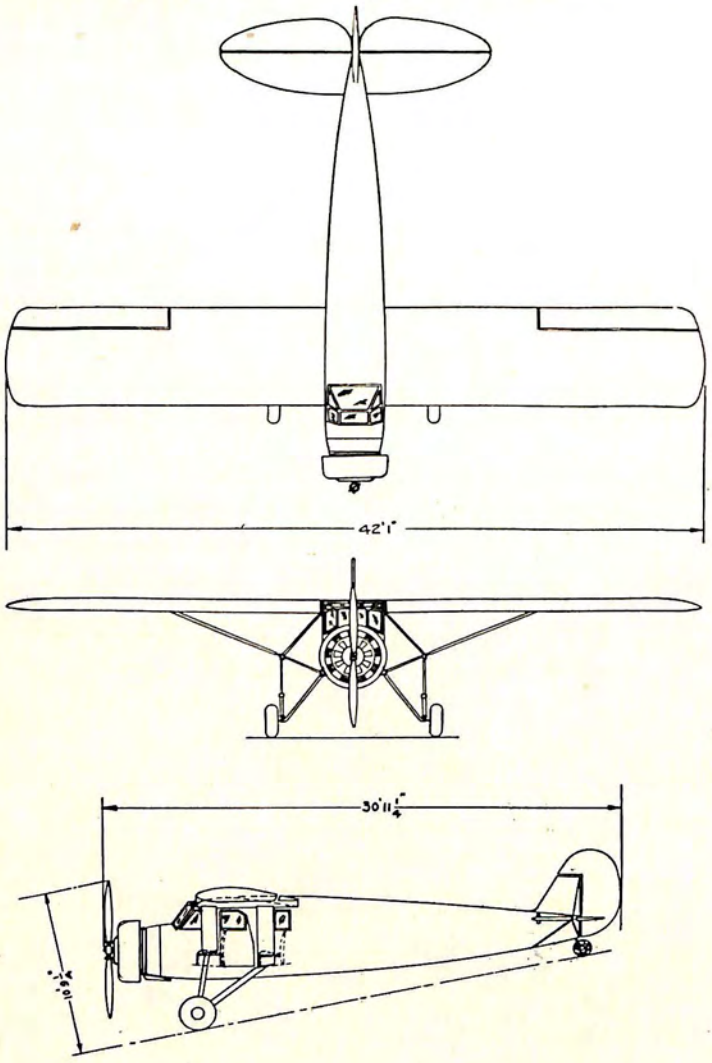
ENGINE: CONTINENTAL A–70
PRATT & WHITNEY WASP, JR,
WRIGHT WHIRLWIND 165



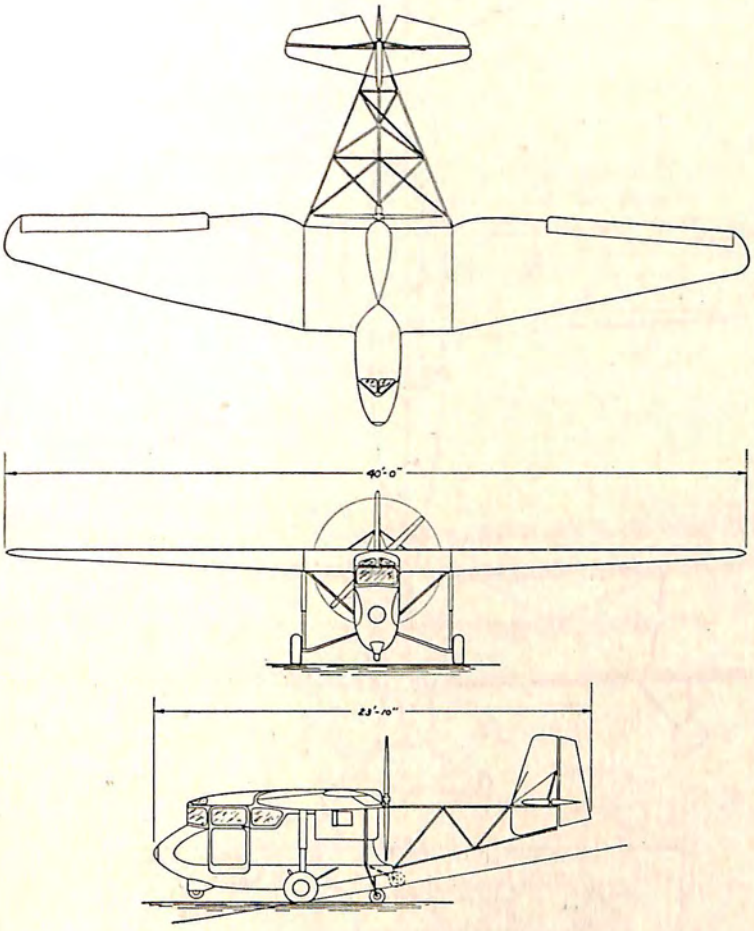
STEARMAN AIRCRAFT COMPANY
Wichita, Kan.
MODEL C 3R — 3 PLACE
ENGINE: WRIGHT WHIRLWIND 240



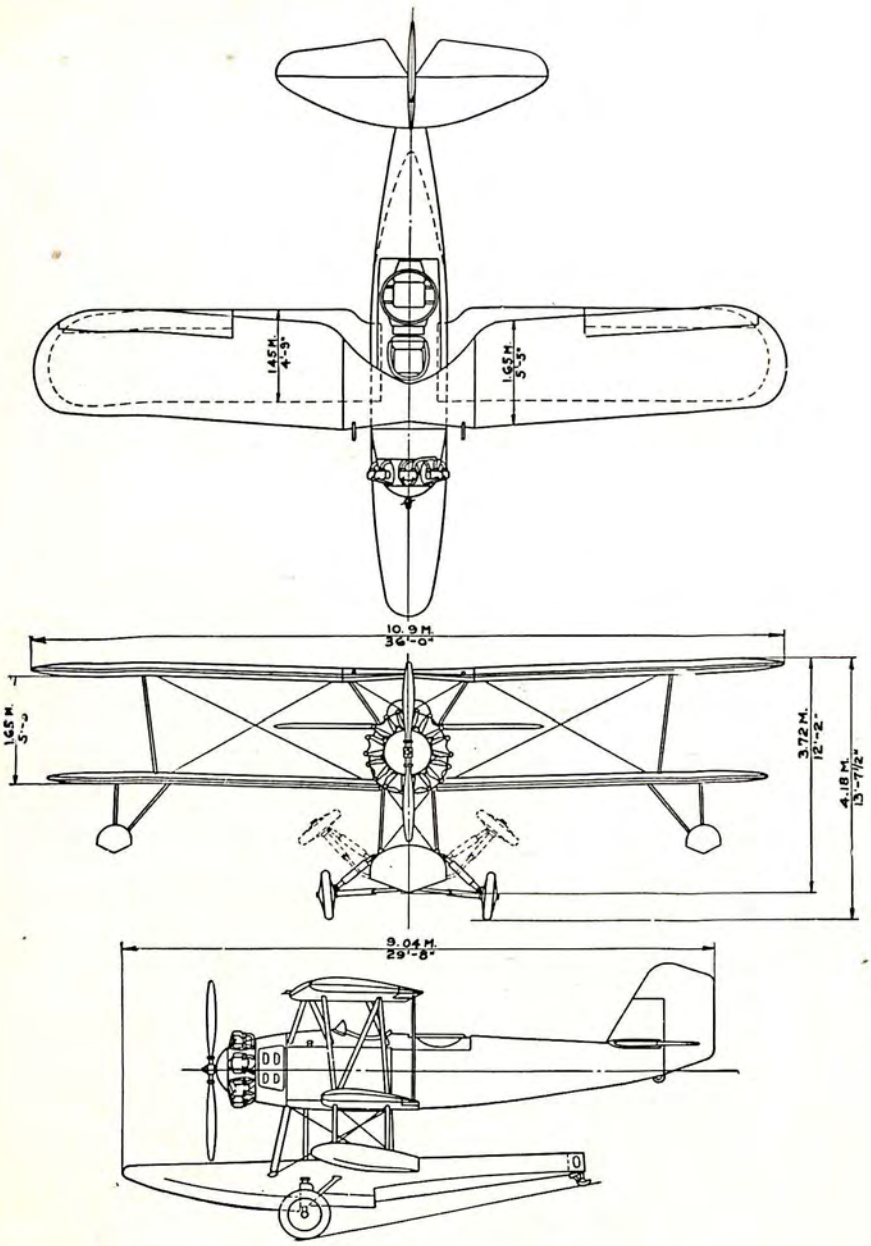
STINSON AIRCRAFT CORPORATION
Wayne, Mich.
MODEL S — 4 PLACE
ENGINE: LYCOMING



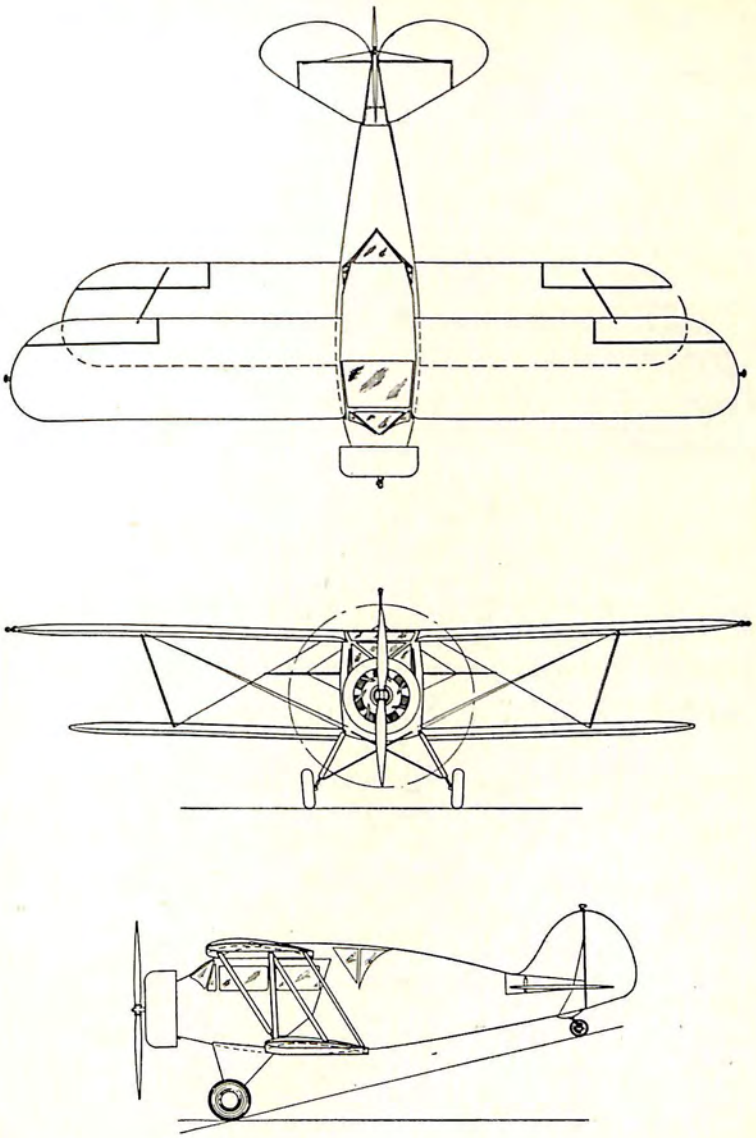
STINSON AIRCRAFT CORPORATION
Wayne, Mich.
MODEL W — 1 PLACE
ENGINE: PRATT & WHITNEY WASP, JR.



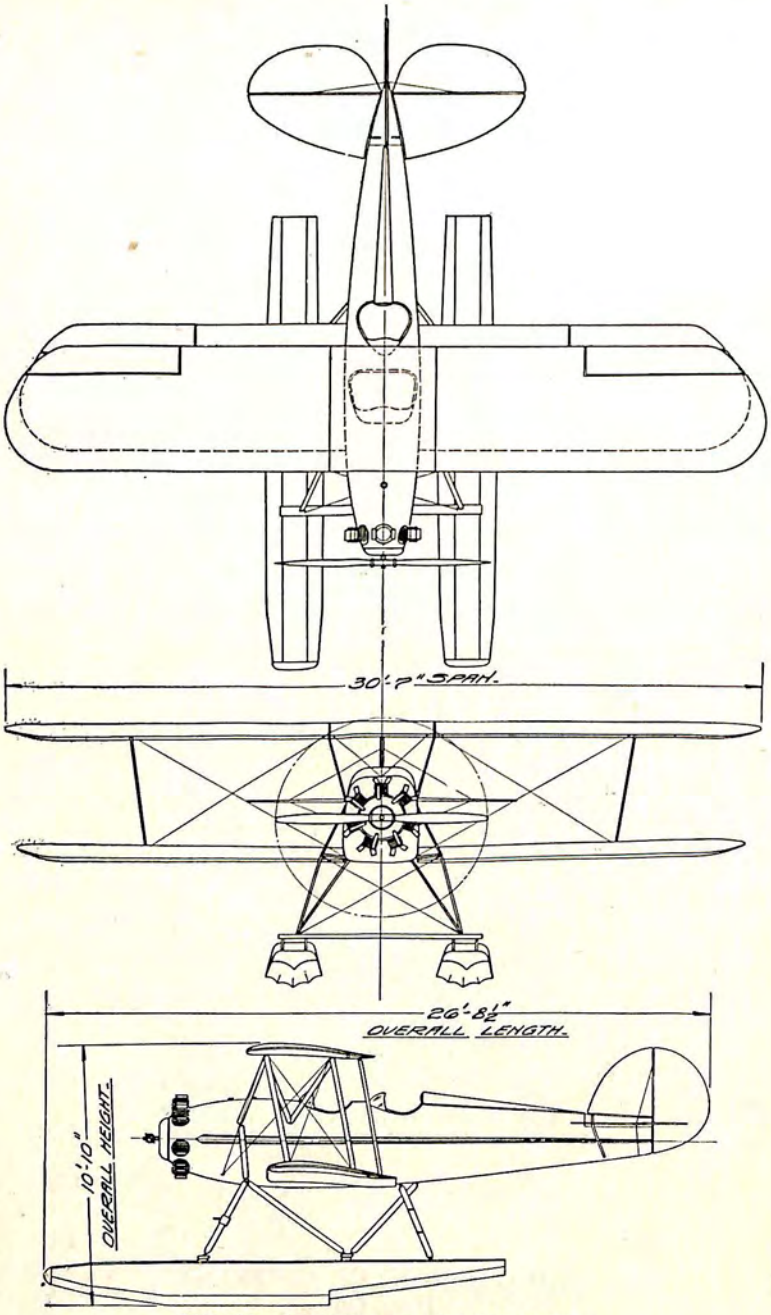
STOUT ENGINEERING LABORATORIES, INC.
Dearborn, Mich.
SKY CAR — 2 PLACE
ENGINE: MICHIGAN ROVER



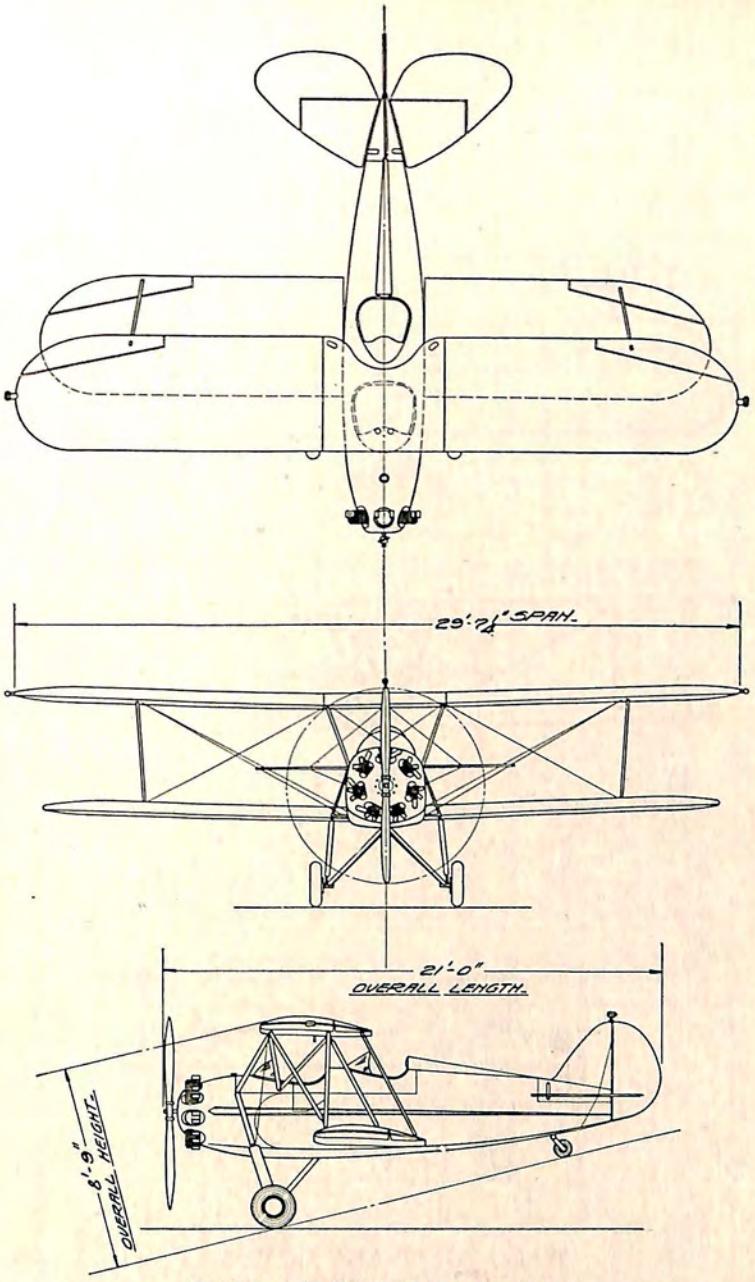
CHANCE VOUGHT CORPORATION
Hartford, Conn.
MODEL O 2U-4 — 2 PLACE
ENGINE: PRATT & WHITNEY WASP



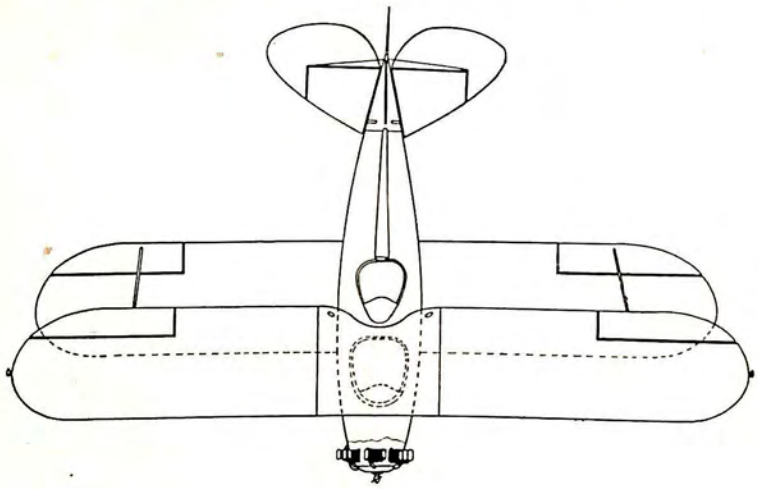
WACO AIRCRAFT COMPANY
Troy, Ohio
MODEL QDC — 4 PLACE
ENGINE: CONTINENTAL A–70

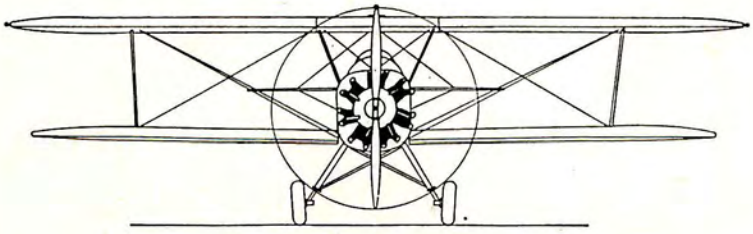


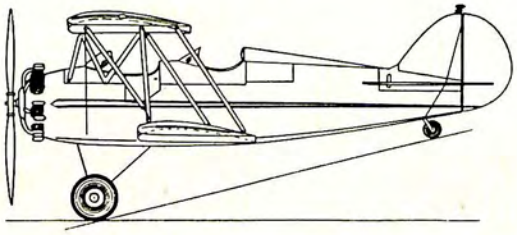
WACO AIRCRAFT COMPANY
Troy, Ohio
MODEL CSO — 3 PLACE
ENGINE: WRIGHT WHIRLWIND 165
WRIGHT WHIRLWIND 240



WACO AIRCRAFT COMPANY
Troy, Ohio
MODEL INF, RNF — 3 PLACE
ENGINE: KINNER B 5
WARNER SCARAB





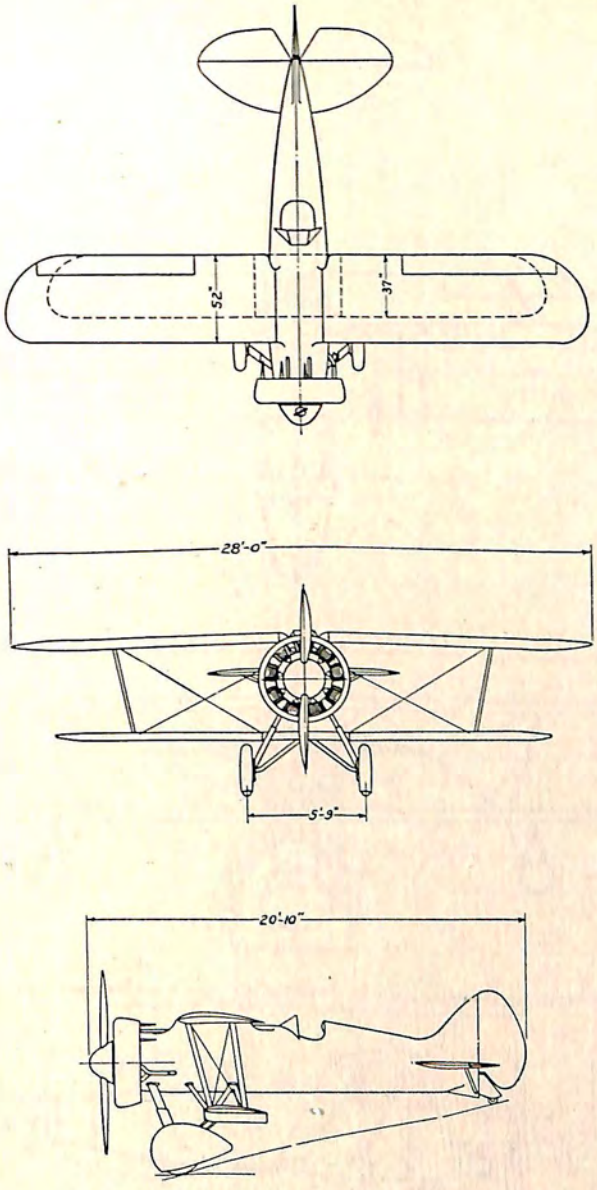


WACO AIRCRAFT COMPANY
Troy, Ohio
MODEL 2FC — 3 PLACE
ENGINE: CONTINENTAL A–70–2
JACOBS LA–1

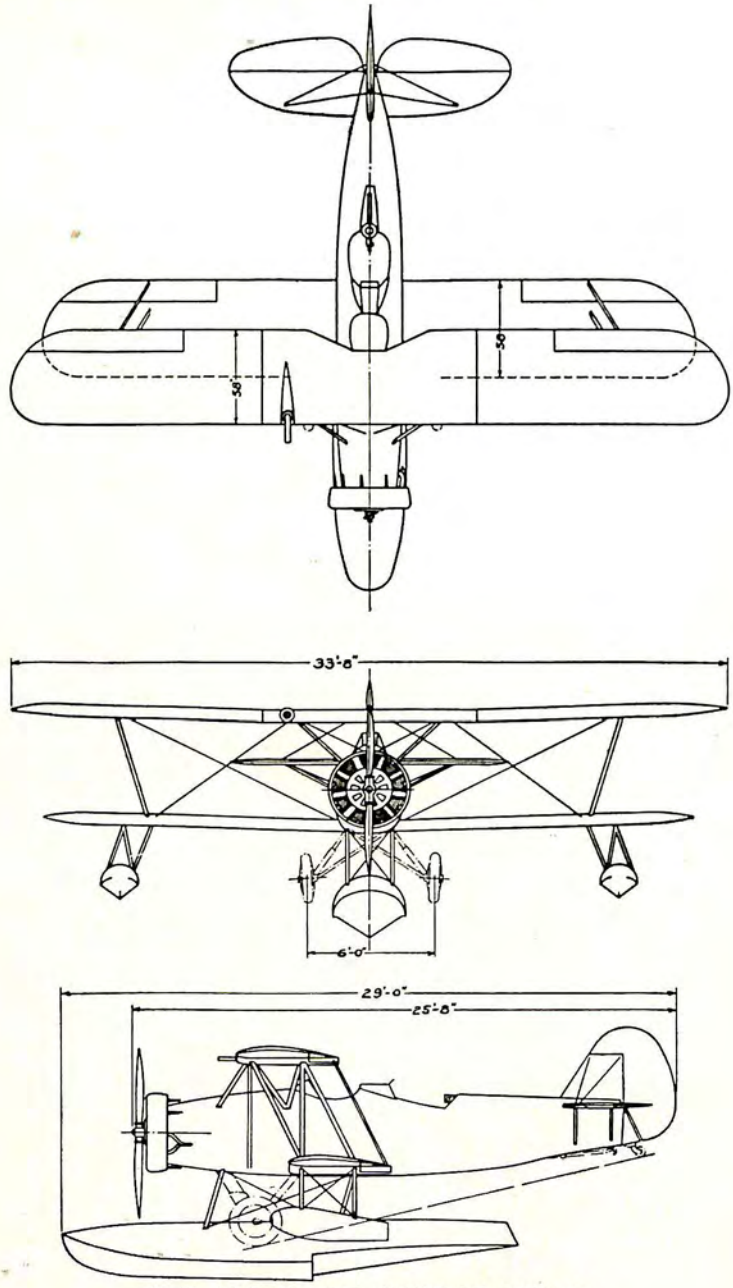
Name of Manufacturer	*Model*	*A.T.C. No.*	*Make of Engine*	*Total Rated H.P.*	*Wing Area, Sq. Ft.*	*Gross Weight, Lbs.*	*Pay Load, Lbs.*	*High Speed, M.P.H.*	*Cruising Speed, M.P.H.*	*Stalling Speed, M.P.H.*	*Service Ceiling, Ft.*	*Cruising Radius, Mi.*
Aeronautical Corp.....	Aeronca C-2	351	Aeronca E-107A	26	142.2	672	220	76	62	36	13,000	240
Aeronautical Corp.....	Aeronca PC-2	351	Aeronca E-107A	26	142.2	756	220	73	60	40	9,000	230
Aeronautical Corp.....	Aeronca C-3	396	Aeronca E-113	36	142.2	875	360	80	65	44	14,000	220
Aeronautical Corp.....	Aeronca PC-3	396	Aeronca E-113	36	142.2	963	360	76	61	46	10,000	200
Aeronautical Corp.....	Aeronca C-2N	448	Aeronca E-113	36	142.2	672	220	85	70	36	16,000	240
Alexander Aircraft.....	D-1	439	Continental A-40	37	175	962	170	80	70	28	8,500	190
Alexander Aircraft.....	D-2	449	Szekely	45	175	982	173	93	75	30	13,000	150
American Airplane.....	Pilgrim KR-21	215	Kinner K-5	100	192.6	1,635	210	105	89	50.2	9,500	360
American Airplane.....	Pilgrim KR-21B	363	Kinner B-5	125	192.6	1,730	237	115.4	98	51.8	11,000	400
Amphibions.....	P-2	370	Warner Scarab	110	192	2,100	210	95	75	52	.....	300
Amphibions.....	P-3	Pending	Continental A-70	165	222	2,500	359	112	95	52	.....	380
Bird Aircraft.....	CK	388	Kinner 3-5	125	266	2,335	510	120	100	35	17,000	550
Curtiss A. & M.....	Fledgling	191	Curtiss Challenger	185	365	2,825	.....	104	88	44	15,500	365
Curtiss-Wright Airplane	Robin	143	Curtiss Challenger	185	223	2,600	560	120	96	45	13,000	515
Curtiss-Wright Airplane	Robin	309	Curtiss Challenger	185	243	2,850	510	118.3	100	47	12,000	525
Curtiss-Wright Airplane	Moth	197	Wright Gipsy	90	.....	1,650	516	102	80	44	11,000	3,400
Curtiss-Wright Airplane	Mystery S.	.....	Wright Whirlwind Supercharged	450	150	1,940	.....	225	190	65	30,000	525
Detroit Aircraft.....	Lockheed Altair	386	Pratt-Whitney Wasp	420	275	5,200	1,215	210	176	64	21,600	560
Detroit Aircraft.....	Lockheed Sirius	300	Pratt-Whitney Wasp	420	275	4,600	972	175	143	61	18,000	800
Detroit Aircraft	Ryan C-1	346	Wright Whirlwind 240	240	219	3,350	568	128	105	55	14,000	615
Great Lakes.....	2T-1A	228	American Cirrus	90	187.6	1,580	223	110	90	45	13,000	370
Keystone Aircraft	Commuter	261	Wright Whirlwind 300	300	437	4,130	640	112	87	47	12,000	400
Sikorsky.....	S-39	375	Pratt & Whitney Wasp Jr.	300	350	4,000	717	123	100	50	14,000	403
Spartan Aircraft	C2-60	427	Jacobs L-3	55	162	1,195	190	93	83	39	13,000	350
Spartan Aircraft.....	C4-225	310	Wright Whirlwind 240	240	300	3,515	.....	130	109	51	15,000	615
Spartan Aircraft.....	C4-300	383	Wright Whirlwind 300	300	300	3,965	660	143	122	56	15,400	642
Spartan Aircraft.....	C4-301	394	Pratt & Whitney Wasp Jr.	300	300	4,056	710	145	124	56.5	15,200	648
Spartan Aircraft.....	C5-301	389	Pratt & Whitney Wasp Jr.	300	300	4,175	805	145	124	57.5	14,600	648
Stearman Aircraft.....	Beta	Pending	Menasco	165	137	1,770	255	170	144	51	22,700	560

PRIVATE OPERATION AND AERIAL SERVICE

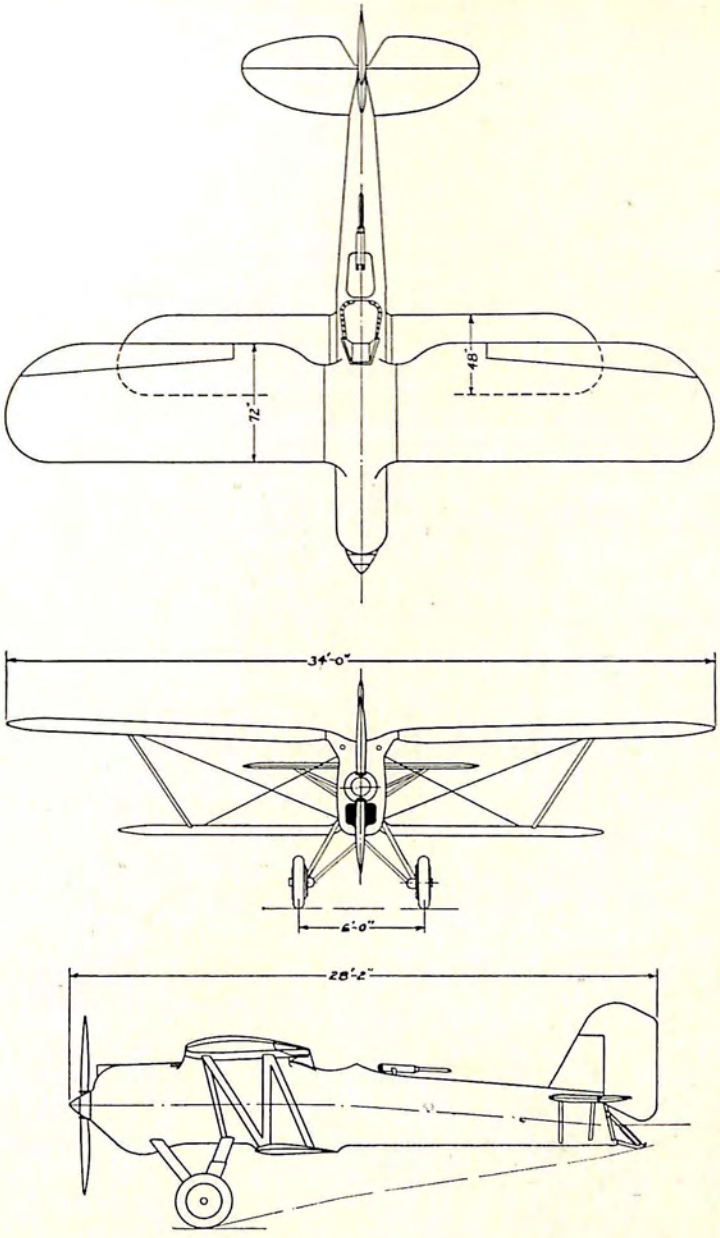
Name of Manufacturer	*Model*	*A.T.C. No.*	*Make of Engine*	*Total Rated H.P.*	*Wing Area, Sq. Ft.*	*Gross Weight, Lbs.*	*Pay Load, Lbs.*	*High Speed, M.P.H.*	*Cruising Speed, M.P.H.*	*Stalling Speed, M.P.H.*	*Service Ceiling, Ft.*	*Cruising Radius, Mi.*
Stearman Aircraft.....	Beta	Pending	Pratt & Whitney Wasp Jr.	300	137							
Stearman Aircraft.....	C 3R	251	Wright Whirlwind 240	240	288	2,754	361	136	110	53	16,600	458
Stearman Aircraft	C 3R Seaplane	251	Wright Whirlwind 240	240	288	3,050	331	131	105	55	14,000	437
Stearman Aircraft.....	Cloudboy 6A	365	Wright Whirlwind 165	165	272.2	2,400	256	110	87	45	12,300	395
Stearman Aircraft.....	Cloudboy 6D	.....	Pratt & Whitney Wasp Jr.	300	272.2							
Stearman Aircraft.....	Cloudboy 6F	371	Continental A-70	165	272.2	2,400	262	110	87	45	12,300	395
Stinson Aircraft.....	W	435	Pratt & Whitney Wasp Jr.	300	235	3,650	610	140	118	57.5	18,000	470
Stinson Aircraft.....	S	423	Lycoming	215	235	3,265	579	120	100	56	11,000	380
Chance Vought.....	O2U-4 Landplane	.....	Pratt & Whitney Wasp S.C.	450	318.5	4,008	1,462	140	120	58	16,100	515
Chance Vought.....	02U-4 Seaplane	.....	Pratt & Whitney Wasp	450	318.5	4,248	1,462	135	115	59	14,500	490
Waco Aircraft.....	QDC	412	Continental A-70	165	245	2,652	660	120	105	45	.....	442
Waco Aircraft.....	QCF	416	Continental A-70	165	241.4	2,300	518	126	108	40	.....	455
Waco Aircraft.....	INF	345	Kinner B-5	125	241.4	1,938	355	112	95	38	.....	448
Waco Aircraft.....	RNF	311	Warner Scarab	110	241.4	1,938	372	108	92	38	.....	432
Waco Aircraft.....	CSO	240	Wright Whirlwind 240	240	288	2,600	364	128	110	44	.....	550



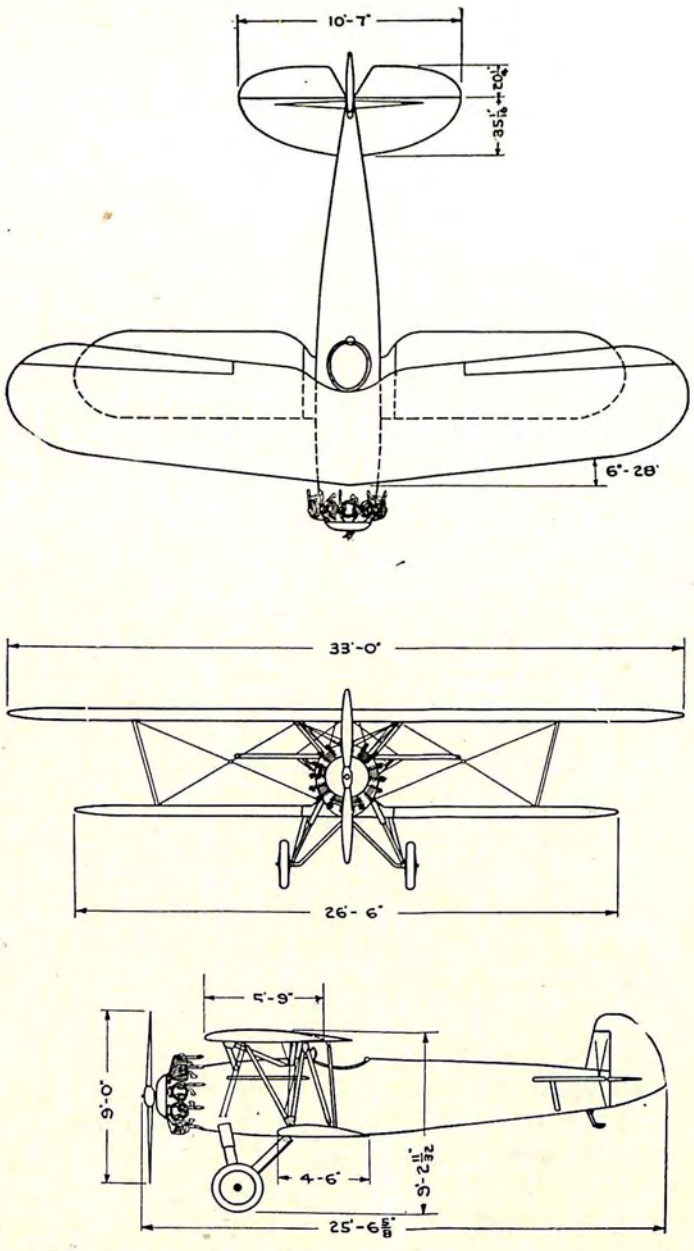
B/J AIRCRAFT CORPORATION
Baltimore, Md.
FIGHTER XFJ-2
ENGINE: PRATT & WHITNEY WASP



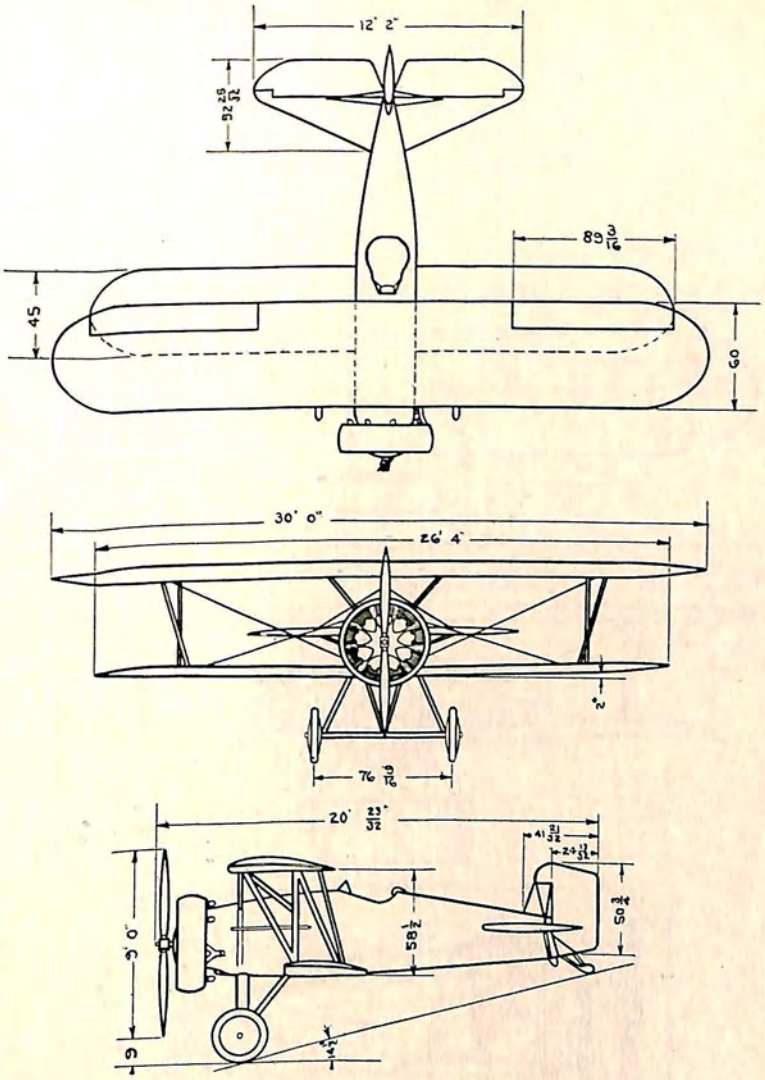
B/J AIRCRAFT CORPORATION
Baltimore, Md.
OBSERVATION XOJ–1
ENGINE: PRATT & WHITNEY WASP, JR.



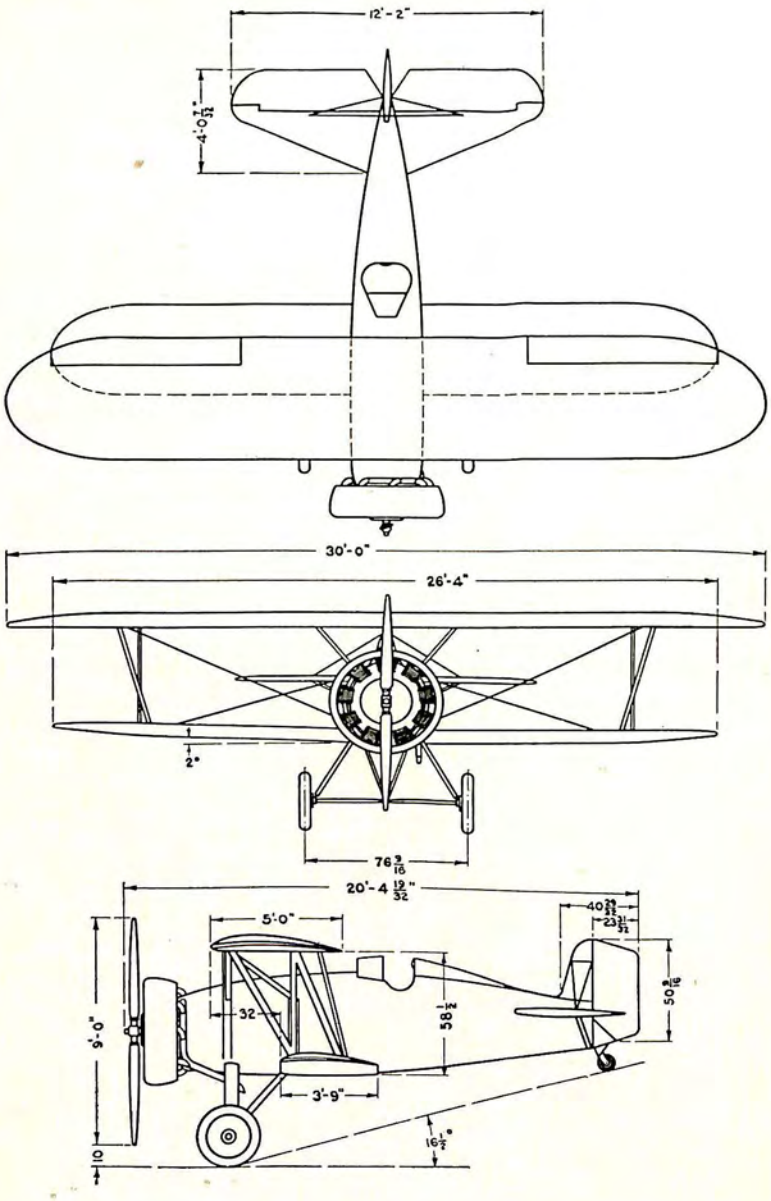
B/J AIRCRAFT CORPORATION
Baltimore, Md.
PURSUIT V 1 P–16
ENGINE: CURTISS CONQUEROR



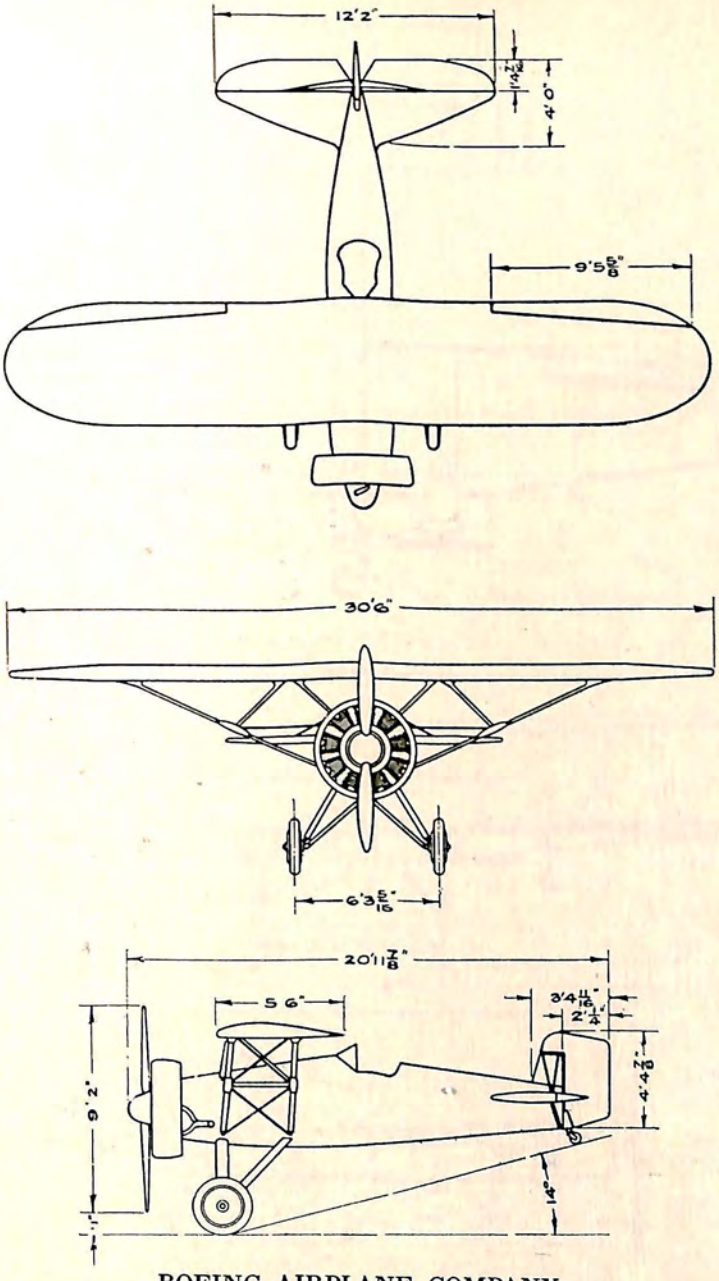
BOEING AIRPLANE COMPANY
Seattle, Wash.
FIGHTER F-3—B-1
ENGINE: PRATT & WHITNEY WASP



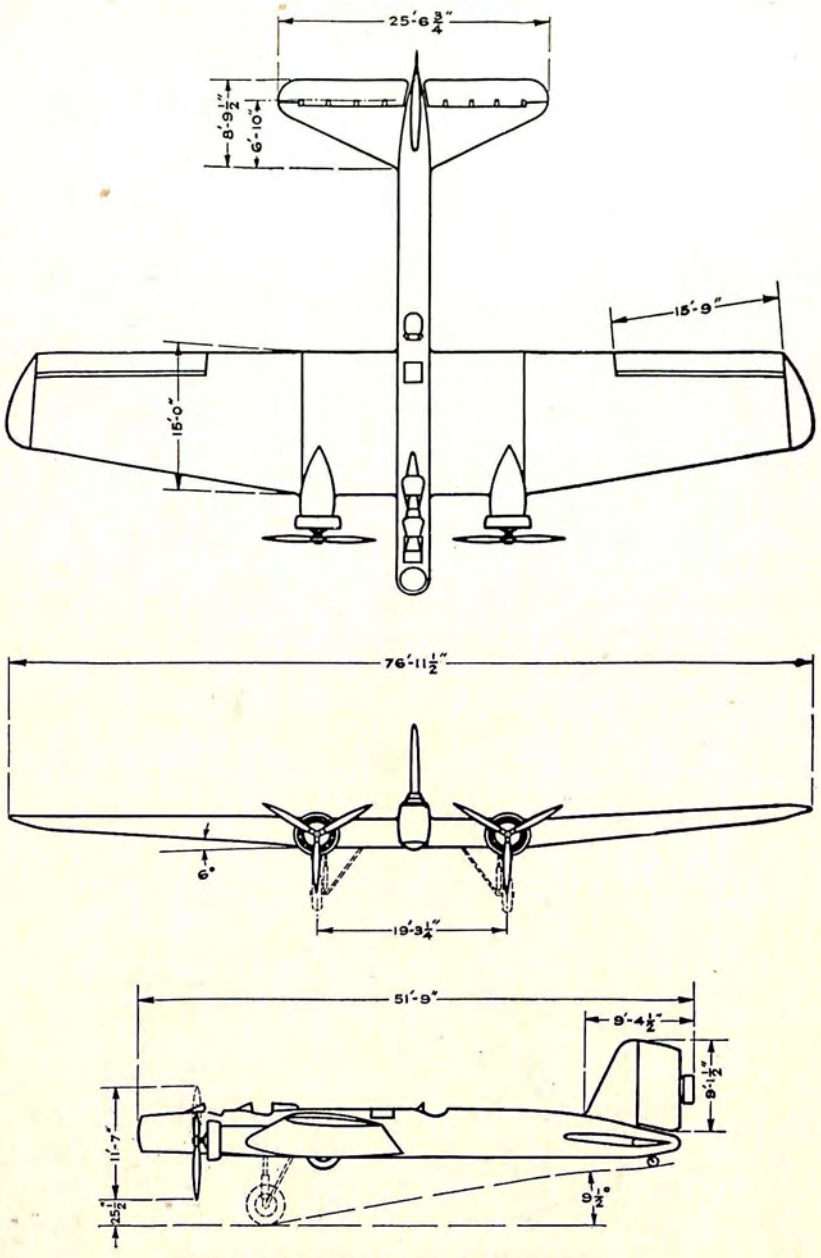
BOEING AIRPLANE COMPANY
Seattle, Wash.
MODEL P 12 C—F 4 B 2
ENGINE: PRATT & WHITNEY WASP



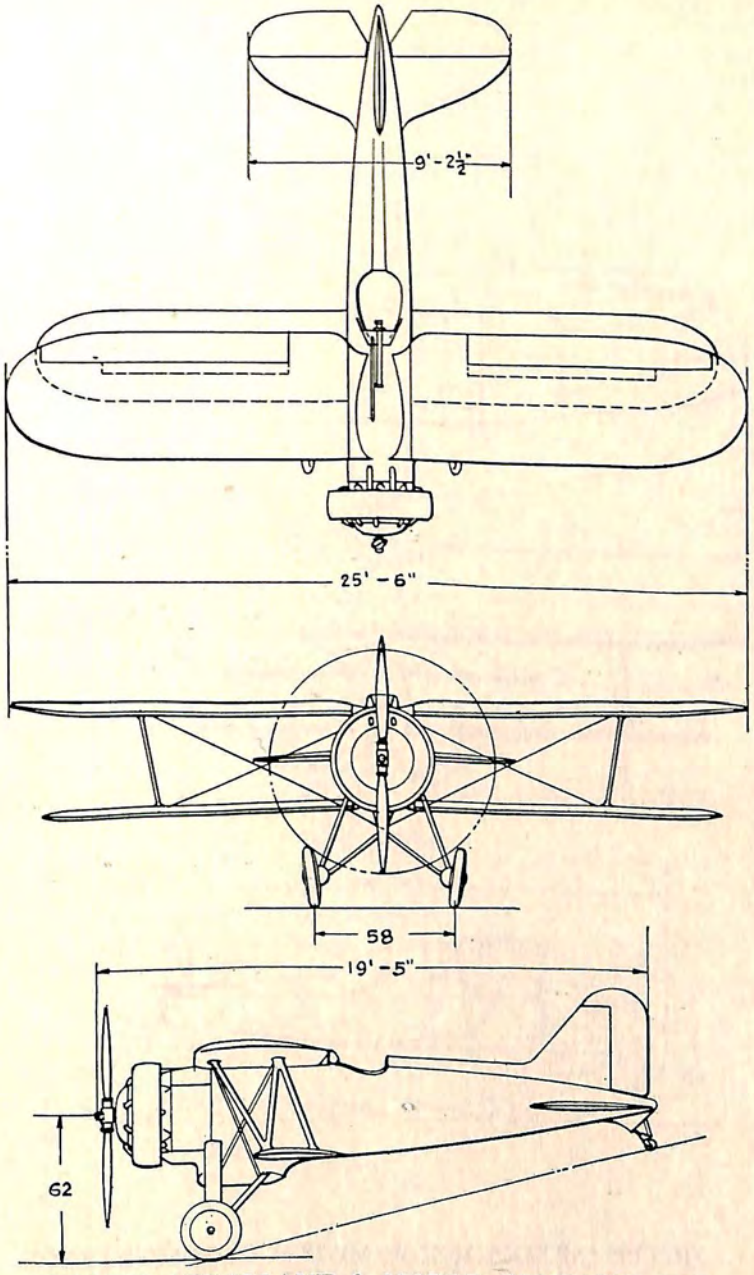
BOEING AIRPLANE COMPANY
Seattle, Wash.
MODEL P12E — F4B3
ENGINE: PRATT & WHITNEY WASP



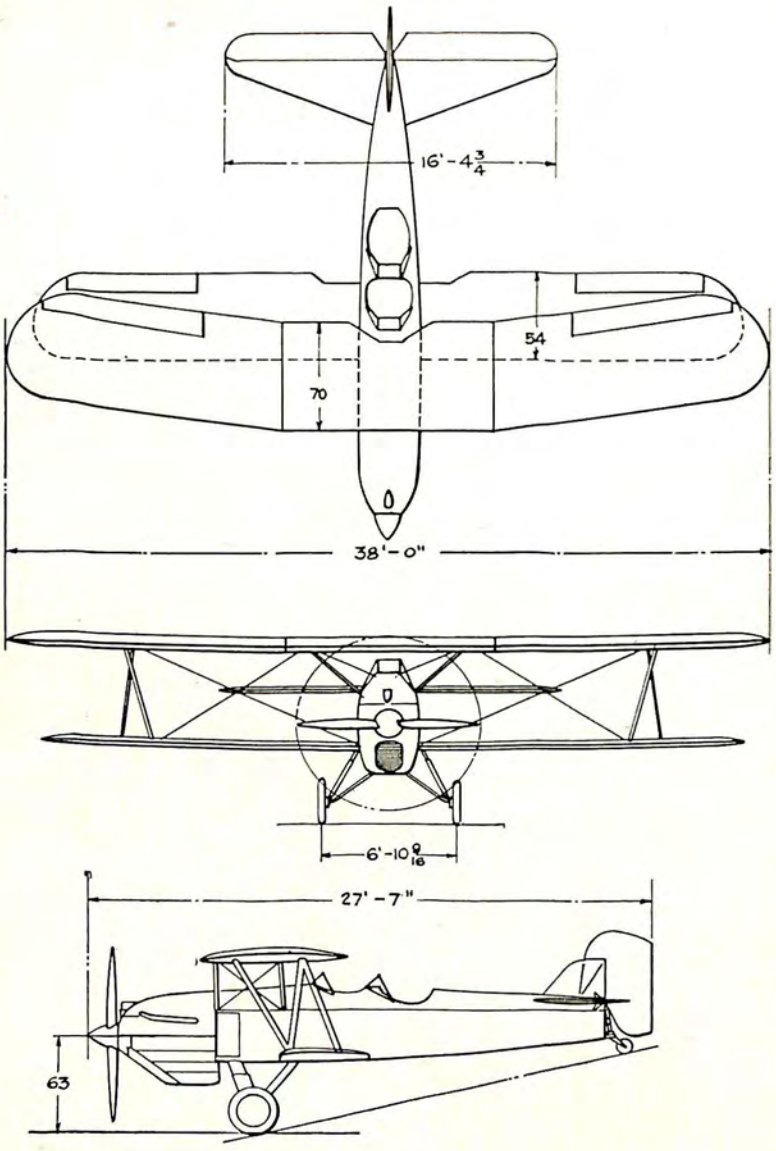
BOEING AIRPLANE COMPANY
Seattle, Wash.
MODEL 202
ENGINE: PRATT & WHITNEY WASP



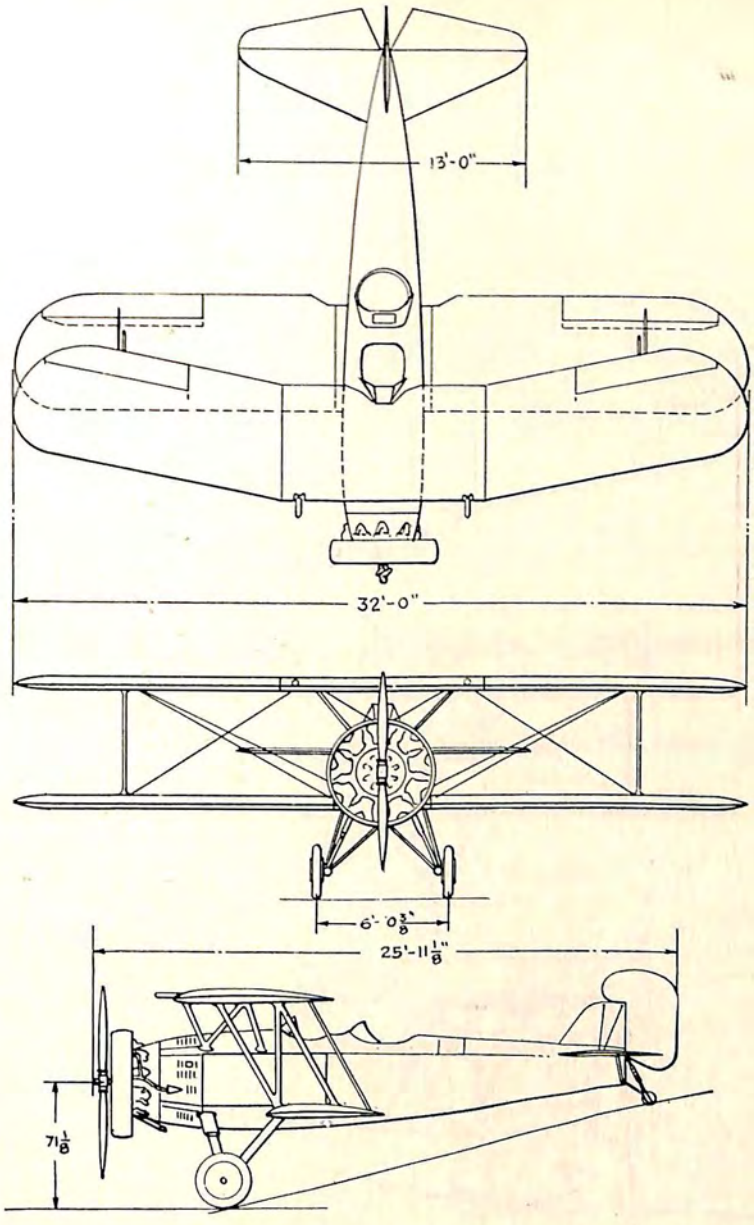
BOEING AIRPLANE COMPANY
Seattle, Wash.
MODEL 215 BOMBER
ENGINE: TWO PRATT & WHITNEY HORNETS, GEARED



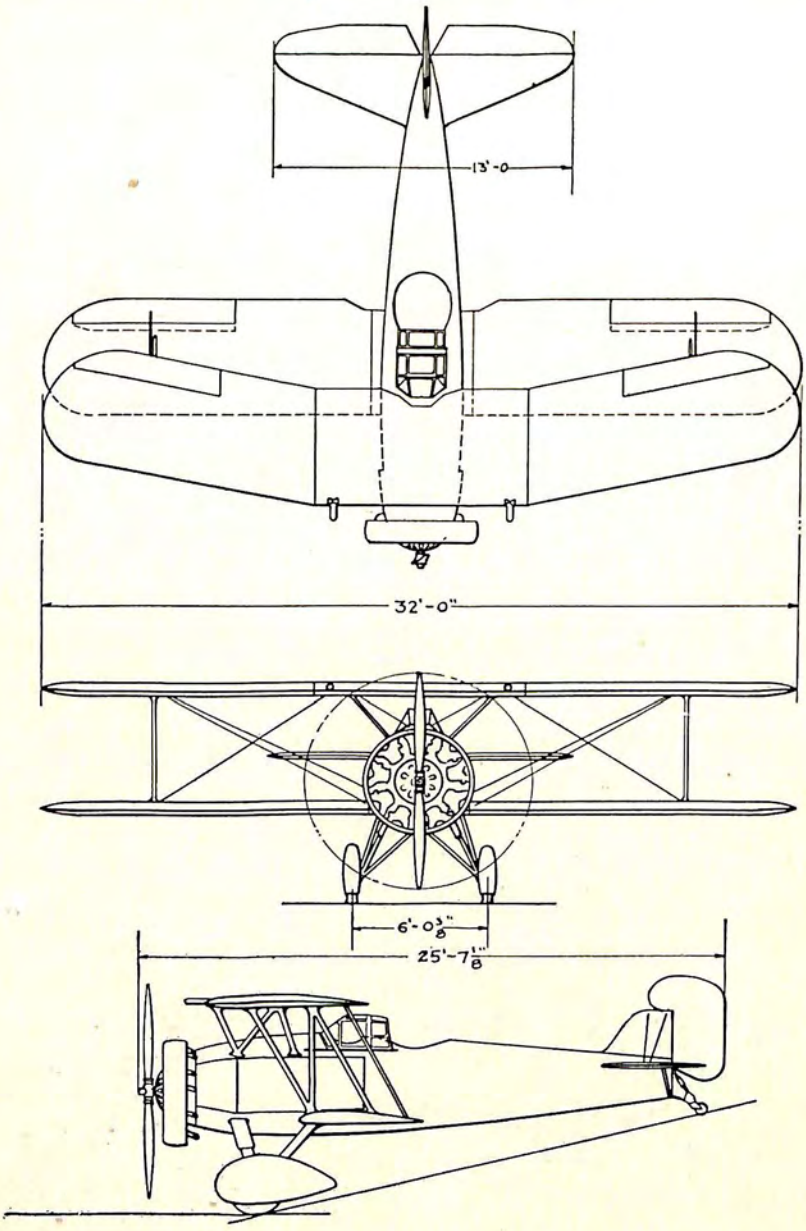
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Buffalo, N. Y.
FIGHTER XF9C–1
ENGINE: WRIGHT WHIRLWIND



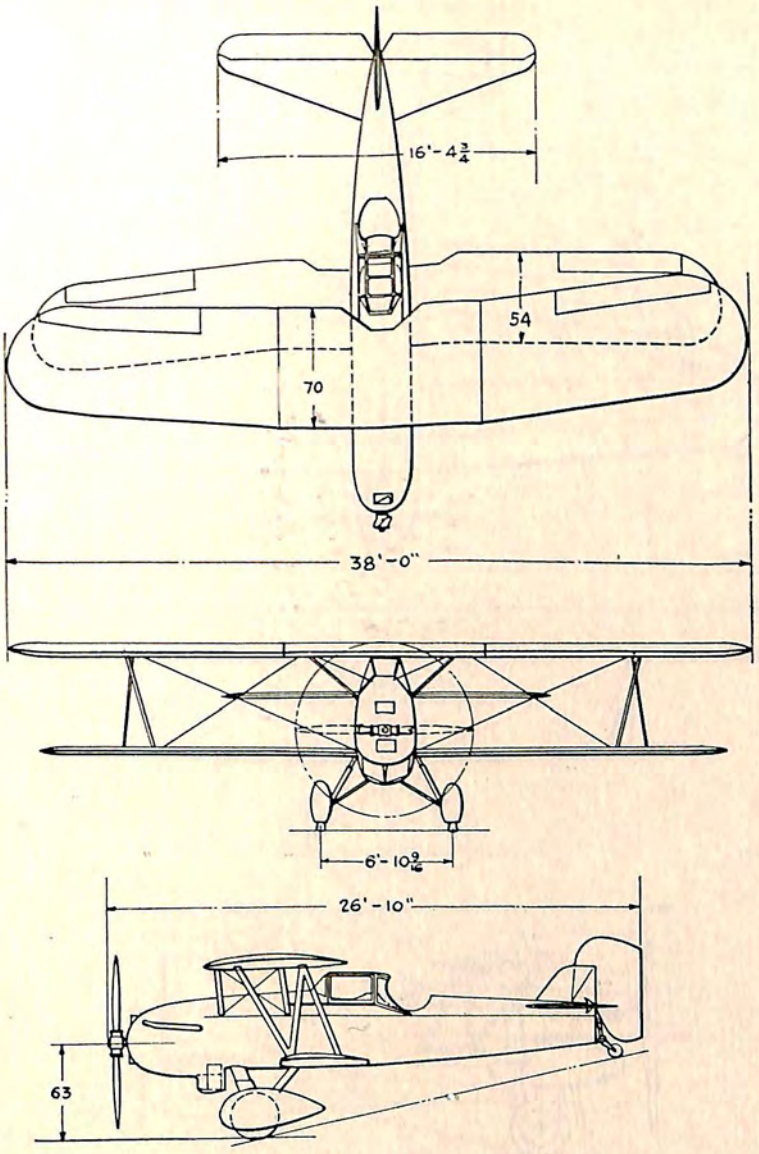
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Buffalo, N. Y.
OBSERVATION O1-G
ENGINE: CURTISS D-12



CURTISS AEROPLANE & MOTOR COMPANY, INC.
Buffalo, N. Y.
OBSERVATION O2C–1
ENGINE: PRATT & WHITNEY WASP



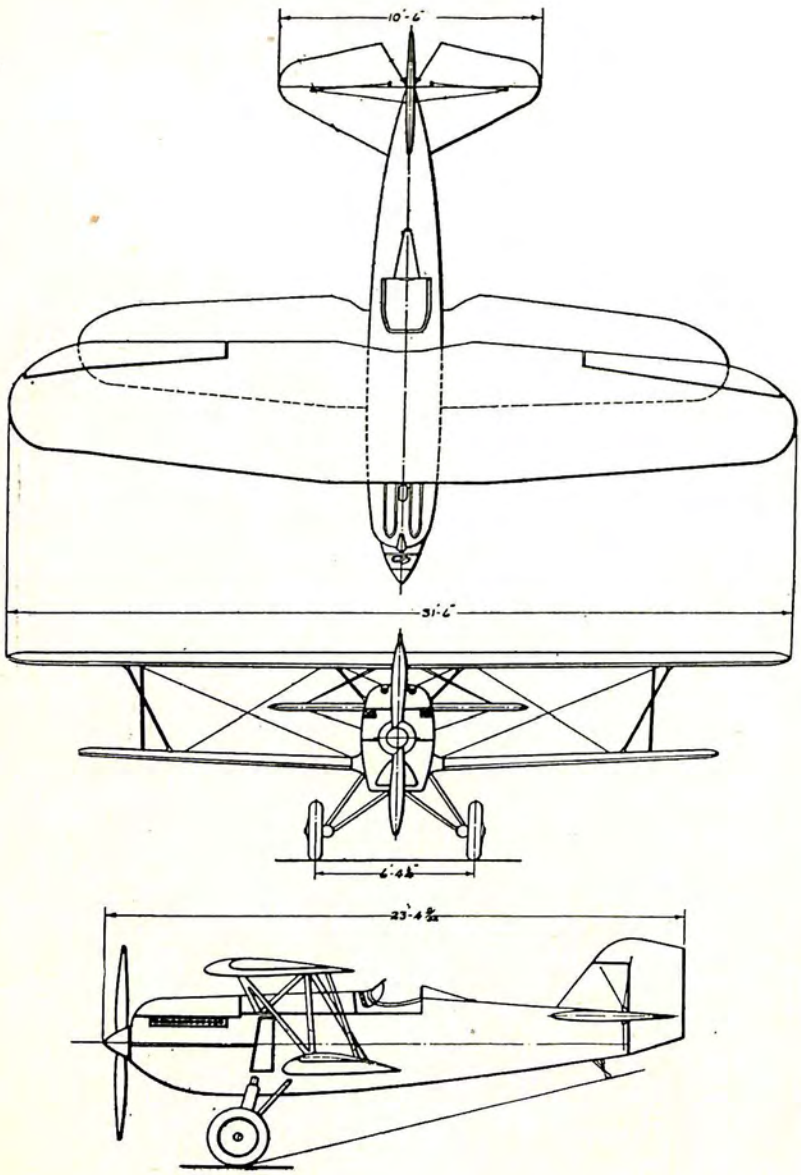
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Buffalo, N. Y.
OBSERVATION O2C–2
ENGINE: WRIGHT CYCLONE



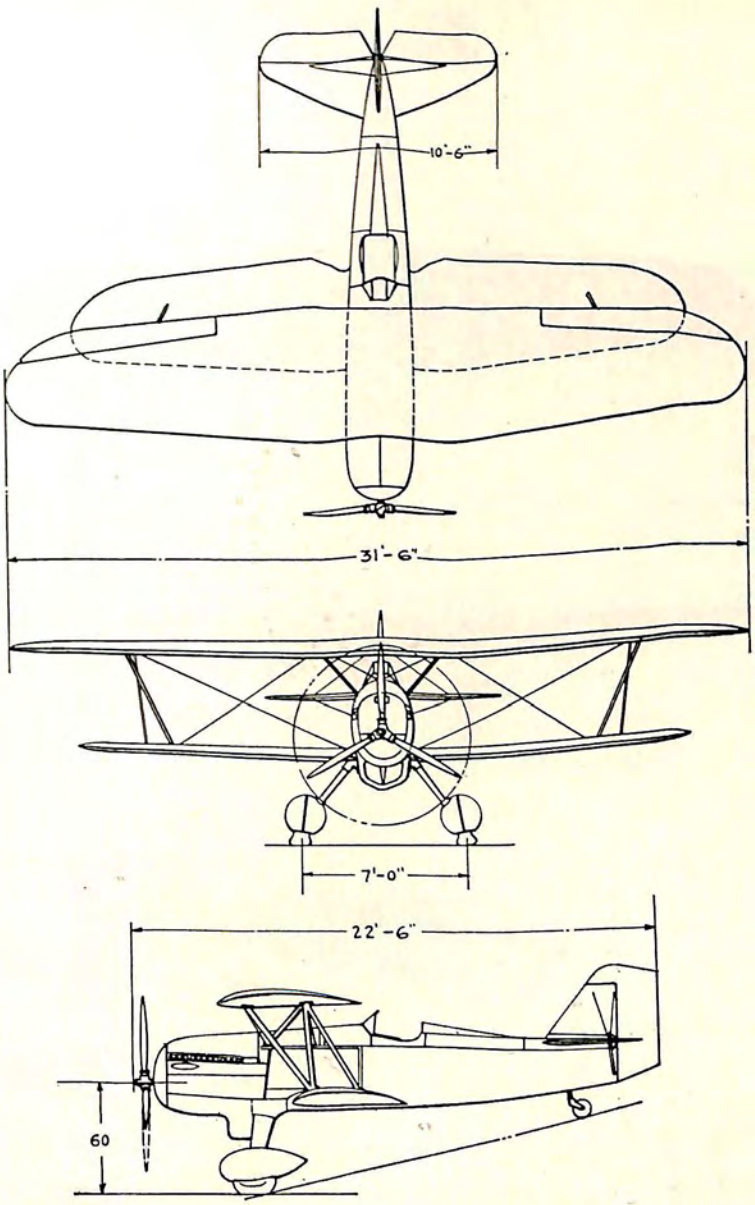
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Buffalo, N. Y.

OBSERVATION O-39

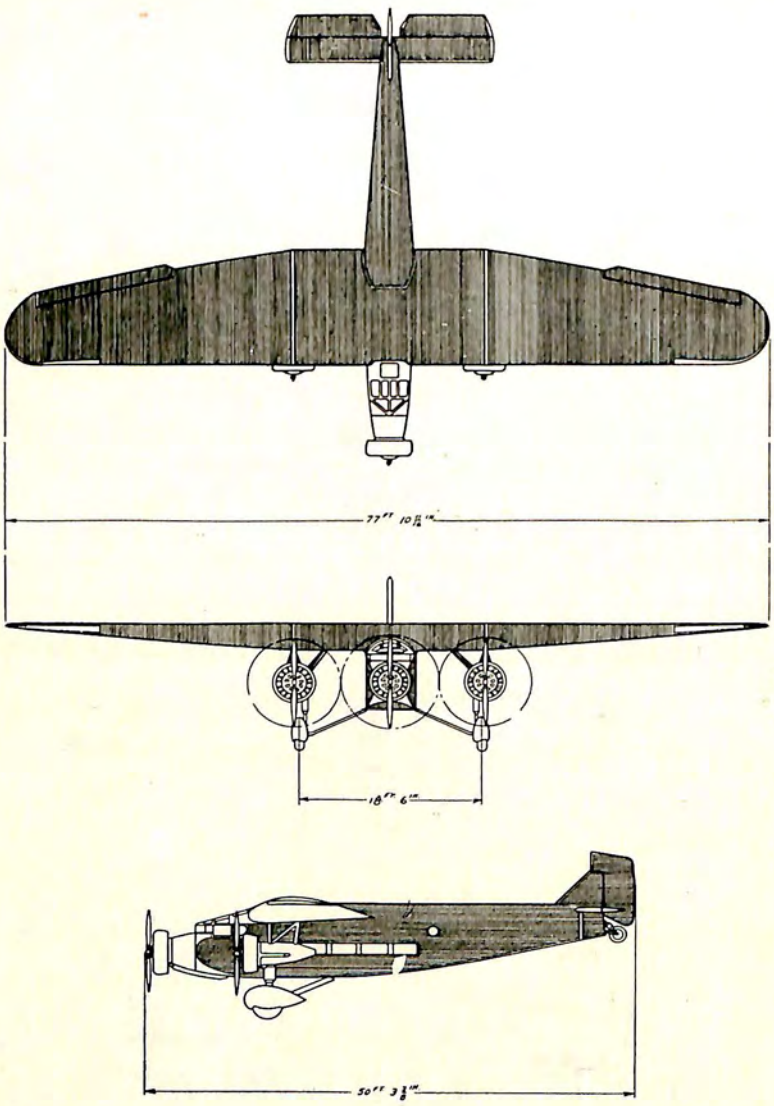
ENGINE: CURTISS CONQUEROR



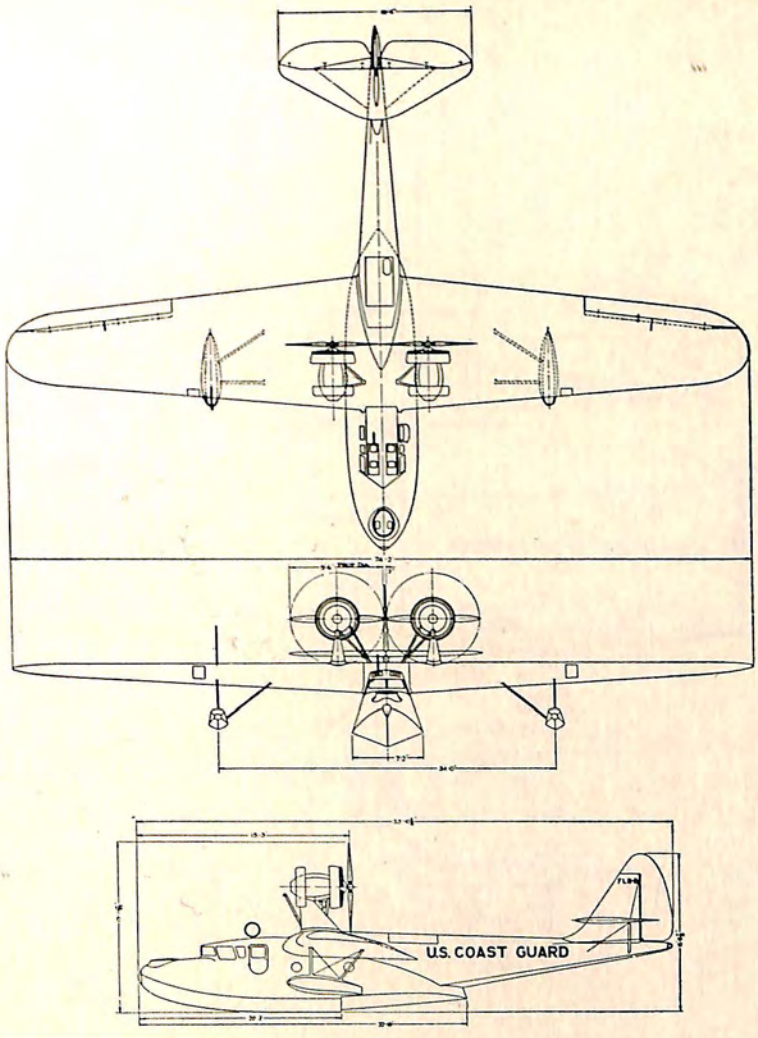
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Buffalo, N. Y.
PURSUIT P-6
ENGINE: CURTISS CONQUEROR



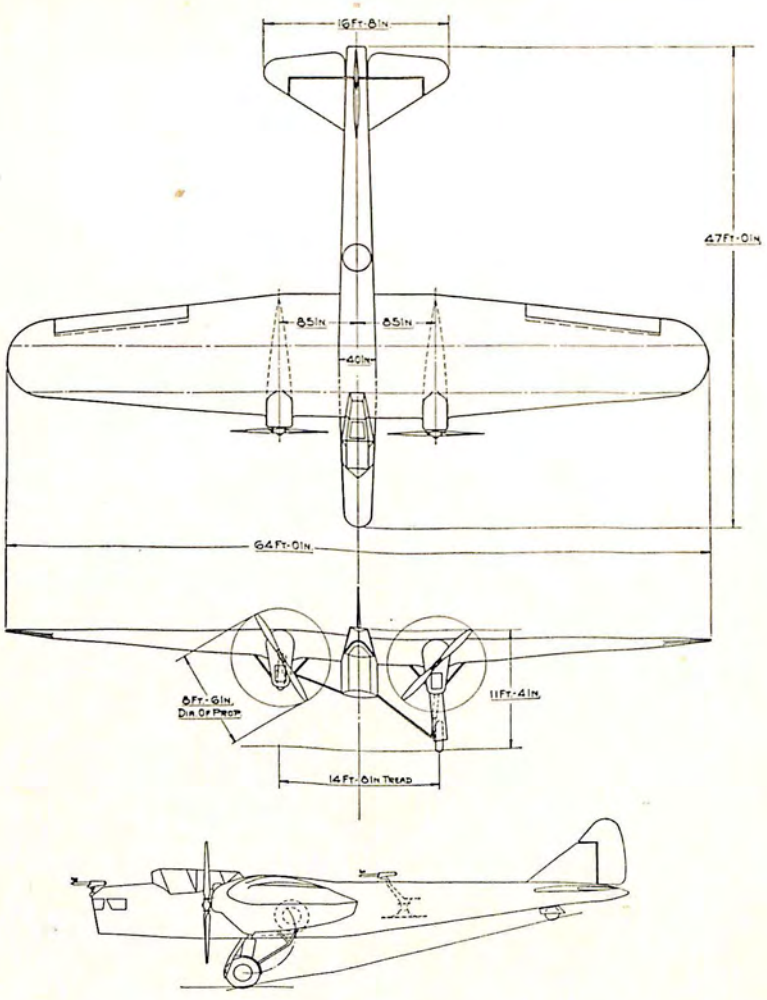
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Buffalo, N. Y.
PURSUIT P 6–E
ENGINE: CURTISS CONQUEROR



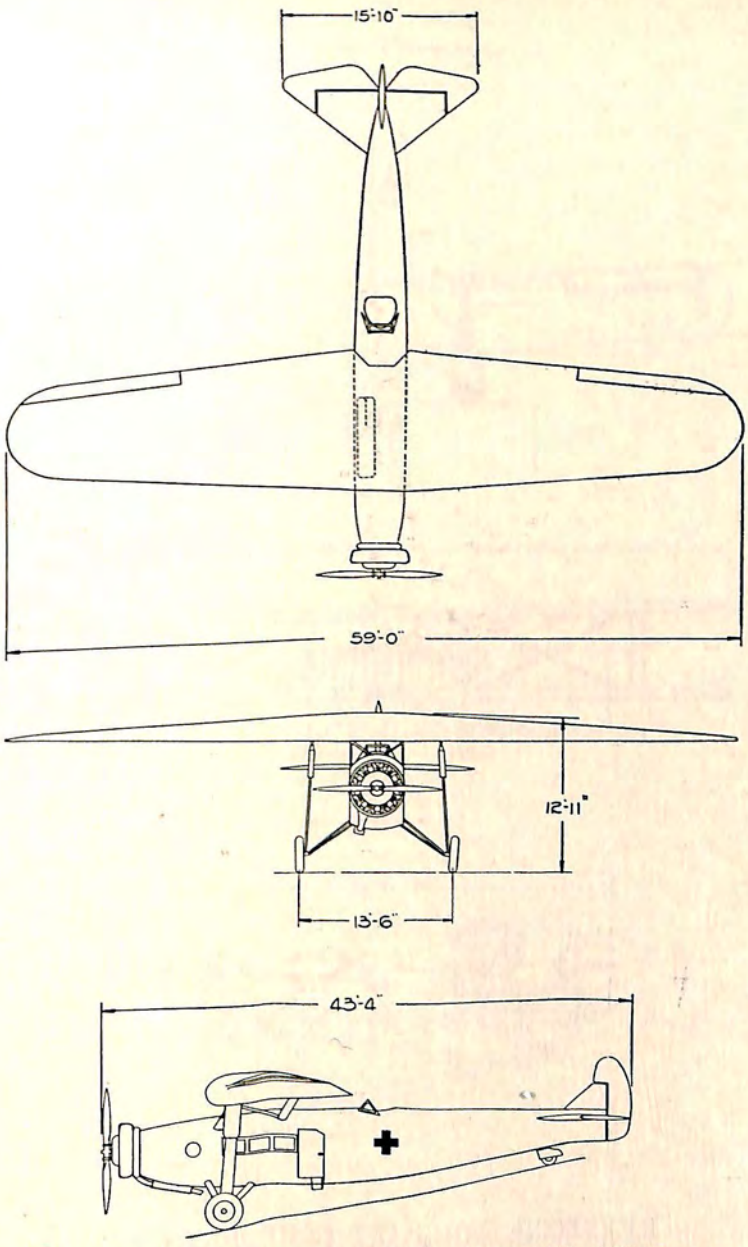
FORD MOTOR COMPANY
Stout Metal Airplane Division
Dearborn, Mich.
TRANSPORT C–4A
ENGINE: THREE PRATT & WHITNEY WASPS



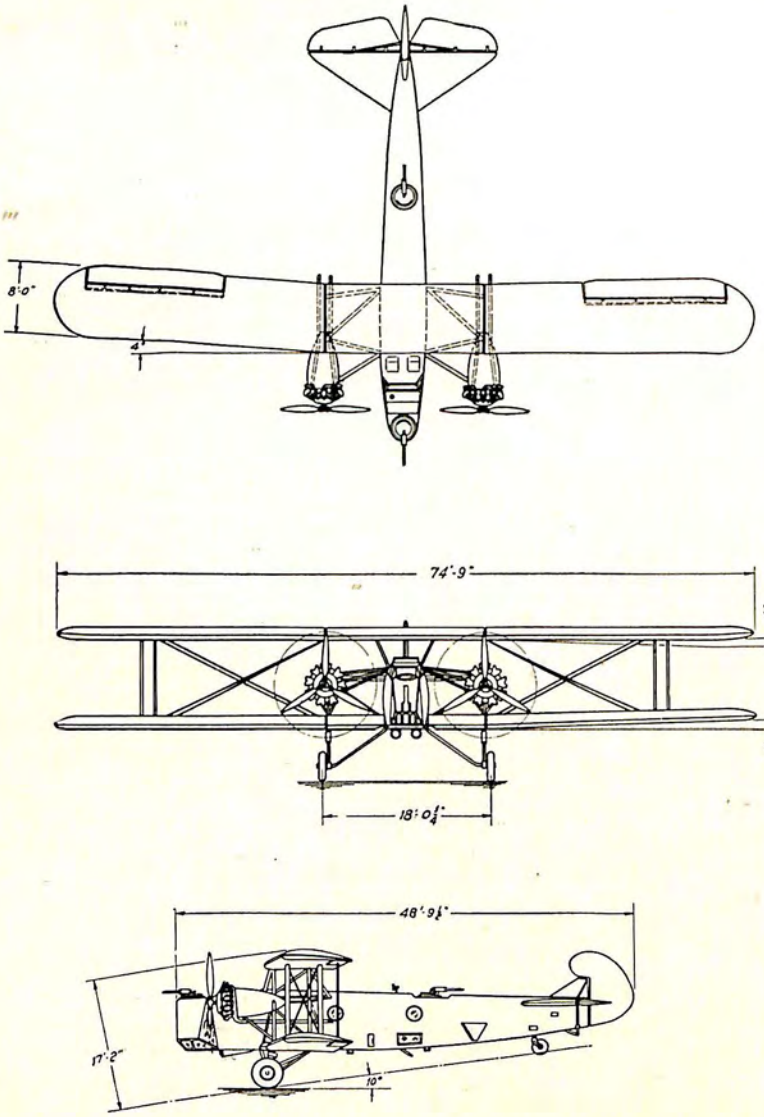
GENERAL AVIATION MANUFACTURING COMPANY
Dundalk, Md.
MODEL FLB–8
ENGINE: 2 PRATT & WHITNEY WASPS



GENERAL AVIATION MANUFACTURING COMPANY
Dundalk, Md.
OBSERVATION XO–27
ENGINE: 2 CURTISS CONQUERORS



GENERAL AVIATION MANUFACTURING COMPANY
Dundalk, Md.
TRANSPORT Y1C–14
ENGINE: WRIGHT CYCLONE

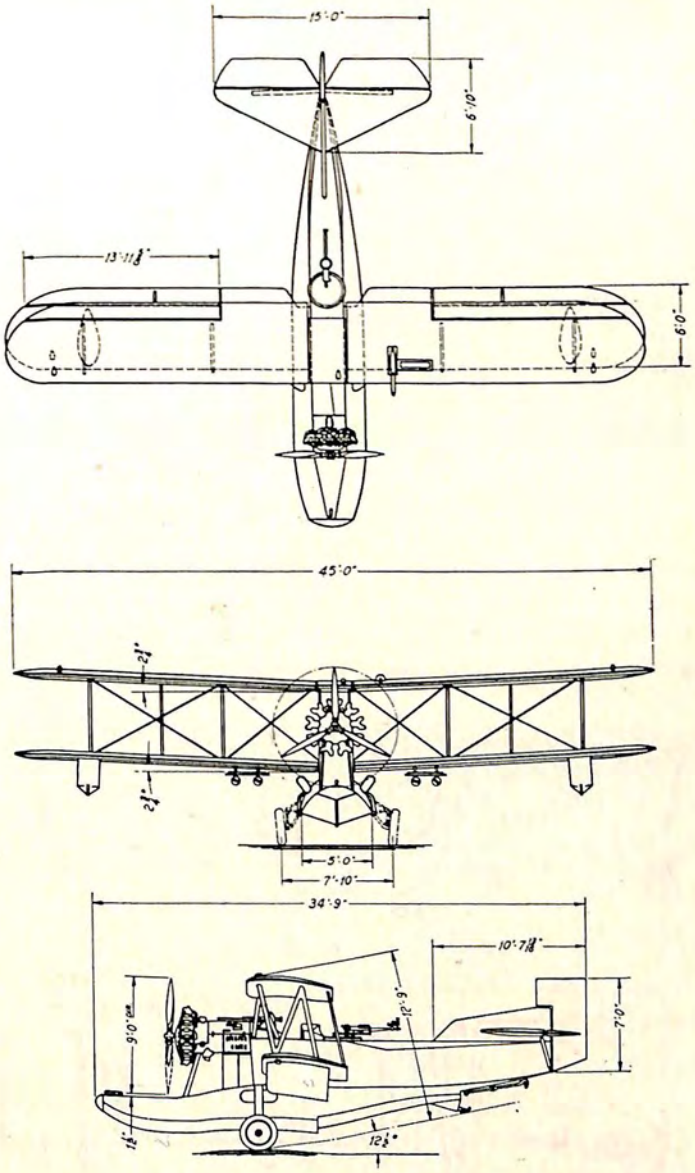


KEYSTONE AIRCRAFT CORPORATION

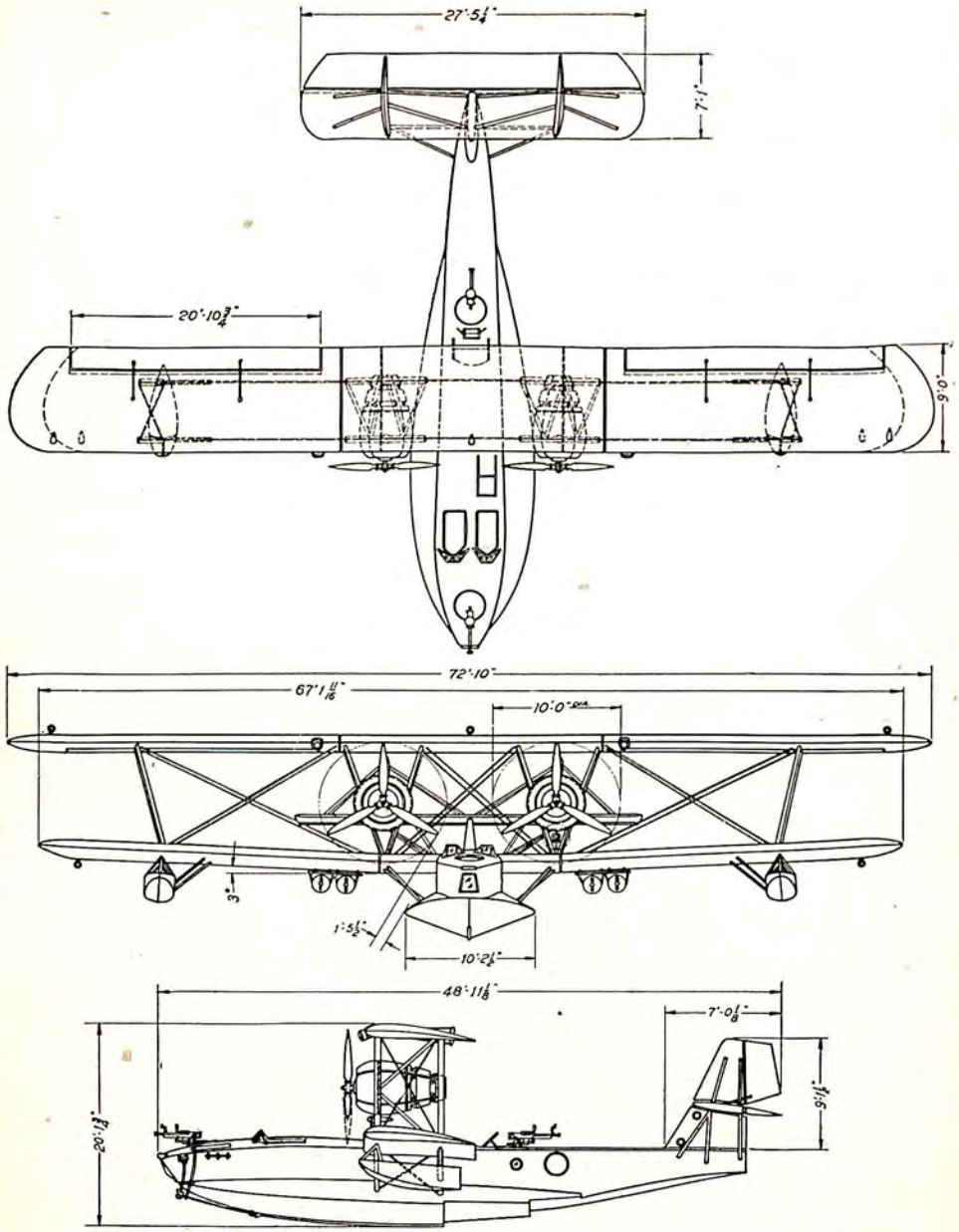
Bristol, Pa.

MODEL B4–A — B6–A

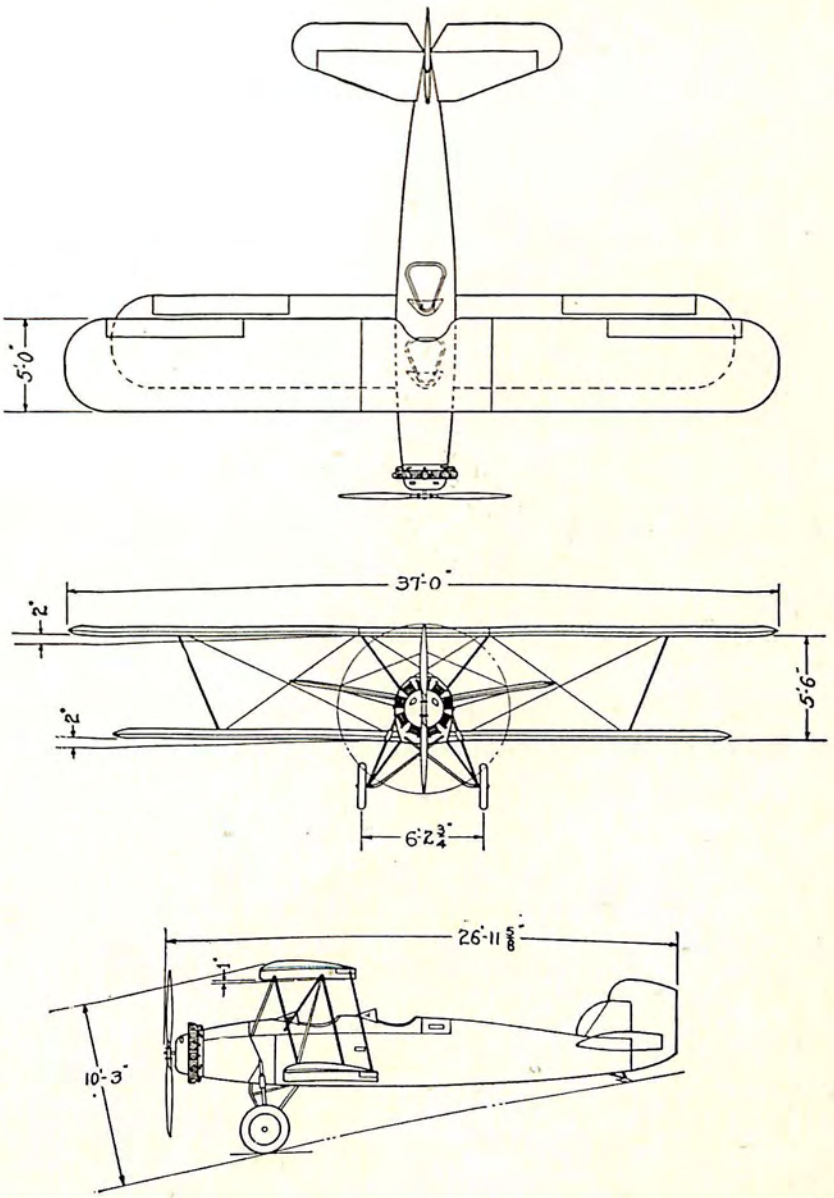
ENGINE: TWO PRATT & WHITNEY HORNETS
TWO WRIGHT CYCLONES



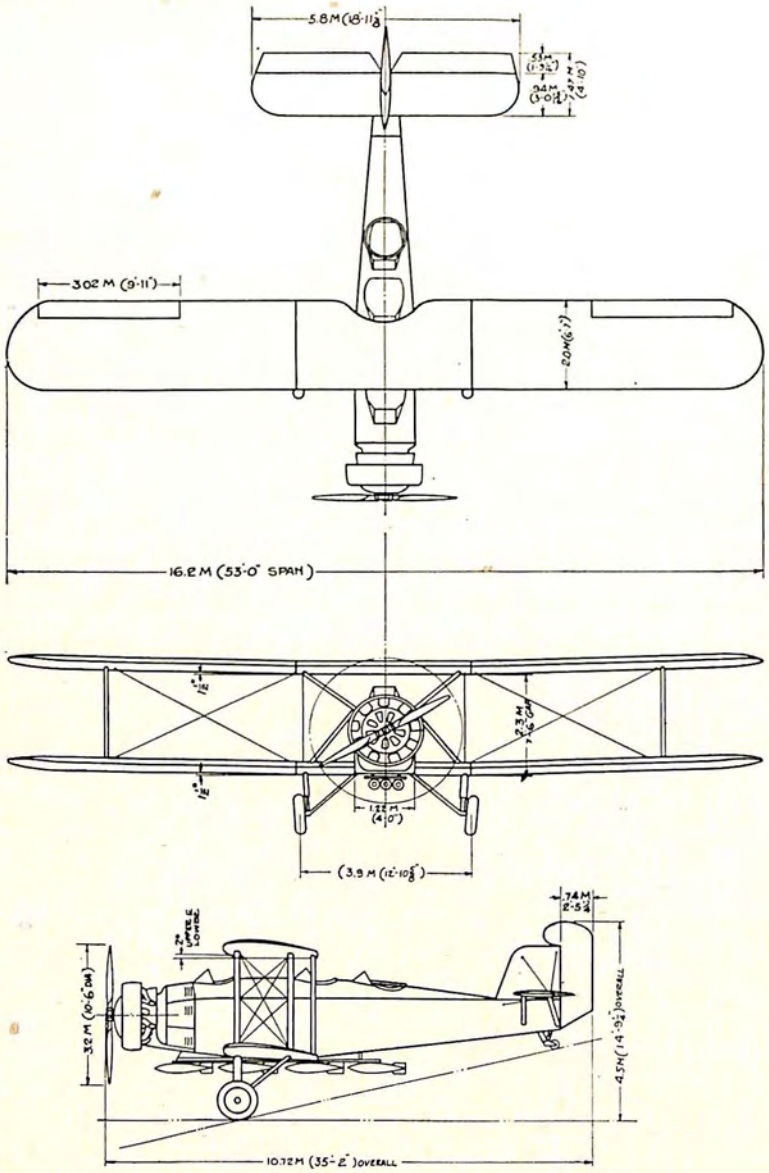
KEYSTONE AIRCRAFT CORPORATION
Bristol, Pa.
MODEL OL–9
ENGINE: PRATT & WHITNEY WASP



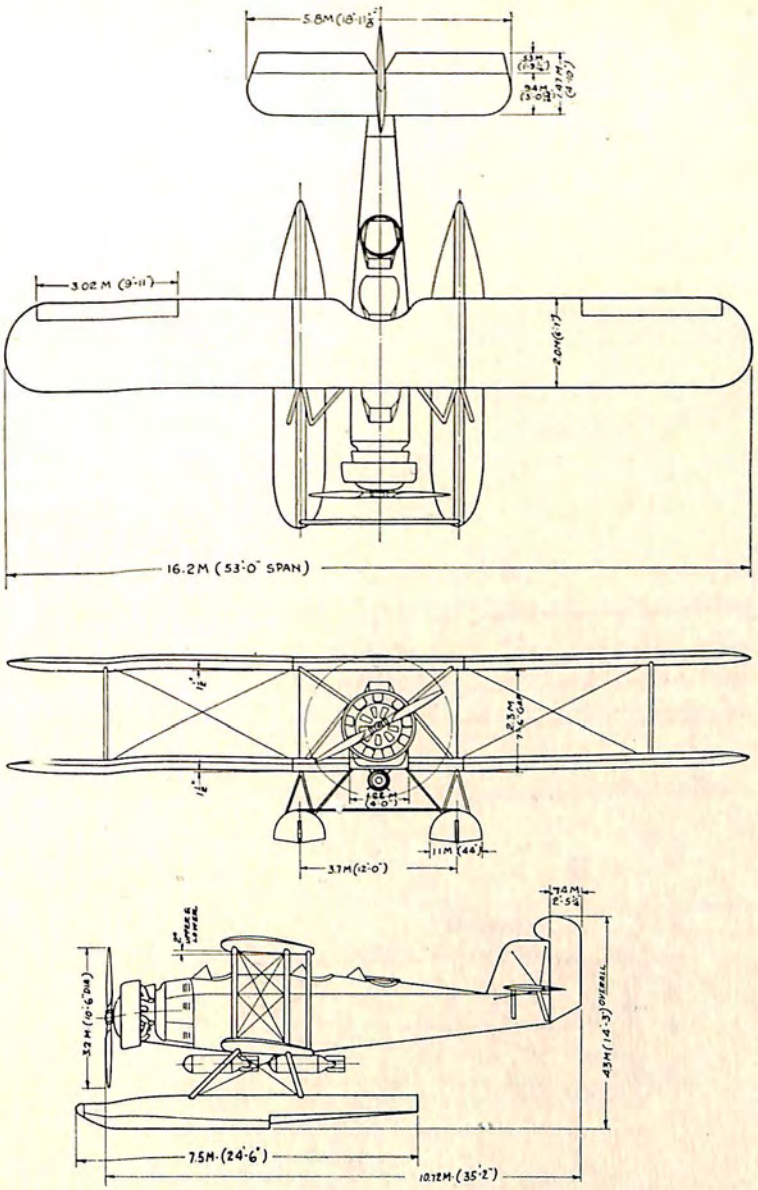
KEYSTONE AIRCRAFT CORPORATION
Bristol, Pa.
MODEL PK–1
ENGINE: TWO WRIGHT CYCLONES



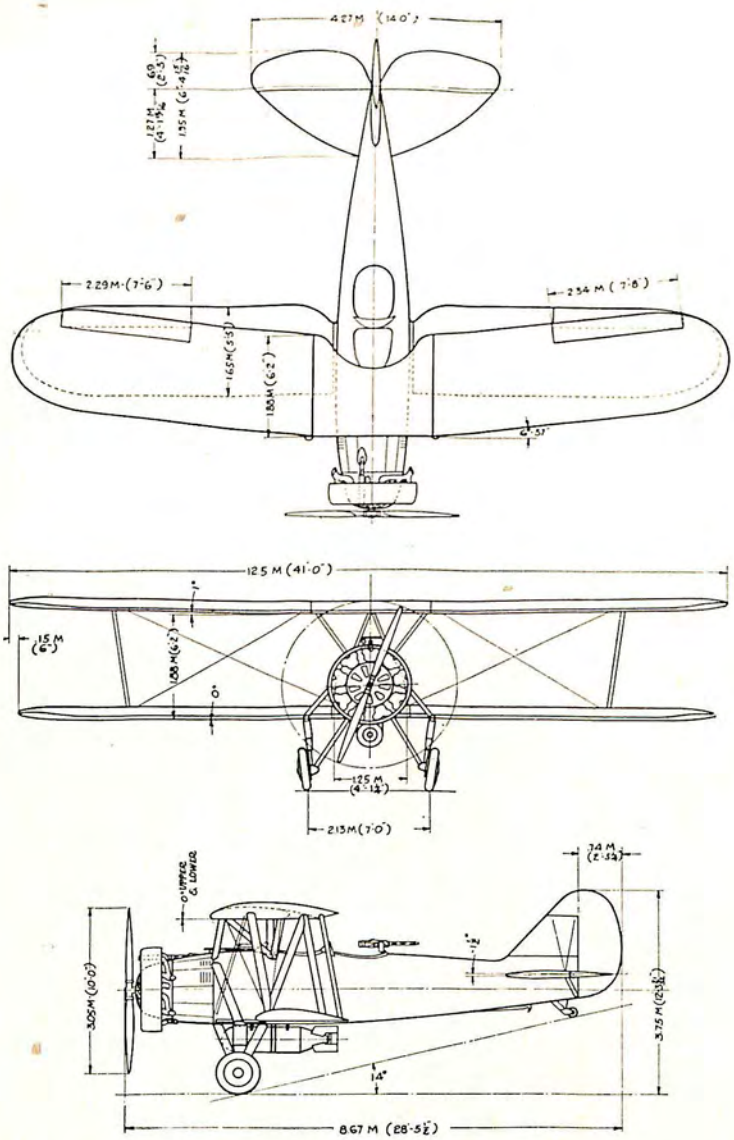
KEYSTONE AIRCRAFT CORPORATION
Bristol, Pa.
TRAINER NK–1
ENGINE: WRIGHT WHIRLWIND 240



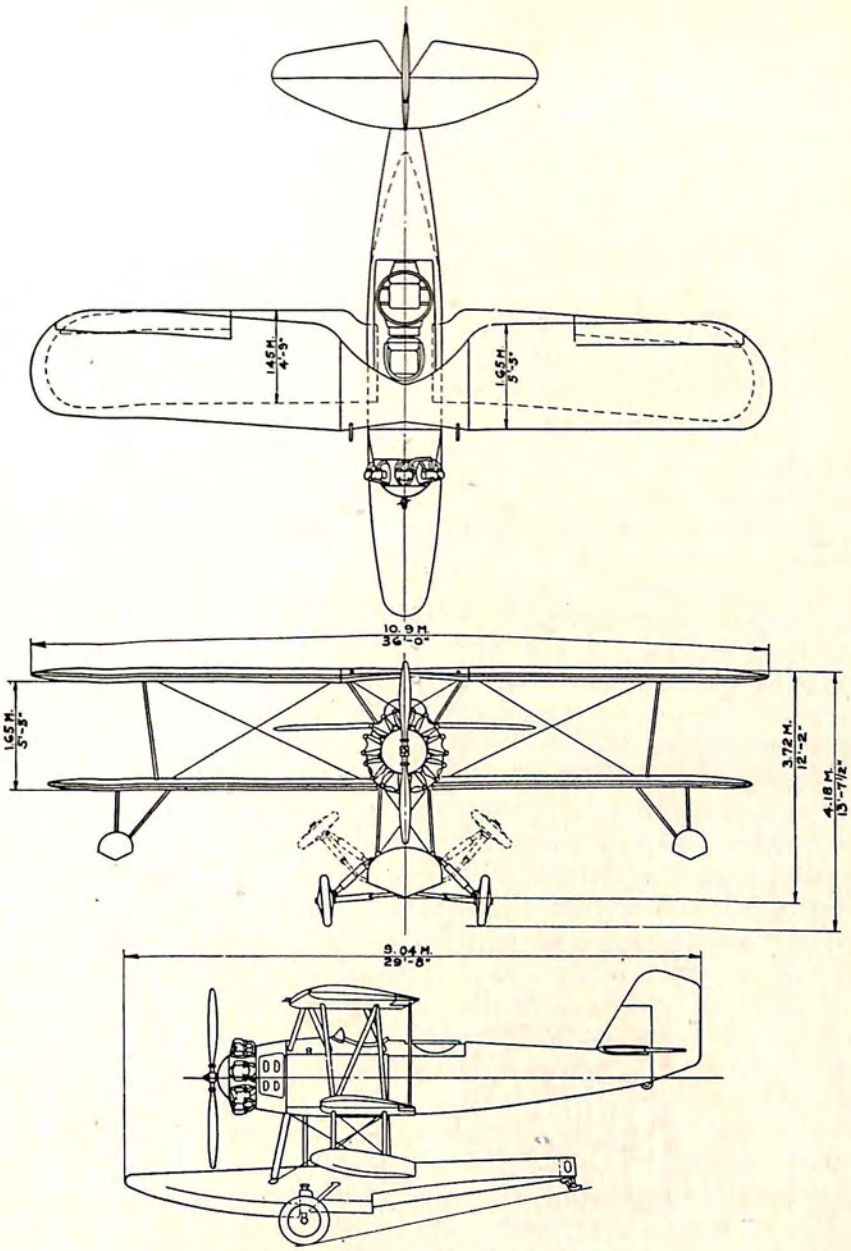
THE GLENN L. MARTIN COMPANY
Baltimore, Md.
MODEL 124
ENGINE: PRATT & WHITNEY HORNET
WRIGHT CYCLONE



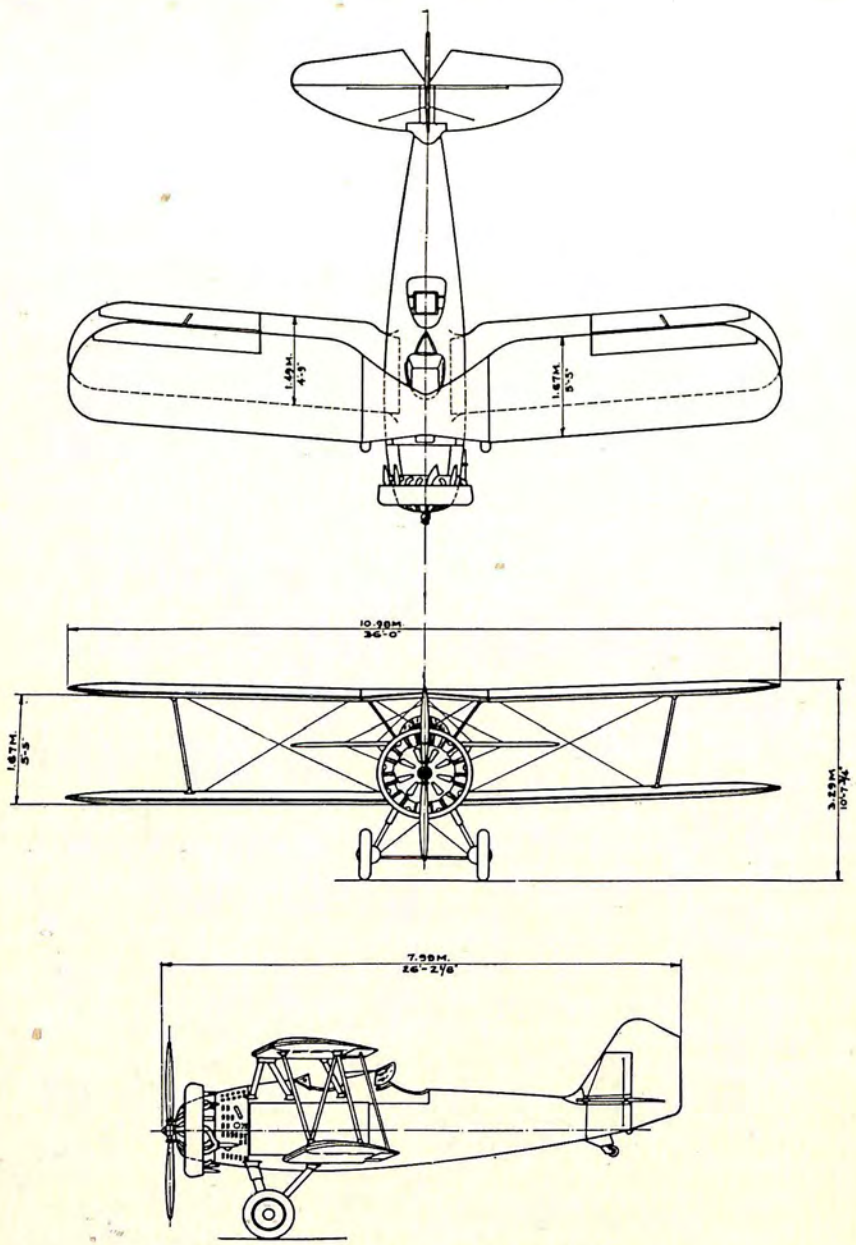
THE GLENN L. MARTIN COMPANY
Baltimore, Md.
MODEL 124
ENGINE: PRATT & WHITNEY HORNET
WRIGHT CYCLONE



THE GLENN L. MARTIN COMPANY
Baltimore, Md.
MODEL 125, DIVING BOMBER
ENGINE: WRIGHT CYCLONE



CHANCE VOUGHT CORPORATION
Hartford, Conn.
OBSERVATION O2U–4
ENGINE; PRATT & WHITNEY WASP



CHANCE VOUGHT CORPORATION
Hartford, Conn.
OBSERVATION FIGHTER O3U–2
ENGINE: PRATT & WHITNEY HORNET

CHAPTER XX

THE AUTOGIRO: NEWCOMER IN THE SKIES

Makes Debut In Commercial Market—Navy Buys Three—Pitcairn Receives Collier Trophy—Kellett And Buhl Enter Manufacturing Field—Newest Developments Reviewed

INTO a year when few manufacturers were willing to brave the chilled economic waters of depression to launch a new product, the autogiro made its debut in the commercial market, with marked success. Perhaps no new product ever enjoyed a more spectacular entrance into a market, with the lay public and skilled engineers alike looking upon its future as "unlimited," "most promising" and "perhaps revolutionary."

When Thomas A. Edison, a few months before his death, watched an autogiro being put through its paces at Newark Airport, nodded his head, and said: "That's the answer!", he was expressing the thoughts of many who had seen in the autogiro's performance the possibilities of fulfilling their desires for a machine that would land and take-off in a small space, would be easy to learn to fly, and would guarantee an additional factor of personal safety. It promised to open up a new market for the sale and operation of aircraft, not competitive with the airplane, but among persons who would not consider the airplane adaptable to their needs or ability. It is interesting, therefore, to review in this edition the progress of this, the first year of commercial operation of autogiros, in a special chapter devoted to these widely discussed, but still little understood, machines.

The first commercial autogiro, sold February 12 almost concurrently with the announcement that autogiros were to be offered for sale to the general public, was delivered to The Detroit News, whose active aviation editor, James V. Piersol, had been an early enthusiast for the new type of craft. A Pitcairn PCA-2 (Wright Whirlwind) autogiro, the new Detroit News ship flew hundreds of hours on news and photographic missions to the scenes of stories inaccessible to other means of fast transport. This machine was the first of more than 30 sold commercially during 1931 by Pitcairn Aircraft, Inc., of Willow Grove, Pa.

Early in 1931, the United States Navy contracted for delivery of a Pitcairn PCA-2 (Wright Whirlwind) autogiro and after completing a series

of tests with it, bought two more of the same type. A series of investigations into the potentialities of this type of aircraft for military and naval service were carried on throughout the year, preparations being made near the close of 1931 for the testing of one of its machines as a seaplane, with particular reference to catapult work on the battleships and cruisers. Their use aboard aircraft carriers was satisfactorily demonstrated by several landings and take-offs from the "Langley."

New honors were heaped on the autogiro in April when it was announced that Harold F. Pitcairn and his associates had been awarded the Collier Trophy for the previous year's greatest achievement in aeronautics, the commercial development of the autogiro. Dramatically landing on the South Lawn of the White House, an autogiro formed the background for the ceremonies as Pitcairn received the trophy from the hands of President Hoover.

Engineers from all parts of the country were gathered at the Sixth Annual Aeronautic Engineering Research Conference of the National Advisory Committee for Aeronautics at Langley Field in May when a Pitcairn PCA-2 (Wright Whirlwind) was put through its paces in a series of overload tests, carrying a ballast load of 1,000 pounds without seriously impairing its performance. The National Advisory Committee shortly afterward purchased an autogiro of this model for research and test flying.

In July, the Kellett K-2 (Continental) autogiro joined the Pitcairn PCA-2 as an approved commercial machine carrying the Department of Commerce's Approved Type Certificate. It was a two-place side-by-side open cockpit machine powered with a 165 horsepower Continental engine, the product of two years' concentrated and uninterrupted study of the problems of autogiro design by the Kellett Aircraft Company of Philadelphia, which took over a new plant at Philadelphia Airport early in the year.

The widespread interest and attention manifested in the autogiro was reflected in the request of the Smithsonian Institution at Washington, which houses many of the nation's treasured marks of progress, for the first autogiro to be flown in the United States. The historic machine, brought from England late in 1928 by Pitcairn to perform yeoman service during two and one-half years of arduous development work, was landed on the restricted grounds of the Institution, the first aircraft of its wide collection to reach the museum's doors by air.

The National Air Races in Cleveland provided another opportunity for the public to stand awe-stricken at the antics of the "windmills," a fleet of from four to eight autogiros performing every day during the long race program. Flights across the continent to the Pacific Coast, passenger hops, aerial photography, transport of executives and business or pleasure flying aided to acquaint additional thousands with the autogiro. Among those

PITCAIRN RECEIVES COLLIER TROPHY

White House grounds become an airport as Pitcairn PCA-2 (Wright Whirlwind) autogiro lands for presentation of award to Harold Pitcairn.

PRESIDENT CONGRATULATES PITCAIRN

President Hoover congratulates Harold Pitcairn, who with his associates received the Collier Trophy "for year's greatest achievement."

who operated machines extensively during the year were The Detroit News, Des Moines Register and Tribune, Beech-Nut Packing Company, Steel Pier Corporation of Atlantic City, the marketing agency of Silverbrook anthracite coal, Champion Spark Plug Company, Standard Oil Companies of New York and Ohio, and Santa Barbara Airports, Ltd.

A number of entirely new uses for autogiros were developed, and the possible geographical points for aircraft operation multiplied many times by the machines' capabilities in using restricted areas for landing and take-offs. Among the entirely new uses to which autogiros were adapted on a commercial scale was that of aerial photography in color. Such photographs had previously been expensive to the point of prohibiting their wide use, since only airships and balloons had been able to fly slowly enough to accommodate the relatively slow speed of the color camera.

The year also witnessed the entrance of a third company into development of autogiros for the commercial market under licenses of the Autogiro Company of America when the Buhl Aircraft Company of Marysville, Mich., announced completion of arrangements to become a manufacturing licensee. Its first design, a two-place machine of the pusher type, was being tested at the close of the year with plans for its production in 1932.

The Kellett Aircraft Corporation, the second licensee of the Autogiro Company of America, concentrated its attention on an interpretation of the autogiro for private and commercial flying in the Kellett K-2, which differed in several respects from all other autogiros produced in this country and abroad. Its outstanding features of design were the undercarriage and the pylon in addition to the side-by-side seating arrangement. The undercarriage differed from that of other machines in that it was an all-rigid design without wires of any kind, and was made an integral part of the fuselage construction in such a manner that it reduced to a minimum one of the most difficult problems in autogiro design, namely, the deflection of the structure under tremendous torsional loads applied about the longitudinal axis of the fuselage and due to the reaction of the rotor and undercarriage side loads. The rotor pylon was a "pin-ended" structure entirely, making it possible to obtain absolute rigidity with a degree of lightness which could not be achieved with the simpler rigid form.

The Kellett concern carried on a research program with investigations of the relationship between the fixed wing and rotor of the autogiro and a practical study of the application of electrically spot-welded stainless steel to aircraft manufacturing, particularly for skin-stressed structures for the fuselage and autogiro rotor blades.

Pitcairn Aircraft, Inc., the first licensee of the Autogiro Company of America, introduced three models to the commercial market during the year, the PCA-2, a 3,000 pound gross weight autogiro carrying a pilot and two passengers and powered with a Wright Whirlwind 300 horsepower

FINAL HAPPY LANDING

First autogiro in United States, an English Avro (Wright Whirlwind) lands at Smithsonian Institution to be installed in museum.

"THAT'S THE ANSWER"

The late Thomas A. Edison voices his views of the new flight principle at Newark Airport after James Ray completes autogiro flight.

engine; the PCA-3, an autogiro of similar design with a 300 horsepower Pratt and Whitney Wasp, Jr., engine; and the PAA-1, a small two-place training and sport autogiro powered with a Kinner B-5 engine and having a gross weight of 1,750 pounds. Three-view drawings of the Pitcairn and Kellett models introduced during the year, showing details of design and construction, immediately follow this chapter.

The story behind the development of the autogiro for its introduction to the commercial market in 1931 is an interesting one centering around its inventor, Juan de la Cierva; its American sponsor and developer, Harold F. Pitcairn; and the small group of engineers and executives associated with the Pitcairn, Kellett, Buhl and the Autogiro companies.

Aircraft with freely rotative, hinged "windmill" blades above the fuselage had been undergoing steady experimental flying since the first successes achieved by the Spanish inventor early in 1923. In 1925, de la Cierva moved the scene of his major development work to England, where a syndicate under the name of the Cierva Autogiro Company, Ltd., was formed the following year.

Steady, cumulative success followed the efforts of de la Cierva and his associates in the involved work of improving the aerodynamic and structural efficiency of the revolutionary new type of aircraft. Several long flights in 1928 drew the world's attention to the fact that the autogiro was rapidly becoming a practical aircraft capable of extending the manifold uses found for the highly developed airplanes and dirigible airships, which had represented the two extremes of the successful flight systems up to that time.

In the United States, little had been heard of the autogiro until the announcement, late in 1928, that Harold F. Pitcairn, head of aircraft manufacturing and operating interests bearing his name, had purchased an English autogiro and was bringing it to this country as the forerunner of an entirely new type of commercial aircraft.

The Autogiro Company of America, as the concern controlling the American manufacture of autogiros, was formed early in 1929 and immediately instituted an extensive program of research for the practical application of the principles which seemed to offer a new degree of personal security in aircraft operation.

De la Cierva's unsatisfactory experiences with wind tunnel model research in England, and his own belief that discrepancy of rotational speeds and scale effect in models made the wind tunnel tests of doubtful value, helped determine the course of action in shaping it along practical lines from the start.

Most obvious of the autogiro's needs from a practical viewpoint was a consistent and convenient means of starting the rotor system before the take-off. This had been accomplished on the later English models by a

AUTOGIRO DEFIES NIAGARA

Pitcairn PCA-2 (Wright Whirlwind) autogiro of the Horizon Company flies Jack Kuhne of Fox Movietone into Niagara's gorge.

AUTOGIRO ON HUNTING PATROL

Pennsylvania game protectors using Pitcairn PCA-2 (Wright Whirlwind) autogiro in drive against illegal hunting methods.

biplane deflector tail system, which could be utilized to deflect the slipstream upward into the rotor during the warm-up period.

This system, in application to the larger and more highly powered American machines, seemed to offer difficulties in the way of rapid improvement in reduction of drag and structural weight. Development of a mechanical starter geared directly to the engine was undertaken, and together with a new design of rotor hub was in successful operation within a few months.

The first American autogiro was flown October 10, 1929, with de la Cierva officiating as test pilot. It was immediately recognized that on account of greater horsepower, the American designs offered entirely new standards of performance. However, many detail problems of balance and consistency of rotor smoothness in the production of large numbers of machines remained to be worked out. The autogiro engineers decided to devote 1930 to test flying and the mechanical research entailed in the production of an entirely practical, reliable workaday aircraft.

During 1930, de la Cierva made another visit to the United States to supervise the final checkover of the first commercial model. At this time it became possible to verify the conclusions reached in his embracing work, "Theory of the Autogiro," as the performance characteristics of the machine corresponded, within limits of two to three per cent., with his predictions.

A new blade design of radically different construction had come from England late in 1929. Its aerodynamic characteristics were determined to be of high efficiency, but trouble developed in maintaining contours in the skin, which was of mahogany planking. These blades, of high aspect ratio, were constructionally modified to take an ordinary doped fabric covering with a structure of great local strength. The main spar remained a single steel tube. Since the major loads on this tube were torsional no difficulty was experienced in practical use with the single-spar system.

The placement and loadings of the three sets of ball bearings in the rotor hub were decided upon in an arrangement which has since held as standard. The other features of the hub, such as the articulation lugs, universal blocks, incidence adjusting terminals for the blades, rotor axle and support cable cone were given final testing and approval.

Almost every component detail design was markedly different from those encountered in airplane practice—fixed wings, landing gear, rotor pylon, control system, engine mount, etc.

During this period, these unusual problems resolved themselves into examination and settlement, through formulae by which the design of a set of rotor blades for a specific type of autogiro might be undertaken almost in the light of a routine problem. As the design of the autogiro progressed, many of the manifold resources of the aircraft industry were

called into play. Special designs in such important components as shock struts, blade shock dampers and other units were produced with a precision and promptness which, autogiro engineers said, testified to the highly developed plane on which the aircraft industry has been built to operate.

By midsummer of 1930, most of the important practical problems had been fully and satisfactorily solved. It was decided to make the first public demonstration of the American machines at the National Air Races in Chicago. One of the machines, a Pitcairn PCA-2 (Wright Whirlwind), was equipped with a mechanical starter which brought the rotating wings

FIRST AMERICAN CABIN 'GIRO

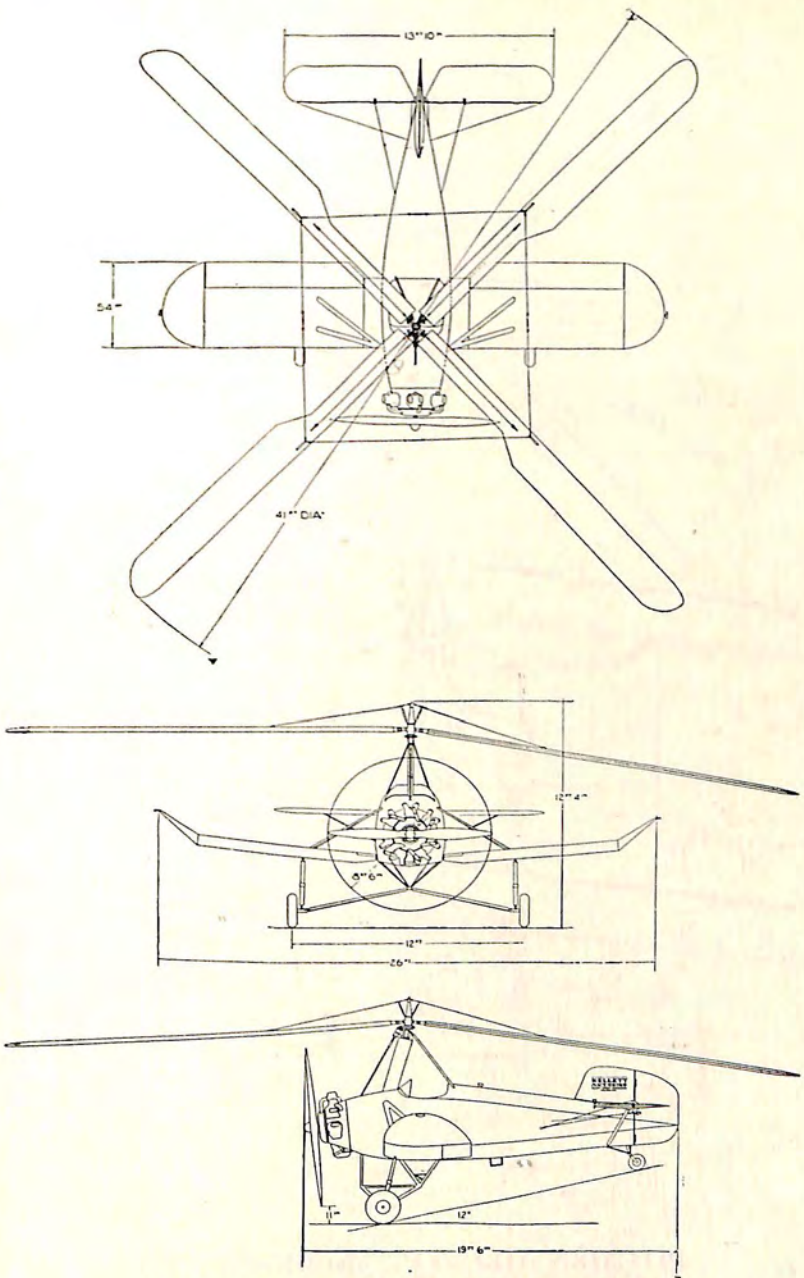
Kellett K-2 (Continental 165) autogiro, the first cabin two-place side-by-side model produced in the United States.

to their necessary flying speed in less than 30 seconds during the warm-up. This starter, the first design from the Autogiro Specialties Company of Philadelphia—an organization formed to produce typical autogiro components for various manufacturers—became standard on all American autogiros built during 1931, with but detail variations in construction. The PCA-2 along with an earlier model, the PCA-1B (Wright Whirlwind), went through their paces daily at the races after having been flown directly from Philadelphia, a distance greater than the range of the latest English autogiro at the time, the C.19 Mark II (Armstrong-Siddeley Genet Major). The English machine was crated and shipped to the races. The widespread attention which the successful operation of autogiros during 1930

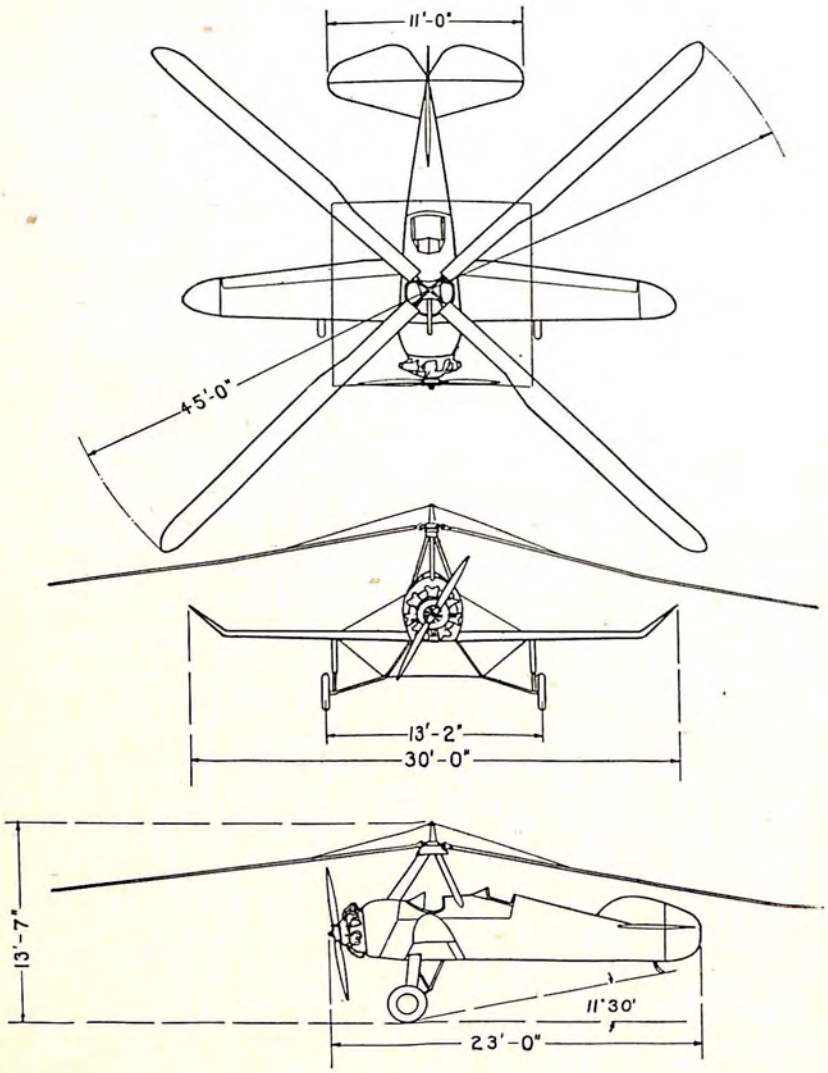
produced led to the announcement of autogiros for the commercial market early in 1931.

Progress during 1931, while probably greatest in this country, was not confined to America. In England, a number of new developments were announced, including a cabin type machine of high efficiency and projections of larger cabin transport types. The French Navy was announced to have under construction a number of secretly designed autogiro flying boats, while the Soviet Government had test flown its first government-designed machine.

Everyone asked what course the future development of the autogiro would take. The future trends in aircraft built according to the Cierva principle were not uncertain, but so wide in scope that no engineer or pilot could safely indicate in what direction the advantages of the new craft would be preponderant. Projections by engineers clearly foreshadowed, however, several distinct types of autogiros as the products of the next few years. Among these were both open and closed machines of the small sport variety, built either as pushers or tractors. Large cabin transports, it was felt, would receive serious consideration because of two cogent factors: the axiom that an autogiro's efficiency increases with the increase in size and the proved personal security which the machines have provided thousands of persons who have ridden in them without injury.



KELLETT AIRCRAFT CORPORATION
Philadelphia, Pa.
MODEL K–2 — 2 PLACE
ENGINE: CONTINENTAL A–70

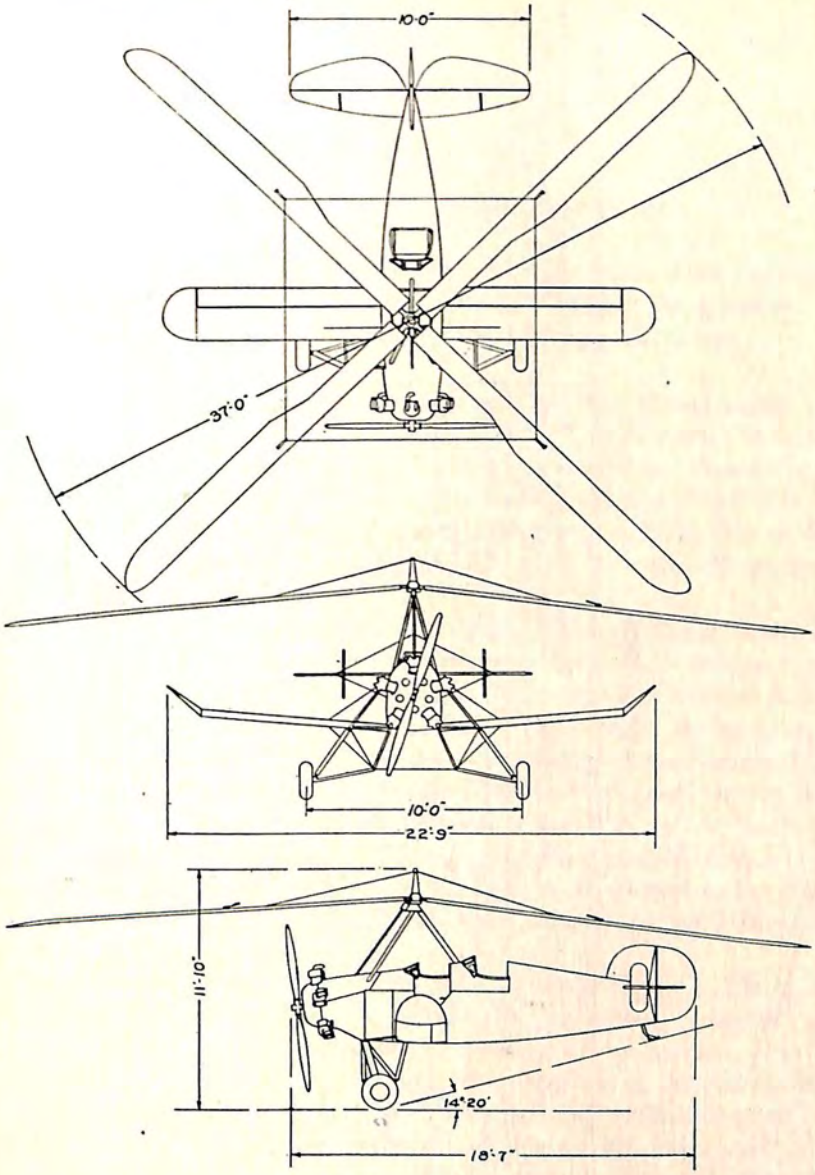


PITCAIRN AIRCRAFT, INCORPORATED

Philadelphia, Pa.

AUTOGIRO PCA-2, PCA-3 — 3 PLACE

ENGINE: PRATT & WHITNEY WASP, JR.
WRIGHT WHIRLWIND 300



PITCAIRN AIRCRAFT, INCORPORATED
Philadelphia, Pa.
AUTOGIRO PAA–1 — 2 PLACE
ENGINE: KINNER B–5

AUTOGIROS

Name of Manufacturer	*Model*	*A.T.C. No.*	*Make of Engine*	*Total Rated H.P.*	*Wing Area, Sq. Ft.*	*Gross Weight, Lbs.*	*Pay Load, Lbs.*	*High Speed, M.P.H.*	*Cruising Speed, M.P.H.*	*Stalling Speed, M.P.H.*	*Service Ceiling, Ft.*	*Cruising Radius, Mi.*
Kellett Aircraft.....	K-2	437	Continental A-70	165	100 Disc A 1328	2,200	235	95	78	None		
Pitcairn Aircraft.....	PCA-2	410	Wright Whirlwind	300	88 Disc A 1590	3,000	376	118	95	None		
Pitcairn Aircraft.....	PCA-3	446	Pratt-Whitney Wasp Jr.	300	88 Disc A 1590	3,063	415	126	95	None		
Pitcairn Aircraft.....	PAA-1	433	Kinner B-5	125	51.6 Disc A 1075.2	1,750	214	90	75	None		

CHAPTER XXI

PRODUCING AMERICAN ENGINES

Refinements in Engine Design Increase Aircraft Efficiency—Fuel Detonation Characteristics Studied—Superchargers and Higher Compression Ratios Employed—Review Year in Major Factories

RELIABILITY and efficiency in American aircraft, of a character sufficient to permit a 'round the world flight in eight days, the linking of the United States and Turkey in a single hop of less than 50 hours, or the day in and day out operation of fleets of airplanes on air line networks throughout the world with regularity of service equal to that of older means of transportation, were due in a large measure to the refinement of aircraft engines.

The every day performance of today was the experimental stunt performance of yesterday. The fact that aircraft engines with certain experimental features in 1931 showed that increased horsepower without marked increases in weight was possible, pointed to even better performance in 1932, and the end was nowhere in sight. Manufacturers made great strides during the year in increasing the horsepower of their standard models without materially increasing weight, by continued "stepping up" or "boosting" of power through supercharging, operating at greater crankshaft speeds and using higher compression ratios. Higher cylinder temperatures for higher thermal efficiency also were permitted with both liquid and air-cooled engines.

The new engines necessarily required a relatively higher grade of fuel and lubricating oil, because of the necessity of preventing detonation and because of higher bearing pressures and cylinder temperatures. The Engine Manufacturers' and Fuels and Lubricants Sections of the Aeronautical Chamber of Commerce, embracing all of the principal producers of engines and aircraft fuels, devoted considerable attention to the problem of determining the detonation characteristics of gasoline and considered plans for a research project to perfect a testing engine to determine knock ratings of aircraft fuels. It was important that fuel was used of a specification like that for which the engine was designed. Leading oil companies cooperated closely with the engine manufacturers in the distribution of improved fuels for the higher horsepower engines.

The use of high-output engines by operators desiring to add speed or increase the altitude performance of their planes made necessary the actual distribution of specially selected fuels of a quality previously used only for racing and military planes. The 'round the world flight of Post and Gatty made necessary the laying down of a high grade fuel at stops throughout the world by distributors of the Stanavo Specification Board, Inc.

The Engine Manufacturers' Section of the Chamber also was active in working with the Department of Commerce on necessary changes in the requirements for manufacturing engines and in developing a system of discounts to the aircraft manufacturer and distributor and dealer. The Fuels and Lubricants Section widely distributed its Uniform Safety Code for the Handling of Aviation Gasoline and the code was adopted by the American Petroleum Institute for the guidance of the oil industry.

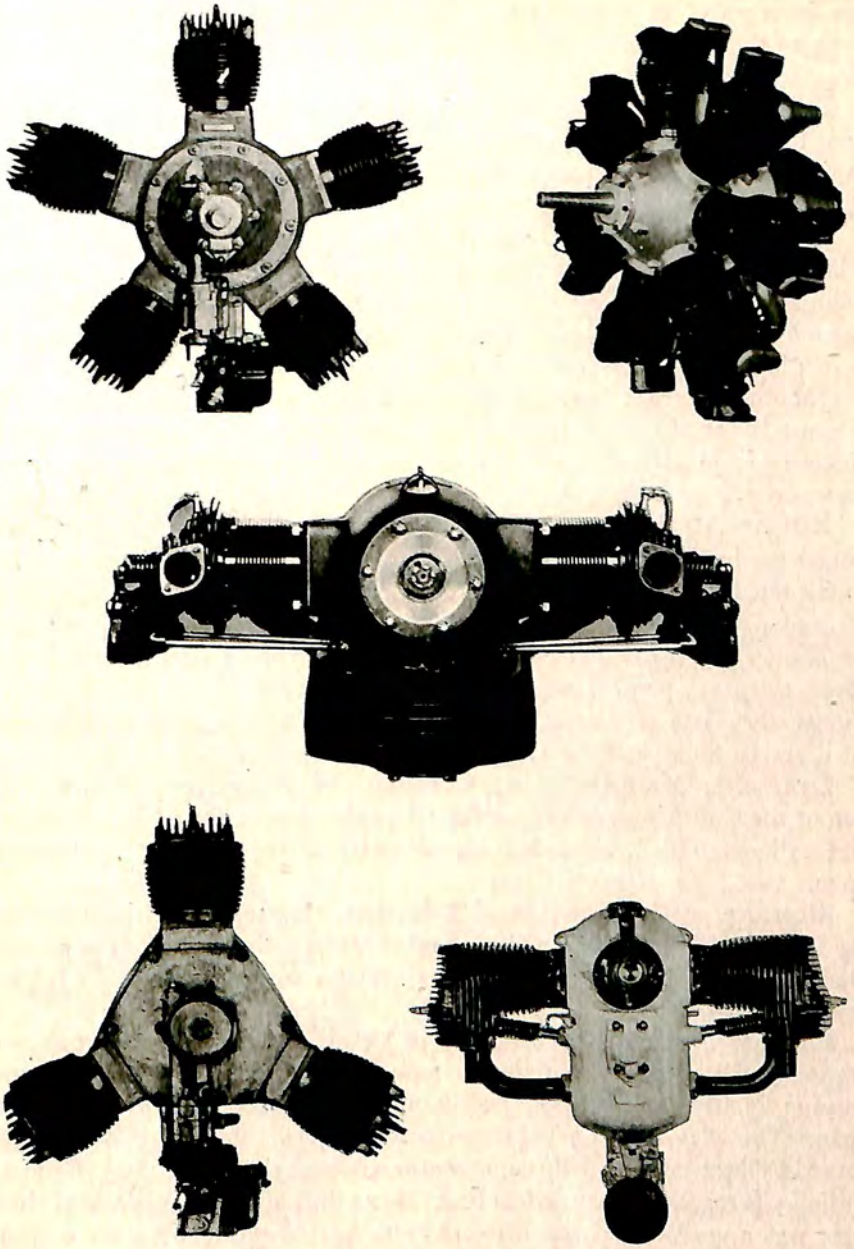
The Department of Commerce listed 41 manufacturers of aircraft engines in the United States in 1931 as compared with 68 listed in 1930. This was the result of a weeding-out of experimental organizations which were manufacturers in name only. Out of the 41 companies listed as manufacturers in the 1931 directory, only 30 were manufacturing under Approved Type Certificates issued by the Department of Commerce. Seventy-five Approved Type Certificates had been issued by the Department of Commerce since it began the inspection of engines in 1927, and 10 of these were issued in 1931.

A brief résumé of the year's activities in each of the major engine manufacturing plants which were actually in production or carried on interesting experimental work during the year should provide a fair picture of the developments in this field and the types of products offered for both the commercial and military markets. They are arranged in alphabetical order for convenience in future reference.

Aeronautical Corporation of America at Cincinnati, O., developed and produced a new two cylinder, opposed, air-cooled engine, the Aeronca E-113, rated at 36 horsepower at 2,400 r.p.m. to supplement its two cylinder air-cooled 30 horsepower engine. The new engine, designed especially to meet the company's needs for a power plant in its two-place light airplane, was the first two cylinder model to pass the 50 hour test of the Department of Commerce for an Approved Type Certificate.

Allison Engineering Company of Indianapolis, Ind., a division of General Motors, continued its experimental work for the Army and Navy, but offered no products for the commercial market.

American Airplane and Engine Corporation, the manufacturing division of The Aviation Corporation, at Farmingdale, N. Y., adopted the trade name of Ranger for its engine models formerly identified with the name of Fairchild. The engine division continued production of the Ranger 6-390, a six cylinder, inverted, in-line, air-cooled engine, rated at



AERONCA, CONTINENTAL AND SZEKELY

Szekely, 70 horsepower (upper left); Continental A-70, 165 horsepower (upper right); Aeronca E-113, 40 horsepower (center); Szekely, 40 horsepower (lower left); and Continental A-40, 35 horsepower (lower right).

120 horsepower at 2,150 r.p.m., and devoted considerable experimental work to the development of a Ranger twelve cylinder, inverted Vee-type air-cooled engine.

E. W. Bliss and Company of Brooklyn, N. Y., continued preparations to manufacture the Jupiter engine, a nine cylinder, radial, air-cooled engine under its American rights to the patents of the Bristol Airplane Company of England.

Continental Aircraft Engine Corporation of Detroit, Mich., a subsidiary of Continental Motors, continued production of the A-70, a seven cylinder, radial, air-cooled engine rated at 165 horsepower at 2,000 r.p.m. A four cylinder, horizontally opposed, air-cooled, L-head engine designed to develop 35 horsepower at 2,500 r.p.m. also was available.

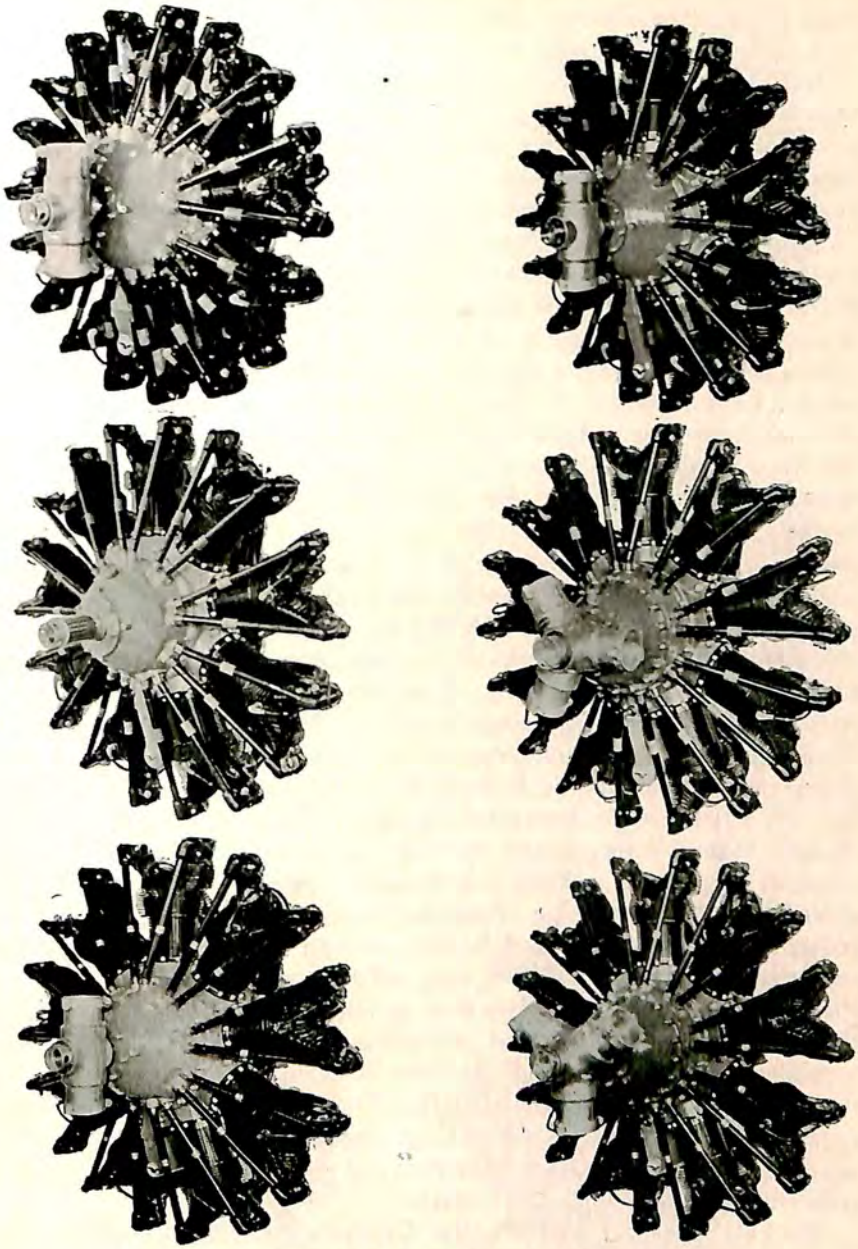
Jacobs Aircraft Engine Company of Camden, N. J., placed two new models on the commercial market, the LA-1, a seven cylinder, radial, air-cooled engine, and a three cylinder, radial, air-cooled engine of 60 horsepower.

Kinner Airplane and Motor Corporation of Glendale, Cal., continued production of the Kinner K-5, a five cylinder, radial, air-cooled engine rated at 100 horsepower at 1,810 r.p.m.; the Kinner B-5, a five cylinder, radial, air-cooled engine rated at 125 horsepower at 1,925 r.p.m.; and the Kinner C-5, a five cylinder, radial, air-cooled engine rated at 210 horsepower at 1,900 r.p.m. During the year, a new engine—designated as the Kinner R-5—was developed as a five cylinder, radial, air-cooled engine rated at 150 horsepower at 1,950 r.p.m.

Lycoming Manufacturing Company of Williamsport, Pa., a division of the Cord Corporation, continued production of the Model R-680, a nine cylinder, radial, air-cooled engine rated at 215 horsepower at 2,000 r.p.m.

Monocoupe Corporation of Robertson, Mo., took over the assets of the Lambert Aircraft Engine Corp. and continued the manufacture of the Model R-266, a five cylinder, radial, air-cooled engine rated at 90 horsepower at 2,375 r.p.m.

Packard Motor Car Company of Detroit, Mich., continued production of its Diesel aircraft engine, a nine cylinder, radial, air-cooled compression ignition oil burning engine rated at 225 horsepower at 1,950 r.p.m. The Diesel had no carburetor or spark plugs, the fuel charge being burned by heat generated through compression of the air in the cylinders. Ordinary furnace oil was used as fuel. Tests during the year revealed that there was a gradual increase of revolutions per minute and power output from sea level to approximately 8,000 feet. In these tests, a Diesel engined plane had a speed of 116.5 miles an hour at sea level with an engine speed of 1,980 r.p.m.; a speed of 118.6 miles per hour at 8,000 feet with an engine speed of 2,015 r.p.m.; and a speed of 110.6 miles an hour at 15,000 feet with



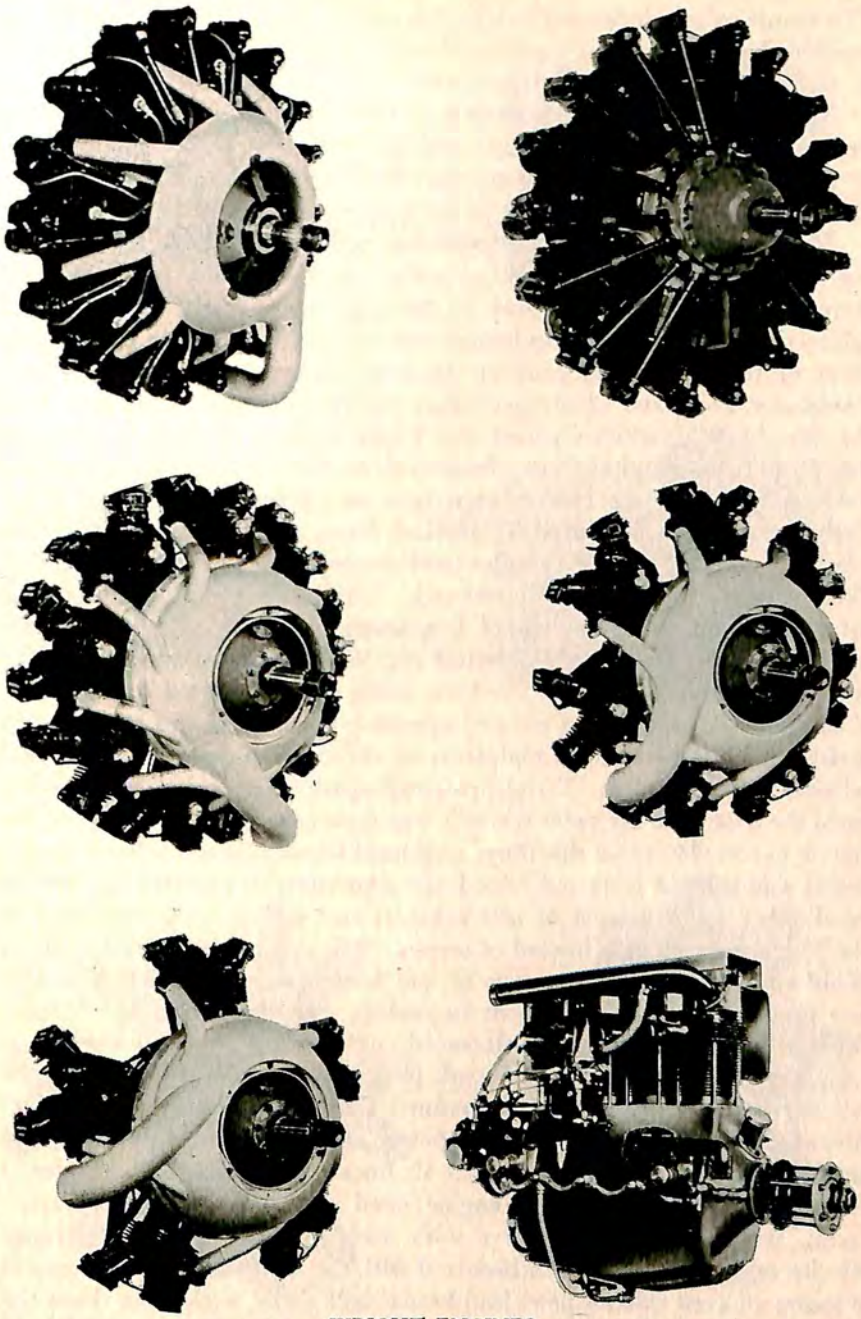
PRATT AND WHITNEY ENGINES

Wasp Junior, 300–400 horsepower (upper left); Wasp Direct Drive Series C-1, 500 horsepower military rating, 420 horsepower commercial rating (upper right); Hornet Series B-1, 575 horsepower (center left); Hornet Series B-1, Geared, 575 horsepower (center right); Hornet Series A-2, 525 horsepower (lower left); Hornet Series A-2, Geared, 500 horsepower (lower right).

1,950 r.p.m. The absolute ceiling during the test was 20,000 feet, where forward speed was 82 miles an hour and the engine, 1,750 r.p.m. Considerable development work also was done on the Packard 2500 water-cooled gasoline engines, of 1,400 and 1,600 horsepower. The 1,400 horsepower of the Model 2500 was obtained through use of a 10 to 1 compression ratio. During the summer, a supercharger was developed for this engine to boost its performance to 1,600 horsepower at 2,700 r.p.m.

The Pratt and Whitney Aircraft Company of East Hartford, Conn., a division of United Aircraft and Transport Corp., continued production in 1931 of the same models manufactured in 1930. The Series C Wasp, a nine cylinder, radial, air-cooled engine rated at 420 horsepower at 2,000 r.p.m.; the Series A-2 Hornet, a nine cylinder, radial, air-cooled engine rated at 525 horsepower at 1,900 r.p.m.; the Series B Hornet, a nine cylinder, radial, air-cooled engine rated at 575 horsepower at 1,950 r.p.m.; and the Wasp Junior, a nine cylinder, radial, air-cooled engine rated at 300 horsepower at 2,000 r.p.m. were offered to the commercial and military markets. The Wasp Junior also was available with a supercharger to develop 400 horsepower at 2,300 r.p.m. at sea level or 360 horsepower at 4,000 feet. The Series C Wasp was offered supercharged to 450 horsepower at 2,100 r.p.m. at 6,000 feet. During the summer of 1931, the Series C Wasp was superseded by Series C-1, a development of the Series C, with no change in rating or weight. The Series B-1 Hornet superseded the Series B Hornet with no change in rating. Production on the Series D Wasp, developing 500 horsepower at 6,000 feet and used for military purposes, was continued and the Series E Wasp was put into service for military use with a rating of 500 horsepower at 2,200 r.p.m. at 11,000 feet. A supercharged Hornet B for military use was built, with a rating of 575 horsepower at 1,950 r.p.m. at 8,000 feet. Geared engines available included the C and C-1 Wasp with 5:4 reduction drive; the A-2 Hornet with 2:1 reduction drive; and the B and B-1 Hornet with 3:2 reduction drive. The supercharged B and B-1 Hornet were offered with reduction gearing, too. Pratt and Whitney geared drives were manufactured under patents held by the company. One of the most interesting developments of the year was a combination hotspot and oil regulator designed for installation between the carburetor and rear section of all type Pratt and Whitney engines. The regulator utilized the temperature drop caused by evaporation of gasoline to cool the oil and in the same unit provided means of heating the mixture from the engine exhaust in cold weather.

Szekely Aircraft and Engine Company of Holland, Mich., continued production of its three cylinder, radial, air-cooled engines of 35, 45 and 55 horsepower. Additions made to this series during the year included a four cylinder, horizontally opposed, air-cooled engine of 65 horsepower and two five cylinder, radial, air-cooled models of 75 and 90 horsepower.



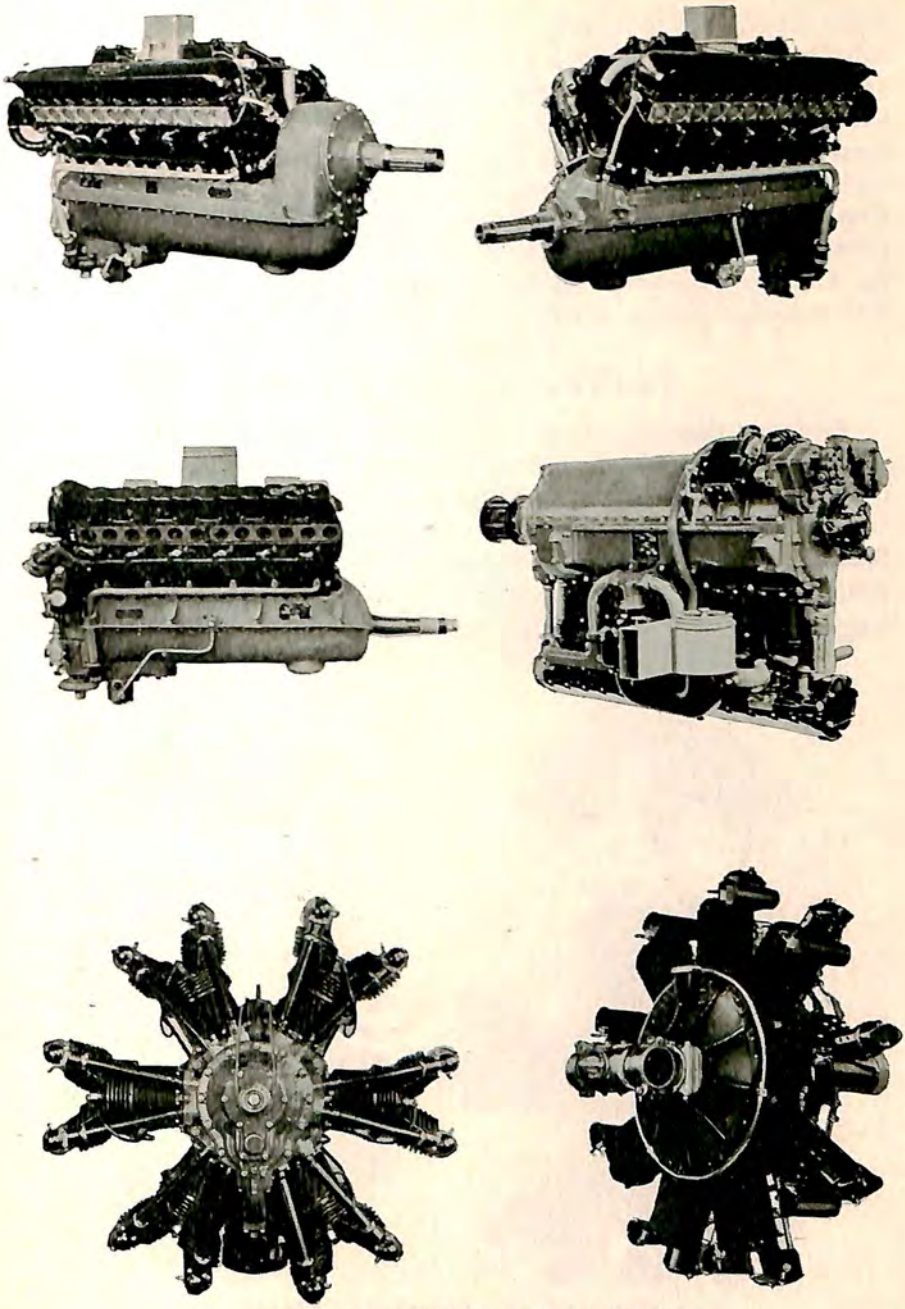
WRIGHT ENGINES

Cyclone, 575 horsepower (upper left); Cyclone, 525 horsepower (upper right); Whirlwind, 300 horsepower (center left); Whirlwind, 240 horsepower (center right); Whirlwind, 165 horsepower (lower left); and Gipsy, 90 horsepower (lower right).

The company's facilities were expanded during 1931 with the addition of considerable machine tool equipment and a major increase in the capacity of its assembly and testing departments.

Warner Aircraft Corporation of Detroit, Mich., continued production of the Warner Scarab, a seven cylinder, radial, air-cooled engine rated at 100 horsepower at 1,850 r.p.m., and the Scarab Junior, a five cylinder, radial, air-cooled engine rated at 90 horsepower at 2,025 r.p.m.

Wright Aeronautical Corporation of Paterson, N. J., a division of the Curtiss-Wright Corp., took over the engine division of the Curtiss Aeroplane and Motor Company of Buffalo, N. Y., early in 1931. All production machinery and equipment was moved from Buffalo to the main plant of the Wright company at Paterson, where the Curtiss engines—Conqueror, D-12, and Challenger—were put into production together with the Wright Whirlwind, Cyclone and Gipsy engines, under the name of the Wright Aeronautical Corp. Employees on the payroll increased during the year from 1,242 on November 1, 1930, to 1,848 on November 1, 1931. Early in 1931, an improved Whirlwind series engine, incorporating an adaptation of the "E" type cylinder head developed for the new and refined Cyclone series in 1930, was introduced. The fundamental design of the three radial, air-cooled engines of five, seven and nine cylinders—known by their horsepower as the Whirlwind 165, Whirlwind 240 and Whirlwind 300, respectively—which comprised the series, was not altered. Refinement of the cylinder head design reduced operating head temperatures, increased performance, and simplified maintenance. Features of the new Whirlwind cylinder head included: Wright patented spark plug coolers which dissipated the heat from the point where it was most intensified and adapted the engine to complete radio shielding; additional finning on the exhaust rocker boxes; side exhaust ports and finned cast aluminum elbows which could be faced either way for front or rear exhaust; and rocker box covers held in place by clamps or bails instead of screws. The supercharged nine-cylinder Whirlwind, developing in excess of 400 horsepower at 2,300 r.p.m. also was produced. An improvement in cooling was effected on the Wright Gipsy, a four cylinder, in-line, air-cooled engine, rated at 90 horsepower at 1,950 r.p.m., by the insertion of spark plug coolers in the right side of the cylinder head. Production of the refined Cyclone, a nine cylinder, radial, air-cooled engine, rated at 575 horsepower at 1,900 r.p.m., was continued for the Army, Navy and commercial air lines. The Curtiss Challenger, a six cylinder, radial, air-cooled engine rated at 185 horsepower at 2,000 r.p.m., was refined during 1931 with such improvements as: constant velocity cams with timing synchronized with the articulated rod movement to secure an even exhaust note; lead bronze half shells, with three times the life of babbitt shells, fitted to master rods; a redesigned heater valve of high tensile aluminum alloy, etc. The Curtiss Conqueror, a 12 cylinder,



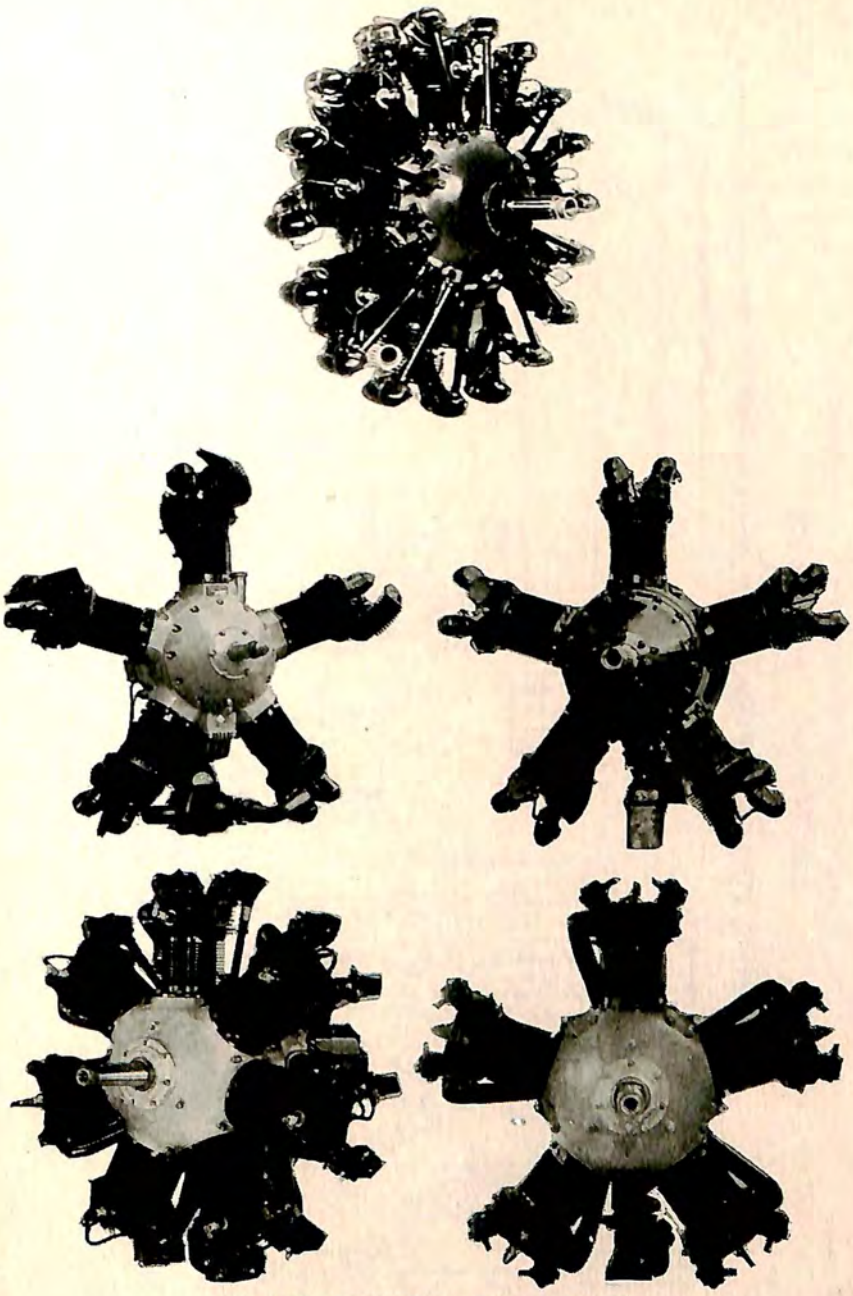
AMERICAN, CURTISS, AND PACKARD

Curtiss Geared Conqueror, 600 horsepower (upper left); Curtiss Conqueror, 600 horsepower (upper right); Curtiss D-12, 435 horsepower (center left); American Ranger 6-390, 120 horsepower (center right); Curtiss Challenger, 185 horsepower (lower left); and Packard Diesel, 225 horsepower (lower right).

liquid-cooled, Vee type engine, was produced in three models in 1931, with reduction gearing of 2:1 or 7:5 and as a direct drive engine. As a direct drive engine, the Conqueror was rated at 600 horsepower at 2,400 r.p.m., while the geared models were rated at 600 horsepower at 2,450 r.p.m., crankshaft speed. The Curtiss D-12, a 12 cylinder, water-cooled, Vee type engine rated at 435 horsepower at 2,300 r.p.m., was produced for the Army. Development work was continued on the Wright Tornado, a 12 cylinder, air-cooled, Vee type engine of 1,500 cubic inch displacement, for the Army. All models of the Whirlwind and Cyclone series were offered with reduction gearing of either 1.58 or 1 or 2 to 1.

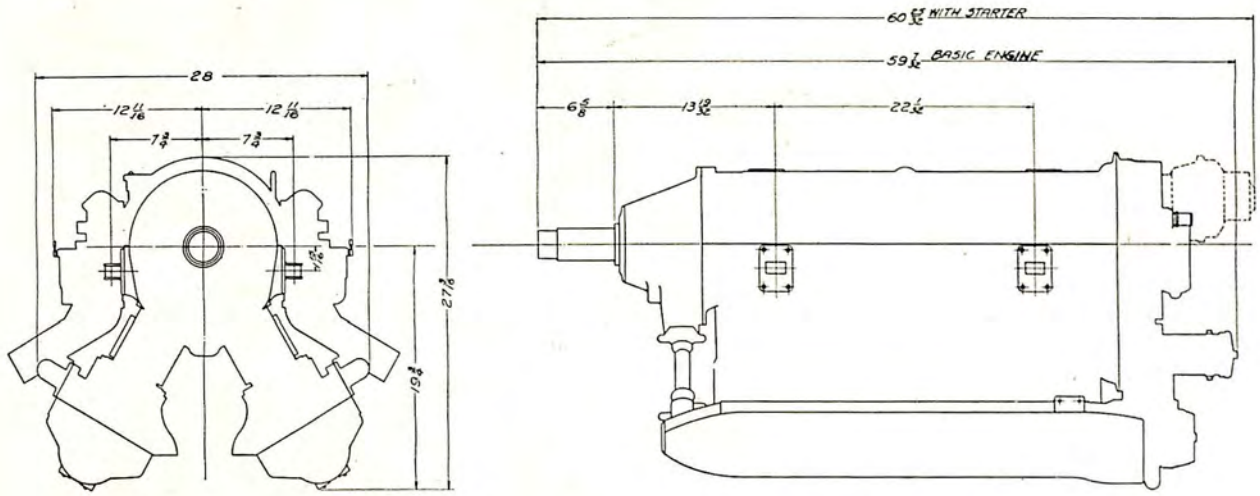
Two-View Drawings Presented

Two-view drawings of the principal American engines developed or produced during 1931 are presented immediately following this chapter, in alphabetical order according to the name of the producer. This is the first time that the engine designs have been presented in The Aircraft Year Book as an integral part of this chapter. The revised organization plan was effected to permit quick reference to engine designs mentioned in the text of the chapter.



KINNER, LYCOMING AND WARNER

Lycoming R-680, 215 horsepower (top); Kinner B-5, 125 horsepower (center left); Kinner C-5, 210 horsepower (center right); Warner Scarab, 110 horsepower (lower left); and Warner Scarab, Jr., 90 horsepower (lower right).

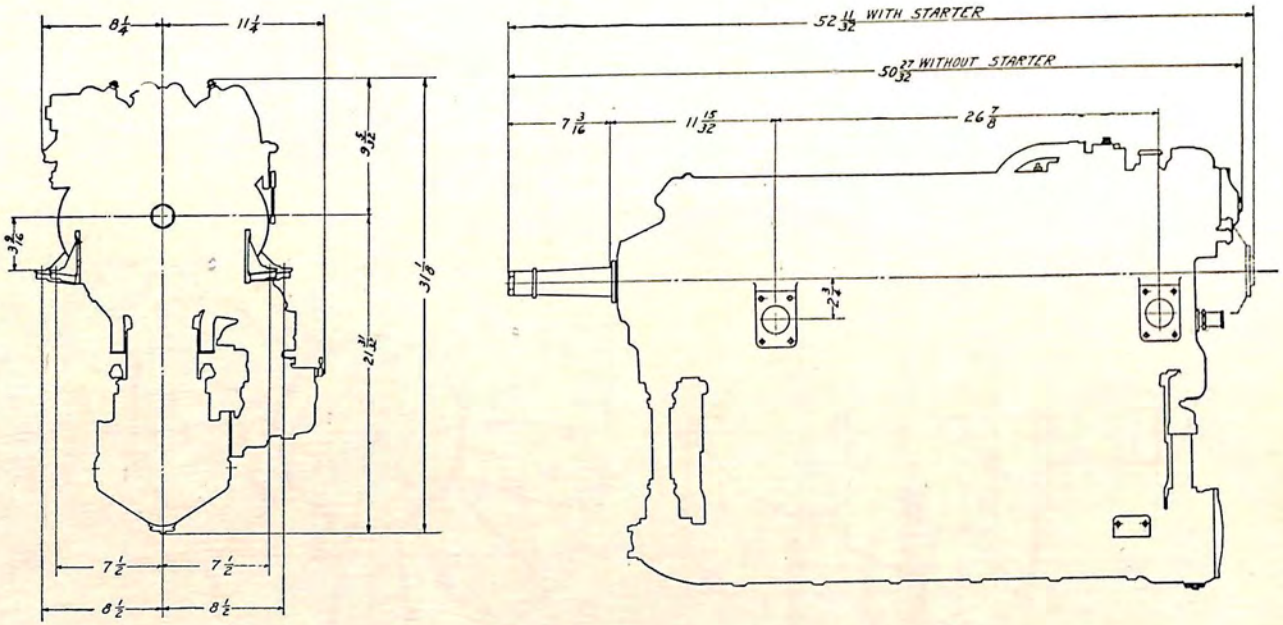


AMERICAN AIRPLANE & ENGINE CORPORATION

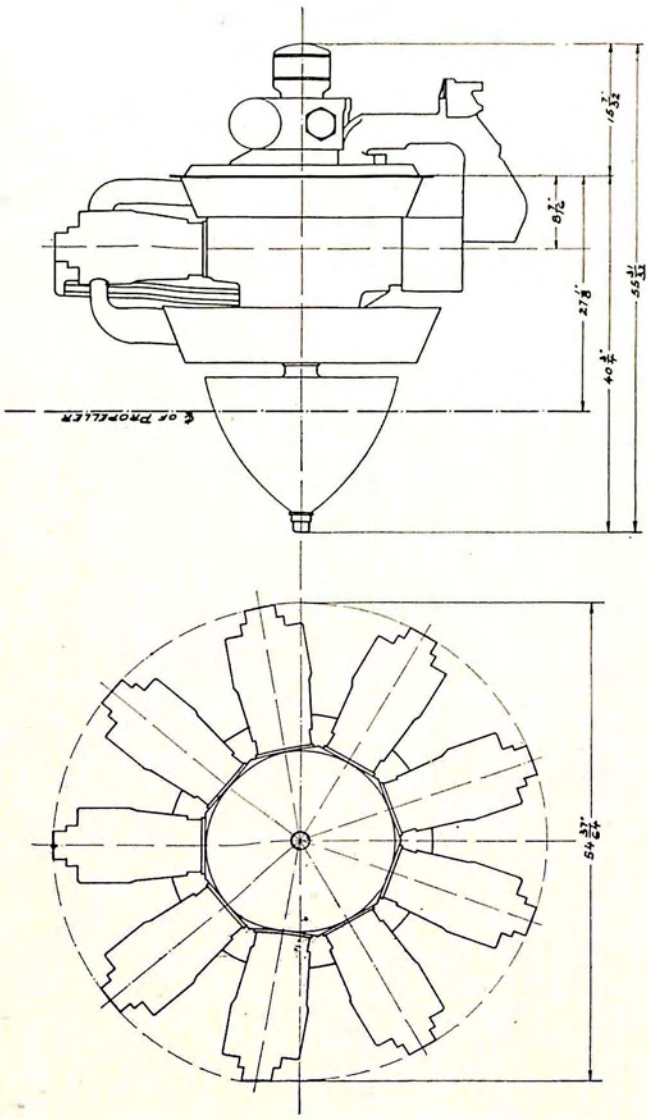
Farmingdale, L. I., N. Y.

RANGER V-770 — 270 H.P.

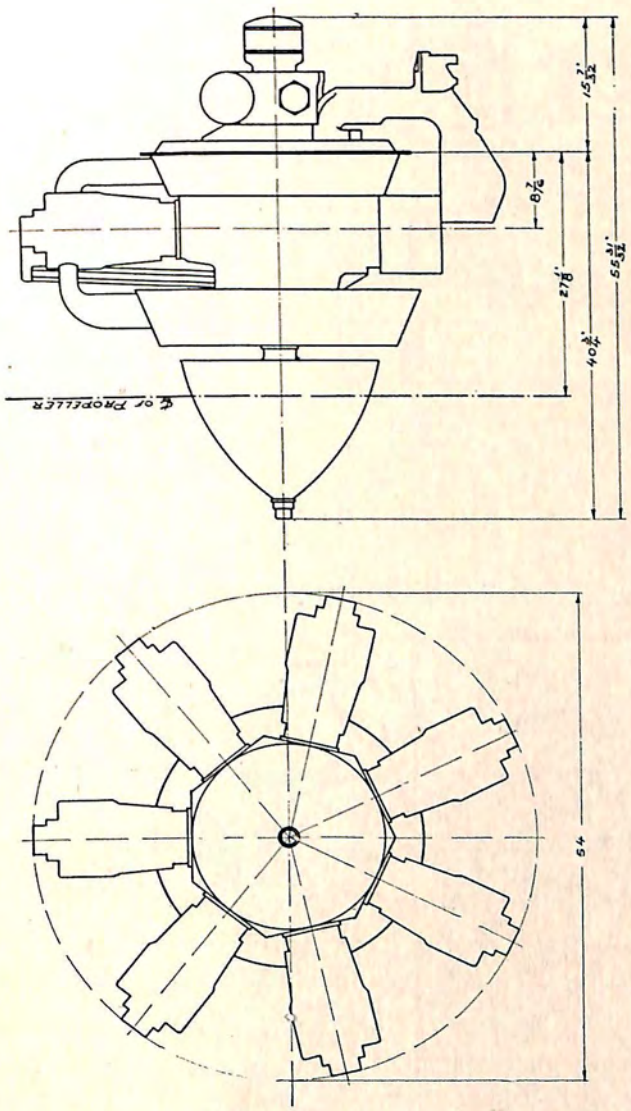
12 CYLINDER INVERTED V TYPE AIRCOOLED



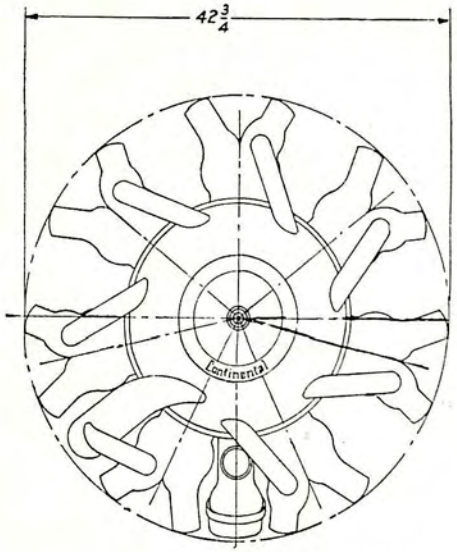
AMERICAN AIRPLANE & ENGINE CORPORATION
Farmingdale, L. I., N. Y.
RANGER 6-390 — 120 H.P.
6 CYLINDER INVERTED IN LINE AIRCOOLED

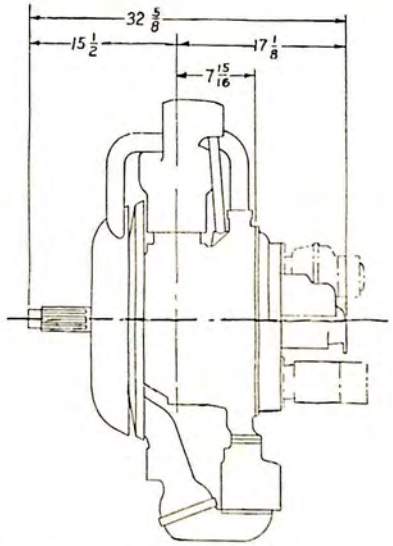


E. W. BLISS COMPANY
Brooklyn, N. Y.
BLISS-JUPITER — 550 H.P.
9 CYLINDER RADIAL AIRCOOLED



E. W. BLISS COMPANY
Brooklyn, N. Y.
BLISS–NEPTUNE — 400 H.P.
7 CYLINDER RADIAL AIRCOOLED

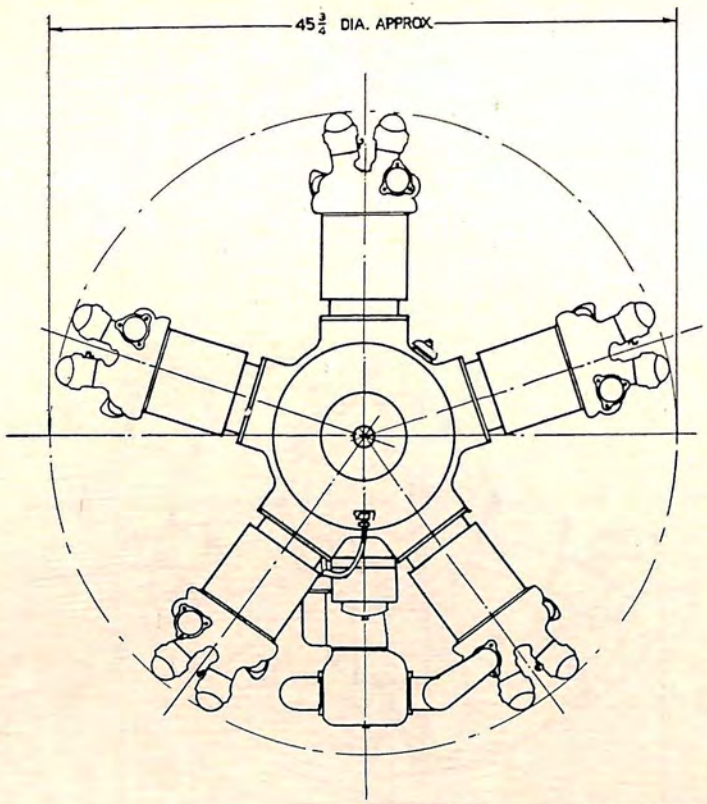


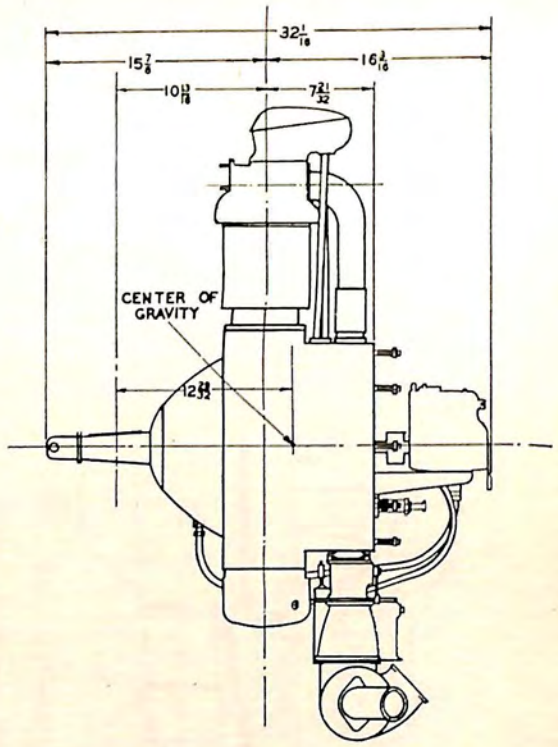


CONTINENTAL AIRCRAFT ENGINE COMPANY
Detroit, Mich.

MODEL A70-2 — 165 H.P.

7 CYLINDER RADIAL AIRCOOLED

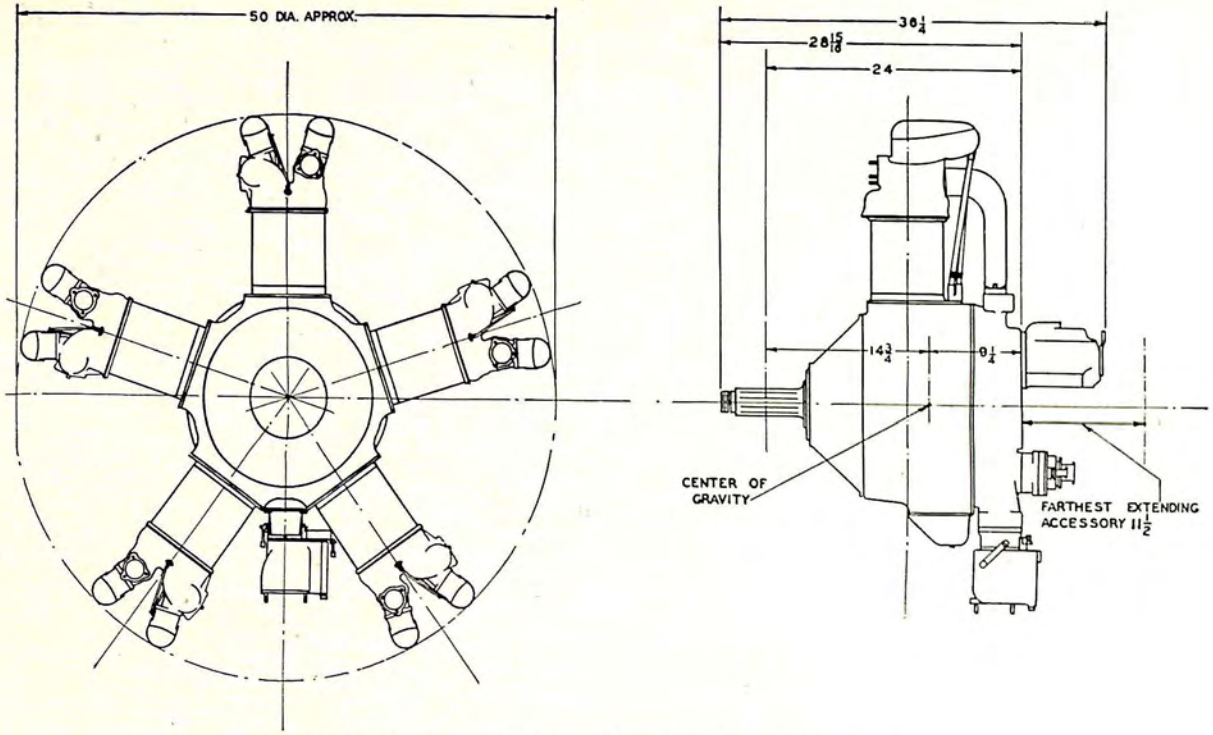




KINNER AIRPLANE & MOTOR CORPORATION
Glendale, Calif.

MODEL B–5 — 125 H.P.

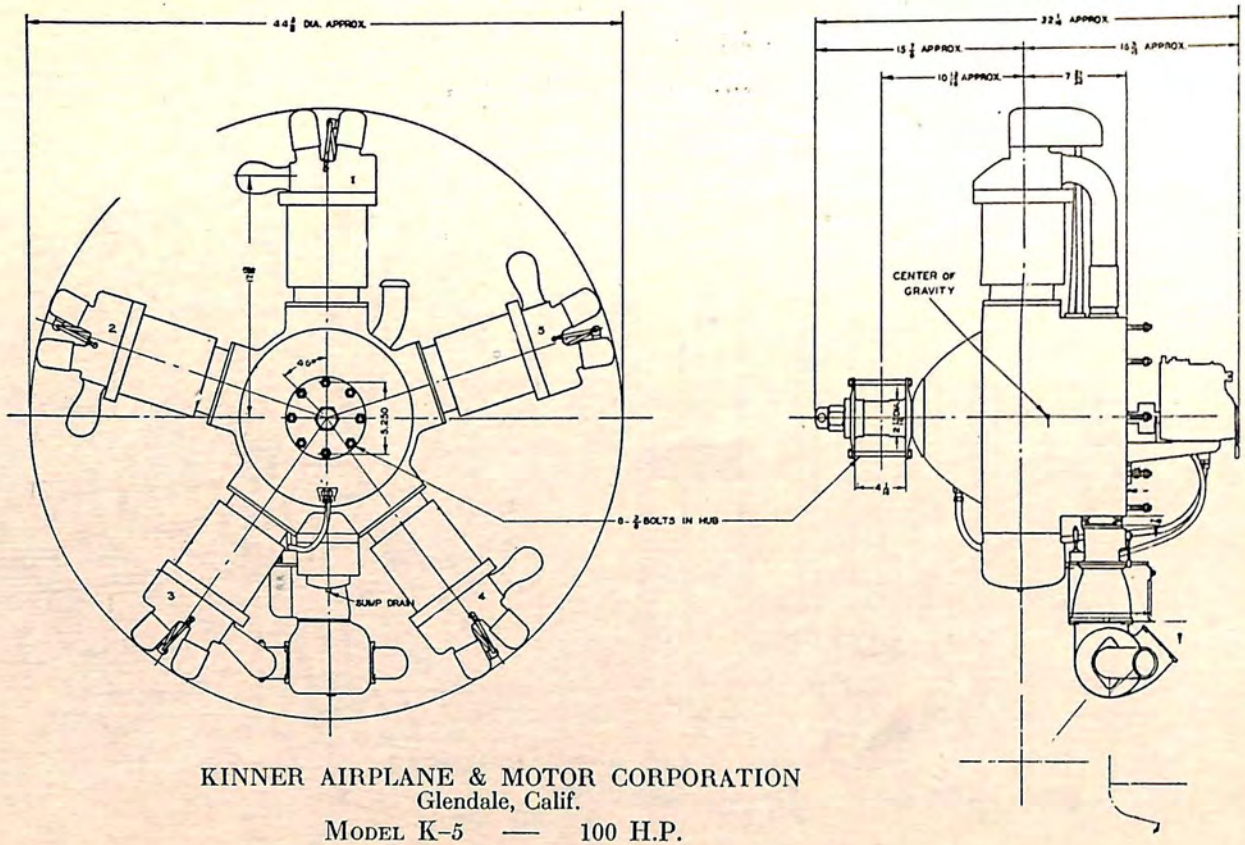
5 CYLINDER RADIAL AIRCOOLED



KINNER AIRPLANE & MOTOR CORPORATION
Glendale, Calif.

MODEL C-5 — 210 H.P.

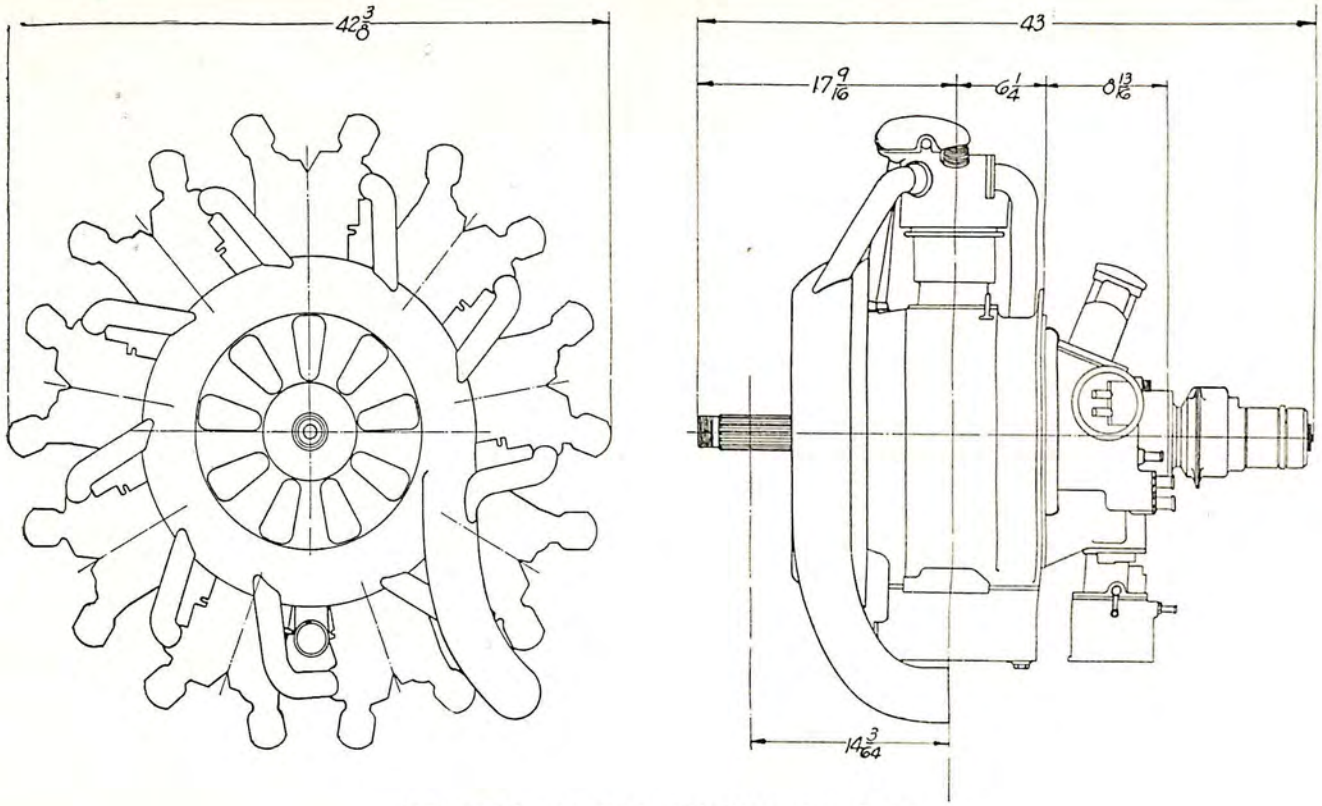
5 CYLINDER RADIAL AIRCOOLED



KINNER AIRPLANE & MOTOR CORPORATION
Glendale, Calif.

MODEL K–5 — 100 H.P.

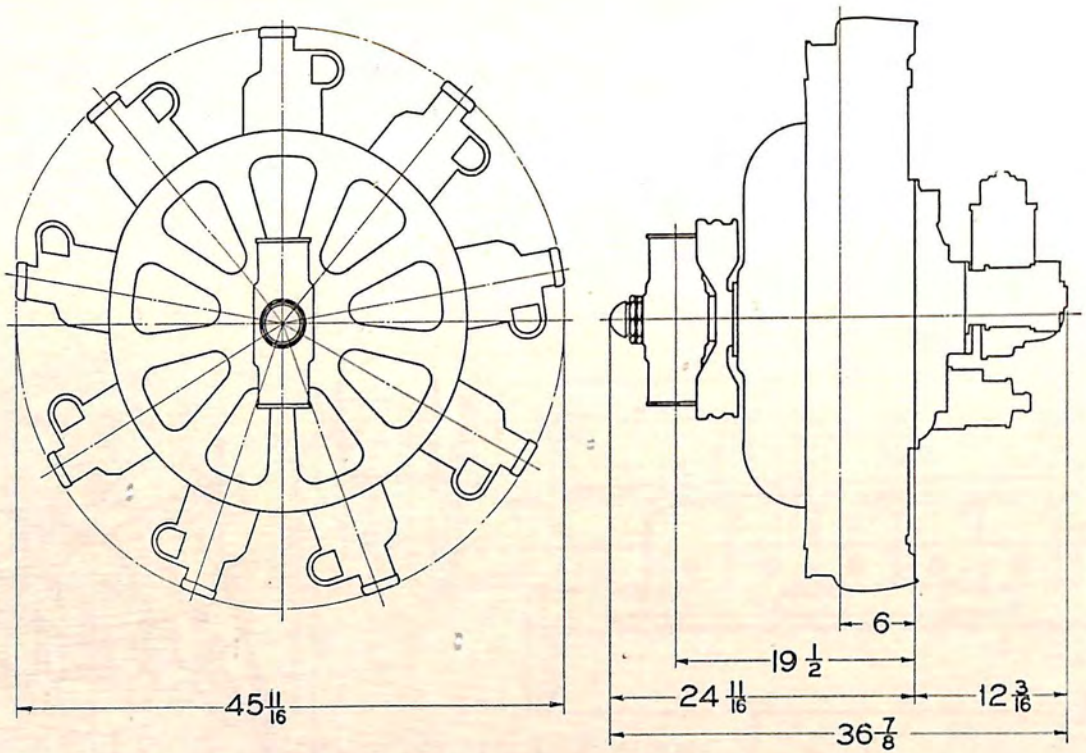
5 CYLINDER RADIAL AIRCOOLED



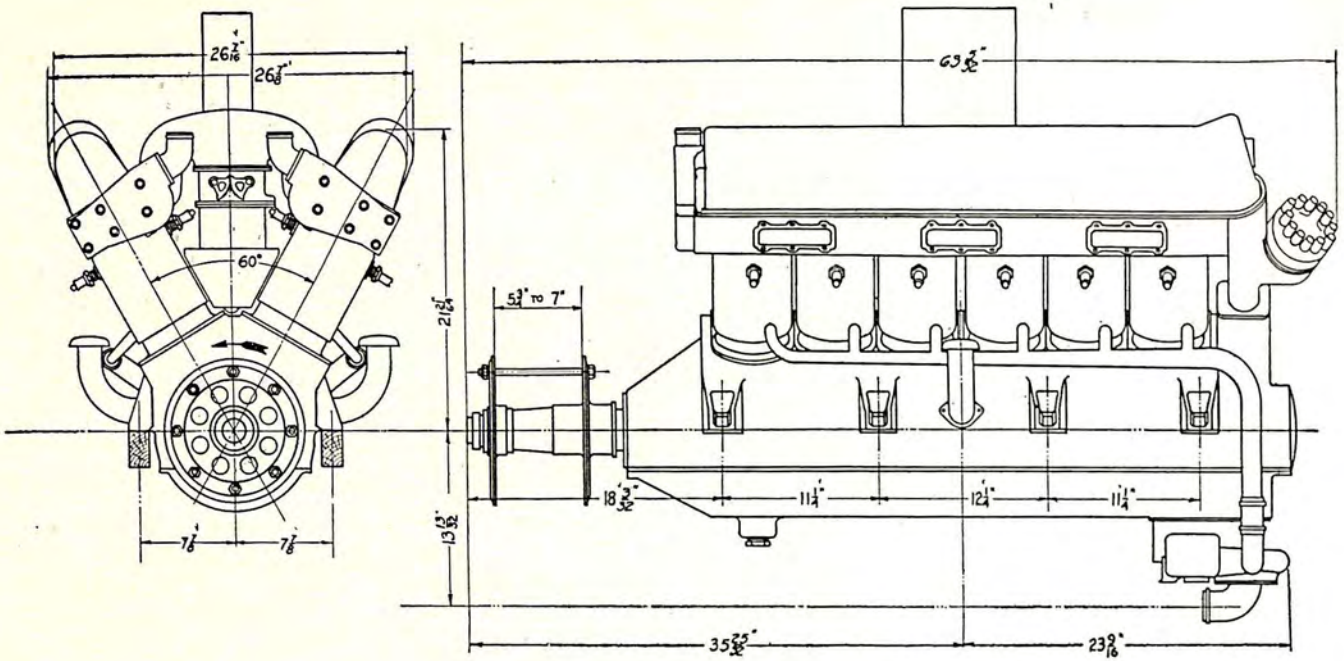
LYCOMING MANUFACTURING COMPANY
Williamsport, Pa.

MODEL R-680 — 215 H.P.

9 CYLINDER RADIAL AIRCOOLED



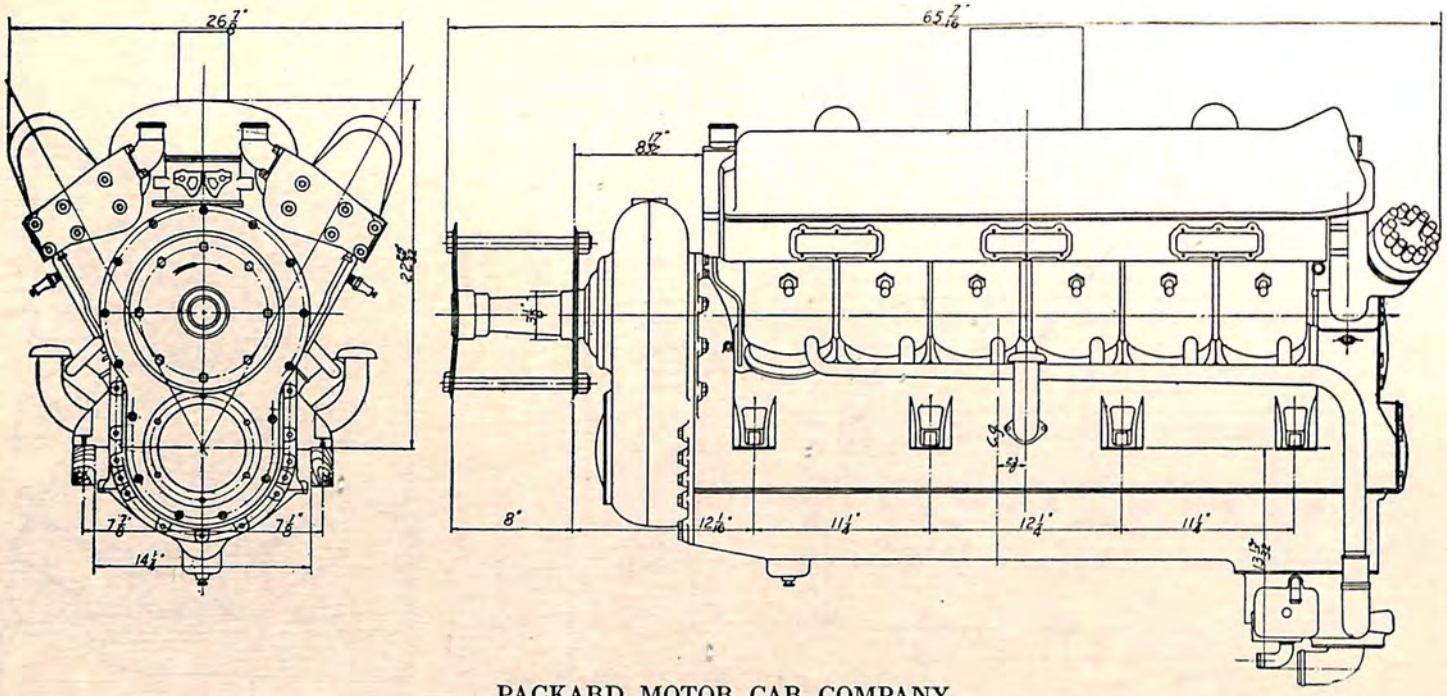
PACKARD MOTOR CAR COMPANY
Detroit, Mich.
MODEL DR-980 — 225 H.P.
9 CYLINDER RADIAL AIRCOOLED



PACKARD MOTOR CAR COMPANY
Detroit, Mich.

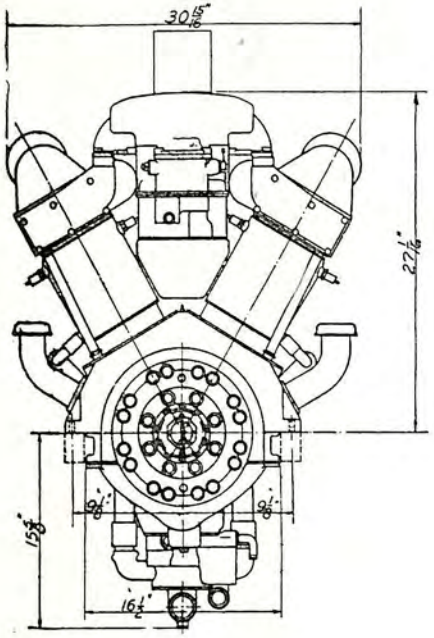
MODEL 2A–1500 — 600 H.P.

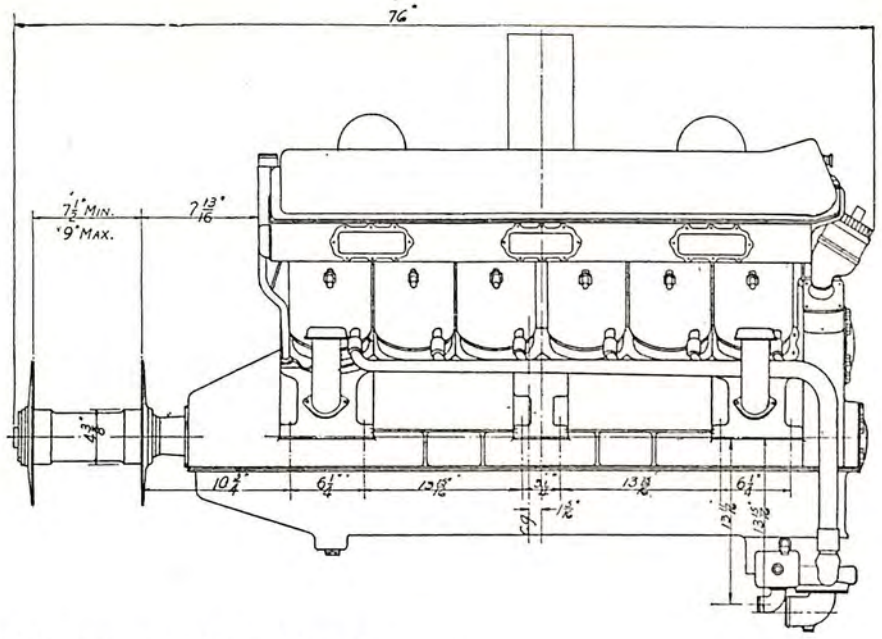
12 CYLINDER V TYPE WATERCOOLED



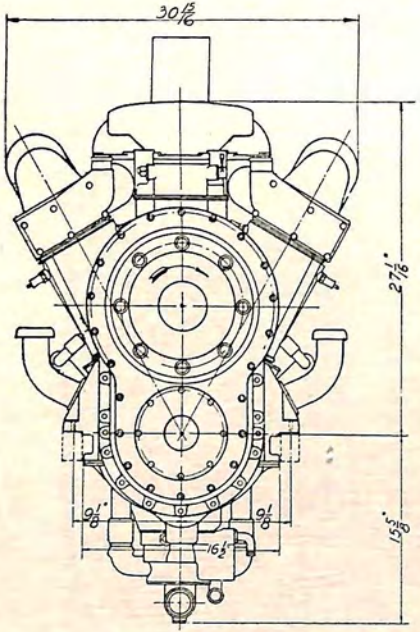
PACKARD MOTOR CAR COMPANY
Detroit, Mich.

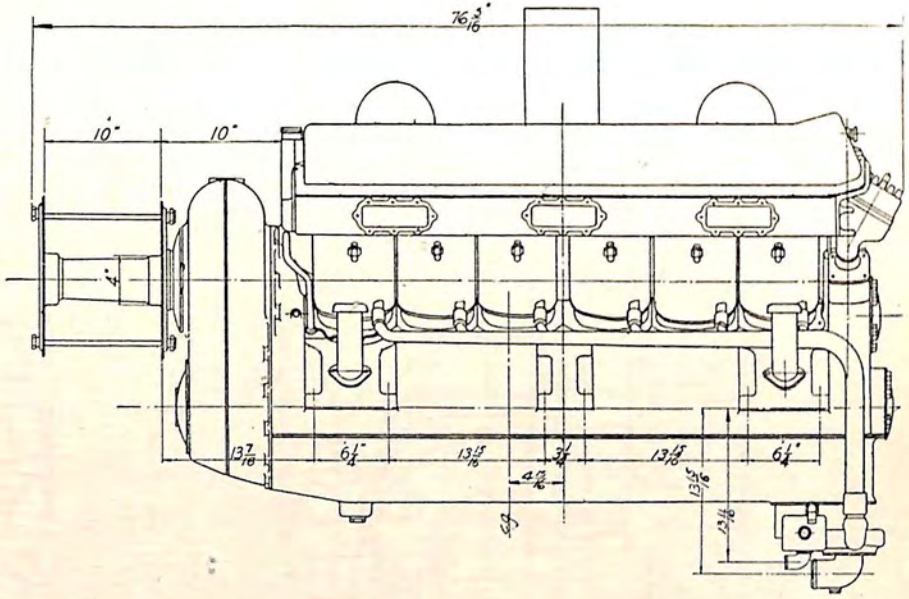
MODEL 2A–1500 (GEARED) — 600 H.P.
12 CYLINDER V TYPE WATERCOOLED





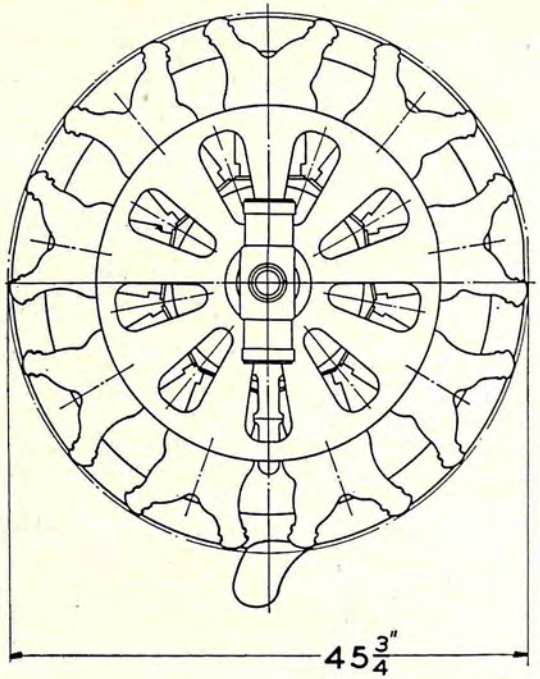
PACKARD MOTOR CAR COMPANY
Detroit, Mich.
MODEL 2A–2500 — 800 H.P.
12 CYLINDER V TYPE WATERCOOLED

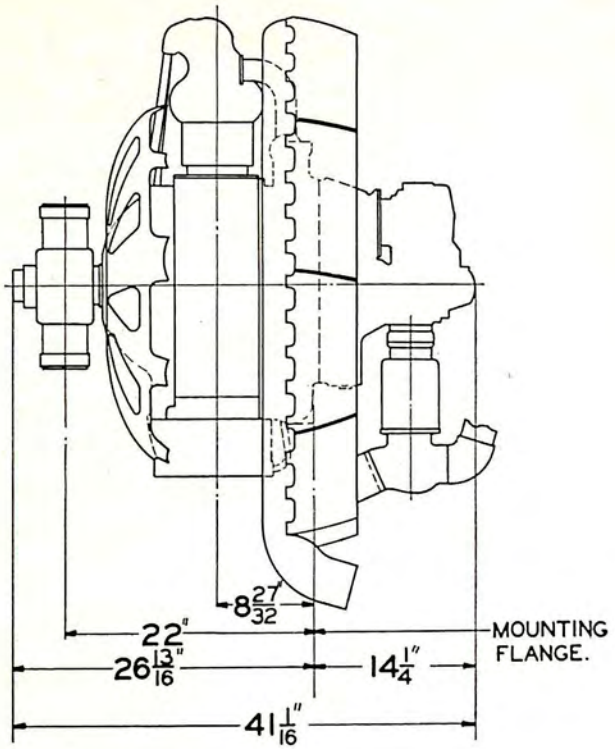




PACKARD MOTOR CAR COMPANY
Detroit, Mich.

MODEL 2A-2500 (GEARED) — 800 H.P.
12 CYLINDER V TYPE WATERCOOLED

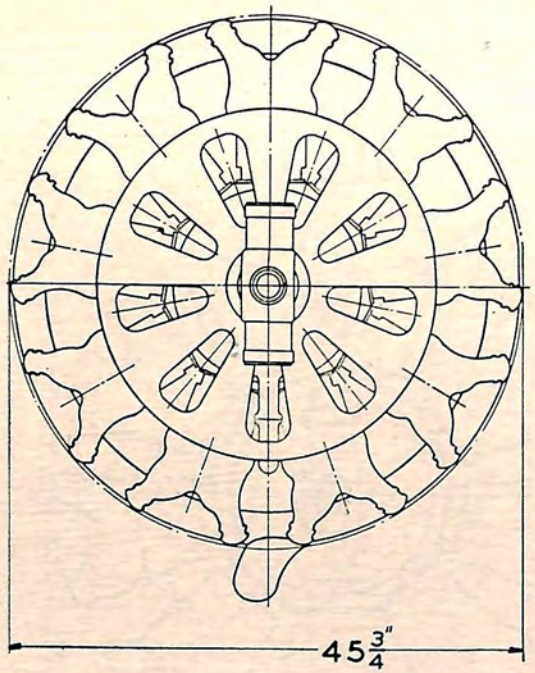


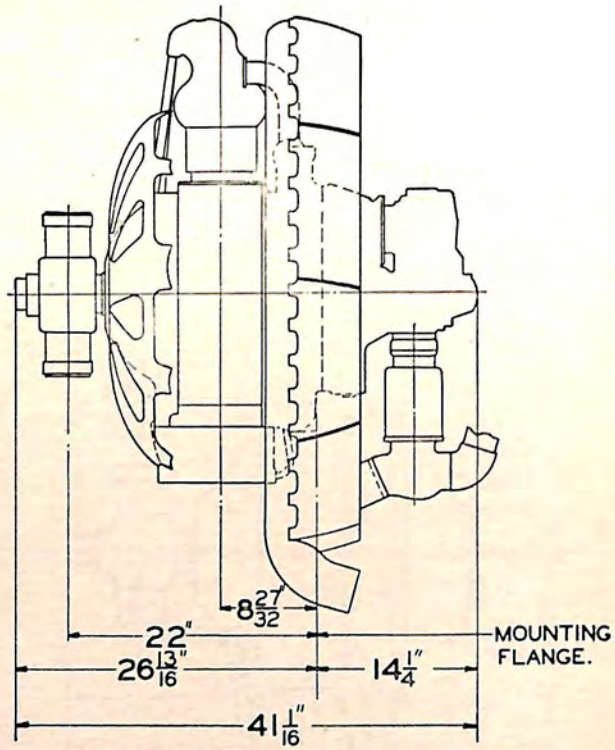


PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.

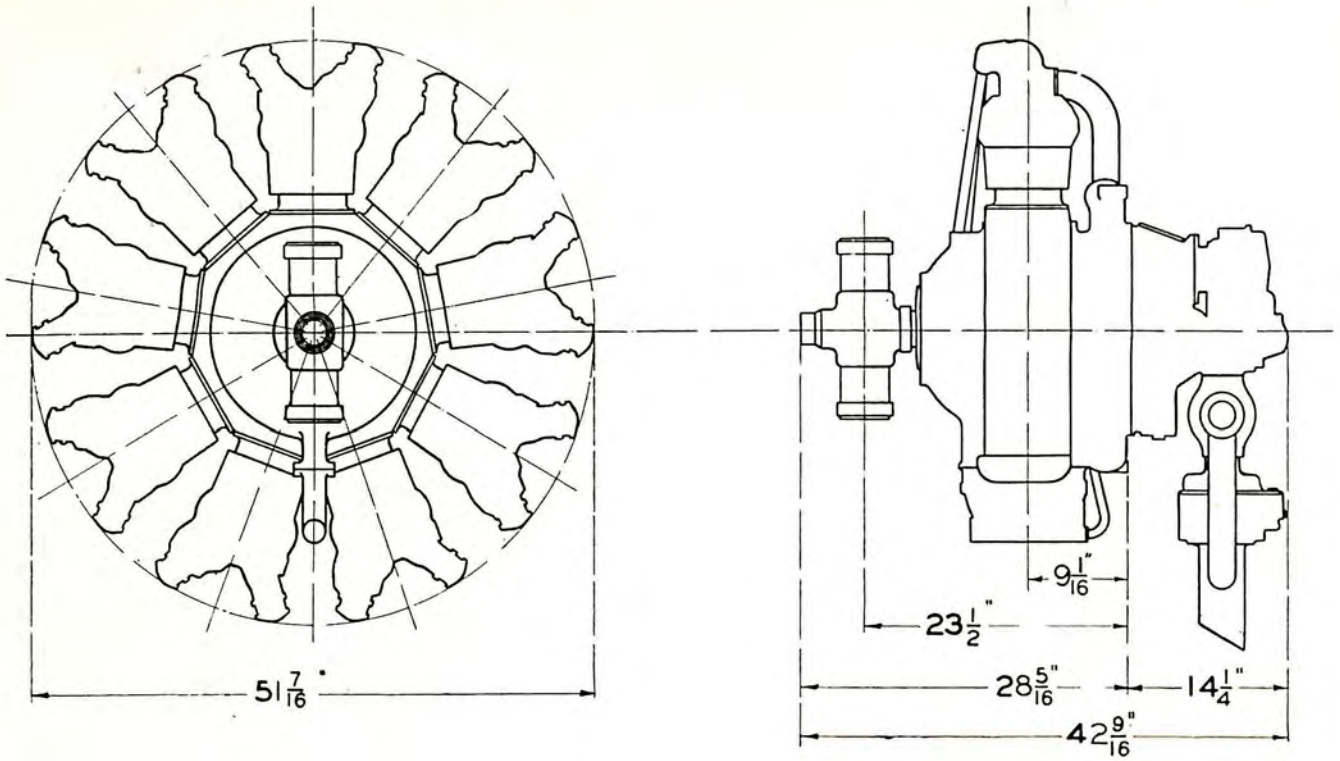
WASP, JR. — 300 H.P.

9 CYLINDER RADIAL AIRCOOLED

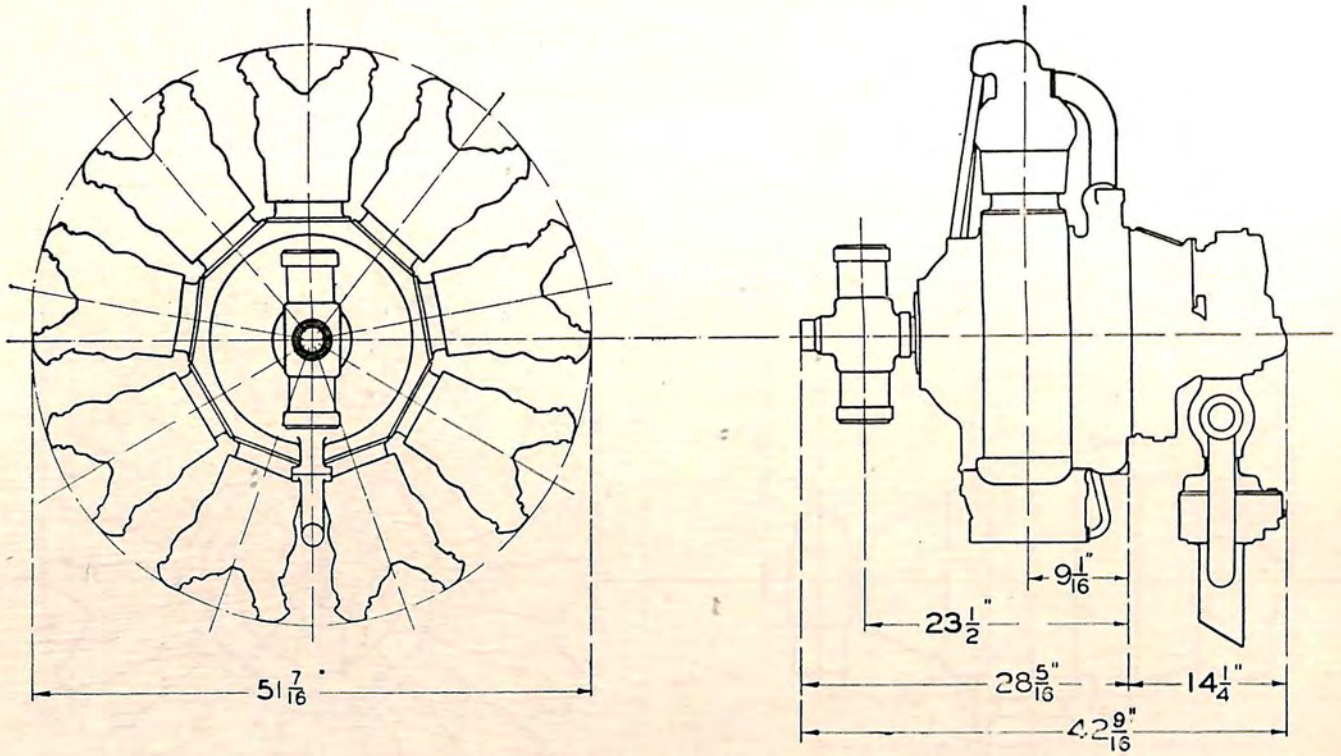




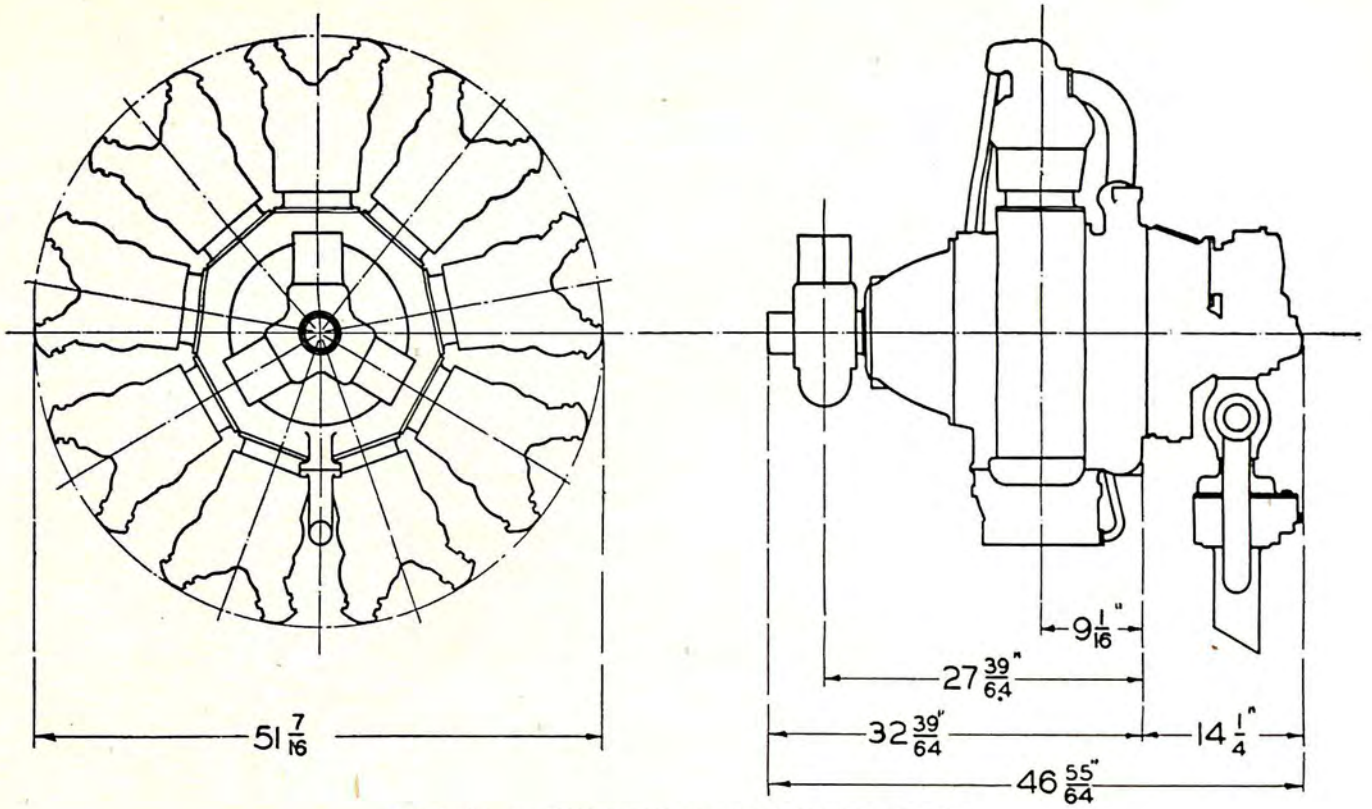
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
WASP, JR. — 400 H.P.
9 CYLINDER RADIAL AIRCOOLED



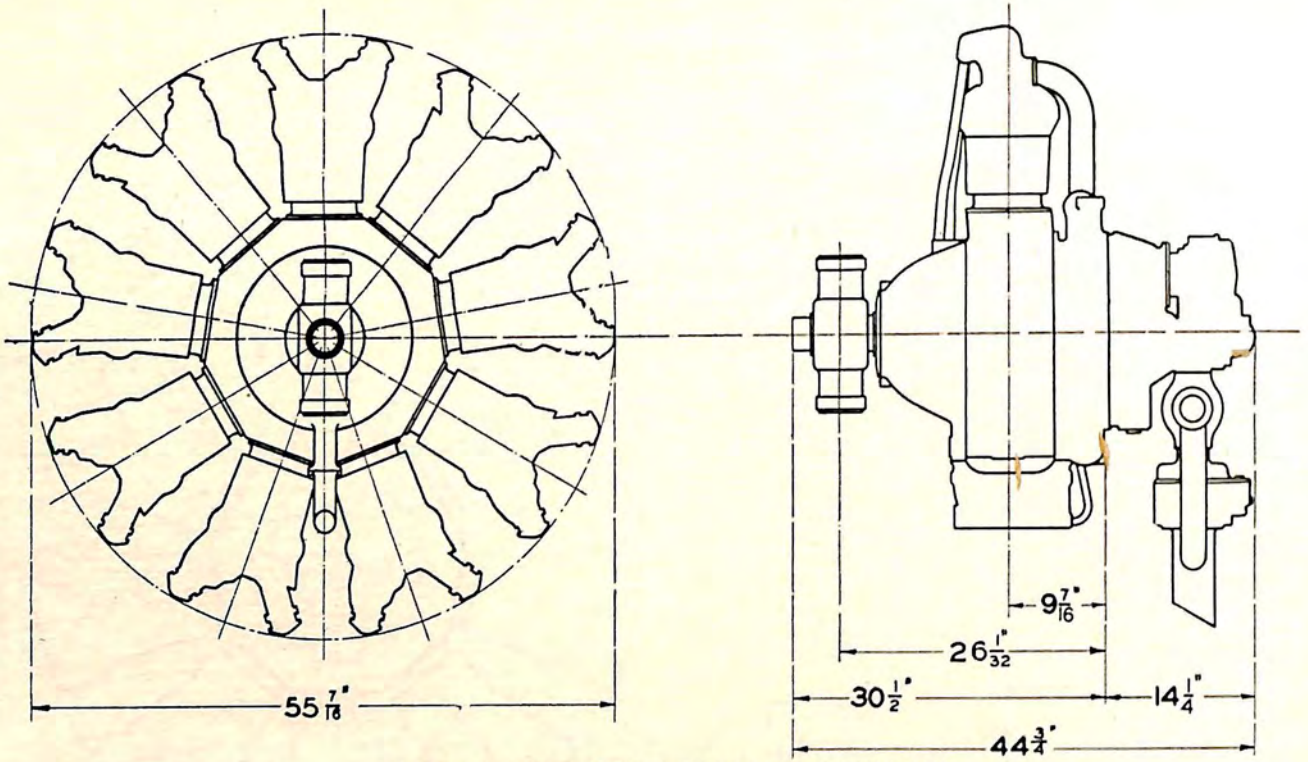
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
WASP C-1 — 420 H.P.
9 CYLINDER RADIAL AIRCOOLED



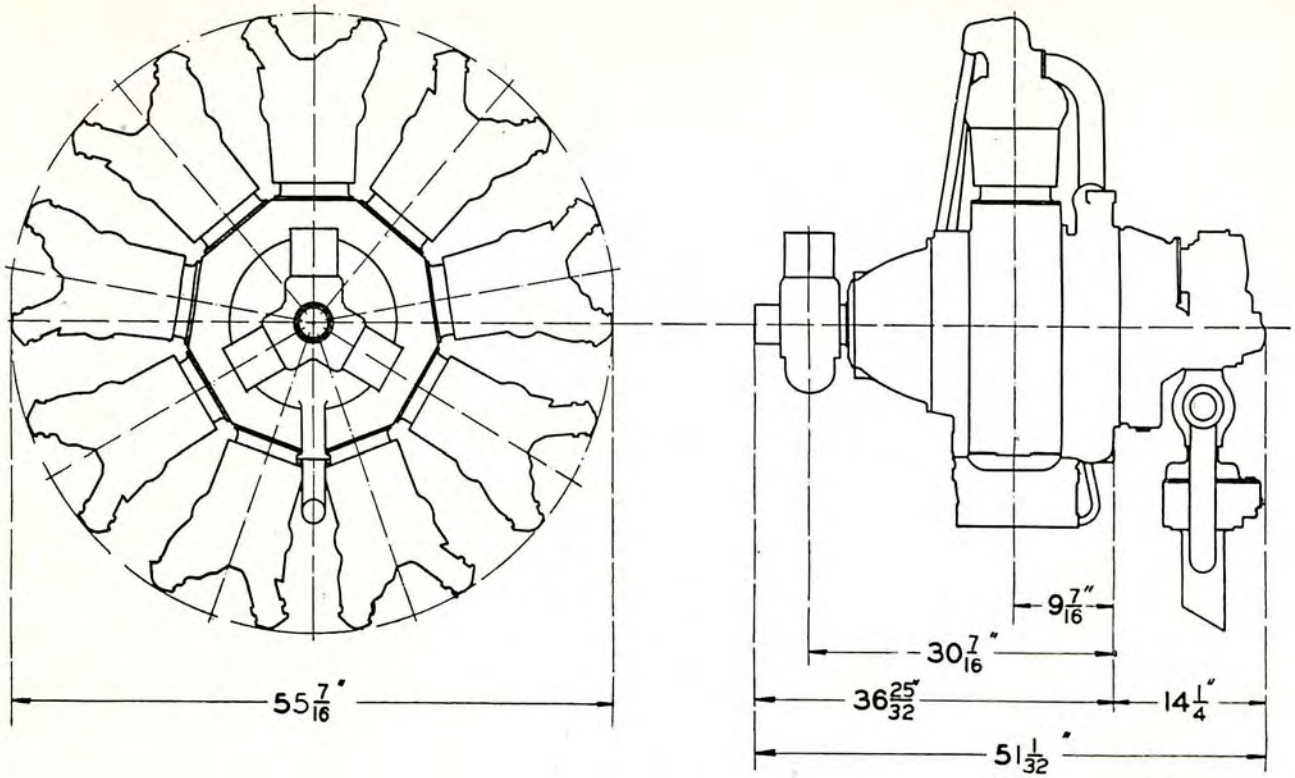
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
WASP D, E — 500 H.P.
9 CYLINDER RADIAL AIRCOOLED



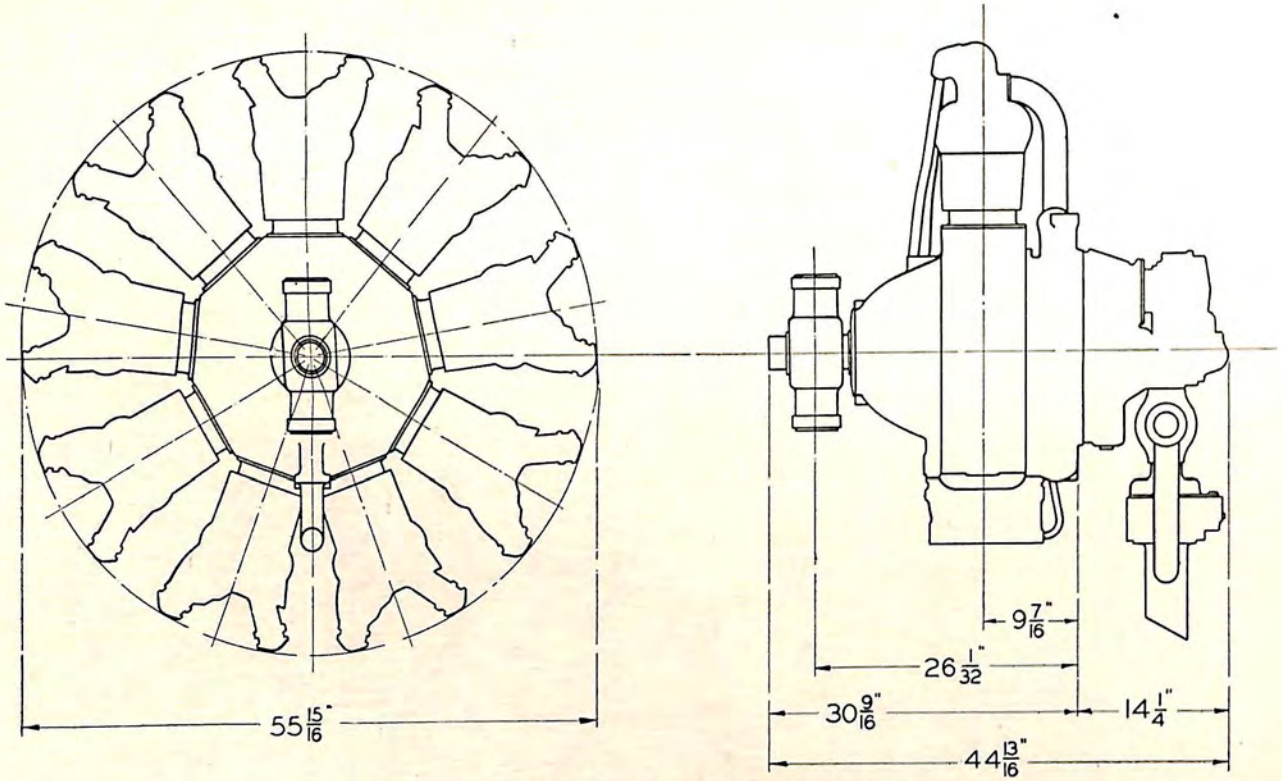
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
WASP C–1 (GEARED) — 420 H.P.
9 CYLINDER RADIAL AIRCOOLED



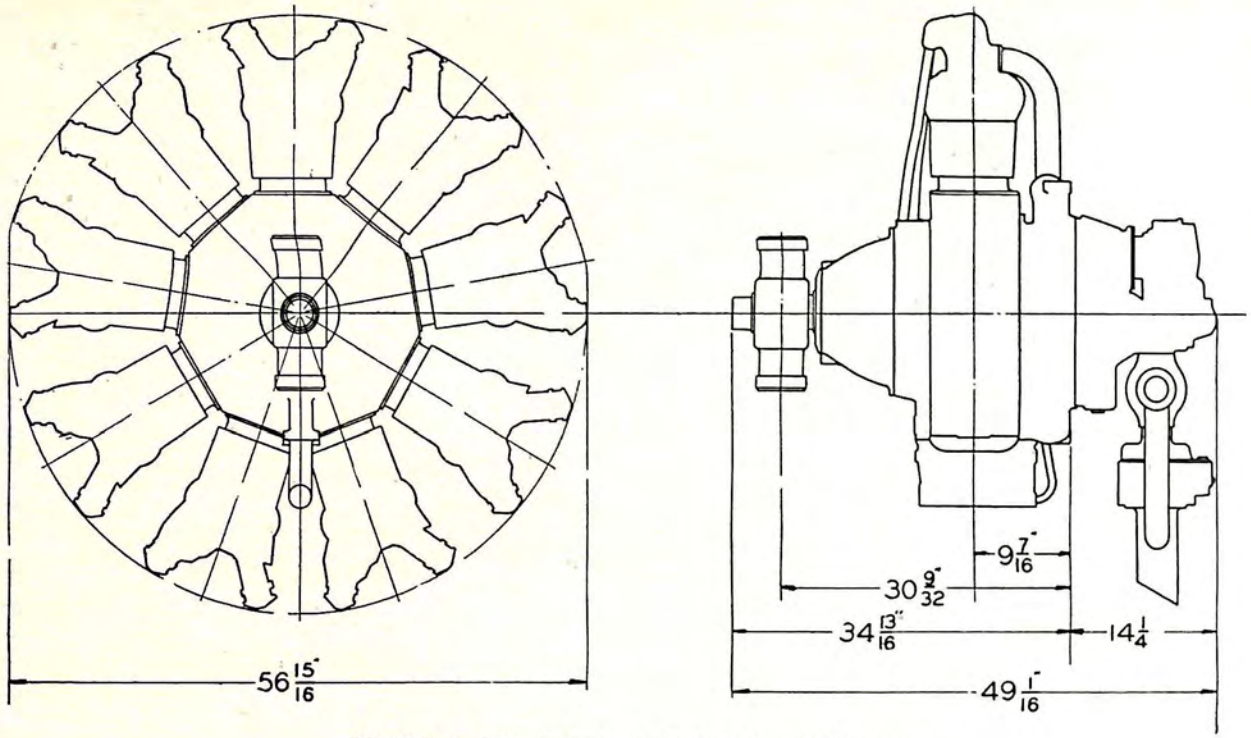
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
HORNET A-2 — 525 H.P.
9 CYLINDER RADIAL AIRCOOLED



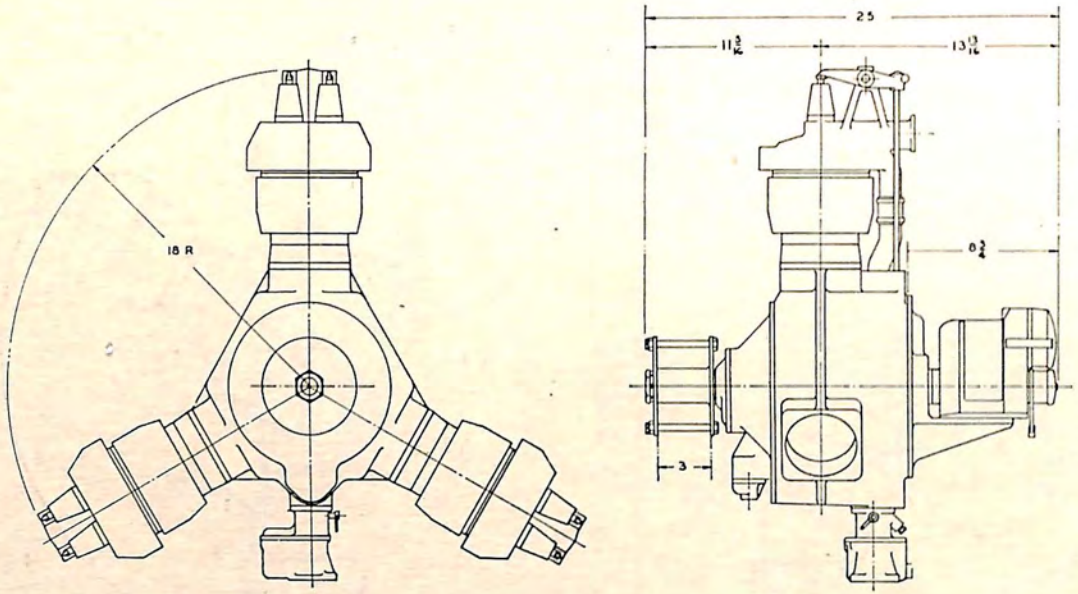
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
HORNET A–2 (GEARED) — 525 H.P.
9 CYLINDER RADIAL AIRCOOLED



PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
HORNET B-1 — 575 H.P.
9 CYLINDER RADIAL AIRCOOLED



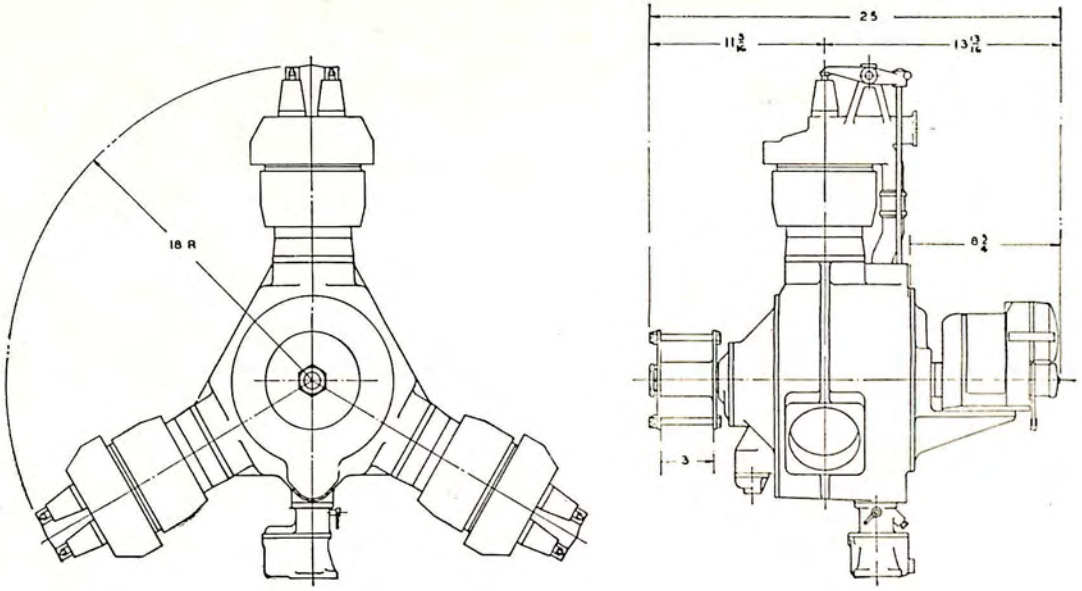
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
HORNET B-1 (GEARED) — 575 H.P.
9 CYLINDER RADIAL AIRCOOLED



SZEKELY AIRCRAFT & ENGINE COMPANY
Holland, Mich.

MODEL 3-35 — 35 H.P.

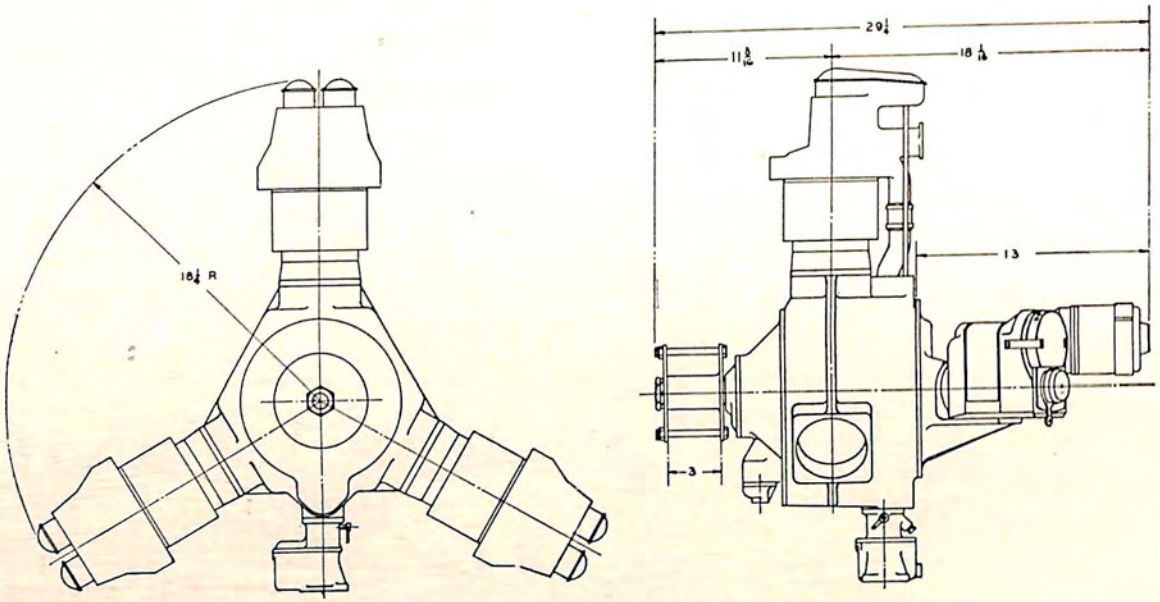
3 CYLINDER RADIAL AIRCOOLED



SZEKELY AIRCRAFT & ENGINE COMPANY
Holland, Mich.

MODEL 3–45 — 45 H.P.

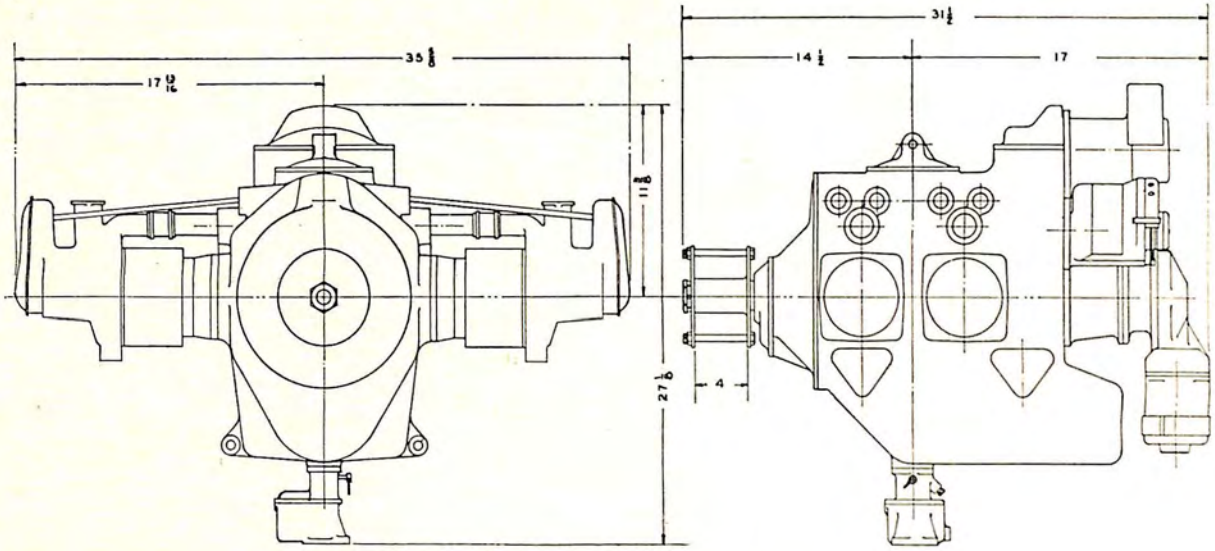
3 CYLINDER RADIAL AIRCOOLED



SZEKELY AIRCRAFT & ENGINE COMPANY
Holland, Mich.

MODEL 3-55 — 55 H.P.

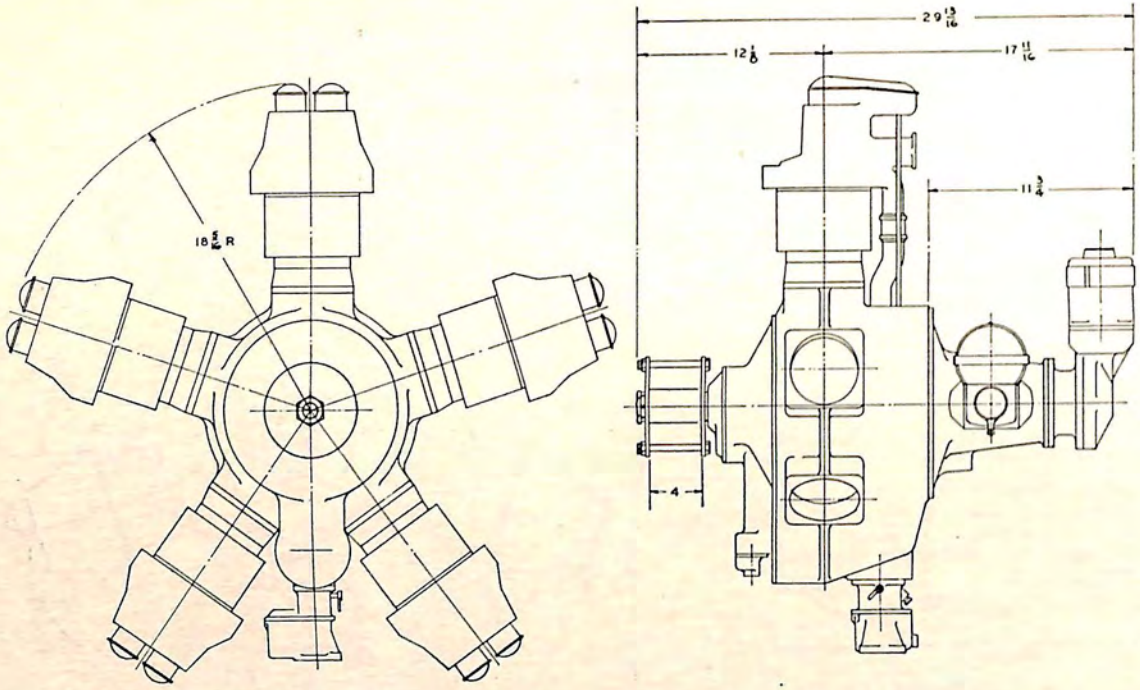
3 CYLINDER RADIAL AIRCOOLED



SZEKELY AIRCRAFT & ENGINE COMPANY
Holland, Mich.

MODEL 4-65 — 65 H.P.

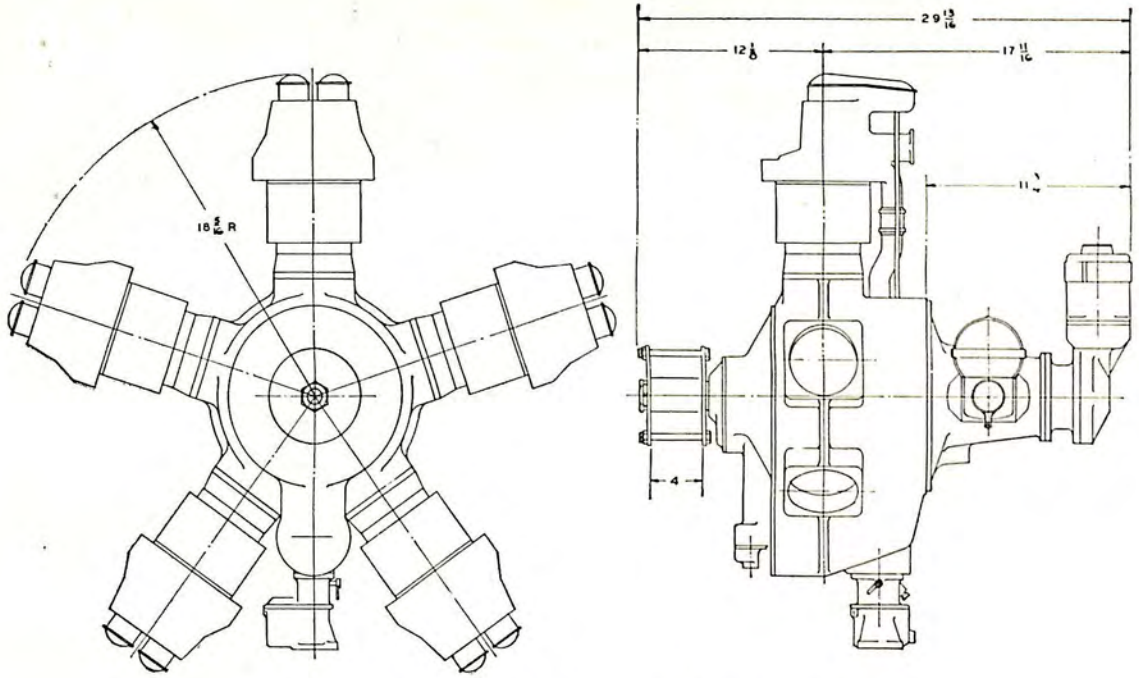
4 CYLINDER OPPOSED AIRCOOLED



SZEKELY AIRCRAFT & ENGINE COMPANY
Holland, Mich.

MODEL 5–75 — 75 H.P.

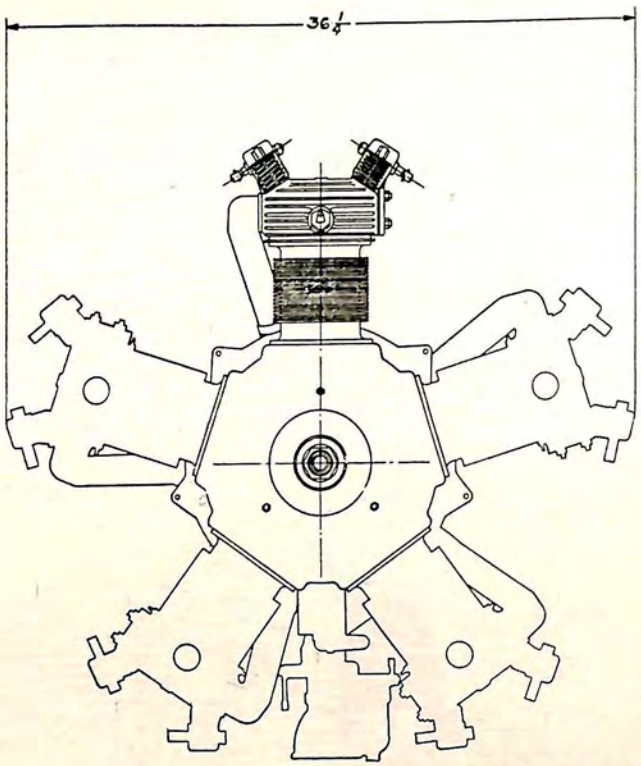
5 CYLINDER RADIAL AIRCOOLED

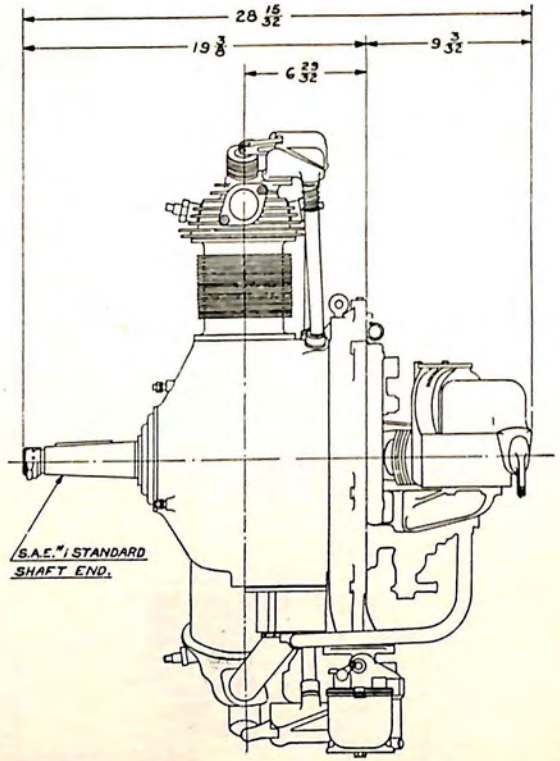


SZEKELY AIRCRAFT & ENGINE COMPANY
Holland, Mich.

MODEL 5–90 — 90 H.P.

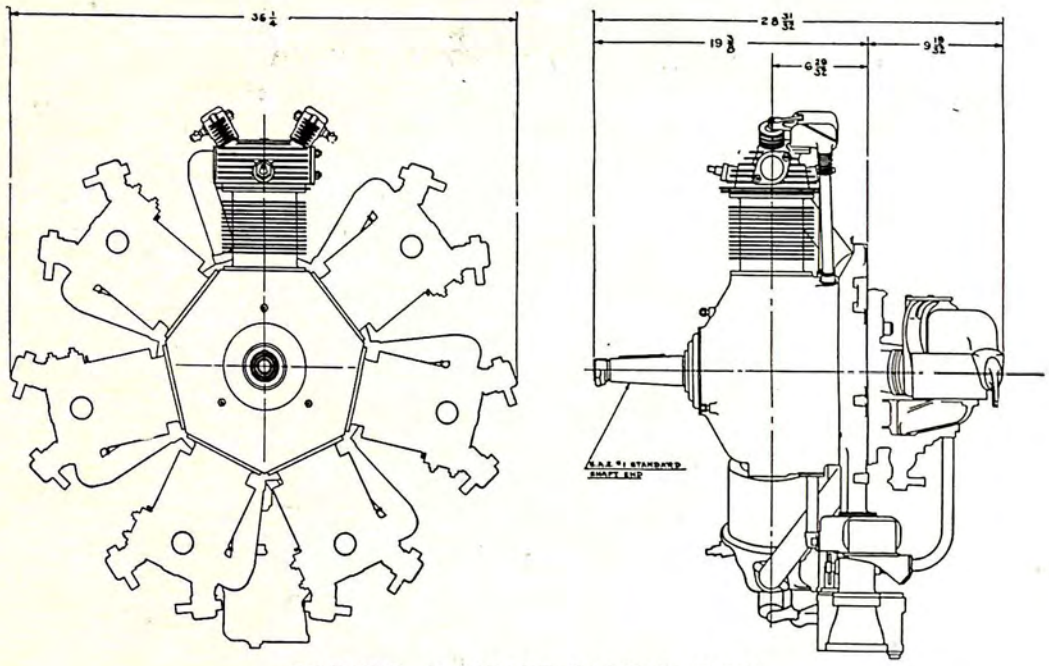
5 CYLINDER RADIAL AIRCOOLED





WARNER AIRCRAFT CORPORATION
Detroit, Mich.

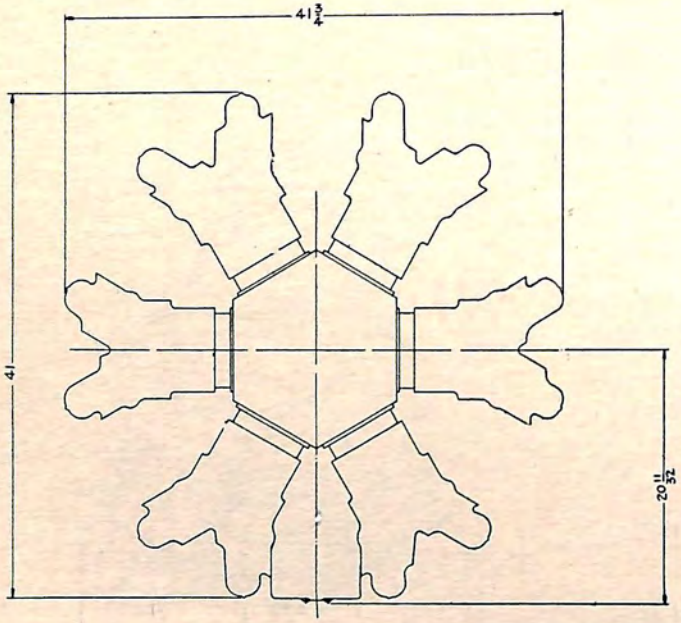
SCARAB, JR. — 90 H.P.
5 CYLINDER RADIAL AIRCOOLED

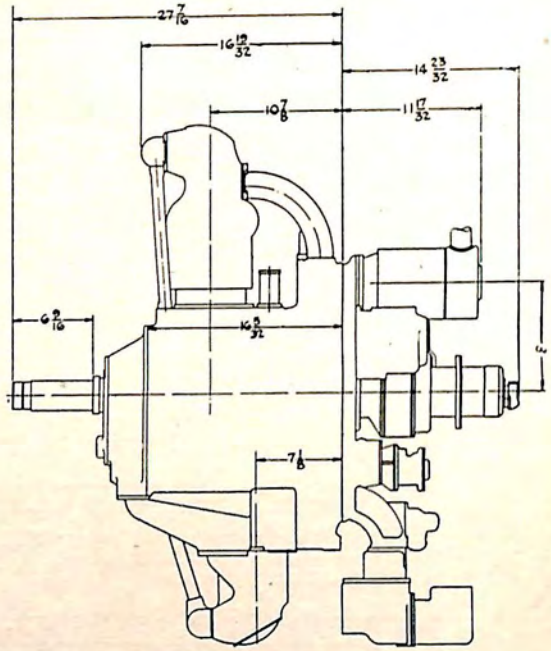


WARNER AIRCRAFT CORPORATION
Detroit, Mich.

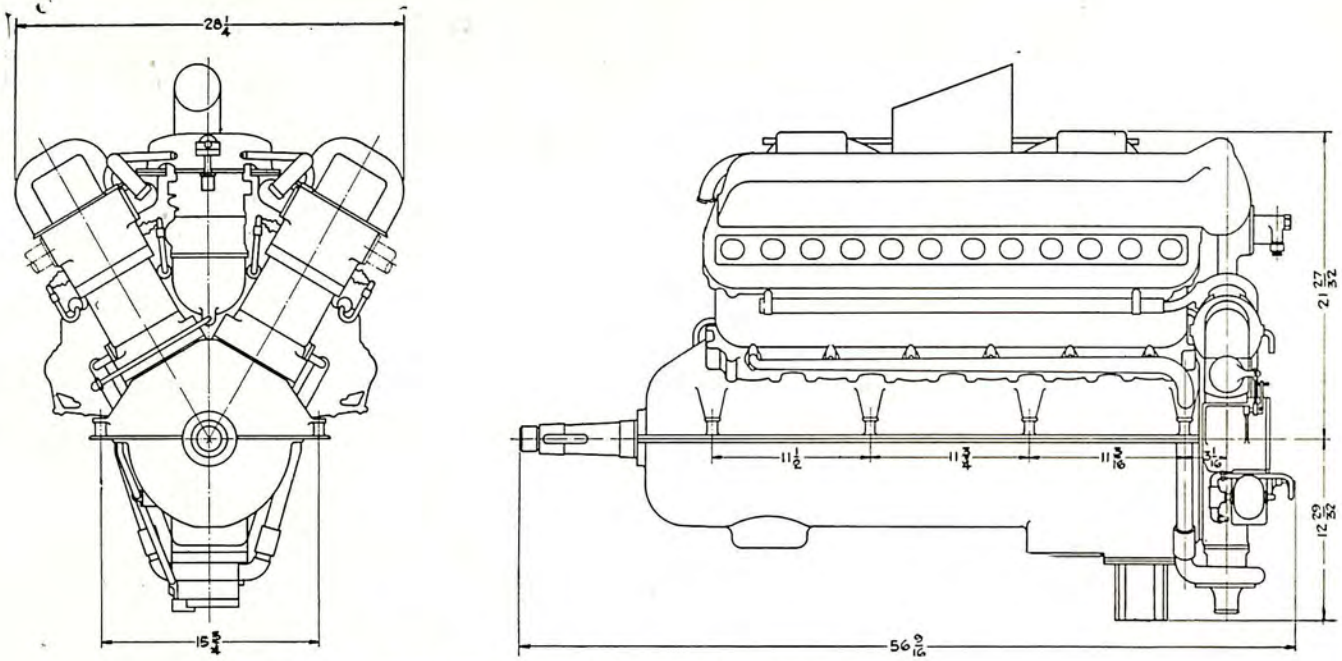
SCARAB — 110 H.P.

7 CYLINDER RADIAL AIRCOOLED





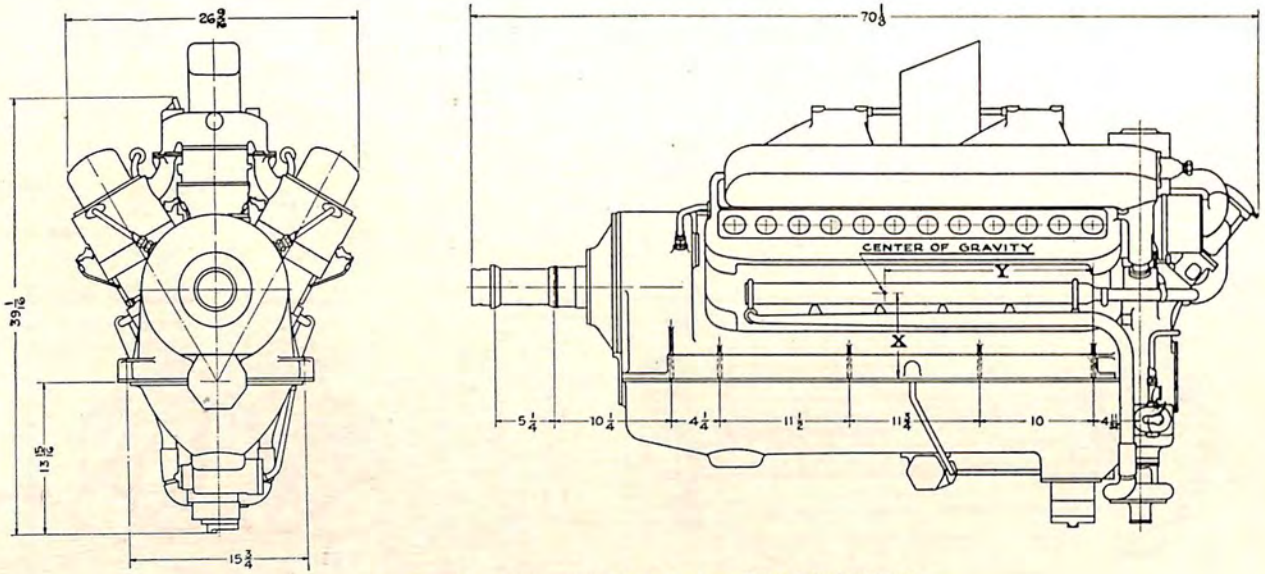
WRIGHT AERNAUTICAL CORPORATION
Paterson, N. J.
CURTISS CHALLENGER — 185 H.P.
6 CYLINDER RADIAL AIRCOOLED



WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.

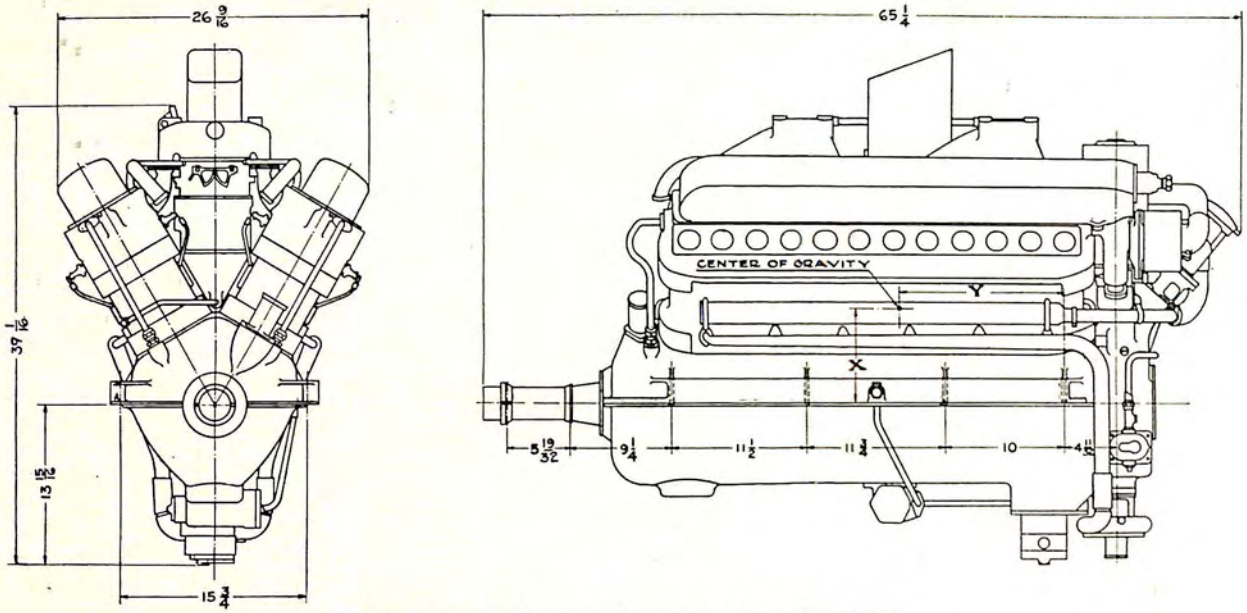
CURTISS D-12 — 435 H.P.

12 CYLINDER V TYPE WATERCOOLED



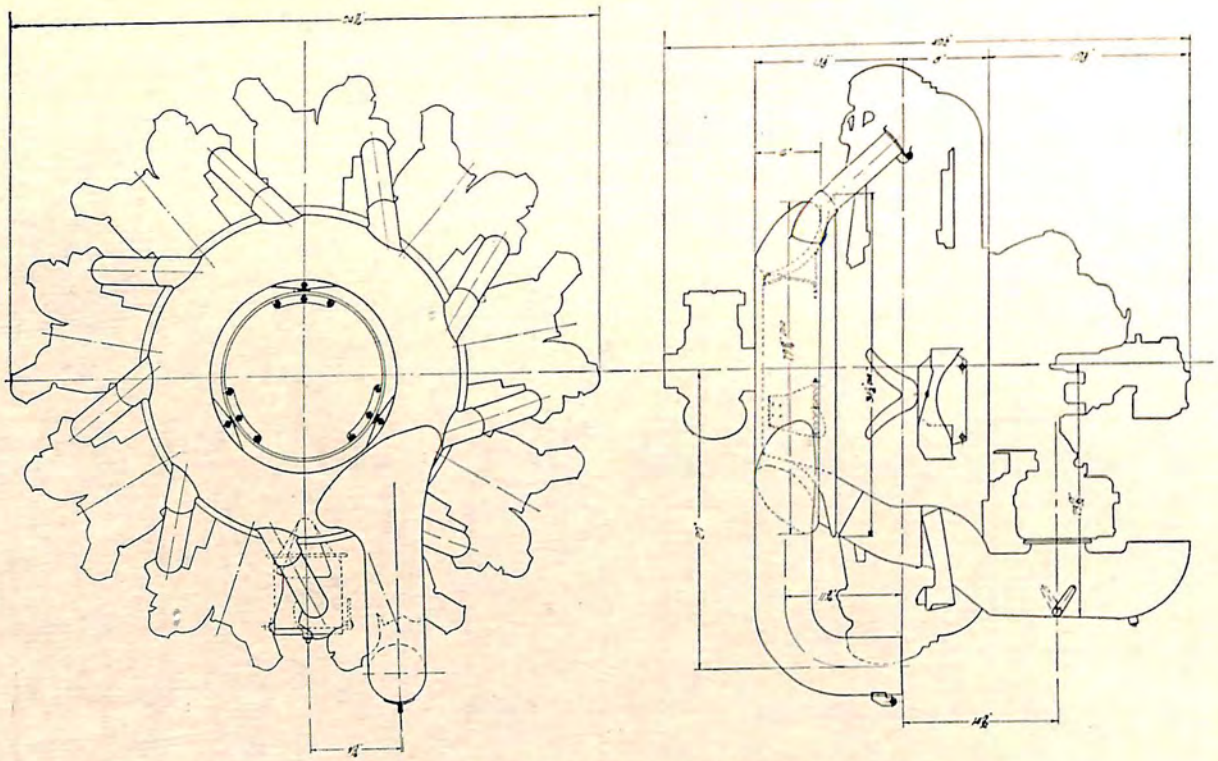
WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.

CURTISS CONQUEROR (GEARED) — 600 H.P.
12 CYLINDER V TYPE LIQUIDCOOLED



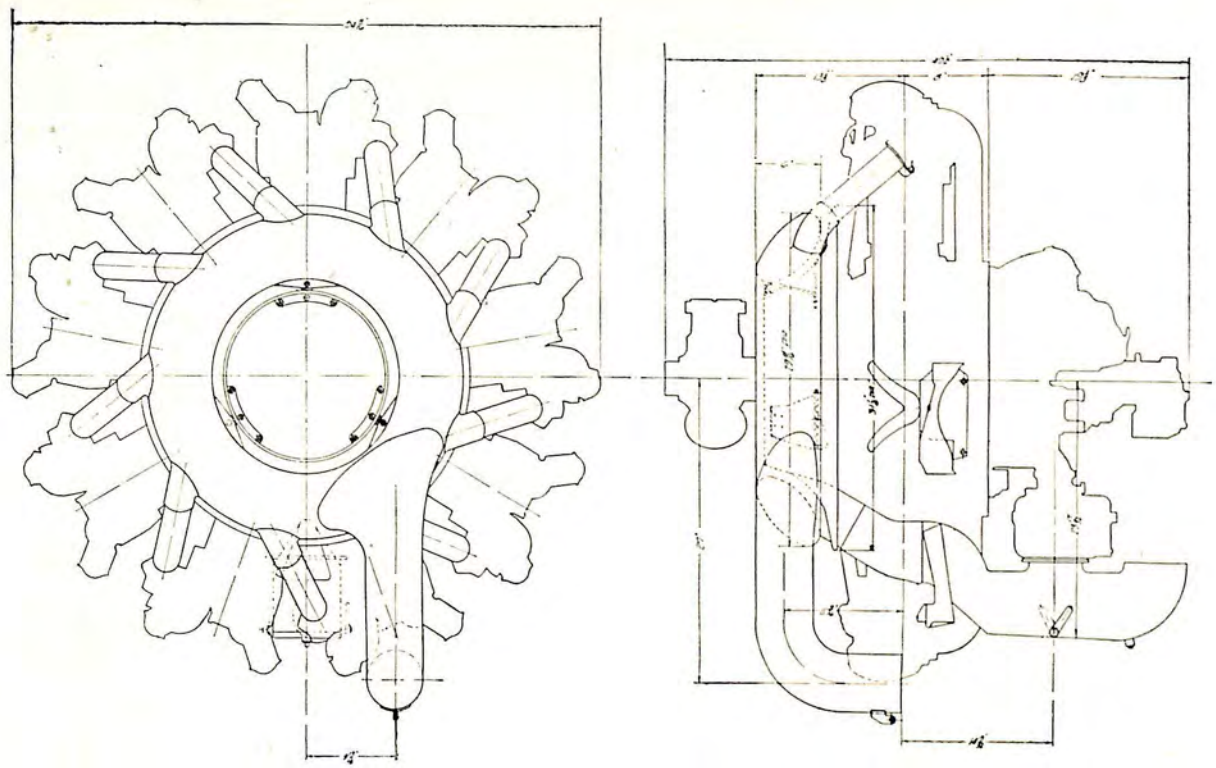
WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.

CURTISS CONQUEROR — 600 H.P.
12 CYLINDER V TYPE LIQUIDCOOLED

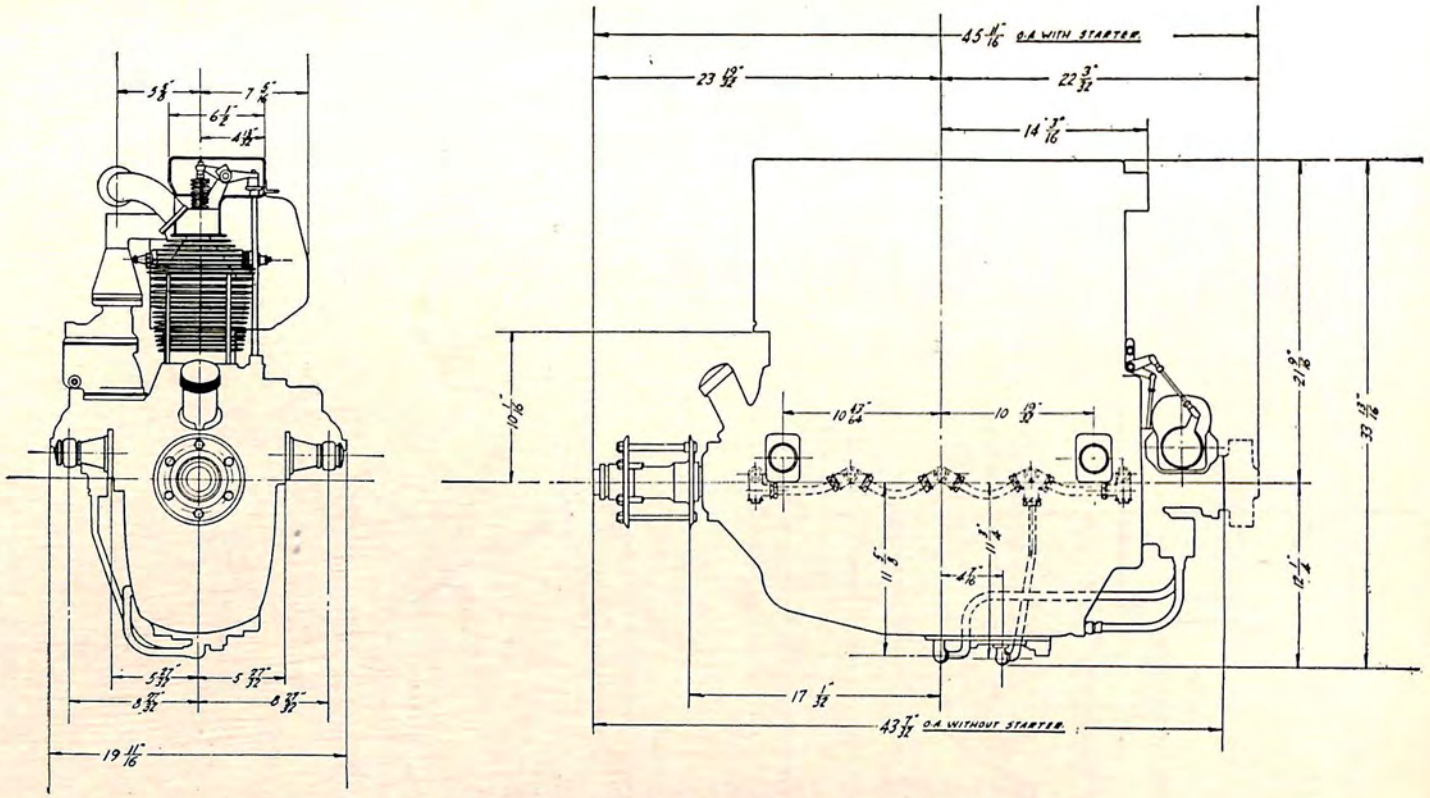


WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.

CYCLONE — 525 H.P.
9 CYLINDER RADIAL AIRCOOLED

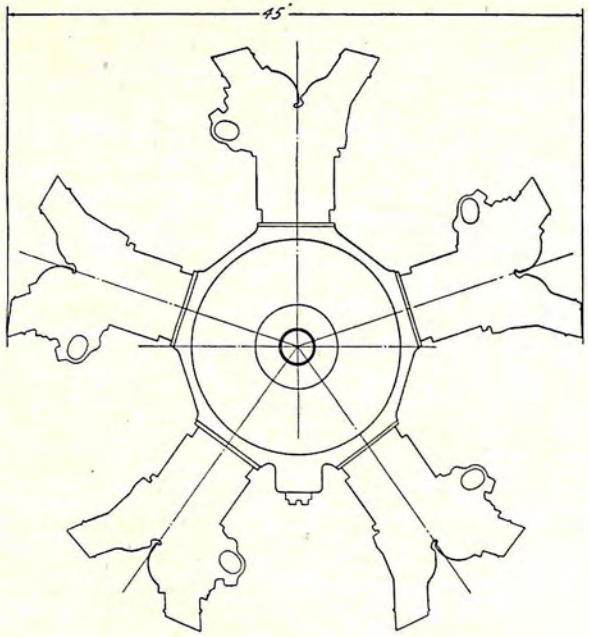


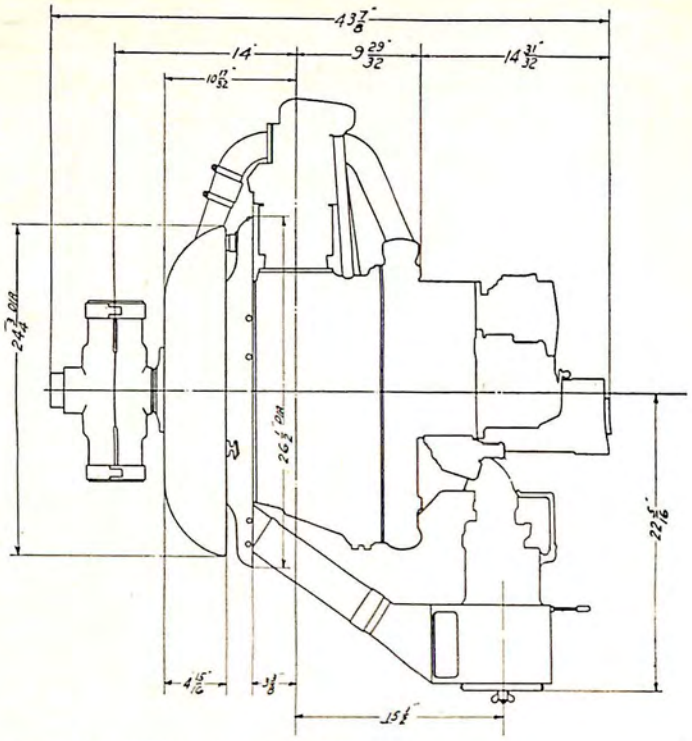
WRIGHT AERONAUTICAL CORPORATION
PATERSON, N. J.
CYCLONE — 575 H.P.
9 CYLINDER RADIAL AIRCOOLED



WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.

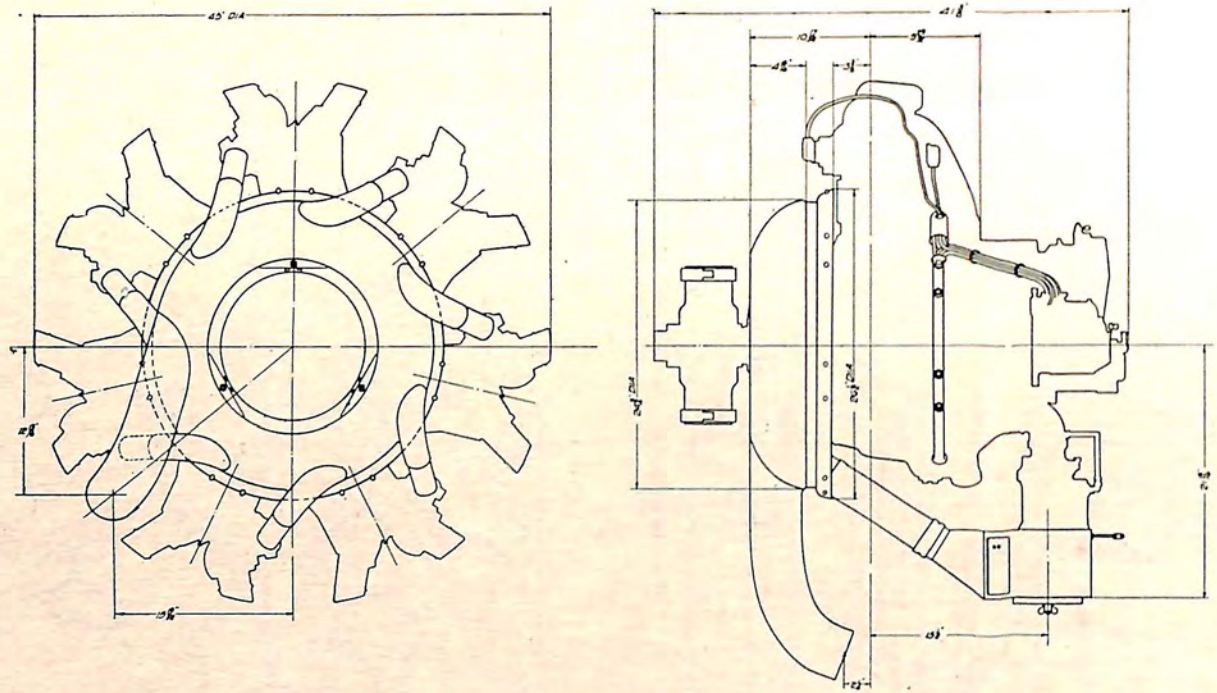
WRIGHT GIPSY — 85 H.P.
4 CYLINDER IN LINE AIRCOOLED





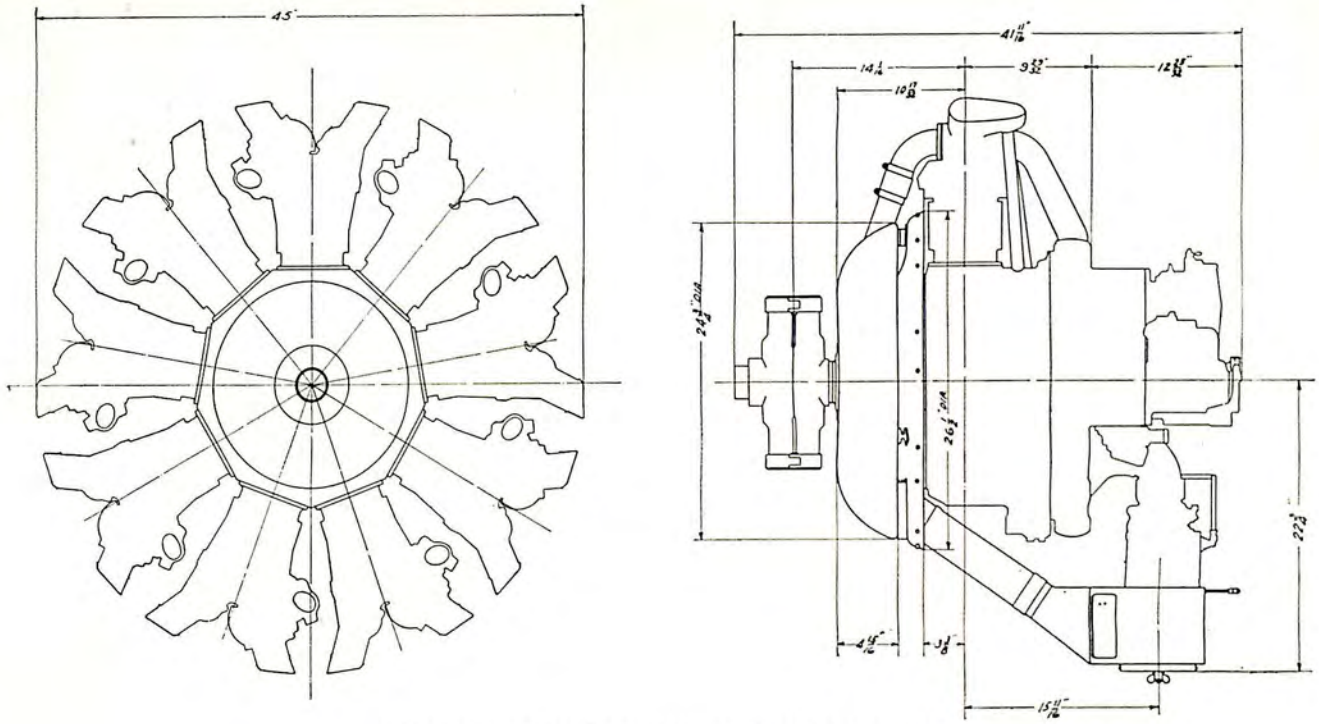
WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.

WHIRLWIND — 165 H.P.
5 CYLINDER RADIAL AIRCOOLED



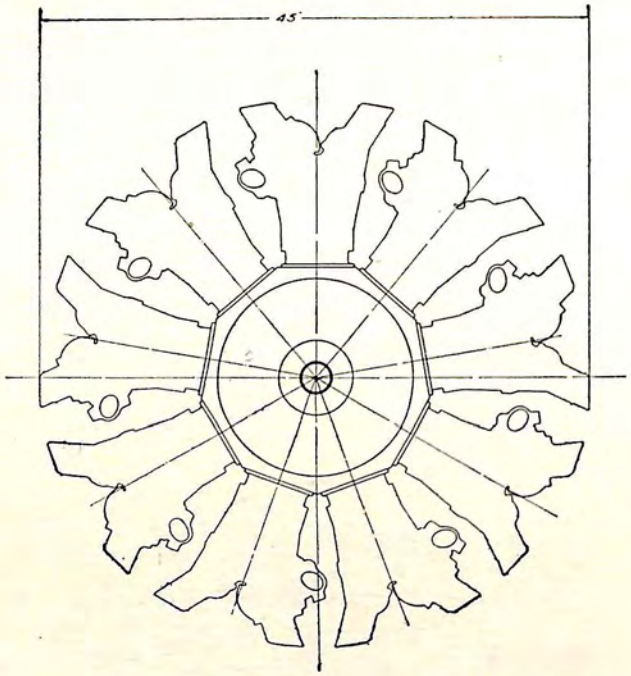
WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.

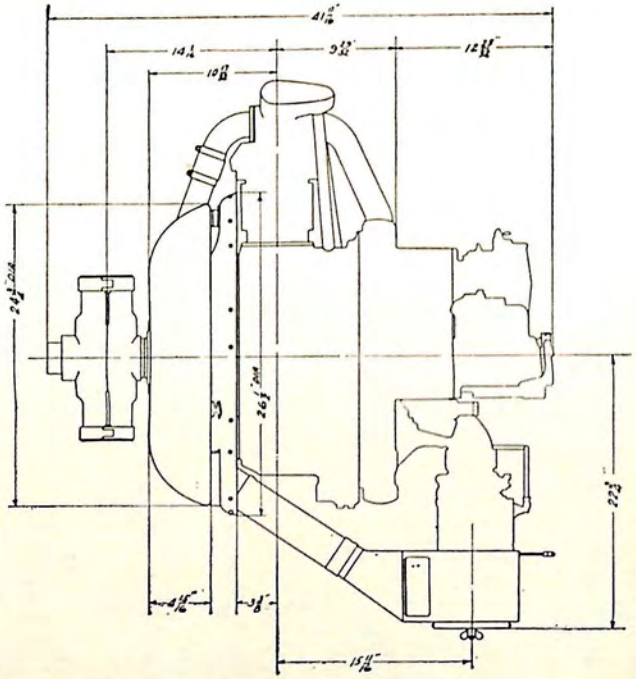
WHIRLWIND — 240 H.P.
7 CYLINDER RADIAL AIRCOOLED



WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.

WHIRLWIND — 300 H.P.
9 CYLINDER RADIAL AIRCOOLED





WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.

WHIRLWIND — 400 H.P.
9 CYLINDER RADIAL AIRCOOLED

PART III

Aviation
Chronology and Records

CHRONOLOGY FOR 1931

Jan. 4–9	Evelyn Trout and Edna May Cooper establish women's refueling duration record of 123 hrs. at Los Angeles, Cal. (Curtiss-Robin, Curtiss Challenger motored.)
Jan. 7–10	Mrs. Beryl Hart and Lieut. William S. MacLaren are lost between Bermuda and Azores on attempted transatlantic flight. (Bellanca, CH–300 seaplane, Wright Whirlwind motored.)
Jan. 15	Ten flying boats of Italian Air Service, commanded by Gen. Italo Balbo, reach Rio de Janeiro, Brazil, having left Orbetello, Italy, on Dec. 17, 1930, and flown 6,450 miles in seven hops. (Savoia-Marchetti S-55, Fiat A-22 motored.)
Jan. 29	Election of officers of Aeronautical Chamber of Commerce.
Feb. 2	Northwest Airways, Inc., extends mail service from St. Paul, Minn., to Pembina, N. D., where connections are made with Canadian air mail service.
Feb. 11	Pan American Airways, Inc., extends air mail service from Puerto Cabello, Venezuela, to Port of Spain, Trinidad.
Feb. 20	U. S. Senate ratifies International Convention on Commercial Aviation.
Feb. 26–Mar. 1	Lucien Bossoutrot and Aime Rossi establish closed circuit distance record of 5,468 miles at Oran, Algeria. (Bleriot 110, Hispano-Suiza motored.)
Feb. 26–Mar. 1	Lucien Bossoutrot and Aime Rossi establish closed circuit duration record of 75 hrs. 23 min. at Oran, Algeria. (Bleriot 110, Hispano-Suiza motored.)
Mar. 3–5	Thirty-second International Aeronautical Conference held in London.
Mar. 5	Seventeen representatives of the Aeronautical Chamber of Commerce call on President Hoover to present report of conditions in aeronautical industry.
Mar. 6	Ruth Nichols establishes women's altitude record of 28,743 ft. at Jersey City Airport, N. J. (Lockheed Vega, Pratt & Whitney Wasp motored.)
Mar. 25–27	Third National Airport Conference held at Tulsa, Okla., under auspices of Aeronautical Chamber of Commerce.
Mar. 30–Apr. 2	Jean Mermoz and Anthoine Paillard establish closed circuit distance record of 5,679 miles at Oran, Algeria. (Bernard 80, Hispano-Suiza motored.)
Mar. 31	Mackay Trophy for 1929 is awarded to Capt. Albert W. Stevens in recognition of his high altitude photography.
Mar. 31–Apr. 6	Lt. Comdr. Glen Kidston flies from London to Cape Town, South Africa, in 6 days 10 hrs., establishing new record. (Lockheed Vega, Pratt & Whitney Wasp motored.)
Apr. 1	Eastern Air Transport, Inc., inaugurates air mail service between Richmond, Va., and Jacksonville, Fla., via Charleston, S. C.
Apr. 1–10	Charles W. A. Scott flies from London to Australia in 9 days 3 hrs. 40 min., establishing new record. (DeHavilland Moth 60 M, DeHavilland Gipsy II motored.)
Apr. 8	Amelia Earhart establishes autogiro altitude record of 18,415 ft. at Willow Grove, Pa. (Pitcairn, Wright Whirlwind motored.)
Apr. 11–19	National Aircraft Show held at Detroit, Mich., under auspices of Detroit Board of Commerce and Aeronautical Chamber of Commerce.
Apr. 12–15	Walter E. Lees and Frederick A. Brossy establish unofficial duration record of 74 hrs. 12 min. at Jacksonville, Fla. (Bellanca Pacemaker, Packard Diesel motored.)
Apr. 13	Ruth Nichols establishes women's speed record of 210.636 m.p.h. at Carlton, Mich. (Lockheed Vega, Pratt & Whitney Wasp motored.)
Apr. 14–15	Second National Conference on Aeronautical Education held at Detroit, Mich.

Apr. 22	Collier Trophy for 1930 presented to Harold F. Pitcairn and his associates for work in developing the autogiro.
May 5	Guenther Groenhoff establishes distance glider record of 165 miles from Munich, Germany, to Kaaden, Czechoslovakia.
May 10	Dr. Frederick W. Lancaster is awarded Third Daniel Guggenheim Medal for his contributions to aerodynamics.
May 15–31	International Aeronautical Exhibition held in Stockholm, Sweden.
May 20–30	U. S. Army Air Corps maneuvers held on East Coast.
May 25–28	Walter E. Lees and Frederick A. Brossy establish duration record of 84 hrs. 32 min. at Jacksonville, Fla. (Bellanca Pacemaker, Packard Diesel motored.)
May 26–June 5	Charles W. A. Scott flies from Australia to Lympne, England, in 10 days 13 hrs. 25 min., establishing new record. (DeHavilland Moth, DeHavilland Gipsy II motored.)
May 27	Auguste Piccard, accompanied by Charles Kipfer, establishes altitude record of 51,775 ft. in a hydrogen balloon above Germany and Austria.
May 30	Northwest Airways, Inc., inaugurates air mail service between St. Paul and Duluth, Minn.
June 2	Northwest Airways, Inc., inaugurates air mail service between Fargo and Mandan, N. D.
June 4–5	Lieut. de Vaisseau Paris and M. Gonord establish closed circuit distance record for seaplanes of 3,113.816 miles at Arachon, France. (Latécoère 28-3, Hispano-Suiza motored.)
June 4–5	Lieut. de Vaisseau Paris and M. Gonord establish duration record for seaplanes of 36 hrs. 57 min. at Arachon, France. (Latécoère 28-3, Hispano-Suiza motored.)
June 6–14	Annual F. A. I. congress held at Bucharest, Rumania.
June 7–10	Joseph LeBrix and Marcel Doret establish closed circuit distance record of 6,444.881 miles at Istres, France. (Dewoitine, Hispano-Suiza motored.)
June 8	Pennsylvania Airlines, Inc., extends air mail service from Pittsburgh, Pa., to Washington, D. C.
June 13	Mrs. May Haizlip establishes women's altitude record for light airplanes of 18,097 ft. at St. Clair, Mich. (Buhl Bull Pup, Szekely motored.)
June 15	American Airways, Inc., extends air mail service from Nashville, Tenn., to Fort Worth, Tex.
June 15	American Airways, Inc., inaugurates air mail service between St. Louis, Mo., and New Orleans, La.
June 19	Lissant Beardmore flies across the English Channel in a glider in 1 hr. 30 min.
June 20	Robert Kronfeld makes round-trip flight across English Channel in a glider, winning a prize of $5,000 offered by London Daily Mail.
June 24–25	Holger Hoiriis and Otto Hillig fly from Harbor Grace, Newfoundland, to Krefeld, Germany, in 32 hrs. 6 min. (Bellanca Pacemaker, Wright J-6 motored.)
June 23–July 1	Wiley Post and Harold Gatty, starting from Roosevelt Field, Garden City, L. I., N. Y., fly around the world in 8 days, 15 hrs. 51 min., covering 15,474 miles in 4 days, 10 hrs. 8 min. of actual flying time. (Lockheed Vega, Pratt & Whitney Wasp motored.)
June 28–29	Maryse Bastie establishes women's distance record of 1,849.763 miles from Le Bourget, Paris, France, to Urino, Russia. (Klemm, Salmson motored.)
July 4–25	Harry S. Russell wins Seventh National Air Tour for the Edsel B. Ford Trophy. (Ford tri-motor, Wright Cyclone and 2 Wright J-6 motors.)
July 7	Aeronautical Chamber of Commerce gives dinner in honor of Wiley Post and Harold Gatty.
July 10	Eastern Air Transport, Inc., inaugurates air mail service between New York and Atlantic City, N. J.
July 15	Eastern Air Transport, Inc., inaugurates air mail service between Philadelphia, Pa., and Atlantic City, N. J.

July 15–16	Capt. George Endres and Capt. Alexander Magyar fly from Harbor Grace, Newfoundland, to Bicske, Hungary, in 26 hrs. 12 min. (Lockheed Sirius, Pratt & Whitney Wasp motored.)
July 19–20	National Balloon Race won by Lieut. T. G. W. Settle and Lieut. Wilfred Bushnell, having flown the Navy balloon 195 miles from Akron, Ohio.
July 20	Eastern Air Transport, Inc., inaugurates air mail service between Washington, D. C., and Atlantic City, N. J.
July 23–24	Tenth annual convention of National Aeronautic Association held at Washington, D. C.
July 24–31	"Graf Zeppelin" carries 12 scientists on Arctic expedition.
July 25	E. C. T. Edwards wins King's Cup Race at Heston, England. (Blackburn Bluebird, Cirrus Hermes II motored.)
July 26	Lieut. John C. Crain establishes unofficial duration record for gliders of 16 hrs. 38 min. at Honolulu, Hawaii.
July 27–Aug. 9	Parker Cramer and Oliver Pacquette are lost between Shetland Islands and Denmark on attempted transatlantic flight from Detroit, Mich. (Bellanca Pacemaker seaplane, Packard Diesel motored.)
July 28–30	Russell N. Boardman and John Polando fly from Floyd Bennett Field, Brooklyn, N. Y., to Istanbul, Turkey, in 49 hrs. 20 min., establishing distance record of 5,011.8 miles. (Bellanca CH, Wright J-6 motored.)
July 28–29	Hugh Herndon, Jr., and Clyde Pangborn fly from Floyd Bennett Field, Brooklyn, N. Y., to Moylegrove, Wales, in 31 hrs. 42 min., later continuing as far as Japan on projected flight around the world. (Bellanca Skyrocket, Pratt & Whitney Wasp motored.)
July 28–Aug. 6	Amy Johnson, with C. S. Humphries as mechanic, flies from England to Tokyo, Japan, in approximately 10 days. (DeHavilland Puss Moth, DeHavilland Gipsy III motored.)
July 29–Aug. 6	J. A. Mollison flies from Australia to England in 8 days 21 hrs., establishing new record. (DeHavilland Moth, DeHavilland Gipsy II motored.)
July 29–Aug. 26	Col. and Mrs. Charles A. Lindbergh fly from Glenn H. Curtiss Airport, North Beach, N. Y., to Tokyo, Japan, via Canada, Alaska, and Siberia. (Lockheed Sirius seaplane, Wright Cyclone motored.)
Aug. 1	American Airways, Inc., inaugurates air mail service between Fort Worth and Amarillo, Tex.
Aug. 1	American Airways, Inc., inaugurates air mail service between Albuquerque, N. M., and El Paso, Tex.
Aug. 1	American Airways, Inc., extends air mail service from Boston, Mass., to Bangor, Me.
Aug. 1	Pan American Airways, Inc., inaugurates air mail service between Bangor, Me., and Halifax, N. S.
Aug. 1	Western Air Express inaugurates air mail service between Albuquerqe, N. M., and Pueblo, Col.
Aug. 1	Western Air Express inaugurates air mail service between Pueblo, Col., and Amarillo, Tex.
Aug. 2–16	Second annual national soaring contest held at Elmira, N. Y., under auspices of National Glider Association.
Aug. 8	U. S. S. "Akron" (ZRS-4) christened by Mrs. Herbert Hoover at Akron, Ohio.
Aug. 8–Sept. 1	Capt. Wolfgang von Gronau with Edward Zimmer, Fritz Albrecht, and Franz Hack, flies from List, Isle of Sylt, North Sea, to Chicago, Ill., via Iceland, Greenland, Labrador, and Canada. (Dornier-Wal flying boat, B.M.W. motored.)
Aug. 27	Dornier Do-X arrives in New York, having left Altenrhein, Switzerland, Nov. 5, 1930, and flown via Africa and South America. (Dornier Do-X flying boat. 12 Curtiss Conqueror motors.)
Aug. 29–Sept. 7	National Air Races held at Cleveland, Ohio.
Aug. 29–Sept. 7	"Graf Zeppelin" flies from Friedrichshafen, Germany, to Pernambuco, Brazil, and return.
Sept. 4	Maj. James H. Doolittle flies from Burbank, Cal., to Newark, N. J., in 11 hrs. 16 min., establishing new transcontinental record. (Laird Super-Solution, Pratt & Whitney Wasp Jr. motored.)

Sept. 7	Lowell R. Bayles wins Thompson Trophy Race at speed of 236.239 m.p.h. at Cleveland, O. (Granville Gee Bee Super-Sportster, Pratt & Whitney Wasp Jr. motored.)
Sept. 8–9	Don Moyle and Cecil A. Allen are forced down in Siberia on attempted transpacific flight from Tokyo, Japan, to the United States. (Emsco, Pratt & Whitney Wasp motored.)
Sept. 13	Lieut. J. N. Boothman wins Schneider Cup Race at 342.871 m.p.h., at Calshot, England, securing the Trophy permanently for England. (Vickers Supermarine S6 B, Rolls-Royce R motored.)
Sept. 13–14	Willy Rody, Christian Johanssen, and Fernando Corsta Viega, flying from Juncal do Sol, Portugal, are forced down at sea off Newfoundland and remain afloat for a week before being rescued. (Junkers W-33, Junkers L 5 motored.)
Sept. 17	Mackay Trophy for 1930 is awarded to Major Ralph Royce in recognition of the cross-country mid-winter flight of the First Pursuit Group from Selfridge Field, Mich., to Spokane, Wash., and return.
Sept. 18–28	"Graf Zeppelin" flies from Friedrichshafen, Germany, to Pernambuco, Brazil, and return.
Sept. 23	U. S. S. "Akron" makes maiden flight from Akron, Ohio, carrying 113 persons.
Sept. 29	Lieut. G. H. Stainforth establishes speed record for seaplanes of 406.997 m.p.h. at Calshot, England. (Vickers Supermarine S6 B. Rolls-Royce R motored.)
Oct. 4–5	Hugh Herndon, Jr., and Clyde Pangborn make first non-stop flight from Japan to United States, flying from Tokyo to Wenatchee, Washington, in 41 hrs. 13 min., winning $25,000 prize from Japanese newspaper "Asahi." (Bellanca Pacemaker, Pratt & Whitney Wasp motored.)
Oct. 17	Hugh Herndon, Jr., and Clyde Pangborn land at Floyd Bennett Field, Brooklyn, N. Y., completing flight around the world started on July 28.
Oct. 17–28	"Graf Zeppelin" flies from Friedrichshafen, Germany, to Pernambuco, Brazil, and return.
Oct. 24–25	Ruth Nichols establishes women's distance record of 1,977.6 miles from Oakland, Cal., to Louisville, Ky. (Lockheed Vega, Pratt & Whitney Wasp motored.)
Oct. 26–27	Bert Hinkler makes first non-stop flight from North Beach, N. Y., to Kingston, Jamaica, in 18 hrs. (DeHavilland Puss Moth, DeHavilland Gipsy III motored.)
Oct. 30–Nov. 5	Peggy Salaman and Gordon Store fly from Lympne, England, to Cape Town, South Africa, in 5 days 6 hrs. 40 min., establishing new record. (DeHavilland Puss Moth, DeHavilland Gipsy III motored.)
Oct. 31–Nov. 9	C. A. Butler flies from Lympne, England, to Darwin, Australia, in 9 days 2 hrs. 29 min., establishing new record. (Comper Swift, Pobjoy motored.)
Nov. 2	Pan American Airways extends air mail service from Santos, Brazil, to Buenos Aires, Argentina.
Nov. 3	U. S. S. "Akron" carries 207 persons on ten-hour flight, the largest number of individuals ever carried in a single craft by air.
Nov. 26–27	Bert Hinkler flies from Natal, Brazil, to Bathurst, British Gambia, Africa, in approximately 22 hrs., making first west-east flight across South Atlantic. (DeHavilland Puss Moth, DeHavilland Gipsy III motored.)
Dec. 1	Lowell R. Bayles establishes American speed record of 281.75 m.p.h. at Detroit, Mich. (Granville Gee Bee Sportster, Pratt & Whitney Wasp motored.)
Dec. 10	Herbert Schiff Trophy awarded to U. S. Naval Reserve Aviation Base. Floyd Bennett Field, Brooklyn, N. Y.
Dec. 17–18	Lieut. W. A. Cocke establishes glider duration record of approximately 21 hrs. 34 min., and a closed course distance record of approximately 450 miles at Honolulu, Hawaii. (Marks not yet verified.)
Dec. 19	Major General Benjamin D. Foulois becomes Chief of the Army Air Corps.
Dec. 20	Mr. and Mrs. Charles H. Day arrive at Newark, N. J., completing, except for the two oceans, a 15,000 mile flight around the world.

OFFICIAL WORLD AND AMERICAN AIR RECORDS

Established Under Rules and Regulations of the

FEDERATION AERONAUTIQUE INTERNATIONALE

Translated and Compiled by the Contest Committee, National Aeronautic Association, Washington, D. C.

December 31, 1931

WORLD RECORDS	AMERICAN RECORDS
CONFIRMED BY FEDERATION AERONAUTIQUE INTERNATIONALE	CONFIRMED BY CONTEST COMMITTEE NATIONAL AERONAUTIC ASSOCIATION OF U. S. A.

AIRPLANES—Class C

RETURNING TO POINT OF DEPARTURE WITHOUT REFUELING

Duration (Closed Circuit) (United States)—Walter E. Lees and F. A. Brossy, Bellanca monoplane, Packard Diesel 225 HP, at Jacksonville Beach, Fla., May 25–28, 1931. Time, 84H, 32M.	World and American Record.
Distance (Closed Circuit) (France)—J. LeBrix and M. Doret, "The Hyphen" Dewoitine, Hispano-Suiza 600 HP, at Istres, June 7–10, 1931. Distance, 10,372.051 Kilo. (6,444.881 Miles).	Distance (Closed Circuit)—Lts. Kelly and Macready, U. S. A., T-2, Liberty 375 HP, at Wright Field, Dayton, O., April 16, 17 1923. Distance, 4,050 Kilo. (2,516.55 Miles).
Distance (Airline) (United States)—Russell N. Boardman and John Polando, Bellanca monoplane, Wright J-6 300 HP, from Brooklyn, N. Y., to Istanbul, Turkey, July 28, 29, 30, 1931. Distance, 8,065.736 Kilo. (5,011.8 Miles).	World and American Record.
Altitude (United States)—Lt. Apollo Soucek, Wright "Apache" landplane, Pratt & Whitney 450 HP, at Anacostia, D. C., June 4, 1930. Height, 13,157 Meters (43,166 Feet).	World and American Record.
Maximum Speed (France)—Warrant Officer Bonnett, Ferbois monoplane, Hispano-Suiza, 550 HP, at Istres, December 11, 1924. Speed, 448.171 KPH (278.480 MPH).	Maximum Speed—Lt. A. J. Williams, U. S. N., Curtiss Racer, R-2-C-1, Curtiss D-12a, 500 HP, at Mitchel Field, L. I., N. Y., November 4, 1923. Speed, 429.025 KPH (266.59 MPH).

SPEEDS FOR SPECIFIED DISTANCES WITHOUT PAY LOAD

Speed for 100 Kilometers (United States)—Lt. Cyrus Bettis, U. S. A. S., Curtis R3C-1, Curtiss V-1400 HP, at Mitchel Field, L. I., N. Y., October 12, 1925. Speed, 401.279 KPH (249.342 MPH).	World and American Record.
Speed for 500 Kilometers (France)—Sadi-Le-Cointe, Nieuport-Delage, Hispano-Suiza, 500 HP, at Istres, June 23, 1924. Speed, 306.696 KPH (190.567 MPH).	Speed for 500 Kilometers—Lt. Alex Pearson, U. S. A., Verville Sperry R-3, Wright 350 HP, at Wright Field, Dayton, O., March 29, 1923. Speed, 270.06 KPH (167.80 MPH).
Speed for 1000 Kilometers (France)—Marcel Doret, Dewoitine type 26, No. 7 Hispano-Suiza 500 HP, on the Villesauvage-La Marmogne course, November 30, 1930. Speed, 286.227 KPH (177.853 MPH).	Speed for 1,000 Kilometers—Lt. Harold R. Harris, U. S. A., and Ralph Lockwood, DH-4L, Liberty 400 HP, at Wright Field, Dayton, O., March 29, 1923. Speed, 205.06 KPH (127.42 MPH).
Speed for 2,000 Kilometers (France)—Lt. de Vaisseau Paris, Latécoère 28, Hispano-Suiza 650 HP, at Toulouse, April 11, 1931. Speed, 228.267 KPH (141.838 MPH).	Speed for 2,000 Kilometers—Lt. Harold R. Harris, U. S. A., DH-4L, Liberty 375 HP, at Wright Field, Dayton, O., April 17, 1923. Speed, 183.83 KPH (114.22 MPH).
Speed for 5,000 Kilometers (Spain)—Carlos de Haya Gonzales and Cirpriano Rodriguez Diaz, Breguet, Hispano-Suiza 600 HP, on the Seville-Utrera-Carmona course, October 7, 8, 1930. Speed, 208.152 KPH (130.189 MPH).	(No Record.)

CLASS C—WITH PAY LOAD OF 500 KILOGRAMS

(1,102.31 Lbs.)

WORLD RECORDS	AMERICAN RECORDS
Duration (Closed Circuit) (France)—J. LeBrix and M. Doret, "The Hyphen" Dewoitine, Hispano-Suiza 600 HP, at Istres, March 23, 24, 1931. Time, 32H, 17M.	Duration—Lt. H. R. Harris, U. S. A. S., Douglas DT-2, Liberty 400 HP, at Wright Field, Dayton, O., June 28, 1924. Time, 9H, 11M, 53.4S.
Distance (Closed Circuit) (France)—J. LeBrix and M. Doret, "The Hyphen" Dewoitine, Hispano-Suiza 600 HP, at Istres, March 23, 24, 1931. Distance, 4,670.664 Kilo. (2,902.210 Miles).	Distance—Lt. H. R. Harris, U. S. A. S. Douglas DT-2, Liberty 400 HP, at Wright Field, Dayton, O., June 28, 1924. Distance, 950 Kilo. (590.3 Miles).
Altitude (France)—J. Burtin, Breguet 19, Farman 500 HP, at Toussus-le-Noble, August 23, 1929. Height, 9,374 Meters (30,654 Feet).	Altitude—Lt. H. R. Harris, U. S. A. S., USA-TP-1, Liberty 400 HP, at Wright Field, Dayton, O., May 21, 1924. Height, 8,578 Meters (28,143 Feet).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (United States)—Leland F. Shoenhair, Lockheed Vega "Executive" monoplane NC-308H, Pratt & Whitney 450 HP supercharged, at Jacksonville, Fla., February 18, 1930. Speed, 298.510 KPH (185.49 MPH).	World and American Record.
Speed for 500 Kilometers (Czechoslovakia)—Capt. Joseph Kalla, Letov S 516, Asso 800 HP, on the Praha-Nove Benatky Ripa-Praha course, October 12, 1930. Speed, 276.375 KPH (171.731 MPH).	Speed for 500 Kilometers—Leland F. Shoenhair, Lockheed Vega "Executive" monoplane NC-308H, Pratt & Whitney 450 HP super-charged, at Jacksonville, Fla., February 18, 1930. Speed, 275.580 KPH (171.24 MPH).
Speed for 1,000 Kilometers (Czechoslovakia)—Capt. Joseph Kalla, Letov S 516, Asso 800 HP, on the Praha-Nove Benatky Ripa-Praha course, October 12, 1930. Speed, 275.269 KPH (171.044 MPH).	(No Record.)
Speed for 2,000 Kilometers (France)—Lt. de Vaisseau Paris, Latécoère 28, Hispano-Suiza 650 HP, at Toulouse, April 11, 1931. Speed 228.267 KPH (141.838 MPH).	(No Record.)
Speed for 5,000 Kilometers—(No Record).	(No Record.)

CLASS C—WITH PAY LOAD OF 1,000 KILOGRAMS

(2,204.12 Lbs.)

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS	AMERICAN RECORDS
Duration (Closed Circuit) (France)—J. LeBrix and M. Doret, "The Hyphen" Dewoitine, Hispano-Suiza 600 HP, at Istres, March 23, 24, 1931. Time, 32H, 17M.	Duration—Lt. J. S. Macready, U. S. A. S., Curtiss (Martin) Bomber, NBS 1, 2 Liberty 400 HP, at Wright Field, Dayton, O., October 2, 1924. Time, 2H, 13M, 49.6S.
Distance (Closed Circuit) (France)—J. LeBrix and M. Doret, "The Hyphen" Dewoitine, Hispano-Suiza 600 HP, at Istres, March 23, 24, 1931. Distance, 4,670.664 Kilo. (2,902.210 Miles).	(No Record.)
Altitude (France)—J. Burtin, Breguet 19, Farman 600 HP, at Toussus-le-Noble, July 26, 1929. Height, 8,089 Meters (26,538 Feet).	Altitude—Waldo Waterman, Bach landplane, Wright J-6, at Los Angeles Metropolitan Airport, Los Angeles, Cal., July 26, 1929. Height, 6,346 Meters (20,820 Feet).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (United States)—Leland F. Shoenhair, Lockheed Vega "Executive" monoplane NC-308H, Pratt & Whitney 450 HP supercharged, at Jacksonville, Fla., February 20, 1930. Speed, 283.250 KPH (176 MPH).	World and American Record.
Speed for 500 Kilometers (United States)—Leland F. Shoenhair, Lockheed Vega "Executive" monoplane NC-308H, Pratt & Whitney 450 HP supercharged, at Jacksonville, Fla., February 20, 1930. Speed, 270.800 KPH (168.27 MPH).	World and American Record.
Speed for 1,000 Kilometers (Czechoslovakia)—Adj. Vojtech Svozil, Aero A-42, Asso 800 HP, on the Praha-Nove Benatky Ripa-Praha course, September 20, 1930. Speed, 252.380 KPH (156.821 MPH).	Speed for 1,000 Kilometers—Leland F. Schoenhair, Lockheed Vega "Executive" monoplane NC-308H, Pratt & Whitney 450 HP supercharged, at Jacksonville, Fla., February 20, 1930. Speed, 245.750 KPH (152.70 MPH).
Speed for 2,000 Kilometers (France)—Lt. de Vaisseau Paris, Latécoère 28, Hispano-Suiza 650 HP, at Toulouse, April 11, 1931. Speed, 228.267 KPH (141.838 MPH).	(No Record.)
Speed for 5,000 Kilometers—(No Record).	(No Record.)

CLASS C—WITH PAY LOAD OF 2,000 KILOGRAMS

(4,409.24 Lbs.)

RETURNING TO POINT OF DEPARTURE

World Records	American Records
Duration (France)—J. LeBrix and M. Doret, "Le Trait d'Union" Dewoitine, Hispano-Suiza 600 HP, at Istres, March 23, 24, 1931. Time, 32H, 17M, 48S.	Duration—Lt. H. R. Harris, U. S. A. S., and Mechanician Doug. Culver, Barling Bomber, 6 Liberty 400 HP, at Wright Field, Dayton, O., October 3, 1924. Time, 1H, 47M, 10.5S.
Distance (Closed Circuit) (France)—J. Le Brix and M. Doret, "Le Trait d'Union" Dewoitine, Hispano-Suiza 600 HP, at Istres, March 23, 24, 1931. Distance, 4,670.664 Kilo. (2,902.210 Miles).	(No Record.)
Altitude (France)—Lucein Coupet, Farman 160 biplane No. 3, 2 Farman 500 HP ea., at Toussus-le-Noble, April 28, 1931. Height, 7,507 Meters (24,629.215 Feet).	Altitude—Lt. H. R. Harris, U. S. A. S., Barling Bomber, 6 Liberty 400 HP ea., at Wright Field, Dayton, O., October 25, 1923. Height, 2,049 Meters (6,722 Feet).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (United States)—Leroy Manning and Carl Wenzel, Ford Transport, 3 Pratt & Whitney "Wasp" 425 HP ea., at Dearborn, Mich., September 29, 1930. Speed, 264.628 KPH (164.432 MPH).	World and American Record.
Speed for 500 Kilometers (France)—Dubourdieu, Latécoère 28-2 monoplane, Hispano-Suiza 650 HP, at Toulouse, March 29, 1931. Speed, 226.073 KPH (140.475 MPH).	(No Record.)
Speed for 1,000 Kilometers (France)—Dubourdieu, Latécoère 28-2 monoplane, Hispano-Suiza 650 HP, at Toulouse, March 29, 1931. Speed, 224.733 KPH (139.642 MPH).	(No Record.)
Speed for 2,000 Kilometers (France)—J. Le Brix and M. Doret, "Le Trait d'Union" Dewoitine, Hispano-Suiza 600 HP, at Istres, March 23, 24, 1931. Speed, 151.362 KPH (94.052 MPH).	(No Record.)
Speed for 5,000 Kilometers—(No Record).	(No Record.)

CLASS C—WITH PAY LOAD OF 5,000 KILOGRAMS

(11,023 Lbs.)

WORLD RECORDS	AMERICAN RECORDS
Duration (Germany)—Wilhelm Zimmerman, Junkers J-38, 2 Junkers L-55, 600 HP ea., 2 Junkers L-8, 400 HP ea., at Dessau-Leipzig, April 10, 1930. Time, 3H, 2M.	(No Record.)
Distance (Germany)—Wilhelm Zimmerman, Junkers J-38 monoplane, 2 Junkers L-55, 600 HP ea., 2 Junkers L-8, 400 HP ea., at Dessau-Leipzig, April 10, 1930. Distance, 501.590 Kilo. (311.672 Miles).	(No Record.)
Altitude (France)—L. Bossoutrot, super Farman-Goliath, 4 Farman 500 HP ea., at Le Bourget, November 16, 1925. Height, 3,586 Meters (11,765 Feet).	(No Record.)

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (Germany)—Wilhelm Zimmerman, Junkers J-38, 2 Junkers L-55, 600 HP ea., 2 Junkers L-8, 400 HP ea., at Dessau-Leipzig, April 10, 1930. Speed, 184.464 KPH (114.62 MPH).	(No Record.)
Speed for 500 Kilometers (Germany)—Wilhelm Zimmerman, Junkers J-38, 2 Junkers L-55, 600 HP ea., 2 Junkers L-8, 400 HP ea., at Dessau-Leipzig, April 30, 1930. Speed, 172.950 KPH (107.466 MPH).	(No Record.)
Speed for 1,000 Kilometers—(No Record).	(No Record.)
Speed for 2,000 Kilometers—(No Record).	(No Record.)
Speed for 5,000 Kilometers—(No Record).	(No Record.)

CLASS C—WITH PAY LOAD OF 10,000 KILOGRAMS

WORLD RECORDS	AMERICAN RECORDS
Duration (Italy)—Cav. Domenico Antonini Caproni, Ca 90 biplane, 6 Isotta-Fraschini Asso 1,000 HP ea., at Cascina Malpensa, February 22, 1930. Time, 1H, 31M.	(No Record.)
Altitude (Italy)—Cav. Domenico Antonini Caproni, Ca 90 biplane, 6 Isotta-Fraschini Asso 1,000 HP ea., at Cascina Malpensa, February 22, 1930. Height, 3,231 Meters (10,597 Feet).	(No Record.)
Distance—(No Record).	(No Record.)

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers—(No Record).	(No Record.)
Speed for 500 Kilometers—(No Record).	(No Record.)
Speed for 1,000 Kilometers—(No Record).	(No Record.)
Speed for 2,000 Kilometers—(No Record).	(No Record.)
Speed for 5,000 Kilometers—(No Record).	(No Record.)

CLASS C—GREATEST PAY LOAD CARRIED TO AN ALTITUDE OF 2,000 METERS

(6,671.7 Feet)

WORLD RECORDS	AMERICAN RECORDS
(Italy)—Cav. Domenico Antonini Caproni, Ca 90 biplane, 6 Isotta-Fraschini Asso 1,000 HP ea., at Cascina Malpensa, February 22, 1930. Weight, 10,000 Kgs. (22,046 Lbs.).	Lt. H. R. Harris, U. S. A. S., Barling Bomber, 6 Liberty 400 HP ea., at Wright Field, Dayton, O., October 25, 1923. Weight, 2,000 Kgs. (4,409 Lbs.).

AIRPLANES—CLASS C—REFUELING IN FLIGHT

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS	AMERICAN RECORDS
Duration (United States)—John and Kenneth Hunter, Stinson Detroiter, Wright-Whirlwind 300 HP, at Sky Harbor, Northbrook, Ill., June 11, 1930–July 4, 1930. Time, 553H. 41M. 30S.	World and American Record.
Distance (United States)—Lts. Smith and Richter, U. S. A., DH-4-B, Liberty 400 HP, at Rockwell Field, San Diego, Cal., August 27, 28, 1923. Distance, 5,300 Kilo. (3,293.26 Miles).	World and American Record.

AIRPLANES—CLASS C—WOMEN'S CATEGORY

WORLD RECORDS	AMERICAN RECORDS
Duration (France)—Mme. Maryse Bastie, Klemm, Salmson 40 HP, at Le Bourget, September 2, 3, 4, 1930. Time, 37H. 55M.	(No Record.)
Duration with Refueling in Flight (United States—Miss Evelyn Trout and Miss Edna May Cooper, Curtiss Robin monoplane, Challenger 170 HP, at Los Angeles, Cal., January 4–9, 1931. Time, 123H.	World and American Record.
Distance (Airline) (United States)—Miss Ruth Nichols, Lockheed Vega monoplane, Pratt & Whitney "Wasp" 420 HP, Oakland, Cal., to Louisville, Ky., October 24, 25, 1931. Distance, 3,182.645 Kilo. (1,977.6 Miles).	World and American Record.
Altitude (United States)—Miss Ruth Nichols, Lockheed Vega monoplane, Pratt & Whitney "Wasp" 420 HP, at Jersey City Airport, New Jersey, March 6, 1931. Height, 8,761 Meters (28,743 Feet).	World and American Record.
Speed (United States)—Miss Ruth Nichols, Lockhead Vega monoplane, Pratt & Whitney "Wasp" 420 HP, at Carlton, Mich., April 13, 1931. Time, 338.987 KPH (210.636 MPH).	World and American Record.
Speed for 100 Kilometers (United States)—Miss Amelia Earhart, Lockheed Vega monoplane, Pratt & Whitney "Wasp" 420 HP, at Detroit, Mich., June 25, 1930. Speed, 281.470 KPH (174.897 MPH).	World and American Record.

WITH PAY LOAD OF 500 KILOGRAMS

WORLD RECORDS	AMERICAN RECORDS
Speed for 100 Kilometers (United States)—Miss Amelia Earhart, Lockheed Vega monoplane, Pratt & Whitney "Wasp" 420 HP, at Detroit, Mich., June 25, 1930. Speed, 275.904 KPH (171.438 MPH).	World and American Record.

LIGHT AIRPLANES—THIRD CATEGORY

WORLD RECORDS	AMERICAN RECORDS
Distance (Airline) (France)—Mme. Maryse Bastie, Klemm, Salmson 40 HP, from Le Bourget to Urino, Russia, June 28, 29, 1931. Distance, 2,976.910 Kilo. (1,849.763 Miles).	(No Record.)
Altitude (United States)—Mrs. May Haizlip, Buhl "Bull Pup," Szekely 85 HP, at St. Clair, Mich., June 13, 1931. Height, 5,516 Meters (18,097 Feet).	World and American Record.

LIGHT AIRPLANES—CLASS C—FIRST CATEGORY

Two seaters weight empty less than 400 Kgs. (881 Lbs.)

WORLD RECORDS	AMERICAN RECORDS
Duration (Closed Circuit) (France)—Freton and de La Vergne, Farman 231, Renault 95 HP, at Istres-Nimes and Fosses Jumeaux-Arles courses, April 8, 9, 1931. Time, 29H, 38M.	(No Record.)
Distance (Closed Circuit) (France)—Freton and de La Vergne, Farman 231, Renault 95 HP, at Istres-Nimes and Fosses Jumeaux-Arles courses, April 8, 9, 1931. Distance, 3,465.211 Kilo (2,153.178 Miles).	(No Record.)
Distance (Airline) (France)—Lalouette and de Permangle, Farman 231, Renault 95 HP, from Istres airport to Villa-Cisneros, January 11, 12, 1931. Distance, 2,912 Kilo. (1,809.429 Miles).	(No Record.)
Altitude (Germany)—Woldemar Voigt and K. H. Gaule, Akademische Fliegergruppe Darmstadt, D-18, Armstrong Siddeley, Genet Major 100 HP, at Darmstadt, April 21, 1930. Height, 7,521 Meters (24,672 Feet).	Altitude—Willfred G. Moore, Inland Sport monoplane, Warner 110 HP, at Kansas City, Mo., September 30, 1929. Height, 5,652 Meters (18,543 Feet).

SPEEDS FOR SPECIFIED DISTANCES

Speed over 100 Kilometers (France)—Freton and de La Vergne, Farman 230, Renault 95 HP, at Ville sauvage-La Marmogne course, June 27, 1931. Speed, 223.546 KPH (138.905 MPH).	Speed for 100 Kilometers—Willfred G. Moore, pilot; W. S. Glodfelty, passenger; Inland Sport monoplane, Warner 110 HP, at Kansas City, Mo., February 12, 1930. Speed, 204.313 KPH (126.95 MPH).

CLASS C—SECOND CATEGORY

Two seaters weight empty less than 280 Kgs. (617 Lbs.)

WORLD RECORDS	AMERICAN RECORDS
Duration (Closed Circuit) (France)—Reginensi and de Viscaya, Farman 230, Salmson 40 HP, at Ville sauvage-La Marmogne course, December 27, 1930. Time, 7H, 34M.	(No Record.)
Distance (Closed Circuit) (France)—Reginensi and de Viscaya, Farman 230, Salmson 40 HP, at Ville sauvage-La Marmogne course, December 27, 1930. Distance, 1,000 Kilo. (621.37 Miles).	(No Record.)
Distance (Airline) (France)—Reginensi and Lecointe, Farman 230, Salmson 40 HP, Toussus le-Noble to Marignane (Marseilles), February 18, 1931. Distance, 636.050 Kilo. (395.222 Miles).	(No Record.)
Altitude (France)—Reginensi and de Viscaya, Farman 230, Salmson 40 HP, at Toussus le-Noble, April 12, 1931. Height, 5,305 Meters (17,404.820 Feet).	Altitude—Edna Rudolph, pilot; Thornton Waggoner, passenger; Curtiss Wright Junior, Szekely 43 HP, at East St. Louis, Ill., May 31, 1931. Height, 4,244 Meters (13,924 Feet).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (Poland)—Ing. Georges Drzewiecki and G. Wedrychowski, W. R. D. 7 monoplane, Genet 80 HP, at Varsovie-Skierniewice, August 12, 1931. Speed, 178.748 KPH (111.069 MPH).	(No Record.)

CLASS C—THIRD CATEGORY

Single seaters weight empty 200–350 Kgs., Inc. (440–771 Lbs.)

WORLD RECORDS	AMERICAN RECORDS
Duration (France)—Madame Maryse Bastie, Klemm, Salmson 40 HP, at Le Bourget, September 24, 1930. Time, 37H.	(No Record.)
Distance (Closed Circuit) (France)—Laulhe, Albert, Salmson 40 HP, at Le Bourget, September 4, 5, 1930. Distance, 2,714.400 Kilo. (1,686.646 Miles).	(No Record.)
Distance (Airline) (France)—Madame Maryse Bastie, Klemm, Salmson 40 HP, from Le Bourget to Urino, Russia, June 28, 29, 1931. Distance, 2,976.910 Kilo. (1,849.763 Miles).	Distance (Airline)—D. S. Zimmerly, Barling NB-3, LeBlond 60 HP, Brownsville, Tex., to Winnipeg City, Canada, July 17, 1929. Distance, 2,655 Kilo. (1,650 Miles).
Altitude (Germany)—Woldemar Voigt, Akademische Fliegergruppe Darmstadt D-18, Armstrong Siddeley Genet Major 100 HP, at Darmstadt, May 23, 1930. Height, 8,142 Meters (26,712 Feet).	Altitude—D. S. Zimmerly, Barling NB-3 monoplane, Lambert R266 90 HP, at Forest Park Flying Field, St. Louis, Mo., February 16, 1930. Height, 7,338 Meters (24,074 Feet).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (Great Britain)—Capt. H. S. Broad, DH "Tiger Moth," DH 32 130 HP, at Stage Lane, August 24, 1927. Speed, 300.1 KPH (186.47 MPH).	(No Record.)

CLASS C—FOURTH CATEGORY

Single seaters weight empty less than 200 Kgs. (440 Lbs.)

WORLD RECORDS	AMERICAN RECORDS
Duration (France)—G. Fauvel, Peyret-Mauboussin, A. B. C. Scorpion 34 HP, at Le Bourget, September 12, 1930. Time, 12H, 3M.	(No Record.)
Distance (Closed Circuit) (France)—G. Fauvel, Peyret-Mauboussin, A. B. C. Scorpion 34 HP, at Le Bourget, September 12, 1930. Distance, 1,258.800 Kilo. (782.180 Miles).	(No Record.)
Distance (Airline) (France)—G. Fauvel, Peyret-Mauboussin Type 10, A. B. C. Scorpion, at Le Bourget, September 6, 1929. Distance, 852.100 Kilo. (529.40 Miles).	(No Record.)
Altitude (France)—G. Fauvel, Peyret-Mauboussin Type 10, A. B. C. Scorpion, at Le Bourget, September 5, 1929. Height, 5,193 Meters (17,037 Feet).	Altitude—Kenneth W. Scholter, Aeronca, Aeronca 38 HP, at Detroit, Mich., April 12, 1931. Height, 5,324 Meters (17,467 Feet). (Note: F. A. I. requirement that previous record be beaten by 200 meters in order to establish new international mark prevents international recognition of this record.) World and American Record.
Speed for 100 Kilometers (United States)—Clarence O. Prest, Prest Baby Pursuit, Szekely 40 HP, San Bernardino Co., Cal., May 28, 1930. Speed, 162.21 KPH (100.79 MPH).	

SEAPLANES—CLASS C2

RETURNING TO POINT OF DEPARTURE WITHOUT REFUELING

WORLD RECORDS	AMERICAN RECORDS
Duration (France)—Lt. de Vaisseau Paris and M. Gonord, Latécoère 28-3, Hispano-Suiza 600 HP, at Arcachon, June 4, 5, 1931. Time, 36H, 57M.	Duration—Lts. Arthur Gavin and Zeus Soucek, Navy PN-12, 2 Wright R-1750, 525 HP ea., at Philadelphia, Pa., May 3, 4, 5, 1928. Time, 36H, 1M.
Distance (Closed Circuit) (France)—Lt. de Vaisseau Paris and M. Gonord, Latécoère 28-3, Hispano-Suiza 600 HP, at Arcachon, June 4, 5, 1931. Distance, 5,011.210 Kilo. (3,113.816 Miles).	Distance—Lts. B. J. Connell and H. C. Rodd, PN-10, 2 Packard 600 HP ea., at San Diego, Cal., August 15, 16, 1927. Distance, 2,525 Kilo. (1,569 Miles).
Distance (Airline) (France)—Mermoz, Darby and Gimie, Latécoère 28, Hispano-Suiza 600 HP, St. Louis, Senegal to Natal, Brazil, May 12, 13, 1930. Distance, 3,173.200 Kilo. (1,971.7310 Miles).	Distance (Airline)—Comdr. John Rodgers, U. S. N., and Lt. B. J. Connell, PN-9, 2 Packard 1-A-1500, 500 HP ea., San Pablo Bay, Cal., to near Hawaii, August 31–September 1, 1925. Distance, 2,963 Kilo. (1,841 Miles).
Altitude (United States)—Lt. Apollo Soucek, U. S. N., Wright "Apache," Pratt & Whitney 425 HP supercharged, at Washington, D. C., June 4, 1929. Height, 11,753 Meters (38,560 Feet).	World and American Record.
Maximum Speed (Great Britain)—Flight—Lt. G. H. Stainforth, Vickers Supermarine S6B, Rolls Royce R, at Lee-on-Solent, September 29, 1931. Speed, 655 KPH (406.997 MPH).	Maximum Speed—Lt. Jas. H. Doolittle, U. S. A. S., Curtiss R3C-2, Curtiss V-1400, 600 HP, at Bay Shore, Baltimore, Md., October 27, 1925. Speed, 395.439 KPH (245.713 MPH).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (Great Britain)—Flight-Lt. J. N. Boothman, R. A. F., Vickers Supermarine S6B, Rolls Royce R. at Spithead, September 13, 1931. Speed, 551.800 KPH (342.871 MPH).	Speed for 100 Kilometers—Lt. G. T. Cuddihy, U. S. N., Curtiss R3C-2, Curtiss V-1550, 700 HP, at Norfolk, Va., November 13, 1926. Speed, 388.944 KPH (241.679 MPH).
Speed for 500 Kilometers (United States)—Lt. R. A. Ofstie, Curtiss Navy C-3, Curtiss D-12 450 HP, at Bay Shore, Baltimore, Md., October 25, 1924. Speed, 259.328 KPH (161.14 MPH).	World and American Record.
Speed for 1,000 Kilometers (Germany)—Rolf Starke, Heinkel HE9, BMW, VI-600 HP, at Warnemunde, June 10, 1929. Speed, 222.277 KPH (138.116 MPH).	Speed for 1,000 Kilometers—Lt. R. Irvine, Vought "Corsair," Pratt & Whitney "Wasp" 425 HP, at Hampton Roads, Va., May 21, 1927. Speed, 210.716 KPH (130.932 MPH).
Speed for 2,000 Kilometers (France)—Lt. de Vaisseau Paris and M. Hebert, Latécoère 28, Hispano-Suiza 600 HP, at St. Laurent de la Salanque, June 23, 1930. Speed, 185.931 KPH (117.396 MPH).	Speed for 2,000 Kilometers—Lts. B. J. Connell and H. C. Rodd, U. S. N., PN-10, 2 Packard 600 HP ea., at San Diego, Cal., August 15, 16, 1927. Speed, 126.567 KPH (78.644 MPH).
Speed for 5,000 Kilometers (France)—Lt. de Vaisseau Paris and M. Gonord, Latécoère 28-3, Hispano-Suiza 600 HP, at Arcachon, June 4, 5, 1931. Speed, 139.567 KPH (86.723 MPH).	(No Record.)

CLASS C2—WITH PAY LOAD OF 500 KILOGRAMS (1,102.31 Lbs.)

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS	AMERICAN RECORDS
Duration (France)—Lt. de Vaisseau Paris and M. Hebert, Latécoère 28, Hispano-Suiza 600 HP, at St. Laurent de la Salanque, June 23, 1930. Time, 31H, 1M.	Duration—Lts. B. J. Connell and H. C. Rodd, PN-10, 2 Packard 600 HP ea., at San Diego, Cal., August 15, 16, 1927. Time, 20H, 45M, 40S.
Distance (France)—Lt. de Vaisseau Paris and M. Hebert, Latécoère 28, Hispano-Suiza 600 HP, at St. Laurent de la Salanque, July 17, 1930. Distance, 4,202.496 Kilo. (2,611.305 Miles).	Distance—Lts. B. J. Connell and H. C. Rodd, PN-10, 2 Packard 600 HP ea., at San Diego, Cal., August 15, 16, 1927. Distance, 2,525 Kilo. (1,569 Miles).
Altitude (United States)—Boris Sergievsky, Sikorsky S-38, 2 Pratt & Whitney "Wasp" 420 HP ea. supercharged, Bridgeport, Conn., July 21, 1930. Height, 8,208 Meters (26,929.080 Feet).	World and American Record.

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (Germany)—Rolf Starke, Heinkel HD-38, BMW-6, 600 HP, at Warnemunde, May 7, 1929.
Speed, 259.927 KPH (161.510 MPH).

Speed for 500 Kilometers (Germany)—Rolf Starke, Heinkel, HE-9a, BMW-6 600 HP, at Warnemunde, May 21, 1929.
Speed, 235.941 KPH (146.606 MPH).

Speed for 1,000 Kilometers (Germany)—Rolf Starke, Heinkel HE-9, BMW-6 600 HP, at Warnemunde, June 10, 1929.
Speed, 222.277 KPH (138.116 MPH).

Speed for 2,000 Kilometers (France)—Lt. de Vaisseau Paris and M. Hebert, Latécoère 28, Hispano-Suiza 600 HP, at St. Laurent de la Salanque, June 23, 1930.
Speed, 185.931 KPH (117.396 MPH).

Speed for 5,000 Kilometers—No Record).

Speed for 100 Kilometers—Lt. S. W. Callaway, U. S. N., Vought "Corsair," Pratt & Whitney 425 HP "Wasp," at Hampton Roads, Va., April 23, 1927.
Speed, 236.998 KPH (147.263 MPH).

Speed for 500 Kilometers—Lt. J. D. Barner, U. S. N., Vought "Corsair," Pratt & Whitney "Wasp" 425 HP, at Hampton Roads, Va., April 30, 1927.
Speed, 218.90 KPH (136.023 MPH).

Speed for 1,000 Kilometers—Lt. B. J. Connell and S. R. Pope, PN-10, 2 Packard 600 HP ea., at San Diego, Cal., July 8, 1927.
Speed, 142.74 KPH (88.69 MPH).

Speed for 2,000 Kilometers—Lts. B. J. Connell and H. C. Rodd, U. S. N., PN-10, 2 Packard 600 HP ea., at San Diego, Cal., August 15, 16, 1927.
Speed, 126.567 KPH (78.664 MPH).

(No Record.)

CLASS C2—WITH PAY LOAD OF 1,000 KILOGRAMS (2,204.62 Lbs.)

RETURNING TO POINT OF DEPARTURE

World Records

Duration (France)—Lt. de Vaisseau Paris and M. Hebert, Latécoère 28, Hispano-Suiza 600 HP, at St. Laurent de la Salanque June 22, 1930.
Time, 20H, 2M.

Distance (France)—Lt. de Vaisseau Paris and M. Hebert, Latécoère 28, Hispano-Suiza 600 HP, at St. Laurent de la Salanque, June 22, 1930.
Distance, 2,854.244 Kilo. (1,773.603 Miles)

Altitude (United States)—Boris Sergievsky, Sikorsky S-38, 2 Pratt & Whitney "Hornets" 575 HP ea., at Bridgeport, Conn., July 21, 1930.
Height, 8,208 Meters (26,929.080 Feet).

American Records

Duration—Lts. Zeus Soucek and Lisle J. Maxson, Navy PN-12, 2 Wright R 1750 525 HP ea., at Philadelphia, Pa., May 25, 26, 1928.
Time, 17H, 55M, 13.6S.

Distance—Lt. A. W. Gorton and Chief Boatswain E. E. Reber, U. S. N., PN-12, 2 Pratt & Whitney 525 HP ea., at Philadelphia, Pa., July 11, 12, 1928.
Distance, 2,150 Kilo. (1,336 Miles).

World and American Record.

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (Germany)—Rolf Starke, Heinkel, BMW VI 600 HP, at Warnemunde, May 21, 1929.
Speed, 235.294 KPH (146.205 MPH).

Speed for 500 Kilometers (Germany)—Rolf Starke, Heinkel HE-9a, BMW 600 HP, at Warnemunde, May 7, 1929.
Speed, 235.941 KPH (146.606 MPH).

Speed for 1,000 Kilometers (France)—Lt. de Vaisseau Paris and M. Hebert, Latécoère 28, Hispano-Suiza 600 HP, at St. Laurent de la Salanque, June 23, 1930.
Speed, 190.004 KPH (118.085 MPH).

Speed for 2,000 Kilometers (France)—Lt. de Vaisseau Paris and M. Hebert, Latécoère 28, Hispano-Suiza 600 HP, at St. Laurent de la Salanque, June 23, 1930.
Speed, 185.931 KPH (117.396 MPH).

Speed for 5,000 Kilometers—(No Record).

(No Record.)

Speed for 500 Kilometers—Lt. B. J. Connell and S. R. Pope, PN-10, 2 Packard 600 HP. ea., at San Diego, Cal., July 8, 1927
Speed, 145.68 KPH (90.52 MPH).

Speed for 1,000 Kilometers—Lt. B. J. Connell and S. R. Pope, PN-10, 2 Packard 600 HP ea., at San Diego, Cal., July 8, 1927.
Speed, 142.74 KPH (88.69 MPH).

Speed for 2,000 Kilometers—Lt. A. W. Gorton and Chief Boatswain E. E. Reber, U. S. N., PN-12, 2 Pratt & Whitney 525 HP ea., at Philadelphia, Pa., July 11, 12, 1928.
Speed, 130.427 KPH (81.043 MPH).

(No Record.)

CLASS C2—WITH PAY LOAD OF 2,000 KILOGRAMS (4,400.24 Lbs.)

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS	AMERICAN RECORDS
Duration (United States)—Lt. A. W. Gorton and Chief Boatswain E. E. Reber, U. S. N., PN-12, 2 Pratt & Whitney 525 HP, ea., at Philadelphia, Pa., July 11, 12, 1928. Time, 16H, 39 M.	World and American Record.
Distance (Closed Circuit) (France)—Lt. de Vaisseau Demougeot and M. Gonord, Latécoère 38, 2 Hispano-Suiza 650 HP ea., on the Cape Magnan-Cape Mart in Lion de Terre course, September 2, 1931. Distance, 2,208.420 Kilo. (1, 372.246 Miles).	Distance (closed circuit)—Lt. A. W. Gorton and Chief Boatswain E. E. Reber, U. S. N., PN-12, 2 Pratt & Whitney 525 HP ea., at Philadelphia, Pa., July 11, 12,1928. Distance, 2,150 Kilo. (1,336 Miles).
Altitude (United States)—Boris Sergievsky, Sikorsky S-38, 2 Type B Pratt & Whitney "Hornets" 575 HP ea., at North Beach, Queens, N. Y., August 11, 1930. Height, 6,074 Meters (19,927.78 Feet).	World and American Record.

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (France)—Prevot, Latécoère 28, Hispano-Suiza 650 HP, at St. Laurent de la Salanque, March 5, 1930. Speed, 220.026 KPH (136.718 MPH).	(No record.)
Speed for 500 Kilometers (France)—Prevot, Latécoère 28 monoplane, Hispano-Suiza 650 HP, at St. Laurent de la Salanque, March 5, 1930. Speed, 202.092 KPH (125.573 MPH).	Speed for 500 Kilometers—Lt. B. J. Connell and S. R. Pope, PN-10, 2 Packard 600 HP ea., at San Diego, Cal., July 8, 1927. Speed, 145.68 KPH (90.52 MPH).
Speed for 1,000 Kilometers (Germany)—Richard Wagner, Dornier Superwal, DR-142, 4 Gnome-Rhone-Jupiter 480 HP ea., at Frederickshaven-Lindau, February 2, 1928. Speed, 177.279 KPH (110.155 MPH).	Speed for 1,000 Kilometers—Lt. J. B. Connell and S. R. Pope, PN-10, 2 Packard 600 HP ea., at San Diego, Cal. July 8, 1927. Speed, 142.74 KPH (88.69 MPH).
Speed for 2,000 Kilometers (France)—Lt. de Vaisseau Demougeot and M. Gonord, Latécoère 38, 2 Hispano-Suiza 650 HP ea., on the Cape Magnan-Cape Martin Lion de Terre course, September 2, 1931. Speed, 163.628 KPH (101.674 MPH).	Speed for 2,000 Kilometers—Lt. A. W. Gorton and Chief Boatswain E. E. Reber, U. S. N., PN-12, 2 Pratt & Whitney 525 HP ea., at Philadelphia, Pa., July 11, 12, 1928. Speed, 130.427 KPH (81.043 MPH).
Speed for 5,000 Kilometers—(No Record).	(No Record.)

CLASS C2—WITH PAY LOAD OF 5,000 KILOGRAMS (11,023 Lbs.)

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS	AMERICAN RECORDS
Duration—(No Record).	(No Record.)
Distance—(No Record).	(No Record.)
Altitude (Germany)—Steindorff, Rohrbach Romar, 2 BMW 500 HP ea., at Travemunde, April 17, 1929. Height, 2,000 Meters (6,562 Feet).	(No Record.)
Speed for 100 Kilometers—(No Record).	(No Record.)
Speed for 500 Kilometers—(No Record).	(No Record.)
Speed for 1,000 Kilometers—(No Record).	(No Record.)
Speed for 2,000 Kilometers—(No Record).	(No Record.)
Speed for 5,000 Kilometers—(No Record).	(No Record.)

CLASS C2—WITH PAY LOAD OF 10,000 KILOGRAMS (22,046 Lbs.)

RETURNING TO POINT OF DEPARTURE WITHOUT REFUELING

WORLD RECORDS	AMERICAN RECORDS
Duration—(No Record).	(No Record.)
Distance—(No Record).	(No Record.)
Altitude—(No Record).	(No Record.)

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers—(No Record).	(No Record.)
Speed for 500 Kilometers—(No Record).	(No Record.)
Speed for 1,000 Kilometers—(No Record).	(No Record.)
Speed for 2,000 Kilometers—(No Record).	(No Record.)
Speed for 5,000 Kilometers—(No Record).	(No Record.)

CLASS C2—GREATEST PAY LOAD CARRIED TO AN ALTITUDE OF 2,000 METERS (6,651.7 Feet)

WORLD RECORDS	AMERICAN RECORDS
(Germany)—Steindorff, Rohrbach Romar, 3 BMW 500 HP ea., at Travemunde, April 17, 1929. Weight, 6,450 Kgs. (14,220 Lbs.).	Lts. B. J. Connell and H. C. Rodd, U. S. N., PN-10, 2 Packard 660 HP ea., at San Diego, Cal., August 18, 1927. Weight, 3,504 Kgs. (7,726 Lbs.).

FEMININE RECORDS

Altitude (United States)—Mrs. Marion Eddy Conrad, Savoia-Marchetti, Kinner 125 HP, at Port Washington, L. I., N. Y., October 20, 1930. Height, 4,103 Meters (13,461.259 Feet).	World and American Record.

CLASS C2—LIGHT SEAPLANES—FIRST CATEGORY

Two seaters weight empty less than 500 Kgs. (1,102 Lbs.)

WORLD RECORDS	AMERICAN RECORDS
Duration (France)—Lallouette and Boulanger, Farman, Renault 95 HP, on the Le Pecq-Mantes course, April 24, 1931. Time, 11H, 6M.	(No Record.)
Distance (Closed Circuit) (France)—Lallouette and Boulanger, Farman, Renault 95 HP, on the Le Pecq-Mantes course, April 24, 1931. Distance, 1,492.190 Kilo. (927.202 Miles).	(No Record.)
Distance (Airline) (France)—Lallouette and Albert, Farman 231, Renault 95 HP, from Le Pecq to Caudebec-en-Caux, May 13, 1931. Distance, 122.560 Kilo. (76.155 Miles).	(No Record.)
Altitude (Italy)—Domenico Antonini, pilot; Spartaco Trevisan, passenger; Caproni Ca 100 Idro, Cirrus Hermes 105 HP, at Lambrate Airport, Milan, February 27, 1931. Height, 5,324 Meters (17,467.156 Feet).	(No Record.)
Speed for 100 Kilometers (France)—Lallouette and Boulanger, Farman, Renault 95 HP, on the Draveil-Montereau course, March 28, 1931. Speed, 189.433 KPH (117.708 MPH).	(No Record.)

CLASS C2—LIGHT SEAPLANES—SECOND CATEGORY

Two seaters weight empty less than 350 Kgs. (771 Lbs.)

WORLD RECORDS	AMERICAN RECORDS
Duration (France)—De Viscaya and Chaudet, Farman 230, Salmson 40 HP, Le Pecq–Bonnieres–Le Rhoule, June 26, 1931. Time, 11H, 31M, 32S.	(No Record.)
Distance (Closed Circuit) (France)—De Viscaya and Chaudet, Farman 230, Salmson 40 HP, Le Pecq–Bonnieres–Le Rhoule, June 26, 1931. Distance, 1,184.256 Kilo. (735.861 Miles).	(No Record.)
Distance (Airline)—(No Record).	(No Record.)
Altitude (France)—Jean de Viscaya and Forestier, Farman F-231, Salmson 40 HP, on the Farman to Le Pecq course, June 11, 1931. Height, 3,231 Meters (10,600.361 Feet).	(No Record.)
Speed for 100 Kilometers (France)—De Viscaya and Chaudet, Farman 230, Salmson 40 HP, Le Pecq–Bonnieres–Le Rhoule, June 26, 1931. Speed, 143.540 KPH (89.191 MPH).	(No Record.)

CLASS C2—LIGHT SEAPLANES—THIRD CATEGORY

Single seater weight empty between 250–487.5 Kgs. (551–965 Lbs.)

WORLD RECORDS	AMERICAN RECORDS
Duration (France)—Jean de Viscaya, Farman 230, Salmson 40 HP, on the Bonnieres–Le Rhoule and Pont de St. Germain–Pont de Sartrouville courses, September 28, 1931. Time, 18H, 39M.	(No Record.)
Distance (Closed Circuit) (France)—Jean de Viscaya, Farman 230, Salmson 40 HP, on the Bonnieres–Le Rhoule and Pont de St. Germain–Pont de Sartrouville courses, September 28, 1931. Distance, 2,210.740 Kilo (1,373.687 Miles).	(No Record.)
Distance (Airline)—No Record).	(No Record.)
Altitude (Germany)—Wilhelm Zimmerman, Junkers J 50-W, Armstrong Siddeley Genet 85 HP, at Dessau, June 4, 1930. Height, 5,652 Meters (18,543.270 Feet).	(No Record.)
Speed for 100 Kilometers (Germany)—Pilot Alfred Grundke, Junkers J 50-W, Armstrong Siddeley Genet 85 HP, at Dessau, June 13, 1930. Speed, 165.44 Kilo (102.80 Miles).	(No Record.)

CLASS C2—LIGHT SEAPLANES—FOURTH CATEGORY

Single seater weight empty less than 250 Kgs. (551 Lbs.)

WORLD RECORDS	AMERICAN RECORDS
Duration—(No Record).	(No Record.)
Distance (Closed Circuit) (France)—Vercruysse, Peyret-Mauboussin, A. B. C. Scorpion 34 HP on the Chatou–Epinay course, December 22, 1930. Distance, 550 Kilo. (341.753 Miles).	(No Record.)
Distance (Airline)—(No Record).	(No Record.)
Speed for 100 Kilometers (France)—Vercruysse, Peyret-Mauboussin, A. B. C. Scorpion 34 HP, at Chatou–Epinay course, December 24, 1930. Speed, 122.783 KPH (76.293 MPH).	(No Record.)
Altitude (France)—Vercruysse, Peyret-Mauboussin, A. B. C. Scorpion 34 HP, at Argenteuil, December 10, 1930. Height, 3,461 Meters (11,354.964 Feet).	(No Record.)

CLASS A—BALLOONS

FIRST CATEGORY (600 CUBIC METERS)

WORLD RECORDS	AMERICAN RECORDS
Duration (France)—G. Cormier, August 10, 11, 1924. Time, 22H, 34M.	(No Record.)
Distance (France)—Georges Cormier, July 1, 1922. Distance, 804.173 Kilo. (499.69 Miles).	(No Record.)
Altitude—(No Record).	(No Record.)

SECOND CATEGORY (601–900 CUBIC METERS)

Duration (France)—Jules Dubois, May 14, 15, 1922. Time, 23H, 28M.	Duration—W. C. Naylor and K. W. Warren, "Skylark," Little Rock, Ark., to Crawford, Tenn., April 29, 30, 1926 Time, 19H.
Distance (France)—Georges Cormier, July 1, 1922. Distance, 804.173 Kilo. (499.69 Miles).	Distance—W. C. Naylor and K. W. Warren, "Skylark," Little Rock, Ark., to Crawford, Tenn., April 29, 30, 1926 Distance, 660 Kilo (410 Miles).
Altitude—(No Record).	(No Record.)

THIRD CATEGORY (901–1,200 CUBIC METERS)

Duration (United States)—E. J. Hill and A. G. Schlosser, Ford Airport to Montvale, Va., July 4, 5, 1927. Time, 26H. 46M.	World and American Record.
Distance (United States)—S. A. U. Rasmussen, Ford Airport to Hookerton, N. C., July 4, 5, 1927. Distance, 920.348 Kilo (571 Miles).	World and American Record.
Altitude—(No Record).	(No Record.)

FOURTH CATEGORY (1,201–1,600 CUBIC METERS)

Duration (United States)—E. J. Hill and A. G. Schlosser, Ford Airport to Montvale, Va., July 4, 5, 1927. Time, 26H 46M.	World and American Record.
Distance (United States)—S. A. U. Rasmussen, Ford Airport to Hookerton, N. C., July 4, 5, 1927. Distance, 920.348 Kilo. (571 Miles).	World and American Record.
Altitude—(No Record).	(No Record.)

FIFTH CATEGORY (1,601–2,200 CUBIC METERS)

Duration (France)—Georges Blanchet and Dr. Geo. LeGallee, Gordon Bennett, Detroit to Waverly Hall, Ga., September 10, 11, 12, 1927. Time, 49H.	Duration—E. J. Hill and A. G. Schlosser, Gordon Bennett, Detroit to Baxley, Ga., September 10, 11, 12, 1927. Time, 47H, 55M.
Distance (United States)—Lt. T. G. W. Settle and Ensign W. Bushnell, Pitt Stadium, Pittsburgh, Pa., to Savage Harbor, Prince Edward Island, Canada, May 4, 5, 6, 1929. Distance, 1,531.768 Kilo. (952 Miles).	World and American Record.
Altitude—(No Record).	(No Record.)

SIXTH CATEGORY (2,201–3,000 CUBIC METERS)

Duration (France)—Georges Blanchet and Dr. Geo. LeGallee, Detroit to Waverly Hall, Ga., September 10, 11, 12, 1927. Time, 49H.	Duration—E. J. Hill and A. G. Schlosser, Gordon Bennett, Detroit to Baxley, Ga., September 10, 11, 12, 1927. Time, 47H, 55M.
Distance (United States)—Lt. T. G. W. Settle and Ensign W. Bushnell, Pitt Stadium, Pittsburgh, Pa., to Savage Harbor, Prince Edward Island, Canada, May 4, 5, 6, 1929. Distance, 1,531.768 Kilo. (952 Miles).	World and American Record.
Altitude (United States)—Capt. Hawthorne C. Gray, at Scott Field Belleville, Ill., March 9, 1927. Height, 8,690 Meters (28,510 Feet).	World and American Record.

SEVENTH CATEGORY (3,001–4,000 CUBIC METERS)

Duration (France)—Georges Blanchet and Dr. Geo. LeGallee, Gordon Bennett, Detroit to Waverly Hall, Ga., September 10, 11, 12, 1927. Time, 49H.	Duration—E. J. Hill and A. G. Schlosser, Gordon Bennett, Detroit to Baxley, Ga., September 10, 11, 12, 1927. Time, 47H, 55M.
Distance (United States)—Lt. T. G. W. Settle and Ensign W. Bushnell, Pitt Stadium, Pittsburgh, Pa., to Savage Harbor, Prince Edward Island, Canada, May 4, 5, 6, 1929. Distance, 1,531.768 Kilo. (952 Miles).	World and American Record.
Altitude (United States)—Capt. Hawthorne C. Gray, at Scott Field, Belleville, Ill., March 9, 1927. Height, 8,690 Meters (28,510 Feet).	World and American Record.

EIGHTH CATEGORY (4,001–5,000 CUBIC METERS)

Duration (Germany)—H. Kaulen, December 13–17, 1913. Time, 87H.	Duration—C. B. Harmon, St. Louis to Edina, Mo., October 4, 1909. Time, 48H, 26M.
Distance (Germany)—Berliner, February 8–10, 1914. Distance, 3,052.7 Kilo. (1,896.9 Miles).	Distance—A. R. Hawley, St. Louis to Lake Tschotogama, October 17–19, 1910. Distance, 1,887.6 Kilo. (1,172.9 Miles).
Altitude (Switzerland)—World Altitude Record, Professor Piccard and Paul Kipfer, at Augsburg–Glacier d'Obergurgl, May 27, 1931. Height, 15,781 Meters (51,775 Feet).	Altitude—Capt. Hawthorne C. Gray, at Scott Field, Belleville, Ill., March 9, 1927. Height, 8,690 Meters (28,510 Feet).

CLASS B—AIRSHIPS

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS	AMERICAN RECORDS
Duration (Germany)—Dr. Hugo Eckener, "Graf Zeppelin," 5 Maybach, Lakehurst, N. J., to Fredrickshaven, Germany, November 29, 30, 31, 1928. Time, 71H, 7M.	Duration—Ensign Maytham, Navy A-236, at Miami, Fla., December 24, 25, 1918. Time, 40H, 26M.
Distance (Germany)—Dr. Hugo Eckener, "Graf Zeppelin," 5 Maybach, Lakehurst, N. J., to Fredrickshaven, Germany, November 29, 30, 31, 1928. Distance, 6,384.5 Kilo. (3,967 Miles).	(No Record.)
Altitude (France)—Cohen, at Conte, June 18, 1912. Height, 3,080 Meters (10,102 Feet).	(No Record.)

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers—(No Record.)	(No Record.)
Speed for 500 Kilometers—(No Record.)	(No Record.)
Speed for 1,000 Kilometers—(No Record.)	(No Record.)
Speed for 2,000 Kilometers—(No Record.)	(No Record.)
Speed for 5,000 Kilometers—(No Record.)	(No Record.)

CLASS D—GLIDERS

WORLD RECORDS	AMERICAN RECORDS
Duration (Germany)—Ferdinand Schulz, glider "Westpreussen," at Rossitten Field, May 3, 1927. Time, 14H, 7M.	

GREATEST DISTANCE OVER CLOSED COURSE

Distance (Germany)—Ferdinand Schulz, glider "Westpreussen," at Rossitten Field, May 3, 1927.
Distance, 455.8 Kilo. (283.22 Miles).

GREATEST DISTANCE IN A STRAIGHT LINE

Distance (Austria)—Robert Kronfeld, Wien glider, Wasserkuppe to la Wolzauerhammer, August 24, 1930.
Distance, 164.51 Kilo. (102.221 Miles).

SPEED OVER A CLOSED COURSE

Speed (Germany)—Ferdinand Schulz, glider "Westpreussen," at Rossitten Field, May 5, 1927.
Speed, 54.545 KPH (33.892 MPH).

ALTITUDE ABOVE STARTING POINT

Altitude (Austria)—Robert Kronfeld, "Wien" Rhon-Rossiter, at Lienlas, July 30, 1929.
Height, 2,589 Meters (8,494 Feet).

CLASS G—HELICOPTERS

Duration with return to starting point (Italy)—Marinello Nelli, Ascanio, Fiat A 50, at Rome, October 8, 1930.
Time, 8M, 45S.

Distance in straight line non-stop (Italy)—Marinello Nelli, Ascanio, Fiat A 50, at Rome, October 10, 1930.
Distance, 1,078.60 Meters (3,538.706 Feet).

Altitude above point of take-off (Italy)—Marinello Nelli, Ascanio, Fiat A 50, at Rome, October 13, 1930.
Height, 18 Meters (59.055 Feet).

NATIONAL BALLOON RACE

Akron, Ohio, July 19, 1931

Official Standing of Contestants

Place	*Entrant*	*Pilot and Aide*	*Place of Landing*	*Distance*
1.	U. S. Navy	T. G. W. Settle Wilfred Bushnell	18 mi. ESE of Buffalo, N. Y. 6 mi. NNE of E. Aurora, N. Y. 7 mi. SW of Alden, N. Y.	195 mi.
2.	Goodyear-Zeppelin Corp.	F. A. Trotter R. J. Blair	9½ mi. NW of Buffalo, N. Y. 11½ mi. E of Welland, Ohio 3½ mi. NE of Stevensville, Ont.	185 mi.
3.	Detroit Balloon Club	E. J. Hill A. G. Schlosser	8 mi. E of Erie, Pa. 3 mi. E of Westleyville, Pa	110 mi.
4.	U. S. Army	K. S. Axtater H. H. Couch	1 mi. E of Custards, Pa. 10 mi. S of Meadville, Pa. 5 mi. W of Cochranton, Pa.	80 mi.
5.	Goodyear-Zeppelin Corp.	L. P. Furcolow J. B. Ricker	4 mi. N of Ravenna, Ohio 5 mi. S of Mantua, Ohio 10 mi. NE of Kent, Ohio	18 mi.
6.	U. S. Army	E. M. Fogelsonger John A. Tarre	2½ mi. NE of Brimfield, Ohio	11 mi.

NATIONAL AIR TOUR, 1931

Place at Finish	*Plane*	*Motor Used*	*Rated H.P.*	*Gross Weight*	*Empty Weight*	*Useful Load*	*Unstick Time*	*Stick Time*	*Average Speed**	*Pilot*	*Total Points*
1st	Ford Tri-Motor	2 Wright J6 / 1 Wright Cyclone	1,175	13,000	7,844	5,156	12.2	11.5	143.20	Harry Russell	63,764.3
2nd	Ford Tri-Motor	3 Pratt & Whitney Wasps	1,260	13,500	7,960	5,540	10.3	9.7	143.20	J. H. Smart	53,813.0
3rd	Cessna	1 Warner	110	2,260	1,267	993	15.3	10.3	120.99	Eddie Schneider	44,343.7
4th	G. B. Speedster	1 Warner	110	1,400	912	488	10.7	8.1	140.78	L. R. Bayles	44,106.3
5th	Buhl Air Sedan	1 Wright J6	300	4,200	2,478	1,722	14.6	11.5	126.06	J. B. Story	42,910.6
6th	Bird	1 Kinner	125	2,303	1,318	985	14.1	9.2	97.35	Capt. Wm. Lancaster	40,488.4
7th	Bird	1 Kinner	125	2,303	1,318	985	15.7	13.8	102.75	Lee Gehlbach	40,147.9
8th	Stinson Junior	1 Lycoming	215	3,265	2,222	1,043	13.9	7.2	119.48	Eddie Stinson	38,237.0
9th	Great Lakes	1 Cirrus	90	1,580	1,016	564	13.0	8.9	100.34	Joe Meehan	36,167.2
10th	Aeronca	1 Aeronca	36	875	461	414	12.3	16.5	64.10	G. E. Dickson	32,514.0

* The average speeds shown are computed on the laps scored in each case—that is, they show actual average flying speed.

LIST OF TROPHIES AWARDED—1931 NATIONAL AIR RACES

Donor	*Trophy*	*Awarded to*	*Event*
The Cord Corporation	Special Cord Front Wheel Drive Cabriolet	Phoebe F. Omlie	Sweepstakes Prize—Transcontinental Handicap Air Derby
Bendix Corporation	Vincent Bendix Trophy	J. H. Doolittle	Transcontinental Free-for-All Speed Dash to Cleveland
Ohio Seamless Tube Co.	Ohio Seamless Tube Trophy	Harold Johnson	Transcontinental Free-for-All Speed Dash to Cleveland—non-stop
Shell Eastern Petroleum Products, Inc.	Shell Trophy	M. Lambert	Event No. 101
Shell Eastern Petroleum Products, Inc.	Shell Trophy	Ray Moore	Event No. 102
Shell Eastern Petroleum Products, Inc.	Shell Trophy	John Livingston	Event No. 103
Shell Eastern Petroleum Products, Inc.	Shell Trophy	John Livingston	Event No. 104
Shell Eastern Petroleum Products, Inc.	Shell Trophy	Ray Moore	Event No. 105
Shell Eastern Petroleum Products, Inc.	Shell Trophy	R. H. Hall	Event No. 106
Shell Eastern Petroleum Products, Inc.	Shell Trophy	Lowell Bayles	Event No. 107
Shell Eastern Petroleum Products, Inc.	Shell Trophy	Phoebe Omlie	Event No. 109
Shell Eastern Petroleum Products, Inc.	Shell Trophy	Gladys O'Donnell	Event No. 110
Shell Petroleum Corporation, St. Louis	Shell Trophy	Lowell Bayles	Event No. 108
Shell Petroleum Corporation, St. Louis	Shell Trophy	Maude Tait	Event No. 111
B. F. Goodrich Co., Akron, Ohio	B. F. Goodrich Trophy	Duke Muller	Event No. A
Goodyear Tire & Rubber Co., Akron, Ohio	Goodyear Tire & Rubber Co. Trophy	M. Lambert	Event No. 1
Universal Valve & Fitting Co.	Universal Valve & Fitting Trophy	Vernon Roberts	Event No. 2
General Tire & Rubber Co., Akron, Ohio	General Tire & Rubber Co. Trophy	Ray Moore	Event No. 3
J. H. Williams Co.	J. H. Williams Trophy	R. L. Hall	Event No. 4
Clifford W. Henderson	Clifford W. Henderson Trophy	John Livingston	Event No. 5
B. F. Goodrich Co., Akron, Ohio	B. F. Goodrich Trophy	John Livingston	Event No. 6
General Tire & Rubber Co., Akron, Ohio	General Tire & Rubber Trophy	John Livingston	Event No. 7
Goodyear Tire & Rubber Co.	Goodyear Tire & Rubber Trophy	John Livingston	Event No. 8
Carey Machine Company	Carey Machine Trophy	Ray Moore	Event No. 9
Goodyear Tire & Rubber Co., Akron, Ohio	Goodyear Tire & Rubber Trophy	John Livingston	Event No. 10
General Tire & Rubber Co., Akron, Ohio	General Tire & Rubber Trophy	R. L. Hall	Event No. 11
The Webb C. Ball Co., Cleveland, Ohio	Webb C. Ball Trophy	Jim Haizlip	Event No. 12
Goodyear Tire & Rubber Co., Akron, Ohio	Goodyear Tire & Rubber Trophy	Lowell Bayles	Event No. 13
B. F. Goodrich Co., Akron, Ohio	B. F. Goodrich Trophy	John Livingston	Event No. 14
Goodyear Tire & Rubber Co., Akron, Ohio	Goodyear Tire & Rubber Trophy	Phoebe Omlie	Event No. 25
Carey Machine Company	Carey Machine Trophy	Phoebe Omlie	Event No. 26
Clifford W. Henderson	Clifford W. Henderson Trophy	Gladys O'Donnell	Event No. 27
B. F. Goodrich Co., Akron, Ohio	B. F. Goodrich Trophy	Gladys O'Donnell	Event No. 28
Charles E. Thompson, Cleveland, Ohio	Charles E. Thompson Trophy	Lowell Bayles	Event No. 32
Cleveland Pneumatic Tool Co., Cleveland, Ohio	Cleveland Pneumatic Aerol Trophy	Maude Tait	Event No. 33
The Higbee Company, Cleveland, Ohio	The Higbee Trophy	Eldon Cessna	Event No. 36A
Senator Hiram Bingham, Washington, D. C.	Senator Hiram Bingham Trophy	Lloyd Lane	Special Sportsman Pilot Race—Free-for-All
Douglas Aircraft Company	Douglas Trophy	Capt. J. K. Gill, Ohio National Guard	Event No. 38

1931 NATIONAL AIR RACES

August 29th — September 7th

Cleveland Municipal Airport, Cleveland, O.

TRANSCONTINENTAL HANDICAP AIR DERBY—SANTA MONICA, CALIFORNIA TO CLEVELAND, OHIO
WOMEN'S DIVISION

Place	*Pilot*	*Plane*	*Engine*	*Percentage*	*Cash Prize*
1st	Phoebe Omlie	Monocoupe	Warner	109.19	$3,000.00
2nd	Mae Haizlip	Monocoupe	Lambert	99.42	1,800.00
3rd	Martie Bowman	Inland Sport	Warner	98.98	1,200.00
4th	Edith Foltz	Bird	Kinner	97.43	
5th	Louise Thaden	Thaden-R-4	Wright J-6	94.55	

TEANSCONTINENTAL HANDICAP AIR DERBY—SANTA MONICA, CALIFORNIA TO CLEVELAND, OHIO
MEN'S DIVISION

Place	*Pilot*	*Plane*	*Engine*	*Percentage*	*Cash Prize*
1st	D. C. Warren	D. H. Moth	Gipsy	103.50	$3,000.00
2nd	Lee Brusse	Waco F	Kinner	102.06	1,800.00
3rd	Eldon Cessna	Cessna	Warner	101.37	1,200.00
4th	Marcellus King	Monocoupe	Warner	100.76	
5th	Chas. Goldtrap	Monocoupe	Lambert	100.61	

TRANSCONTIENTAL FREE-FOR-ALL SPEED DASH—BENDIX TROPHY RACE
LOS ANGELES, CALIFORNIA TO CLEVELAND, OHIO

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Cash Prize*
1st	J. H. Doolittle	Laird	Wasp	9:10:21	223.038	$7,500.00
2nd	H. S. Johnson	Lockheed	Wasp	10:14:22	199.816	4,500.00
3rd	Beeler Blevins	Lockheed	Wasp	10:49:33	188.992	3,000.00
4th	Ira C. Eaker	Lockheed	Wasp	10:59:45	186.070	

EVENT "A"—MEN'S 115 CU. IN. FREE-FOR-ALL—6 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Cash Prize*
1st	Duke Muller	Heath	Continental	19:45.21	91.123	$400.00
2nd	W. Franklin	Church	Church J-3	20:11.66	89.133	240.00
3rd	M. Lambert	Heath	Continental	21:55.42	82.103	160.00

EVENT "B"—MEN'S 115 CU. IN. A.T.C. RACE— 6 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Cash Prize*
1st	H. A. Speer	Aeronca	Aeronca	23:49.11	75.571	$300.00
2nd	Thos. Cushman	Aeronca	Aeronca	24:01.07	74.944	180.00
3rd	H. Eichhammer	Aeronca	Aeronca	24:30.28	73.455	120.00
4th	Freddie Lund	Aeronca	Aeronca	24:25.56	73.691	

EVENT NO. 1—MEN'S 275 CU. IN. FREE-FOR-ALL—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	M. Lambert	Heath	Heath 4-in-L	12:30.16	119.974	$500.00
2nd	B. Stevenson	Monocoupe	Lambert	12:53.00	116.429	300.00
3rd	Art C. Chester	Davis	LeBlond	12:05.22	114.617	200.00

EVENT NO. 2—MEN'S 275 CU. IN. A.T.C.—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	Vernon Roberts	Monocoupe	Lambert	12:53.06	116.420	$300.00
2nd	B. Stevenson	Monocoupe	Lambert	12:54.08	116.267	180.00
3rd	Art C. Chester	Davis	LeBlond	13:03.82	114.828	120.00
	H. Christensen	Monocoupe	Lambert	out lap 4		

EVENT NO. 3—MEN'S 400 CU. IN. FREE-FOR-ALL—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	Ray Moore	Keith Rider	Menasco	9:34.91	156.546	$600.00
2nd	Ben O. Howard	Howard	Gipsy	9:58.07	150.484	360.00
3rd	S. J. Wittman	Wittman R.	Cirrus	9:58.91	150.272	240.00

EVENT NO. 4—MEN'S 400 CU. IN. A.T.C. RACE—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	R. L. Hall	Gee Bee D	Menasco C4	13:59.89	128.538	$400.00
2nd	B. Stevenson	Monocoupe	Lambert	15:27.12	116.489	240.00
3rd	Art Chester	Davis	LeBlond	15:40.95	114.777	160.00
4th	Robert Weil	Monocoupe	Lambert	15:47.30	112.817	

EVENT NO. 5—MEN'S 510 CU. IN. FREE-FOR-ALL—6 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	John Livingston	Monocoupe	Warner	12:51.00	140.77	$600.00
2nd	Ben O. Howard	Howard	Gipsy	13:09.20	136.847	360.00
3rd	Vernon Roberts	Monocoupe	Warner	13:32.16	132.978	240.00
4th	Jim Haizlip	Laird	Ranger 6	13:37.48	132.113	

EVENT NO. 6—MEN'S 510 CU. IN. A.T.C. RACE—6 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	John Livingston	Monocoupe	Warner	12:05.85	148.791	$400.00
2nd	Vernon Roberts	Monocoupe	Lambert	12:28.95	144.201	240.00
3rd	Peter Brooks	Monocoupe	Warner	13:10.61	136.603	160.00
4th	Z. Granville	Gee Bee	Warner	13:22.53	134.574	

EVENT NO. 7—MEN'S 650 CU. IN. FREE-FOR-ALL—6 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	John Livingston	Monocoupe	Warner	12:54.15	139.507	$900.00
2nd	Ben O. Howard	Howard	Gipsy	13:04.38	137.688	540.00
3rd	Vernon Roberts	Monocoupe	Warner	13:25.64	133.888	360.00
4th	Jim Haizlip	Laird	Ranger 6	13:32.45	132.931	

EVENT NO. 8—MEN'S 650 CU. IN. A.T.C. RACE—6 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	John Livingston	Monocoupe	Warner	13:34.75	132.555	$600.00
2nd	Vernon Roberts	Monocoupe	Warner	13:51.02	129.960	360.00
3rd	Peter Brooks	Monocoupe	Warner	14:31.54	123.918	240.00
4th	Lowell Bayles	Gee Bee D	Menasco	14:55.43	120.612	

EVENT NO. 9—MEN'S 800 CU. IN. FREE-FOR-ALL—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	Ray Moore	Keith Rider	Menasco	8:06.23	185.097	$1,200.00
2nd	John Livingston	Monocoupe	Warner	10:02.14	149.466	720.00
3rd	Ben O. Howard	Howard	Gipsy	10:04.90	148.784	480.00
4th	Arthur J. Davis	Waco 10 T	Wright J-6	10:07.93	148.043	

EVENT NO. 10—MEN'S 800 CU. IN. A.T.C. RACE—10 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	John Livingston	Monocoupe	Warner	20:39.49	145.221	$800.00
2nd	Arthur Davis	Waco 10 T	Wright J-6	21:07.81	141.977	480.00
3rd	Lloyd O'Donnell	Waco 10 T	Wright J-6	21:10.21	141.708	320.00
4th	Vernon Roberts	Monocoupe	Warner	21:37.66	138.711	
5th	Arthur Killips	Waco 10 T	Wright	22:10.88	135.248	

EVENT NO. 11—MEN'S 1000 CU. IN. FREE-FOR-ALL—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	R. L. Hall	Gee Bee	Wasp Jr.	7:54.82	189.545	$1,500.00
2nd	Ray Moore	Keith Rider	Menasco	8:26.16	177.809	900.00
3rd	W. J. Wedell	Wedell Williams	Wasp	8:58.58	167.106	600.00
4th	Ben O. Howard	Howard	Gipsy	10:16.10	146.080	

EVENT NO. 12—MEN'S 1000 CU. IN. A.T.C. RACE—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	Jim Haizlip	Laird	Wasp Jr.	10:55.14	137.249	$1,000.00
2nd	John Livingston	Monocoupe	Warner	11:05.48	135.240	600.00
3rd	Art. J. Davis	Waco 10 T	Wright J-6	11:25.70	131.252	400.00
4th	Arthur Killips	Waco 10 T	Wright J-6	11:31.35	131.800	

EVENT NO. 13—MEN'S 1875 CU. IN. FREE-FOR-ALL—5 LAPS 10 MILE COURSE

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	Lowell Bayles	Gee Bee S	Wasp Jr.	14:33.78	205.001	$1,800.00
2nd	Jim Haizlip	Laird	Wasp Jr.	20:00.71	149.911	1,080.00
3rd	Ben O. Howard	Howard	Gipsy	20:20.84	147.439	720.00

EVENT NO. 14—MEN'S 1200 CU. IN. A.T.C. RACE—5 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Cash Prize*
1st	John Livingston	Monocoupe	Warner	10:23.58	144.327	$1,200.00
2nd	George Harte	Cessna	Wright J-6	10:30.28	142.793	720.00
3rd	Arthur Davis	Waco 10 T	Wright J-6	11:21.72	132.019	480.00
	Jim Haizlip	Laird	Wasp Jr.	10:20.14	145.128	*

* Cut scattering pylon—disqualified.

EVENTS NOS. 15, 16, 17, 18, 19, 20, 21, 22, 23—SCRATCHED FOR LACK OF ENTRIES

EVENT NO. 24—WOMEN'S 350 CU. IN. A.T.C. RACE—5 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Cash Prize*
1st	Mae Haizlip	Davis	LeBlond	13:56.40	107.604	$500.00
2nd	F. Klingensmith	Monocoupe	Lambert	14:30.60	103.376	$300.00
3rd	Betty Lund	Aeronca	Aeronca	21:24.62	70.059	200.00

EVENT NO. 25—WOMEN'S 510 CU. IN. FREE-FOR-ALL—5 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Cash Prize*
1st	Phoebe Omlie	Monocoupe	Warner	13:51.50	129.885	$500.00
2nd	Mae Haizlip	Gee Bee	Menasco	13:54.08	129.483	300.00
3rd	Maude Tait	Gee Bee	Warner	14:01.56	128.333	200.00

EVENT NO. 26—WOMEN'S 650 CU. IN. A.T.C. RACE—6 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Cash Prize*
1st	Phoebe Omlie	Monocoupe	Warner	13:35.21	132.481	$750.00
2nd	Mae Haizlip	Gee Bee D	Menasco	13:38.68	131.935	450.00
3rd	Maude Tait	Gee Bee E	Warner	13:43.33	131.174	300.00
4th	Jean LaRene	Rearwin	Challenger	15:33.43	115.702	

EVENT NO. 27—WOMEN'S 800 CU. IN. FREE-FOR-ALL—5 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Cash Prize*
1st	Gladys O'Donnell	Waco	Wright	11:09.87	134.354	$1,000.00
2nd	Mae Haizlip	Travelair	Wright	11:23.77	131.623	600.00
3rd	Opal Kunz	Waco	Wright	11:46.24	127.435	400.00
4th	F. Klingensmith	Cessna	Wright	12:03.69	124.362	

EVENT NO. 28—WOMEN'S 1000 CU. IN. A.T.C. RACE—5 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Cash Prize*
1st	Gladys O'Donnell	Waco	Wright J-6	10:49.17	138.638	$1,250.00
2nd	Mae Haizlip	Laird	Wasp Jr.	10:57.49	136.884	750.00
3rd	Florence Klingensmith	Cessna	Wright J-4	11:14.88	133.357	500.00
4th	Mildred Morgan	Travelair	Wright J-5	14:21.08	104.519	

EVENT NO. 29—WOMEN'S 1875 CU. IN. A.T.C. RACE—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	F. Klingensmith	Cessna	Wright J-6	10:37.31	141.218	$1,500.00
2nd	Mae Haizlip	Laird	Ranger	10:41.99	140.189	900.00
3rd	Gladys O'Donnell	Waco	Wright J-5	11:00.21	136.320	600.00

EVENT NO. 30—MEN'S AND WOMEN'S MIXED RACE—5 LAPS 10 MILE COURSE

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	Robert Hall	Gee Bee	Wasp Jr.	13:28.54	222.623	$1,250.00
2nd	J. Wedell	Wed. Williams	Wasp Jr.	13:34.30	221.048	750.00
3rd	Jim Haizlip	Laird	Wasp Jr.	18:16.26	164.194	500.00
4th	Opal Kunz	Travelair	Wright J-6	20:52.47	143.716	
	Bettie Lund	Waco TW	Wright J-5	Out in fourth lap		

EVENT NO. 31—CIVILIAN ACROBATIC EXHIBITION—DEMONSTRATIONS BY INVITATION

August 29

Pilot	Plane	Engine
John Livingston	Monocoupe	Warner
Freddie Lund	Waco	Menasco
Arthur David	Waco	Wright

August 30

Peter Brooks	Monocoupe	Warren
Lowell Bayles	Gee Bee	Ranger 6-390
Milton Hersberger	Travelair	Wright J-6

August 31

H. A. Speer	Aeronca	Aeronca
Thomas Cushman	Aeronca	Aeronca E-113
Owen Lazenby	Aeronca C-3	Aeronca E-113

September 1

Lowell Bayles	Gee Bee	Ranger 6-390
Doug. Davis	Travelair	Wright R-760
Roy Hunt	Great Lakes Tr.	Cirrus

September 3

Freddie Lund	Waco TW	Wright J-5
Milton Hersberger	Travelair	Wright J-6
John Livingston	Monoplane	Warner Radial 110

September 5

Freddie Lund	Waco TW	Wright J-5
Peter Brooks	Monocoupe	Warren
Arthur Killips	Waco TW	Wright 240

EVENT NO. 32—MEN'S FREE-FOR-ALL THOMPSON RACE—10 LAPS 10 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Cash Prize*
1st	Lowell Bayles	Gee Bee	Wasp Jr.	25:23.88	236.239	$7,500.00
2nd	J. Wedell	Wed. Williams	Wasp Jr.	26:19.00	227.902	4,500.00
3rd	Dale Jackson	Laird	Wright J-6	28:24.68	211.183	3,000.00
4th	R. L. Hall	Gee Bee	Wasp C	29:48.81	201.251	
5th	Ira C. Eacker	Lockheed	Wasp	30:29.07	196.821	
6th	Ben O. Howard	Howard	Gipsy	31:40.84	163.513	
7th	Wm. Ong	Laird	Wright J-6	29:12.18	153.049	
	J. H. Doolittle	Laird	Wasp	Out in seventh lap		

EVENT NO. 33—WOMEN'S FREE-FOR-ALL CLEVELAND PNEUMATIC AEROL TROPHY RACE 5 LAPS 10 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Cash Prize*
1st	Maude Tait	Gee Bee Y	Wasp C	15:59.62	187.574	$3,750.00
2nd	Mae Haizlip	Laird	Wasp Jr.	18:09.58	165.201	2,250.00
3rd	F. Klingensmith	Cessna	Wright J-6	18:42.70	160.327	1,500.00
4th	Joan Shankle	Lockheed	Wasp	19:35.54	153.121	
5th	Phoebe Omlie	Monocoupe	Warner	20:07.65	149.039	
6th	Bettie Lund	Waco TW	Wright 240	20:20.85	147.438	
7th	Opal Kunz	Travelair	Wright J-6	20:34.75	145.778	
8th	Gladys O'Donnell	Waco	Wright J-6	20:47.64	144.272	

EVENT NO. 34—MEN'S DEAD STICK LANDING CONTEST—WITH AND WITHOUT BRAKES

August 30

Place	*Pilot*	*Plane*	*Engine*	*Cash Prize*
1st	John Livingston	Monocoupe	Warner	$100.00
2nd	Lloyd Yost	Waco	Warner	60.00
3rd	Arthur Davis	Waco	Wright J-6	40.00

August 31

1st	Thos. Cushman	Aeronca	Aeronca	$100.00
2nd	H. A. Speer	Aeronca	Aeronca	60.00
3rd	Roger Don Rae	Challenger	Curtiss OX	40.00

September 1

1st	Eldon Cessna	Cessna	Warner	$100.00
2nd	J. Livingston	Monocoupe	Warner	60.00
3rd	L. Glasscock	Stinson	Wasp Jr.	40.00

EVENT NO. 34—MEN'S DEAD STICK LANDING CONTEST—WITH AND WITHOUT BRAKES—(Continued)

September 3 (With Brakes)

Place	*Pilot*	*Plane*	*Engine*	*Cash Prize*
1st	John Livingston	Monocoupe	Warner	$100.00
2nd	George L. Harte	Cessna	Wright J-6	60.00
3rd	George Quick	Bellanca	Wright J-6	40.00

Without Brakes

1st	Freddie Lund	Aeronca	Aeronca	$100.00
2nd	T. Cushman	Aeronca	Aeronca	60.00
3rd	Hugh Spooner	Curtiss-Reid	Gipsy	40.00

September 4 (With Brakes)

1st	John Livingston	Monocoupe	Warner	$100.00
2nd	George Harte	Cessna	Wright J-6	60.00
3rd	Lester Glasscock	Stinson	Wasp Jr.	40.00

September 4 and 5 (Without Brakes)

1st	Winston Kratz	Aeronca	Aeronca	$100.00
2nd	G. M. Johnson	Curtiss Wright Jr.	Szekely	60.00
3rd	Arthur Davis	Waco 10 T	Wright J-6	40.00

September 5 (With Brakes)

1st	C. P. Kysor	Cessna	Wright J-5	$100.00
2nd	Lloyd Yost	Waco	Warner	60.00
3rd	Lester Glasscock	Stinson	Wasp	40.00

September 6 (Without Brakes)

1st	Roger Don Rae	Challenger	Curtiss OX	$100.00
2nd	Winston Kratz	Aeronca	Aeronca	60.00
3rd	Russell Holderman	Fleet	Kinner	40.00

September 7

1st	Arthur Davis	Buhl Pup	Szekely	$100.00
2nd	H. A. Speer	Aeronca	Aeronca	60.00
3rd	Russell Holderman	Fleet	Kinner	40.00

EVENT NO. 35—WOMEN'S DEAD STICK LANDING CONTEST—WITH AND WITHOUT BRAKES

August 31 (Without Brakes)

Place	*Pilot*	*Plane*	*Engine*	*Cash Prize*
1st	Bettie Lund	Aeronca	Aeronca	$100.00
2nd	Mrs. A. Davis	Buhl	Szekely	60.00
3rd	Mary Charles	Swallow	Kinner	40.00

September 1 (With Brakes)

1st	F. Klingensmith	Whirlwind J-5	Kinner	$500.00
2nd	Edith Foltz	Bird	Whirlwind J-5	60.00
3rd	Joan Shankle	Stearman		40.00

September 4 (With Brakes)

1st	F. Klingensmith	Waco F	Kinner	$100.00
2nd	Mrs. A. Davis	Buhl Pup	Szekely	60.00
3rd	Clema Granger	Swallow	Wright J-5	40.00

September 4 and 5 (Without Brakes)

1st	F. Klingensmith	Waco F	Kinner	$100.00
2nd	Winifred Spooner	Curtiss-Reid	Gipsy	60.00
3rd	Mildred Morgan	Travelair	Wright J-5	40.00

September 5 (With Brakes)

1st	Edith Foltz	Bird	Kinner	$100.00
2nd	F. Klingensmith	Stearman	Wright J-6	60.00
3rd	Bettie Lund	Bird	Kinner	40.00

September 6 (Without Brakes)

1st	Clema Granger	Swallow	Wright J-5	$100.00
2nd	Mrs. A. Davis	Buhl	Szekely	60.00
3rd	F. Klingensmith	Stearman	Wright J-6	40.00

September 7

	Mildred Morgan	Travelair	Wright J-5	These two contestants tied for first place and agreed to
	Joan Shankle	Stearman	Wright J-5	divided prize money
3rd	Edith Foltz	Bird	Kinner	$40.00

EVENT NO. 36—AIR TRANSPORT—SPEED AND EFFICIENCY CONTEST MULTI-MOTORED

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Cash Prize*
1st	Lee Sherrick	Ford Tri-motor	Wasp C	12:13.68	122.669	$1,000.00
2nd	Waldo Waterman	Bach	1 Wasp, 2 Kinner	12:25.70	120.691	600.00
3rd	Wm. Atwell	Sikorsky	Wasp	15:08.76	99.036	400.00

EVENT NO. 36A—SPEED AND EFFICIENCY CONTEST FOR SINGLE MOTORED PLANES

Place	*Pilot*	*Plane*	*Engine*	*Figure of Merit*	*Cash Prize*
1st	Eldon Cessna	Cessna	Warner	2010.518	$750.00
2nd	Walter Carr	Cessna	Warner	1768.587	450.00
3rd	H. T. Airlor	Waco	Continental	1549.306	300.00
4th	J. Wesley Smith	Bellanca	Wright J-6	1539.564	

EVENT NO. 37—ARMY, NAVY AND MARINES—SCHEDULED AS RESPECTIVE SERVICES DESIRED

EVENT NO. 38—NATIONAL GUARD RACE—DOUGLAS TROPHY

Place	*Pilot*	*Plane*	*Handicap*	*Time*	*Plus Handicap*
1st	Capt. J. K. Gill	O-38	50.68	20:56.24	143.284..Douglas Trophy
2nd	Lt. Wm. Newhall	O-38B	Scratch	21:00.14	142.841
3rd	Lt. W. K. Ebel	O-38	50.68	21:03.04	142.513

EVENT NO. 39—PARACHUTE JUMPING CONTEST FOR MEN

August 30

Place	*Pilot*	*Points*	*Cash Prize*
1st	K. Hartley	3	$100.00
2nd	J. Wessling	2	60.00
3rd	Roger Don Rae	1	40.00

August 31

1st	Joe Sirl	3	$100.00
2nd	Ev. Stewart	2	60.00
3rd	Dale Dryer	1	40.00

September 3

1st	Roger Don Rae	3	$100.00
2nd	B. Rowe	2	60.00
3rd	W. C. Hartley	1	40.00

September 4—2 Contests—Morning

3rd	Shirley Rauner	1	$40.00
1st	Joe Crane	3	100.00
2nd	W. C. Hartley	2	60.00
3rd	Roger Don Rae	1	40.00

September 4—2 Contests—Evening

1st	Roger Don Rae	3	$100.00
2nd	Joe Crane	2	60.00

September 5

1st	Joe Crane	3	$100.00
2nd	Roger Don Rae	2	60.00
3rd	Shelton Jenkins	1	40.00

September 6—Morning

	Ralph LaPere	$50.00
	Shirley Rauner	50.00
	Roger Don Rae	50.00
	Jos. Crane	50.00

September 6—Evening

1st	Roger Don Rae	3	$100.00
2nd	Joe Crane	2	60.00
3rd	Shirley Rauner	1	40.00

September 7—Morning

1st	Roger Don Rae	3	$100.00
2nd	Ralph LaPere	2	60.00
3rd	E. Verne Stewart	1	40.00

September 7—Evening

1st	Roger Don Rae	3	$100.00
2nd	Gene Rock	2	60.00
3rd	Jos. Crane	1	40.00

SPECIAL SPORTSMAN PILOT RACE—FREE-FOR-ALL—5 LAPS 5 MILE COURSE—TROPHY

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Speed*	*Cash Prize*
1st	Lloyd Lane	Laird	Wasp Jr.	10:12.75	146.878	Senator Hiram Bingham Trophy
2nd	W. L. Stribling	Travelair	Wright	10:21.05	144.915	
3rd	F. W. Zelcer	Laird	Wright J-6	10:50.82	138.287	
4th	Henry Timken, Jr.	Ford Tri-motor	Wasp C	11:59.50	125.086	

PART IV

Flying Facts and Figures

FLYING IN THE UNITED STATES

Calendar Year 1931

Summary of Air Transport Operations

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	52,034	.....	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)

(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.

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.....	168	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	95,050,645	1,128,937	2,621,769	12,283
1931*.....	352	3,238	71,582,750	842,150	1,875,992	9,141

* Statistical estimates based on a large number of typical reports.

Summary of Private Flying

(Corporate and Personal)

Estimated

	1928	1929	1930	1931
Miles flown.....	12,000,000	25,000,000	40,000,000	30,000,000
Planes in service.....	1,500	3,125	4,974	6,057

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

(a) Includes National Guard.
(b) Includes Marine Corps and Naval Reserve.

General Flying Summary

	1928	1929	1930	1931
Civilian and Commercial...	30,883,913	149,579,451	164,793,612	144,978,228
Government.....	34,665,023	47,967,139	60,473,355	73,912,275

PRODUCTION AND SALES OF SALABLE AIRCRAFT IN THE UNITED STATES
COMMERCIAL AND MILITARY

Type	Places	Production—1930		Sales—1930		Production—1931		Sales—1931	
		Number	Value*	Number	Value*	Number	Value*	Number	Value*
Biplanes	1	8	$58,300.00	7	$55,370.00	20	$169,978.00	20	$167,715.00
Open Cockpit	2	421	1,103,641.00	412	1,102,592.00	172	424,303.00	183	467,573.00
	3	646	1,926,943.00	790	2,222,353.00	190	628,564.00	259	776,801.00
	Up	8	77,426.00	8	81,098.00	42	132,495.00	34	108,535.00
Sub-total		1,083	$3,166,310.00	1,217	$3,461,413.00	424	$1,355,340.00	496	$1,520,624.00
Cabin Single Engine	All	20	285,880.00	19	267,980.00	45	351,350.00	37	317,793.00
Cabin Multi-Engine	All	7	505,581.00	7	505,581.00	2	136,000.00	3	204,000.00
Total Biplanes		1,110	$3,957,771.00	1,243	$4,234,974.00	471	$1,842,690.00	536	$2,042,417.00
Monoplanes	1	58	104,618.00	49	101,658.00	206	208,096.00	148	164,885.00
Open Cockpit	2	166	524,073.00	150	425,022.00	496	703,482.00	417	570,752.00
	3	22	73,680.00	22	73,680.00	2	6,300.00	1	3,750.00
	Up	4	29,619.00	3	15,990.00	0	.....	0	.....
Sub-total		250	$731,990.00	224	$616,350.00	704	$917,878.00	566	$739,387.00
	1	4	40,025.00	3	41,550.00	0	.....	0	.....
	2	29	115,870.00	25	94,810.00	33	81,435.00	35	97,810.00
	3	34	112,261.00	263	593,385.00	1	3,600.00	99	219,439.00
Cabin Single Engine	4	276	1,135,211.00	293	1,174,525.00	162	437,570.00	168	445,086.00
	5	9	86,729.00	12	104,364.00	11	105,944.00	13	123,819.00
	6	109	1,243,860.00	118	1,328,607.00	26	252,870.00	42	385,450.00
	7	31	458,732.00	39	544,748.00	11	204,625.00	23	395,820.00
	8 and Up	13	224,855.00	10	174,840.00	10	222,880.00	11	252,130.00
Sub-total		505	$3,417,543.00	763	$4,056,829.00	254	$1,308,924.00	391	$1,919,554.00
Cabin Multi-Engine	All	38	1,389,984.00	35	1,027,155.00	63	1,342,206.00	71	1,514,082.00
Total Monoplanes		793	$5,539,517.00	1,022	$5,700,334.00	1,021	$3,569,008.00	1,028	$4,173,023.00
Seaplanes	All	17	954,386.00	23	1,091,539.00	2	15,500.00	2	12,585.00
Amphibians	All	17	294,369.00	36	639,362.00	37	819,859.00	46	1,051,716.00
Autogiros		0	.....	0	.....	51	408,681.00	46	377,086.00
Sub-total		34	$1,248,755.00	59	$1,730,901.00	90	$1,244,040.00	94	$1,441,387.00
Commercial Total		1,937	10,746,043.00	2,324	11,666,209.00	1,582	6,655,738.00	1,658	7,656,827.00
Military Total		747	10,723,720.00	801	11,272,343.00	812	12,971,028.00	811	13,216,761.00
Grand Total		2,684	$21,469,763.00	3,125	$22,938,552.00	2,394	$19,626,766.00	2,469	$20,873,588.00

*Values represent planes less engines.

MONTHLY PRODUCTION AND SALES STATISTICS

Military and Salable Commercial Aircraft *

PRODUCTION

	1930				1931			
	Military		Commercial		Military		Commercial	
	Units	Value	Units	Value	Units	Value	Units	Value
January	43	$446,573	120	$857,243	86	$976,027	59	$248,435
February	47	428,637	171	1,078,451	84	1,301,635	88	562,480
March	51	589,969	198	1,199,722	87	1,158,968	148	560,019
April	56	731,171	217	1,329,959	73	1,024,510	197	834,692
May	52	642,241	243	1,330,037	61	991,506	226	777,045
June	37	411,065	213	1,249,938	80	1,385,045	264	861,720
July	69	1,309,625	196	915,234	61	1,120,876	176	690,484
August	53	1,106,439	198	706,855	36	767,403	140	622,977
September	71	1,195,755	115	533,831	47	791,806	113	590,228
October	72	1,626,624	114	728,573	72	1,237,701	76	385,581
November	73	801,785	78	427,869	58	1,043,255	50	329,066
December	123	1,433,836	74	388,331	67	1,172,296	45	193,011
Total	747	$10,723,720	1,937	$10,746,043	812	$12,971,028	1,582	$6,655,738

SALES

January	56	$673,349	115	$644,471	86	$976,027	55	$229,162
February	65	693,637	126	759,610	83	1,331,335	80	592,139
March	65	794,969	216	1,150,891	89	1,196,768	157	831,535
April	53	659,171	237	1,305,682	71	969,010	187	777,418
May	52	642,241	307	1,491,202	63	1,047,006	233	806,630
June	39	427,065	243	1,338,719	79	1,366,045	229	959,843
July	70	1,339,625	246	1,143,697	62	1,139,776	180	735,182
August	62	845,229	263	953,886	36	767,403	149	807,648
September	70	1,196,477	214	903,176	46	706,153	149	716,206
October	72	1,626,624	168	856,760	71	1,501,687	98	543,336
November	65	786,319	111	618,059	58	1,043,255	70	393,921
December	132	1,587,637	78	500,056	67	1,172,296	71	263,807
Total	801	$11,272,343	2,324	$11,666,209	811	$13,216,761	1,658	$7,656,827

* 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

(1) Source: Derived from U. S. Census Reports.

AIRPLANE ENGINE PRODUCTION

Annual Totals

	Military		*Commercial*	
Year	Units	*Value*	*Units*	*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	5,517	17,895,300
1930	1,841	10,823,423	1,925	6,255,493
1931	1,800	10,417,718	1,955	4,148,131

(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

	1930				*1931*			
	Military		*Commercial*		*Military*		*Commercial*	
	Units	*Value*	*Units*	*Value*	*Units*	*Value*	*Units*	*Value*
January	157	$877,110	197	$549,123	122	$626,916	55	$112,215
February	115	667,999	127	581,263	124	608,108	148	347,145
March	114	749,651	192	788,664	195	1,031,220	232	396,565
April	145	881,000	216	663,080	156	853,971	334	606,353
May	136	787,750	264	882,950	195	1,190,643	321	452,776
June	152	912,400	239	599,600	179	1,098,429	268	585,488
July	164	966,588	162	599,544	145	963,268	212	479,504
August	224	1,281,708	147	455,776	118	713,080	82	219,920
September	146	863,116	94	249,399	126	812,050	91	242,685
October	153	817,699	138	418,599	125	752,350	85	281,675
November	174	1,140,425	79	231,471	147	885,733	85	253,305
December	161	877,977	70	236,024	168	881,950	63	214,600
Total	1,841	$10,823,423	1,925	$6,255,493	1,800	$10,417,718	1,976	$4,192,231

SALES

January	168	$906,510	131	$524,931	152	$910,916	71	$216,815
February	128	712,599	143	594,738	144	748,819	191	538,385
March	132	819,851	176	704,106	172	918,408	243	533,105
April	145	881,000	217	624,990	169	902,503	278	488,070
May	139	794,400	234	732,188	195	1,190,643	299	522,404
June	146	898,800	261	757,220	180	1,103,429	245	461,628
July	166	980,588	145	415,825	135	911,268	208	475,224
August	227	1,293,033	201	556,703	122	729,290	123	274,480
September	145	853,116	161	516,551	126	812,050	120	279,165
October	148	792,069	147	417,295	124	738,150	89	290,685
November	170	1,118,525	87	297,510	140	848,300	89	277,075
December	171	926,977	58	168,694	168	873,765	53	218,976
Total	1,885	$10,977,468	1,961	$6,310,751	1,827	$10,687,541	2,009	$4,576,012

PRODUCTION AND SALES OF COMMERCIAL AND MILITARY AIRPLANE ENGINES IN THE UNITED STATES

H. P.	*1930 Production*		*1930 Sales*		*1931 Production*		*1931 Sales*	
	Number	*Value*	*Number*	*Value*	*Number*	*Value*	*Number*	*Value*
Under 75	215	$158,213.00	188	$125,126.00	749	$452,705	680	$404,790
76–125	678	1,277,884.00	649	1,201,219.00	341	584,905	361	647,560
126–175	68	165,248.00	84	210,093.00	157	280,071	173	345,547
176–225	280	604,600.00	289	642,700.00	311	674,770	331	707,915
226–300	260	1,094,895.00	322	1,387,571.00	124	560,360	158	691,290
301–400	424	2,954,653.00	429	2,744,042.00	15	57,450	8	35,040
401–500					134	692,240	154	841,710
501–600					141	849,730	139	859,660
601–up					4	34,000	5	42,500
Commercial Totals	1,925	$6,255,493.00	1,961	$6,310,751.00	1,976	$4,192,231	2,009	$4,576,012
MILITARY:								
126–175	.....	.....	.....	.....	31	$82,032	31	$82,032
176–225	.....	.....	.....	.....	15	29,011	30	88,131
226–300	.....	.....	.....	.....	29	143,840	6	28,840
301–400	.....	.....	.....	.....	41	163,530	41	163,530
401–500	.....	.....	.....	.....	869	4,461,372	877	4,525,372
501–600	.....	.....	.....	.....	705	4,530,333	734	4,809,636
601–up	.....	.....	.....	.....	110	1,007,000	108	990,000
Military Totals	1,841	$10,823,423.00	1,885	$10,977,468.00	1,800	$10,417,718	1,827	$10,687,541
Grand Total	3,766	$17,078,916.00	3,846	$17,288,219.00	3,776	$14,609,949	3,836	$15,263,553

EXPORTS OF AIRCRAFT, ENGINES AND PARTS FROM THE UNITED STATES IN 1931

AIRPLANES, SEAPLANES AND AMPHIBIANS

Country of Destination	Full Year 1929		Full Year 1930		Full Year 1931	
	No.	Value	No.	Value	No.	Value
China	24	$528,741	41	$935,472	38	$644,170
Mexico	85	1,624,501	45	445,626	27	374,745
United Kingdom	3	77,080	7	123,718	7	263,512
Canada	80	799,353	63	673,776	16	62,394
Colombia	1	60,000	2	33,350	4	59,700
Chile	40	721,750	17	355,090	1	58,602
Argentina	25	375,693	20	233,871	6	51,199
Siam	...	.....	...	.....	2	42,750
Hong Kong	11	104,600	10	71,064	5	42,600
Panama	7	112,353	10	73,044	4	37,000
Spain	1	45,092	1	2,790	4	32,575
Philippine Islands	5	88,622	1	7,500	6	26,472
Australia	1	3,600	...	.....	1	25,000
Italy	5	99,219	1	10,800	1	21,000
Honduras	3	22,761	...	.....	1	15,599
Guatemala	4	10,000	2	4,032	4	11,400
Czechoslovakia	...	.....	...	.....	1	11,000
Netherlands	3	16,000	...	.....	3	8,766
British India	...	.....	1	8,500	3	7,369
Brazil	11	184,951	21	510,234	1	5,050
Union of South Africa	...	.....	2	6,097	1	4,489
France	...	.....	...	.....	1	2,500
Rumania	...	.....	...	.....	1	1,835
Germany	1	7,500	...	.....	1	1,600
Greece	...	.....	...	.....	1	1,500
Peru	7	115,652	45	794,654	...	.....
Japan	17	291,767	14	301,687	...	.....
Java and Madura	...	.....	7	140,000	...	.....
Cuba	5	46,836	5	36,858	...	.....
Other Netherlands East Indies	...	.....	1	20,000	...	.....
Venezuela	...	.....	2	19,951	...	.....
Bermuda	...	.....	1	6,000	...	.....
Denmark	...	.....	1	4,515	...	.....
Iceland	...	.....	1	1,040	...	.....
Ecuador	5	187,237	...	.....	...	.....
Salvador	3	27,840	...	.....	...	.....
Norway	2	8,053	...	.....	...	.....
French Oceania	1	7,000	...	.....	...	.....
New Zealand	2	3,954	...	.....	...	.....
Dominican Republic	1	2,525	...	.....	...	.....
Uruguay	1	1,800	...	.....	...	.....
Total	354	$5,574,480	321	$4,819,669	140	$1,812,827

AIRCRAFT ENGINES

Country of Destination	Full Year 1929 No.	Full Year 1929 Value	Full Year 1930 No.	Full Year 1930 Value	Full Year 1931 No.	Full Year 1931 Value
Soviet Russia in Europe	2	$19,643	46	$185,188	45	$322,460
Netherlands	20	68,458	27	121,683	31	185,192
Mexico	40	113,205	24	79,298	37	151,419
Panama	31	165,869	38	148,231	28	110,815
China	9	39,000	11	65,090	38	100,120
Chile	6	30,577	14	71,900	12	81,450
Argentina	14	43,083	5	26,030	19	81,247
Finland	...	.....	1	7,496	10	71,008
Poland and Danzig	35	121,015	...	.....	10	48,098
Sweden	3	1,810	1	15,865	7	38,372
Hong Kong	...	.....	1	4,000	6	35,400
Italy	3	5,660	6	23,292	9	35,391
Japan	24	75,098	14	64,557	7	35,161
Canada	28	107,718	51	69,994	12	24,904
Trinidad and Tobago	...	.....	3	22,444	7	24,393
Java and Madura	...	.....	14	105,961	4	23,141
Brazil	4	17,428	4	27,122	6	20,093
Colombia	3	20,021	1	7,200	3	14,805
United Kingdom	3	12,100	1	4,462	4	12,856
Germany	49	321,471	30	212,747	7	10,563
Peru	7	43,242	34	180,007	2	10,500
Cuba	1	4,827	7	21,153	3	10,050
Nicaragua	1	4,000	...	.....	1	7,500
Turkey	...	.....	...	.....	1	4,753
Belgium	1	12,000	5	20,275	1	3,556
Newfoundland	...	.....	...	.....	1	3,500
British Honduras	...	.....	...	.....	1	3,375
Switzerland	1	19,375	...	.....	1	1,278
Guatemala	4	7,150	4	7,758	1	1,200
Honduras	2	4,949	15	59,255	1	1,107
New Zealand	2	8,266	...	.....	1	482
France	12	43,843	1	4,025	1	300
Australia	2	1,529	5	22,734	...	.....
Rumania	...	.....	6	19,083	...	.....
West Indies	...	.....	2	9,000	...	.....
Bolivia	...	.....	1	7,650	...	.....
Spain	1	3,960	2	7,254	...	.....
Venezuela	...	.....	1	7,232	...	.....
Union of South Africa	...	.....	1	6,890	...	.....
Philippine Islands	5	52,271	1	200	...	.....
Surinam	1	4,000	...	.....	...	.....
Persia	3	2,100	...	.....	...	.....
El Salvador	1	913	...	.....	...	.....
Trinidad	1	766	...	.....	...	.....
Norway	1	200	...	.....	...	.....
French Oceania	1	150	...	.....	...	.....
Total	321	$1,375,697	377	$1,635,076	317	$1,474,489

AIRCRAFT PARTS AND ACCESSORIES (EXCEPT TIRES)

Country of Destination	Full Year 1929 Value	Full Year 1930 Value	Full Year 1931 Value
Canada	$857,033	$465,196	$292,675
Soviet Russia in Europe	225,097	337,987	210,697
China	136,088	134,084	164,236
Brazil	46,715	165,443	126,399
Japan	81,191	73,671	116,106
Chile	38,068	265,574	74,837
Netherlands	36,183	40,869	71,476
Peru	124,649	151,639	65,786
United Kingdom	58,511	20,640	60,852
Mexico	114,027	84,091	60,053
Argentina	89,109	204,676	48,413
Cuba	41,710	58,182	32,913
Panama	38,428	52,442	27,048
Italy	29,504	10,876	26,416
Philippine Islands	20,227	12,027	23,958
Java and Madura	67	27,135	21,378

Country of Destination	Full Year 1929 Value	Full Year 1930 Value	Full Year 1931 Value
Germany	88,969	48,908	15,729
Australia	14,827	20,470	10,143
Belgium	22,660	11,603	8,288
France	25,319	17,925	7,725
Colombia	26,842	14,486	5,756
Guatemala	50	1,558	5,756
Finland	4,050	1,632	5,747
Poland and Danzig	24,340	7,787	5,612
Czechoslovakia	1,096	2,062	3,915
Switzerland	985	6,622	3,388
Newfoundland and Labrador	.....	294	2,868
Union of South Africa	19,672	3,879	2,797
Hong Kong	5,500	619	2,725
Sweden	8,163	3,126	2,433
Trinidad	396	18,618	.....
Trinidad and Tobago	.....	.....	2,019
Italian Africa	.....	.....	1,730
Other British West Indies	1,731	872	1,580
Salvador	1,913	4,243	1,307
Kwangtung	.....	.....	1,236
British India	31	534	1,135
Siam	36,501	3,321	1,050
Norway	1,500	.....	899
Other Netherlands East Indies	.....	.....	796
New Zealand	1,444	472	707
Venezuela	17	11,356	655
Spain	741	7,490	540
Turkey in Asia and Europe	.....	.....	499
Jamaica	.....	.....	494
Honduras	1,607	929	441
Rumania	.....	.....	341
Haiti	6,652	2,678	240
Egypt	.....	.....	230
Denmark	2,769	175	175
Dominican Republic	231	1,101	175
Latvia	.....	.....	140
Bermuda	4,575	.....	130
Ecuador	1,030	.....	118
British Guiana	.....	.....	96
Bolivia	567	4,222	81
Syria	.....	430	81
Barbados	.....	.....	64
Azores and Madeira Islands	.....	.....	52
Yugoslavia	.....	9,731	.....
Yugoslavia and Albania	.....	.....	37
Hungary	.....	25	29
Bulgaria	.....	.....	13
Surinam	655	21,286	.....
Other French Africa	.....	6,037	.....
Nicaragua	3,368	4,241	.....
Uruguay	.....	2,042	.....
Persia	.....	1,800	.....
Virgin Islands	1,603	1,536	.....
Costa Rica	.....	1,175	.....
British Honduras	.....	1,057	.....
Austria	.....	610	.....
British East Africa	.....	98	.....
Other Portuguese Africa	.....	25	.....
Lithuania	.....	25	.....
British Malaya	.....	19	.....
French Oceania	860	.....	.....
French West Indies	300	.....	.....
Other Countries	4,637	.....	.....
Total	$2,252,208	$2,351,651	$1,523,215

NOTE—1931 subject to slight changes.

AIRPLANE LICENSES

December 15, 1931

State	Total No.	No Date	Mfd. Prior 1926	Mfd. 1926	Mfd. 1927	Mfd. 1928	Mfd. 1929	Mfd. 1930	Mfd. 1931	By Manufacturers	By Transport	By Schools	By Aerial Service	By Others
Ala.	32	1	....	....	2	7	11	5	6	....	....	6	7	19
Ariz.	39	....	1	....	....	7	15	12	4	....	....	....	17	22
Ark.	51	....	....	1	4	10	15	10	11	....	....	....	22	29
Cal.	963	22	2	10	74	237	390	173	55	51	90	33	205	584
Colo.	49	....	....	....	1	3	27	12	6	2	....	....	22	25
Conn.	116	1	1	1	3	15	50	31	14	22	....	2	42	50
Del.	55	....	....	1	1	12	32	5	4	11	26	....	9	9
D. of C.	78	1	....	....	6	16	17	27	11	....	16	....	4	58
Fla.	117	1	....	2	7	18	44	29	16	2	....	....	52	63
Ga.	41	....	....	1	....	7	18	10	5	1	4	....	19	17
Idaho	22	....	....	....	1	6	5	7	3	....	....	....	10	12
Ill.	508	1	....	14	18	107	211	92	65	17	66	7	155	263
Ind.	178	3	....	1	8	39	77	26	24	2	11	3	67	95
Iowa.	135	....	....	....	6	32	55	31	11	2	....	....	53	80
Kans.	183	1	....	1	5	28	70	46	32	41	3	1	59	79
Ky.	35	....	....	....	4	7	15	7	2	....	....	....	16	19
La.	84	4	7	....	....	17	29	21	6	....	19	....	34	31
Me.	33	....	....	....	1	8	16	4	4	....	....	....	22	11
Md.	83	3	....	1	5	11	41	14	8	17	....	1	19	45
Mass.	203	3	2	2	5	40	82	47	22	9	....	....	85	108
Mich.	398	3	....	4	18	72	140	81	80	95	8	2	91	202
Minn.	114	2	....	2	7	28	42	26	7	....	18	1	26	69
Miss.	27	....	....	....	1	2	14	9	1	....	....	....	10	17
Mo.	232	8	1	....	11	42	104	44	22	37	28	14	55	98
Mont.	33	....	....	....	1	8	17	4	3	....	3	1	11	18
Nebr.	157	6	....	....	3	17	69	37	25	11	9	10	52	75
Nev.	13	....	....	....	1	5	5	....	2	....	....	....	6	7
N. H.	24	....	1	1	2	7	11	2	....	....	....	....	14	10
N. J.	202	3	3	1	4	27	84	58	22	31	....	....	68	103
N. M.	21	....	....	....	....	1	14	4	2	....	....	....	12	9
N. Y.	957	16	2	2	29	170	447	211	80	75	142	14	237	489
N. C.	62	....	....	4	7	14	23	8	6	....	....	....	27	35
N. D.	38	....	1	....	2	9	17	9	1	....	....	....	16	22
Ohio.	437	8	3	4	13	83	171	99	56	49	47	2	131	208
Okla.	256	1	....	....	4	44	131	58	18	27	10	12	55	152
Ore.	85	1	....	....	7	16	33	20	8	....	9	9	23	44
Pa.	460	10	3	8	21	100	163	116	39	37	25	5	124	269
R. I.	28	1	....	....	....	6	12	6	3	....	....	....	13	15
S. C.	18	....	....	....	....	8	7	1	2	....	....	....	7	11
S. D.	53	1	....	....	1	17	18	12	4	....	2	....	18	33
Tenn.	73	2	....	....	2	8	37	18	6	....	3	....	29	41
Tex.	335	9	....	2	16	55	174	60	19	....	44	15	116	160
Utah.	31	1	....	....	....	11	12	7	....	....	8	2	8	13
Vt.	19	1	....	....	1	5	8	3	1	....	....	....	6	13
Va.	50	....	1	....	2	12	24	14	6	2	4	....	26	27
Wash.	134	....	....	1	17	35	47	26	8	8	36	3	32	55
W. Va.	43	1	....	....	2	6	12	17	5	....	1	....	14	28
Wisc.	178	2	....	2	12	51	67	29	15	....	1	....	70	107
Wyo.	55	2	....	....	14	8	14	10	7	....	31	....	9	15
Alaska, etc.	32	2	....	....	....	3	16	9	2	....	17	....	5	10
Total. . .	7,579	121	28	66	349	1,496	3,153	1,607	759	549	681	143	2,231	3,075

AIRPLANE LICENSES AND IDENTIFICATIONS

State	Total Number	No Date of Mfg.	Mfd. Prior 1926	Mfd. 1926	Mfd. 1927	Mfd. 1928	Mfd. 1929	Mfd. 1930	Mfd. 1931	By Manufacturers	By Transport	By Schools	By Aerial Service	By Others
Ala.	62	7	....	1	4	11	17	12	10	....	....	6	19	37
Ariz.	49	.....	3	....	1	9	17	13	6	....	....	....	19	30
Ark.	73	4	2	2	9	15	16	13	12	....	....	....	25	48
Cal.	1,175	71	40	13	97	266	412	208	68	61	92	37	259	726
Colo.	82	3	1	3	4	9	33	19	10	5	....	....	34	43
Conn.	143	6	3	3	4	19	54	39	15	29	....	2	46	66
Del.	69	.....	....	1	2	12	32	11	11	23	26	....	9	11
D. of C.	82	1	....	....	7	18	17	27	12	....	16	....	7	59
Fla.	179	11	7	3	15	27	53	43	20	2	....	1	68	108
Georgia	87	10	4	4	9	16	23	14	7	1	4	....	25	57
Idaho.	33	1	1	....	2	8	6	11	4	....	....	....	13	20
Ill.	744	51	17	18	40	154	243	132	89	52	66	7	192	427
Ind.	238	30	7	5	19	58	88	46	35	5	11	3	85	184
Ia.	213	16	5	2	10	44	63	55	18	5	....	....	74	134
Kans.	336	34	8	3	21	53	97	77	43	72	3	1	76	184
Ky.	55	1	2	1	5	15	18	11	2	....	....	....	21	34
La.	102	7	10	....	2	22	31	24	6	....	19	....	37	46
Me.	53	3	2	....	2	13	22	6	5	....	....	....	28	25
Md.	106	9	1	2	6	13	42	22	11	19	....	1	28	58
Mass.	244	9	4	4	6	51	90	57	23	9	....	....	99	136
Mich.	552	33	12	11	33	86	167	113	97	127	8	2	119	296
Minn.	199	19	6	2	15	48	56	37	16	....	18	1	43	137
Miss.	38	3	....	....	3	4	16	11	1	....	....	....	12	26
Mo.	356	35	10	5	19	60	118	62	47	64	28	20	78	166
Mont.	04	7	2	1	7	15	19	7	6	....	3	1	23	37
Neb.	213	24	....	1	7	28	79	48	26	33	9	10	53	108
Nev.	17	.....	1	....	1	5	5	2	3	....	....	....	6	11
N. H.	29	.....	3	1	2	7	11	4	1	....	....	....	14	15
N. J.	328	24	14	5	12	55	107	81	30	43	....	....	89	196
N. M.	25	1	....	....	1	2	14	5	2	....	....	....	12	13
N. Y.	1,214	49	29	10	49	217	496	261	103	101	147	15	290	661
N. C.	110	10	3	5	18	27	25	14	8	1	....	....	30	79
N.D.	72	12	4	2	4	13	21	15	1	....	....	....	21	51
Ohio.	618	42	15	8	34	117	198	134	70	68	49	2	168	331
Okla.	358	31	6	2	15	52	143	77	32	33	10	12	73	230
Ore.	149	17	1	1	11	30	42	32	15	6	9	13	34	87
Penn.	570	33	11	12	27	113	176	143	55	63	27	6	134	340
R. I.	34	3	1	....	....	6	14	7	3	....	....	....	13	21
S. C.	47	9	....	....	3	11	11	10	3	....	....	....	12	35
S.D.	70	2	3	1	4	23	20	12	5	....	2	....	18	50
Tenn.	106	10	2	1	4	13	47	23	6	....	3	....	33	70
Tex.	450	47	11	3	33	71	187	73	25	7	44	16	151	238
Utah.	39	1	1	....	....	14	15	7	1	....	8	2	9	20
Vt.	22	1	1	....	1	5	9	4	1	....	....	....	6	16
Va.	75	3	1	2	2	16	26	18	7	2	4	....	28	41
Wash.	193	8	3	3	24	46	54	41	14	11	36	3	56	87
W. Va.	60	7	3	....	3	10	13	19	5	....	1	....	16	43
Wisc.	278	21	11	7	22	65	78	48	26	5	1	....	97	175
Wyo.	67	2	....	....	16	15	15	12	7	....	31	....	9	27
Total U. S.	10,528	728	271	148	635	2,007	3,556	2,160	1,023	841	675	161	2,811	6,040
Alaska, etc.	41	5	2	1	1	3	17	10	2	....	17	....	7	17
Gr. Total.	10,569	733	273	149	636	2,010	3,573	2,170	1,025	841	692*	161	2,818	6,057

* Airplanes licensed in name of Transport Companies, but used for non-scheduled work, listed under Aerial Service.

AIRPLANE IDENTIFICATIONS

State	Total Number	No Date of Mfg.	Mfd. Prior 1926	Mfd. 1926	Mfd. 1927	Mfd. 1928	Mfd. 1929	Mfd. 1930	Mfd. 1931	By Manufacturers	By Transport	By Schools	By Aerial Service	By Others
Ala.	30	6	...	1	2	4	6	7	4	...	...	...	12	18
Ariz.	10	...	2	...	1	2	2	1	2	...	...	...	2	8
Ark.	22	4	2	1	5	5	1	3	1	...	...	...	3	19
Cal.	212	49	38	3	25	29	22	35	15	10	2	4	54	142
Colo.	33	3	1	3	3	6	6	7	4	3	...	...	12	18
Conn.	27	5	2	2	1	4	4	8	1	7	...	...	4	16
Del.	14	...	...	...	1	...	...	6	7	12	...	...	...	2
D. of C.	4	...	...	...	1	2	...	...	1	...	...	...	3	1
Fla.	62	10	7	1	8	9	9	14	4	...	...	1	10	45
Ga.	46	10	4	3	9	9	5	4	2	...	...	...	6	40
Idaho	11	1	1	...	1	2	1	4	1	...	...	...	3	8
Ill.	236	50	17	4	22	47	32	40	24	35	...	...	37	164
Ind.	110	27	7	4	11	19	11	20	11	3	...	...	18	89
Iowa.	78	16	5	2	4	12	8	24	7	3	...	...	21	54
Kans.	153	33	8	2	16	25	27	31	11	31	...	...	17	105
Ky.	20	1	2	1	1	8	3	4	...	...	...	...	5	15
La.	18	3	3	...	2	5	2	...	...	...	...	...	3	15
Me.	20	3	2	...	1	5	6	2	1	...	...	...	6	14
Md.	23	6	1	1	1	2	1	8	3	2	...	...	9	12
Mass.	41	6	2	2	1	11	8	10	1	...	...	...	13	28
Mich.	154	30	12	7	15	14	27	32	17	32	...	...	28	94
Minn.	85	17	6	...	8	20	14	11	9	...	...	...	17	68
Miss.	11	3	...	...	2	2	2	2	...	...	...	...	2	9
Mo.	124	27	9	5	8	18	14	18	25	27	...	6	23	68
Mont.	31	7	2	1	6	7	2	3	3	...	...	...	12	19
Neb.	56	18	...	1	4	11	10	11	1	22	...	...	1	33
Nev.	4	...	1	...	...	...	...	2	1	...	...	...	...	4
N. H.	5	...	2	...	...	...	...	2	1	...	...	...	...	5
N. J.	126	21	11	4	8	28	23	23	8	12	...	...	21	93
N. M.	4	1	...	...	1	1	...	1	...	...	...	...	...	4
N. Y.	257	33	27	8	20	47	49	50	23	26	5	1	53	172
N. C.	48	10	3	1	11	13	2	6	2	1	...	...	3	44
N. D.	34	12	3	2	2	5	4	6	...	...	...	...	5	29
Ohio	181	34	12	4	21	34	27	35	14	19	2	...	37	123
Okla.	102	30	6	2	11	8	12	19	14	6	...	...	18	78
Ore.	64	16	1	1	4	14	9	12	7	6	...	4	11	43
Penn.	110	23	8	4	6	13	13	27	16	26	2	1	10	71
R. I.	6	2	1	...	...	...	2	1	...	...	...	...	...	6
S. C.	29	9	...	...	3	3	4	9	1	...	...	...	5	24
S. D.	17	1	3	1	3	6	2	...	1	...	...	...	...	17
Tenn.	33	8	2	1	2	5	10	5	...	...	...	...	4	29
Texas	115	38	11	1	17	16	13	13	6	1	...	1	35	78
Utah.	8	...	1	...	...	3	3	...	1	...	...	...	1	7
Vt.	3	...	1	...	...	...	1	1	...	...	...	...	...	3
Va.	16	3	...	2	...	4	2	4	1	...	...	...	2	14
Wash.	59	8	3	2	7	11	7	15	6	3	...	...	24	32
W. Va.	17	6	3	...	1	4	1	2	...	...	...	...	2	15
Wisc.	100	19	11	5	10	14	11	19	11	5	...	...	27	68
Wyo.	12	...	...	...	2	7	1	2	...	...	...	...	...	12
Alaska, etc.	9	3	2	1	1	...	1	1	...	...	...	...	2	7
Total...	2,990	612	245	83	287	514	420	563	266	292	11	18	587	2,082

AIRCRAFT APPROPRIATIONS, UNITED STATES

1922–1933

			Total	*Increase or Decrease*	*Net*
1922–23	Army	$12,895,000		−$6,305,000	
	Navy	14,683,590		+1,270,159	
	Air Mail	1,900,000		+650,000	
	N.A.C.A.	210,000	$29,688,590	+10,000	−$4,347,841
1923–24	Army	12,426,000		−469,000	
	Navy	14,647,174		−36,416	
	Air Mail	1,500,000		−400,000	
	N.A.C.A.	283,000	28,856,174	+73,000	−832,416
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	+3,884,288
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
1932–33‡‡	Army	25,482,900		−5,996,735	
	Navy	26,660,000		−4,485,000	
	Air Mail	26,000,000(13)		−1,000,000	
	N.A.C.A.	1,012,310		−38,760	
	Commerce	8,929,660(14)	88,084,870	−1,432,640	−12,953,135

(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.
(13) Includes $7,000,000 for Foreign Air Mail.
(14) Includes $1,301,160 for "Aircraft in Commerce."
‡ Plus $6,250,000 "contract authorizations" for additional purchases of aircraft.
+ Shows amount of increase. −Shows amount of decrease. ‡‡ Proposed expenditures.

AIR MAIL OPERATIONS BY ROUTES DURING CALENDAR YEAR 1931

A M Number and Termini	Length of Route (Miles)	Miles Scheduled	Miles Actually Flown	Pounds of Mail Dispatched	Amount Paid to Carrier
1. Boston-New York	200	282,567	242,263	137,112	$163,267.35
2. Chicago-Memphis	523	472,928	437,549	66,424	262,130.28
3. Chicago-Dallas	1,048	1,856,326	1,673,011	511,452	1,193,209.40
4. Salt Lake City-San Diego	782	1,042,679	1,028,007	638,616	930,486.97
5. Salt Lake City-Seattle	1,017	1,283,230	1,217,227	347,082	951,541.50
8. Seattle-San Diego	1,238	1,386,172	1,340,103	400,715	891,102.09
9. Chicago-Pembina	1,620	1,478,431	1,422,430	276,091	912,557.50
11. Washington-Cleveland	326	466,044	388,804	91,111	171,151.36
12. Cheyenne-Albuquerque-Amarillo	771	353,174	339,507	107,209	201,625.17
16. Cleveland-Louisville*	351	126,364	111,874	30,160	83,074.16
17. New York-Chicago	736	2,087,185	1,813,590	1,709,864	1,482,729.98
18. Chicago-San Francisco	2,027	4,204,365	4,088,665	1,807,535	3,747,952.83
19. New York-Miami	2,254	3,204,685	2,986,161	849,817	1,816,513.45
20. New York-Fort Worth	1,793	1,125,088	1,009,469	175,931	615,750.90
21. Dallas-Galveston	333	244,945	233,233	37,263	139,799.03
22. Dallas-Brownsville	547	406,301	395,092	84,012	248,585.91
23. Atlanta-New Orleans	488	356,370	342,957	100,876	215,809.76
24. Chicago-Cincinnati	274	403,386	375,654	83,222	243,955.77
25. Atlanta-Miami†	777	285,163	258,838	88,786	157,891.44
26. Great Falls-Salt Lake City	509	648,147	634,909	62,747	365,668.25
27. Bay City-Chicago	1,384	1,241,322	1,151,721	181,352	612,711.65
28. St. Louis-Omaha‡	404	216,706	199,847	60,534	55,087.25
29. New Orleans-Houston	325	236,170	230,085	51,198	111,825.38
30. Omaha-Atlanta (part)	1,208	1,135,527	1,039,203	259,380	688,310.83
30. Kansas City-Denver (part)§	544	228,480	216,856	15,463	86,742.40
33. Atlanta-Los Angeles (part)	3,052	2,019,786	1,888,829	240,380	1,645,928.71
33. Albuquerque-El Paso (part)‖	222	67,200	66,096	3,123	52,269.09
34. New York-Los Angeles	3,339	3,425,191	3,073,553	587,624	1,811,191.46
Total	26,560	30,283,932	28,205,533	9,005,079	$19,858,869.87

* A M 16 Consolidated with A M 20 effective June 1, 1931.
† A M 25 Consolidated with A M 19 effective April 1, 1931.
‡ A M 28 Consolidated with A M 30 (Omaha-Atlanta Part) effective June 1, 1931.
§ Operations started June 1, 1931
‖ Operations started Aug. 1, 1931.

MONTHLY AIR TRANSPORT OPERATIONS

AMERICAN AIR LINES

1930	Miles Scheduled	Miles Flown	Passengers	Passenger Miles	Air Mail	Air Express
January	1,977,240	1,607,336	11,214	4,080,665	559,044	12,846
February	1,792,100	1,551,477	28,675	4,861,636	593,862	15,038
March	2,034,961	1,885,826	34,153	5,216,621	667,705	27,349
April	2,304,177	2,233,034	37,950	9,957,403	714,914	26,814
May	2,444,995	2,412,801	40,140	10,753,952	743,955	25,448
June	2,602,053	2,533,847	40,847	11,909,361	716,849	30,569
July	3,122,349	3,098,570	44,115	11,610,514	724,631	23,670
August	3,027,370	3,006,069	46,299	11,813,046	728,326	28,790
September	3,046,808	2,993,261	43,818	11,141,631	737,350	28,562
October	2,889,928	2,690,890	21,789	4,903,425	773,784	24,566
November	2,798,750	2,505,513	19,215	4,246,075	670,039	22,110
December	2,662,388	2,315,343	17,695	4,051,455	797,659	21,036
Total	30,703,119	28,833,967	385,910	94,545,784	8,428,118*	286,798
1931						
January	2,753,550	2,475,306	17,549	4,064,869	723,096	61,063
February	2,632,848	2,288,395	20,978	4,903,387	678,371	62,455
March	2,988,916	2,663,940	27,872	6,724,101	757,451	85,486
April	3,651,618	3,412,594	32,079	8,320,518	778,164	59,165
May	3,717,970	3,491,309	34,737	9,213,029	776,663	57,631
June	4,066,955	3,910,931	42,928	12,263,006	803,935	61,940
July	4,325,875	4,213,403	55,782	14,681,694	807,508	76,850
August	4,716,697	4,528,908	54,163	13,978,567	832,919	101,992
September	4,578,488	4,381,597	62,419	15,778,643	825,174	117,263
October	4,808,494	4,437,306	50,958	12,575,584	863,039	88,071
November	4,715,720	3,861,073	31,415	7,442,473	747,666	45,122
December	4,506,542	3,730,616	26,873	6,288,282	757,209	68,126
Total	47,463,673	43,395,478	457,753	116,232,153	9,351,195	885,164

* Does not include an annual total of 85,557 pounds carried on small lines for which monthly figures are not available.

AIRWAY MARKING AND LIGHTING IN 1931

ROUTES In Service	LIGHTING							WEATHER		RADIO		
	Airway Miles	Lighted Miles	Lighted Intermediate Fields	Boundary Lights	Obstruction Lights	Rotate Lights	Flash Lights	Airways Teletype	U.S.W.B. Teletype	Communications Stns.	Radio Beacon	Marker Beacon
Albuquerque—Amarillo	295	295	2	76	18	19	17	3	0	2	0	0
Amarillo—Kansas City	484	482	6	154	64	39	21	7	4	4	2	0
Atlanta—Chicago	649	649	14	413	55	51	2	12	5	3	6	4
Atlanta—New York	788	788	15	427	172	80	6	17	5	6	6	4
Brownsville—Fort Worth	522	522	7	209	26	32	1	0	7	1	1	0
Brownsville—Houston	345	345	10	124	4	32	0	0	3	0	0	0
Chicago—New York	728	728	22	491	147	76	2	24	1	4	5	9
Chicago—Twin Cities	381	381	10	223	50	42	7	0	6	2	1	0
Cincinnati—Chicago	276	276	6	163	12	26	0	4	2	2	3	1
Cleveland—Albany	457	457	10	223	72	39	2	0	10	3	5	1
Cleveland—Detroit	132	132	1	30	3	8	1	4	0	1	1	0
Columbus—Philadelphia	426	426	6	190	19	38	14	10	0	1	1	0
El Paso—Fort Worth	544	544	15	604	28	40	2	0	6	1	1	0
Fort Worth—Atlanta	785	172	0	0	0	2	0	2	10	3	2	0
Fort Worth—Wichita	350	350	6	160	26	24	16	0	2	3	2	0
Indianapolis—Dayton	134	134	2	73	19	10	0	4	0	0	1	0
Kansas City—Chicago	407	407	6	211	29	47	1	3	4	2	3	0
Kansas City—Omaha	170	170	3	76	26	15	0	4	0	2	2	1
Kansas City—St. Louis	228	228	6	154	31	21	0	5	0	2	3	1
Los Angeles—Amarillo	976	326	0	0	0	25	0	9	5	5	1	0
Los Angeles—Salt Lake	634	634	21	553	18	51	66	0	17	2	2	0
Los Angeles—San Francisco	380	380	7	172	29	34	3	10	3	3	3	1
Louisville—Cleveland	311	311	7	151	50	31	1	6	0	2	3	0
Miami—Atlanta	631	631	11	271	46	46	2	0	7	1	1	0
Michigan Airways	364	364	1	33	11	17	0	9	8	1	0	0
Milwaukee—Green Bay	123	123	1	27	5	5	0	0	1	0	0	0
New Orleans—Atlanta	484	226	6	136	48	22	5	0	4	1	1	0
New York—Boston	201	201	3	95	26	19	10	6	1	2	2	1
New York—Montreal	342	142	2	60	28	12	2	0	7	2	2	0
Norfolk—Washington	144	144	3	80	18	11	0	3	1	1	1	0
Omaha—Chicago	429	420	10	226	57	37	1	9	2	3	4	2
Portland—Spokane	330	330	11	282	29	31	23	8	5	2	1	0
Pueblo—Cheyenne	200	200	5	117	14	17	7	0	4	1	1	0
Salt Lake—Great Falls	507	150	4	120	8	15	3	3	15	3	1	0
Salt Lake—Omaha	893	893	26	621	36	79	25	19	3	5	8	6
Salt Lake—Pasco	538	538	13	302	62	50	14	0	9	4	4	0

AIRWAY MARKING AND LIGHTING IN 1931—*Continued*

ROUTES In Service	*LIGHTING*							*WEATHER*		*RADIO*		
	Airway Miles	*Lighted Miles*	*Lighted Intermediate Fields*	*Boundary Lights*	*Obstruction Lights*	*Rotate Lights*	*Flash Lights*	*Airways Teletype*	*U.S.W.B. Teletype*	*Communications Stns.*	*Radio Beacon*	*Marker Beacon*
San Diego—Los Angeles	113	113	1	36	5	8	0	4	2	1	0	0
San Francisco—Salt Lake	642	642	19	560	75	54	75	15	15	5	5	2
San Francisco—Seattle	735	735	17	396	125	73	15	19	10	4	1	0
St. Louis—Chicago	286	286	5	96	0	15	2	4	1	2	2	0
St. Louis—Evansville	161	161	4	118	13	15	0	3	2	1	2	0
St. Louis—Indianapolis	233	233	3	83	22	20	0	4	0	1	3	0
Tulsa—Ponca City	75	75	2	47	5	2	20	0	1	1	1	0
Washington—Cleveland	329	329	5	136	40	25	4	6	5	3	2	0
Total	18,160	16,082	337	8,720	1,571	1,355	370	178	113	51	53	24
Under construction:												
Dallas—Louisville	646	157	3	0	0	15	1	0	0	0	0	0
Fort Worth—Atlanta	477	146	1	0	0	11	0	0	0	0	0	0
Jacksonville—Richmond	581	557	8	0	0	41	1	0	0	0	0	0
Los Angeles—Amarillo	715	663	15	0	0	65	1	0	0	0	0	0
New Orleans—Atlanta Cut Off	458	458	7	0	0	35	0	0	0	0	0	0
San Diego—El Paso	727	727	11	0	0	45	13	0	0	0	0	0
Total under construction as of June 30, 1931	3,604	2,708	45	0	0	212	16	0	0	0	0	0
Grand Total	21,764	18,790	382	8,720	1,571	1,567	386	178	113	51	53	24

COMPARATIVE TABULATIONS OF ACCIDENTS—CIVIL AERONAUTICS FOR THE YEARS, 1928, 1929, 1930 AND THE FIRST SIX MONTHS OF 1931

(Compiled by Aeronautics Branch, Department of Commerce)

Mileage Flown Per Accident

	*January–June 1928**	*July–December 1928*	*January–June 1929**	*July–December 1929*	*January–June 1930**	*July–December 1930*	*January–June 1931**
Miles flown in scheduled transport operation	4,484,612	6,188,838	9,201,338	15,940,161	16,902,728	20,042,475	20,304,430
Miles flown in miscellaneous operations, including student instruction and experimental flying	12,000,000	48,000,000	47,000,000	63,000,000	51,767,200	56,502,560	43,282,595
Total	16,484,612	54,188,838	56,201,338	78,940,161	68,669,928	76,545,035	63,587,025
Accidents, all services	430	692	774	924	930	1,163	1,052
Miles flown per accident, all services	38,337	78,308	72,612	85,433	73,839	477,066	376,356
Accidents, scheduled transport operations	35	51	61	76	44	47	61
Miles flown per accident, scheduled transport operations	128,132	121,350	150,842	209,739	384,152	426,436	332,860
Accidents, miscellaneous operations	395	651	713	848	886	1,116	991
Miles flown per accident, miscellaneous operations	30,380	74,883	65,919	74,292	58,427	50,630	43,676
Fatal accidents, all services§	97	130	127	183	150	163	114
Miles flown per fatal accident all services	169,944	416,837	442,530	431,367	457,800	7,033,966	4,457,974
Fatal accidents, scheduled transport operations§	5	7	9	15	6	3	5
Miles flown per fatal accident, scheduled transport operations	896,922	884,120	1,022,371	1,062,677	2,817,121	6,680,825	4,060,886
Fatal accidents, miscellaneous operations§	92	123	118	168	144	160	109
Miles flown per fatal accident, miscellaneous operations	130,435	390,244	398,305	375,000	359,494	353,141	397,088
Pilot fatalities, all services	69	92	87	140	123	133	95
Miles flown per pilot fatality, all services	238,907	589,009	645,992	563,858	558,292	7,115,460	4,541,804
Pilot fatalities, scheduled transport operations	4	5	9	14	5	3	5
Miles flown per pilot fatality, scheduled transport operations	1,121,153	1,237,768	1,022,371	1,138,583	3,380,545	6,680,825	4,060,886
Pilot fatalities, miscellaneous operations	65	87	78	126	118	130	90
Miles flown per pilot fatality, miscellaneous operations	184,615	551,724	602,564	500,000	438,705	434,635	480,918

* 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 (passengers, pilot, or crew) were killed or fatally injured.

Causes of Accidents

Scheduled Air Transport Operations

Causes	Percentages						
	*January–June, 1928**	*July–December, 1928**	*January–June, 1929*	*July–December, 1929*	*January–June, 1930*	*July–December, 1930*	*January–June, 1931*
Number of accidents involved	35	51	61	76	44	47	61
PERSONNEL:							
Pilot:							
Error of judgment	9.14	5.88	12.62	11.12	12.27	3.19	8.85
Poor technique	6.14	7.16	7.21	6.51	8.18	5.21	3.44
Disobedience of orders	3.14	0	2.05	0	0	0	2.29
Carelessness or negligence	4.00	5.39	8.61	4.74	7.84	2.13	6.15
Miscellaneous	0	.98	0	3.95	1.14	2.13	0
Total pilot errors	22.42	19.41	30.49	26.32	29.43	12.66	20.73
Other personnel:							
Supervisory	1.43	1.96	1.14	6.25	2.27	.53	1.14
Miscellaneous	1.43	2.94	.82	1.32	0	2.13	3.28
Total personnel errors	25.28	24.31	32.45	33.89	31.70	15.32	25.15
MATERIEL:							
Power Plant:							
Fuel system	2.00	1.47	2.05	1.64	0	1.60	3.85
Cooling system	0	0	0	0	0	0	0
Ignition system	.86	1.47	0	2.89	1.70	0	1.64
Lubrication system	.71	0	0	0	0	1.06	0
Engine structure	3.29	1.57	4.93	5.26	11.37	11.17	3.28
Propellers and accessories	0	0	0	0	0	2.13	4.92
Engine-control system	0	.98	0	0	0	0	0
Miscellaneous	0	0	0	0	0	0	1.64
Undetermined	1.00	6.37	6.56	5.59	2.27	6.38	1.64
Total power-plant failures	7.86	11.86	13.54	15.38	15.34	22.34	16.97
Structural:							
Flight-control system	0	0	0	0	0	0	0
Movable surfaces	0	0	0	1.32	0	0	0
Stabilizing surfaces	0	0	0	0	0	0	0
Wings, struts, and bracings	0	.49	3.28	0	0	0	.57
Undercarriage	7.14	5.88	1.64	1.32	2.27	7.45	8.20
Wheels, tires, and brakes	2.14	1.67	2.46	3.94	1.70	4.79	3.69
Pontoons or boats	0	0	0	0	0	0	0
Fuselage, engine mountings and fittings	0	0	0	0	0	0	0
Tail-skid assembly	2.14	1.96	0	0	0	0	0
Miscellaneous	0	0	0	0	0	0	0
Undetermined	0	0	0	0	0	0	0
Total structural failures	11.42	10.00	7.38	6.58	3.97	12.24	12.46
Handling qualities	0	0	1.64	0	2.05	2.66	10.65
Instruments	0	0	.82	0	0	0	0
Total airplane failures	11.42	10.00	9.84	6.58	6.02	14.90	23.11
MISCELLANEOUS:							
Weather	23.29	37.45	28.11	20.86	27.16	32.02	21.73
Darkness	6.58	3.65	2.13	1.32	.68	.53	0
Airport and terrain	13.00	6.07	8.77	8.55	13.98	11.70	10.33
Other	6.00	.78	1.23	5.92	0	3.19	.25
Total miscellaneous causes	48.87	47.95	40.24	36.65	41.82	47.44	32.31
Undetermined and doubtful	6.57	5.88	3.93	7.50	5.12	0	2.46
	100	100	100	100	100	100	100

*Figures for 1928 include a small percentage of minor mishaps.

Causes of Accidents

Non-Scheduled Air Transport Operations

Causes	Percentages						
	*January–June, 1928**	*July–December, 1928**	*January–June, 1929*	*July–December, 1929*	*January–June, 1930*	*July–December, 1930*	*January–June, 1931*
Number of accidents involved	395	641	713	873	917	1,116	991
PERSONNEL:							
Pilot:							
Error of judgment	8.87	13.32	12.80	12.15	11.17	7.17	9.23
Poor technique	25.80	31.75	34.66	29.78	36.85	38.75	32.98
Disobedience of orders	4.75	2.78	1.90	4.03	2.11	1.77	3.53
Carelessness or negligence	6.60	10.57	9.66	6.73	6.07	5.11	6.26
Miscellaneous	.61	.53	.58	1.87	.52	.20	.55
Total pilot errors	46.63	58.95	59.60	54.56	56.72	53.00	52.55
Other personnel:							
Supervisory	.23	.36	.18	.74	.36	0	.05
Miscellaneous	3.06	1.53	1.55	2.11	.85	.33	.86
Total personnel errors	49.92	60.84	61.33	57.41	57.93	53.33	53.46
MATERIEL:							
Power Plant:							
Fuel system	5.05	3.84	6.51	5.67	2.88	3.87	4.20
Cooling system	.74	.77	.90	1.01	.54	.23	.84
Ignition system	4.38	2.49	2.96	1.74	1.24	1.70	1.79
Lubrication system	.06	.32	3.8	.11	.13	.43	.62
Engine structure	1.11	1.69	1.40	2.14	8.49	9.42	3.15
Propellers and accessories	.68	.58	.84	.78	.23	.07	.60
Engine-control system	0	.53	.06	.45	.28	.40	.18
Miscellaneous	.45	0	.28	.17	.41	.67	3.18
Undetermined	4.87	5.48	5.09	6.93	.84	1.79	4.81
Total power-plant failures	17.34	15.70	18.42	19.00	15.04	18.58	19.37
Structural:							
Flight-control system	.85	.35	.29	1.08	.53	.72	1.01
Movable surfaces	.35	.08	.14	.43	.11	.02	.25
Stabilizing surfaces	0	0	.14	.09	.22	.09	.25
Wings, struts, and bracings	1.08	1.89	1.06	1.74	1.11	.85	1.65
Undercarriage	1.24	1.66	3.06	3.71	2.83	4.38	4.06
Wheels, tires, and brakes	.20	.09	.98	1.55	1.31	2.76	1.38
Pontoons and boats	.03	0	0	0	.05	.09	0
Fuselage, engine mounts and fittings	.76	.08	.36	.48	.35	.18	.50
Tail-skid assembly	0	0	0	0	.16	.04	.10
Miscellaneous	.23	0	.28	.49	.33	0	.30
Undetermined	0	.04	0	.11	.27	.13	.23
Total structural failures	4.74	4.19	6.31	9.68	7.27	9.26	9.73
Handling qualities	.56	.26	2.42	2.02	1.99	1.96	2.02
Instruments	0	0	0	.06	0	.07	0
Total airplane failures	5.30	4.45	8.73	11.76	9.26	11.29	11.75
MISCELLANEOUS:							
Weather	8.22	2.19	3.04	2.70	5.38	3.90	3.81
Darkness	.73	.21	.37	.30	.06	.65	.25
Airport or terrain	7.74	3.49	2.28	2.04	9.63	9.01	9.96
Other	3.74	3.41	1.02	1.35	1.46	1.72	.75
Total miscellaneous causes	20.43	9.30	6.71	6.39	16.53	15.28	14.77
Undetermined and doubtful	7.01	9.71	4.81	5.44	1.24	1.52	.65

*Figures for 1928 include a small percentage of minor mishaps.

Injuries Classified

January to June, 1931, 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	186	5	4	7	47	63	1	1	1	4	7
Student instruction	234	13	17	18	134	182	5	6	9	29	49
Experimental	71	12	4	9	27	52	1	0	0	0	1
Commercial	476	19	13	26	180	238	1	0	0	4	5
Pleasure	973	46	29	71	385	531	1	0	0	4	5
Total	1940	95	67	131	773	1066	9	7	10	41	67

Kind of Flying	Total Persons Involved	Passengers					Aircraft Crew				
		Fatal	Severe	Minor	No Injury	Total	Fatal	Severe	Minor	No Injury	Total
Schedule	186	9	2	24	73	108	0	1	5	2	8
Student instruction	234	0	1	0	2	3	0	0	0	0	0
Experimental	71	2	1	0	9	12	3	0	0	3	6
Commercial	476	13	15	32	166	226	0	1	0	6	7
Pleasure	973	46	35	51	302	434	1	0	0	2	3
Total	1940	70	54	107	552	783	4	2	5	13	24

STATE AERONAUTICAL LEGISLATION IN 1931

The following is a list of states which considered aeronautical legislation during 1931, showing the number of bills introduced, laws enacted and bills defeated in each state. The list was prepared by the Legal and Legislative Research Service of the Aeronautical Chamber of Commerce.

Character of Legislation	Favorable Action	Unfavorable Action	Total
LICENSING BILLS			
1. Alabama	1	1	
2. Florida	1	1	
3. Georgia	0	1	
4. Idaho	2	0	
5. Illinois	1	3	
6. Kansas	1	0	
7. Massachusetts	0	1	
8. Minnesota	0	2	
9. Missouri	0	1	
10. Montana	0	1	
11. Nevada	0	2	
12. New Hampshire	1	0	
13. New Jersey	1	0	
14. North Dakota	1	0	
15. Ohio	1	1	
16. Oklahoma	1	1	
17. Oregon	1	2	
18. Pennsylvania	1	0	
19. Tennessee	1	2	
20. Texas	0	1	
21. Utah	1	1	
22. Vermont	1	0	
23. Washington	0	2	
24. West Virginia	1	1	
25. Wisconsin	0	1	
26. Wyoming	1— 18	0— 25	43

AIRPORT ENABLING ACTS

1. Alabama	1	1	
2. Colorado	1	1	
3. Connecticut	0	2	
4. Delaware	1	0	
5. Florida	1	4	
6. Georgia	0	1	
7. Idaho	2	0	
8. Illinois	0	1	
9. Indiana	0	1	
10. Iowa	0	1	
11. Maine	1	1	
12. Massachusetts	0	1	
13. Michigan	0	2	
14. Minnesota	2	5	
15. Montana	1	0	
16. Nebraska	0	1	
17. New Hampshire	1	0	
18. North Carolina	1	0	
19. North Dakota	2	1	
20. Pennsylvania	2	3	
21. Rhode Island	0	1	
22. South Dakota	1	0	
23. Tennessee	4	2	
24. Texas	1	0	
25. Utah	1	0	
26. Washington	0	1	
27. West Virginia	0	1	
28. Wyoming	1— 24	0— 31	55

REGULATION OF AERONAUTICS; AIR TRAFFIC RULES; REGULATORY BODIES; AIDS TO AIR NAVIGATION

1. Alabama	1	2	
2. Arkansas	1	1	
3. California	0	9	
4. Colorado	1	1	
5. Connecticut	3	3	
6. Georgia	0	3	
7. Idaho	3	0	
8. Illinois	1	6	
9. Indiana	1	1	
10. Iowa	0	4	
11. Kansas	1	6	
12. Maine	1	3	
13. Maryland	1	0	
14. Massachusetts	1	10	
15. Michigan	6	0	
16. Minnesota	2	8	
17. Missouri	0	1	
18. Montana	0	4	
19. Nebraska	0	1	
20. Nevada	0	2	
21. New Hampshire	1	0	
22. New Jersey	1	0	
23. New Mexico	0	1	
24. New York	4	10	
25. Ohio	1	4	
26. Oklahoma	0	1	
27. Oregon	2	3	
28. Pennsylvania	0	4	
29. Tennessee	2	2	
30. Texas	1	1	
31. Utah	1	0	
32. Washington	0	4	
33. West Virginia	1	1	
34. Wisconsin	1	3	
35. Wyoming	1— 39	0— 99	138

TAXATION

1. Alabama	1	7	
2. Arizona	1	0	
3. Arkansas	1	11	
4. California	0	7	
5. Colorado	0	10	
6. Connecticut	2	1	
7. Florida	0	20	
8. Georgia	0	5	
9. Illinois	1	3	
10. Indiana	1	5	
11. Iowa	0	4	
12. Kansas	0	9	
13. Maine	3	3	
14. Maryland	1	2	
15. Massachusetts	2	6	
16. Michigan	0	5	
17. Minnesota	1	5	
18. Mississippi	1	0	
19. Missouri	0	1	
20. Montana	1	2	
21. Nebraska	0	6	
22. Nevada	0	1	
23. New Hampshire	0	1	
24. New Jersey	1	3	
25. New Mexico	1	6	
26. New York	0	8	
27. North Carolina	1	0	
28. North Dakota	2	1	
29. Ohio	0	5	
30. Oklahoma	2	4	
31. Oregon	2	0	
32. Pennsylvania	1	7	
33. South Carolina	0	2	
34. South Dakota	0	4	
35. Tennessee	1	10	
36. Texas	2	2	
37. Utah	0	2	
38. Vermont	1	2	
39. Washington	0	2	
40. West Virginia	0	3	
41. Wisconsin	1	3	
42. Wyoming	1— 32	1—179	211

APPROPRIATIONS FOR AERONAUTICS

1. Alabama	0	2	
2. California	0	2	
3. Connecticut	0	2	
4. Georgia	0	1	
5. Idaho	3	0	
6. Indiana	1	1	
7. Maine	2	2	
8. Maryland	0	1	
9. Massachusetts	1	1	
10. Michigan	1	2	
11. Minnesota	0	2	
12. New York	0	3	
13. Pennsylvania	1	3	
14. Rhode Island	0	2	
15. South Dakota	0	1	
16. Tennessee	0— 9	1— 26	35

LIABILITY

1. Illinois	0	1	
2. Maryland	1	1	
3. New Mexico	0	1	
4. New York	0— 1	2— 5	6

INSURANCE

1. Idaho	1	0	
2. Massachusetts	2	2	
3. Montana	1	0	
4. New Hampshire	0	1	
5. New Jersey	0	1	
6. New York	0	1	
7. Pennsylvania	1— 5	1— 6	11

Miscellaneous				
1. Alabama	1		0	
2. California	0		3	
3. Georgia	0		1	
4. Michigan	1		0	
5. New Mexico	0		1	
6. Pennsylvania	1	3	0	5
Grand Totals		131		376

AVIATION GASOLINE TAX SUMMARY

The following is a summary of gasoline tax laws as they apply to aviation in the several states. The list was prepared by the Legal and Legislative Research Service of the Aeronautical Chamber of Commerce.

State	*Tax*	*Disposition of Receipts*	*Applicable to Aircraft Fuel*	*Exemption or Refund*
1. Alabama	4¢	Highways	Yes	No
2. Arizona	5¢	Highways	Yes	Refund
3. Arkansas	5¢	Highways, Airports	Yes	No
4. California	3¢	Highways	Yes	Refund
5. Colorado	4¢	Highways	Yes	Refund
6. Connecticut	2¢	Highways	No	Exemption
7. Delaware	3¢	Highways	Yes	Refund
8. Dist. of Columbia	2¢	Highways	Yes	Refund
9. Florida	6¢	Roads—Schools	Yes	No
10. Georgia	6¢	Roads—Schools	Yes	No
11. Idaho	5¢	Airfuel Tax to Aeronaut. Fund	Yes	No
12. Illinois	3¢	Highways	Yes	Refund
13. Indiana	4¢	Highways	Yes	Refund
14. Iowa	3¢	Highways	Yes	Refund
15. Kansas	3¢	Highways	Yes	Refund
16. Kentucky	5¢	Highways	Yes	No
17. Louisiana	5¢	Highways	Yes	Fed. Gov't only
18. Maine	5¢	Highways	Yes	⅘ of tax
19. Maryland	4¢	Highways	Yes	Refund
20. Massachusetts	3¢	Highways	Yes	Refund
21. Michigan	3¢	Highways—Aeronautics	Yes	No
22. Minnesota	3¢	Highways	Yes	Refund
23. Mississippi	5½¢	Highways	Yes	No
24. Missouri	2¢	Highways	Yes	Refund
25. Montana	5¢	Highways	Yes	Refund
26. Nebraska	4¢	Highways	Yes	No
27. Nevada	4¢	Highways	Yes	Refund
28. New Hampshire	4¢	Highways	Yes	Refund
29. New Jersey	3¢	Traffic—Waterways	.....	Exemption
30. New Mexico	5¢	Highways	Yes, unless interstate flying	Refund
31. New York	2¢	Highways	Yes	Refund
32. North Carolina	5¢	Highways	Yes	Refund
33. North Dakota	4¢	Highways	Yes	Refund
34. Ohio	4¢	Highways	Yes	Refund
35. Oklahoma	5¢	Highways	Yes, unless interstate flying	No
36. Oregon	4¢	Highways—Aeronautics	Yes	All but 1¢
37. Pennsylvania	3¢	Highways—Aeronautics	Yes	No
38. Rhode Island	2¢	Highways	Yes	Refund
39. South Carolina	6¢	Highways	Yes	No
40. South Dakota	4¢	Highways	Yes	Refund
41. Tennessee	6¢	Highways, except $50,000 to Airways	Yes	No
42. Texas	4¢	Highways—Schools	Yes	Refund
43. Utah	3½¢	Highways	Yes, unless interstate flying	No
44. Vermont	4¢	Highways	Yes	No
45. Virginia	5¢	Highways and Bridges	Yes	Refund
46. Washington	3¢	Highways	Yes	Refund and exemption
47. West Virginia	4¢	Highways	Yes	Refund
48. Wisconsin	2¢	Highways	Yes	Refund
49. Wyoming	4¢	Highways—Airports	Yes	No

STATE LAWS RELATING TO LICENSING OF AIRCRAFT AND AIRMEN As Of January 1, 1932

The following summary of the status of state licensing laws classifying them into nine different groups, indicating 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 1932.

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 footnote *a*, *b*)
6. Idaho	(1931)	(State registration also required)
7. Illinois	(1931)	(See footnotes *a* and *b*)
8. Indiana	(1929)	
9. Iowa	(1929)	(See footnote *c*)
10. Kansas	(1931)	
11. Kentucky	(1930)	(State registration also required)
12. Michigan	(1931)	(State registration also required) (*d*)
13. Mississippi	(1928)	
14. Missouri	(1929)	(Except solo pleasure) (Footnote *e*)
15. Montana	(1929)	
16. Nebraska	(1929)	(Does not apply to non-commercial airmen)
17. New Jersey	(1931)	(See footnote *a*)
18. New Mexico	(1929)	
19. New York	(1928)	(Except airmen in private or pleasure flying) (*f*)
20. North Dakota	(1930)	(Covers only civil aircraft flown for hire)
21. Ohio	(1931)	(See footnote *a*)
22. Oklahoma	(1931)	(See footnote *a*)
23. Rhode Island	(1929)	
24. South Carolina	(1930)	
25. South Dakota	(1929)	
26. Texas	(1929)	(Except public aircraft of U. S. or Texas)
27. Utah	(1931)	(*a*—1st paragraph only)
28. Washington	(1929)	
28. Wisconsin	(1929)	
30. 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. Minnesota	(1929)	
5. New Hampshire	(1929)	
6. Oregon	(1929)	(Does not apply to aircraft—see entry under II, supra)
7. 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. Pennsylvania (1931) (Federal license prerequisite to State license)
2. Vermont (1929)
3. Virginia (1930)

IX. States Having No License Requirements:

1. Georgia
2. Louisiana

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 passenger.

(*d*) 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.

(*e*) Law does not apply to public aircraft owned by, or to pilots in the service of, the U. S. or State of Missouri.

(*f*) Law does not apply to aircraft used exclusively in the governmental service of the U. S., or of the National Guard or of one or more of the civil departments of the State. Certain test flights also excepted.

AERONAUTICAL PURCHASES BY MILITARY SERVICES IN 1931

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 1931, 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-3113	Douglas Aircraft Co., Inc.	146 BT-28 Airplanes
W 535 ac-3123	Boeing Airplane Company	131 P-12C Airplanes
W 535 ac-3274	Thomas-Morse Aircraft Corp.	71 O-19C Airplanes
W 535 ac-3397	Consolidated Aircraft Corp.	1 Fleetster Y1C-11 Plane
W 535 ac-3465	Fokker Aircraft Corp. of America	20 Y1C-14 Airplanes
W 535 ac-3492	Ford Motor Co. (Stout Metal Airplane Company Division)	4 C-4A Cargo Airplanes
W 535 ac-3533	Detroit Aircraft Corp.	1 Y1C-12 Airplane
W 535 ac-3623	Detroit Aircraft Corp.	1 Y1C-17 Airplane
W 535 ac-3768	Douglas Aircraft Co., Inc.	30 O-38B Airplanes 20 BT-2C Airplanes
W 535 ac-3775	The Stearman Aircraft Co.	1 Model 6-A Airplane 3 YPT-9 Airplanes
W 535 ac-3780	Fairchild Airplane Mfg. Corp.	6 F-1A Airplanes
W 535 ac-3791	Consolidated Aircraft Corp.	3 Y1C-22 Airplanes
W 535 ac-3825	Curtiss Aero. & Motor Co., Inc.	30 O-1G Airplanes
W 535 ac-3848	B/J Aircraft Corporation	15 Y1P-16 Airplanes
W 535 ac-3894	Verville Aircraft Company	4 YPT-10 Airplanes
W 535 ac-3895	Northrup Aircraft Corporation	1 YC-19 Airplane 2 Y1C-19 Airplanes
W 535 ac-3928	Thomas-Morse Aircraft Corp.	30 O-19E Airplanes
W 535 ac-3978	Boeing Airplane Co.	34 P-12E Airplanes
W 535 ac-4035	Fokker Aircraft Corp. of America	3 YO-27 Airplanes 3 YB-8 Airplanes
W 535 ac-4075	Consolidated Aircraft Corp.	4 Y1PT-11 Airplanes
W 535 ac-4153	Fokker Aircraft Corp. of America	2 Y1O-27 Airplanes
W 535 ac-4326	Douglas Aircraft Company, Inc.	5 YO-31A Airplanes
W 535 ac-4153	Fokker Aircraft Corp. of America	4 Y1B-8 Airplanes

Engines and Spares

* 88 Curtiss V-1570	*16 Wright R-540
* 60 Curtiss V-1150	90 Liberty engines reconditioned
* 60 Pratt-Whitney R-1690	32 Pratt-Whitney SR-1340E
*892 Pratt-Whitney R-1340	34 Wright R-1820-E
* 1 Pratt-Whitney R-1860	9 Curtiss V-1570-C
* 8 Continental YR-540	4 Continental YR-540
* 40 Wright R-1750	1 Wright R-975
* 7 Wright R-1820	

* Initial equipment for new airplanes.

AIRPLANES DELIVERED TO ARMY AIR CORPS

Quantity	Type	Contractor
146	BT-2B	Douglas Aircraft Co., Inc., Santa Monica, Calif.
131	P-12C	Boeing Airplane Co., Seattle, Wash.
71	O-19C	Thomas-Morse Aircraft Corp., Buffalo, N. Y.
33	O-38	Douglas Aircraft Co., Inc., Santa Monica, Calif.
1	Fleetster Y1C-11	Consolidated Aircraft Corp., Buffalo, N. Y.
16	Y1C-14	Fokker Aircraft Corp. of America, New York, N. Y.
4	C-4A Cargo	Ford Motor Co. (Stout Metal Airplane Co. Division), Dearborn, Mich.
1	Y1C-12	Detroit Aircraft Corp., Detroit, Mich.
1	Y1C-17	Detroit Aircraft Corp., Detroit, Mich.
30	O-38B	Douglas Aircraft Co., Inc., Santa Monica, Calif.
20	BT-2C	
1	Model 6A	The Stearman Aircraft Co., Wichita, Kansas.
3	YPT-9	
6	F-1A	Fairchild Airplane Mfg. Corp., Farmingdale, N. Y.
3	Y1C-22	Consolidated Aircraft Corp., Buffalo, N. Y.
2	O-1G	Curtiss Aero. & Motor Co., Inc., Garden City, L. I.
4	YPT-10	Verville Aircraft Co., Detroit, Mich.
2	Y1C-19	Northrop Aircraft Corp., Burbank, Calif.
4	Y1PT-11	Consolidated Aircraft Corp., Buffalo, N. Y.
479		

NAVY PURCHASES OF AERONAUTICAL EQUIPMENT

Aircraft

Quantity	Type
1	Grumman fighter with Wright Cyclone engine.
30	Boeing fighters with P & W Wasp engines.
1	Boeing fighter with Curtiss R-1535 engine.
1	B/J fighter with Wright Cyclone engine.
1	Navy fighter (engine not known at this time).
1	Curtiss fighter with Wright Cyclone engine.
3	Curtiss observations with Wright Cyclone engines.
51	Vought observations with P & W Wasp engines.
14	Vought observations with P & W Hornet engines.
1	Pitcairn Autogiro with Wright 975-E engine.
2	Pitcairn Autogiros with Wright 975-E engines.
1	Loening amphibian observation with P & W R-985 engine.
1	Sikorsky amphibion observation with P & W R-985 engine.
1	Great Lakes amphibian observation with Wright R-975 engine.
1	DeHavilland Puss-Moth observation with Gypsy III engine.
1	Grumman scout with P & W Hornet engine.
1	Consolidated patrol boat with 2 Wright Cyclone engines.
32	Detroit Aircraft torpedoes with Wright Cyclone engines.
12	Martin bombers with P & W Hornet engines.
1	Consolidated bomber with Wright Cyclone engine.
1	Stout all-metal transport with 3 P & W Wasp engines.
1	Fokker transport with 3 P & W Wasp engines.
1	Sikorsky amphibion transport with 2 P & W Hornet engines.
1	Curtiss-Wright transport with 2 R-975-E Hornet engines.
1	Douglas transport with 2 R-975-E engines.
1	Bellanca transport with P & W Wasp engine.
2	Sikorsky amphibion transport with 2 P & W Wasp engines.
165	

Total Cost of Airplanes	$3,221,398.04
Total Cost of Spare Parts	486,265.50

Engines

Quantity	Type	Quantity	Type
1	Armstrong "Jaguar."	4	VL-2—Maybachs.
3	Rolls Royce.	1	Gypsy III.
1	V-1570—Curtiss.	20	R-1690-A-2—P & W Hornets.
12	R-1860—P & W Hornets.	2	R-1340-E—P & W Wasps.
86	R-1340-D—P & W Wasps.	1	Steel Prod. (12 cyl.-in-line).
10	R-1340-C—P & W Wasps.	2	R-680—Lycomings.
5	R-975—Wright Whirlwinds.	2	R-1535—P & W.
73	R-1820-E Wright Cyclones.	8	GV-1570-C—Wright Conqueror.
4	R-985—P & W Wasp Jr.	1	Fairchild 12-cylinder Vee.
4	R-975-E—Wright Whirlwinds.	2	Wright 12-cyl., liquid cooled.
14	R-760-D—Wright Whirlwinds.		

Total Engines Purchased	256
Total Cost of Engines	$1,740,888.61
Total Cost of Spare Parts	328,273.19

Aircraft Delivered to U. S. Navy

Model	*Quantity Delivered*	*Contractor*
F8C-4	26	Curtiss Aeroplane & Motor Co.
F8C-5	9	Curtiss Aeroplane & Motor Co.
XF8C-7	1	Curtiss Aeroplane & Motor Co.
F4B-2	46	Boeing Aircraft Co.
XFJ-1	1	Berliner-Joyce Aircraft Corp.
O3U-1	73	Chance Vought Corp.
O2C-1	52	Curtiss Aeroplane & Motor Co.
O2C-2	3	Curtiss Aeroplane & Motor Co.
XSL-1	1	Loening Aeronautical Eng. Corp.
OL-9	1	Keystone Aircraft Corp., Inc.
XOP-1	1	Pitcairn Autogiro.
XOJ-1	1	Berliner-Joyce Aircraft Corp.
RR-4	1	Stout Metal Airplane Co.
RC-1	1	Curtiss Aeroplane & Motor Co.
RS-1	1	Sikorsky Aviation Corp.
RS-3	2	Sikorsky Aviation Corp.
XP2M-1	1	Glenn L. Martin Co.
PM-1	27	Glenn L. Martin Co.
P3M-1	3	Glenn L. Martin Co.
PK-1	1	Keystone Aircraft Corp., Inc.
XP4N-1	1	Naval Aircraft Factory.
TG-1	8	Great Lakes Aircraft Corp.
XT6M-1	1	Glenn L. Martin Co.
XT2N-1	1	Naval Aircraft Factory.
N2Y-1	5	Consolidated Aircraft Corp.
N2C-2	20	Curtiss Aeroplane & Motor Co.

Miscellaneous

Free Balloons	1	Goodyear Zeppelin Corp.
Kite Balloons	2	Goodyear Zeppelin Corp.

Aircraft Engines Delivered to U. S. Navy

Model	*Quantity Delivered*	*Contractor*
R-1340-C	10	Pratt & Whitney Aircraft Co.
R-1340-D	114	Pratt & Whitney Aircraft Co.
R-1340-E	1	Pratt & Whitney Aircraft Co.
R-985	4	Pratt & Whitney Aircraft Co.
R-985-A	4	Pratt & Whitney Aircraft Co.
R-1860	11	Pratt & Whitney Aircraft Co.
R-1690A-2	1	Pratt & Whitney Aircraft Co.
R-975	19	Wright Aeronautical Corp.
R-760-D	14	Wright Aeronautical Corp.
R-975-E	2	Wright Aeronautical Corp.
R-1820-E DD	116	Wright Aeronautical Corp.
R-1820-E G	77	Wright Aeronautical Corp.
R-370	11	Kinner Airplane & Motor Corp.
V-1570	1	Curtiss Aeroplane & Motor Co.
Warner	1	Warner Aircraft Corp.
Bliss Jupiter	2	E. W. Bliss Co.

AERONAUTICAL EDUCATION IN AMERICAN UNIVERSITIES AND COLLEGES

The following table of statistics on aeronautial education in American universities and colleges was compiled from three annual surveys made by the Aeronautical Chamber of Commerce of America, Inc., in 1929, 1930 and 1931 for "The Aircraft Year Book." Those starred (*) offer full courses leading to a degree in aeronautical engineering. Years given are for the twelve-month period beginning with the opening of the spring quarter or semester of one year and lapping over into the next calendar year.

Name of Institution	*Full Time Instructors 1931–32*	*Part Time Instructors 1931–32*	*Students Enrolled 1929–30*	*Students Enrolled 1930–31*	*Students Enrolled 1931–32*
Alabama Polytechnic Institute	3	0	..	118	192
University of Alabama *	3	0	40	132	264
University of Arizona	0	1	20	15	18
Armour Institute of Technology	1	4	50	38	44
Boston University	0	1	..	..	20
Bradley Polytechnic Institute	0	1	32	30	20
University of Buffalo	0	0	80	50	0
California Institute of Technology *	3	4	14	15	15
University of California	0	4	59	80	40
Carnegie Institute of Technology *	0	2	136	130	151
Case School of Applied Science	0	2	..	..	7
Catholic University of America	2	0	4	4	15

Name of Institution	*Full Time Instructors 1931–32*	*Part Time Instructors 1931–32*	*Students Enrolled 1929–30*	*Students Enrolled 1930–31*	*Students Enrolled 1931–32*
University of Cincinnati *	2	5	90	110	224
University of Colorado	0	3	..	..	65
Connecticut Agricultural College	0	1	..	11	15
Cornell University	0	1	..	22	25
College of the City of Detroit	0	1	40	40	96
University of Detroit *	3	3	..	640	588
University of Florida	0	2	23	11	35
Georgia School of Technology *	2	0	..	17	49
Harvard University	0	3	..	..	26
Hiram College (Ohio)	0	1	..	..	50
University of Idaho	0	3	15	15	23
University of Illinois	1	0	35	37	29
Iowa State College	1	2	..	42	73
University of Iowa	0	1	10	..	10
Johns Hopkins University	0	3	..	..	..
University of Kansas	0	2	10	23	19
Kansas State College	0	3	8	10	20
Lake Forest College	0	2	..	36	48
Lehigh University	0	2	..	13	13
Marquette University	0	3	20	54	43
Massachusetts Institute of Technology *	20	3	247	272	286
University of Miami	1	1	46	76	41
University of Michigan *	4	1	..	491	433
University of Minnesota *	2	3	220	237	408
Montana State College	0	1	..	20	11
Morningside College	0	2	8	12	25
University of Nebraska	0	4	10	3	..
University of Nevada	0	1	6	10	3
University of New Hampshire	0	2	..	40	37
New Mexico College of A. & M. A.	0	3	..	8	..
University of New Mexico	0	1	..	..	..
New York University *	15	11	246	194	235
North Carolina State College	0	2	50	61	135
University of North Carolina	1	0	12	32	50
North Dakota Agricultural College	0	1	10	..	..
Ohio State University	2	0	20	15	15
Oklahoma A. & M. College	0	2	..	16	15
University of Oklahoma	0	3	3	20	24
Olivet College	0	2	..	..	..
Oregon University	0	2	35	97	103
Oregon State College	1	2	57	53	41
College of the Pacific	0	3	..	..	12
Penn. State College	0	1	..	12	..
University of Pittsburgh *	1	2	100	175	125
Polytechnic Institute of Brooklyn	0	1	..	..	6
Princeton University	1	0	..	..	16
Purdue University	1	1	48	48	74
Rensselaer Polytechnic Inst	0	5	40	35	..
Rose Polytechnic Institute	0	1	..	14	20
Rutgers University	0	1	..	..	6
University of South Dakota	1	3	18	30	42
University of Southern California *	1	2	20	170	189
Stanford University *	3	0	14	14	14
Swarthmore College	0	2	13	..	6
Syracuse University	1	1	20	40	40
University of Tennessee	0	2	..	..	*x*
A. & M. College of Texas	0	2	..	..	32
Tulane University	0	1	..	7	*y*
United States Military Academy	0	12	..	300	300
United States Naval Academy	4	52	..	447	1,450
University of Utah	0	1	18	15	12
Utah State Agricultural College	0	1	..	29	41
Valparaiso University	0	7	..	..	7
Vanderbilt University	0	3	22	29	..
Virginia Polytechnic Institute	0	2	45	30	30
University of Virginia	0	1	..	10	18
Washington University (St. Louis)	0	5	20	32	48
University of Washington (Seattle)*	3	1	73	95	260
State College of Washington	0	2	15	30	30
Municipal University of Wichita *	1	10	..	..	27
College of William and Mary	2	0	..	..	48
University of Wisconsin	0	5	80	151	18
Worcester Polytechnic Institute *	0	5	15	6	10
University of Wyoming	0	1	10	6	..
Yale University	0	2	16	4	30
Totals	86	247	2,243	5,179	7,020

x Courses introduced in 1932. *y* Courses not given 1931–32.

UNITED STATES CONTRACT AIR MAIL OPERATORS

Route No.		Contractor	One Way Distance
		Colonial Air Transport, Inc. Newark Airport, Newark, N. J.	
A. M.	1	Boston, Mass., via Hartford, Conn., to New York, N. Y., and return.	200 Miles
		American Airways, Inc. 122 East 42nd Street, New York, N. Y.	
A. M.	2	Chicago, Ill., via Springfield, Ill., and St. Louis, Mo., to Memphis, Tenn., and return.....	523 Miles
		National Air Transport, Inc. 5936 So. Cicero Avenue, Chicago, Ill.	
A. M.	3	Chicago, Ill., via Moline, Ill., Kansas City, Mo., Wichita, Kans., Ponca City, Tulsa, and Oklahoma City, Okla., to Fort Worth and Dallas, Tex., and return.....	1,078 Miles
		Western Air Express, Inc. United Airport, Burbank, Calif.	
A. M.	4	Salt Lake City, Utah, via Las Vegas, Nev., and Los Angeles, Calif. to San Diego, Calif., and return.....	782 Miles
		Varney Air Lines, Inc. 38th Floor, LaSalle–Wacker Bldg., Chicago, Ill.	
A. M.	5	Salt Lake City, Utah, via Boise, Idaho, Pasco, Wash., Portland, Ore., and Tacoma, Wash., to Seattle, Wash., and return; and from Pasco to Spokane, Wash., and return	1,017 Miles
C. A. M.	6	**Discontinued**	
C. A. M.	7	**Discontinued**	
		Pacific Air Transport, Inc. 38th Floor, LaSalle-Wacker Bldg., Chicago, Ill.	
A. M.	8	Seattle, Wash., via Tacoma, Wash., Portland and Medford, Ore., San Francisco, Oakland, San Jose, Fresno and Bakersfield, and Los Angeles, Calif., to San Diego, Calif., and return.....	1,238 Miles
		Northwest Airways, Inc. Municipal Airport, St. Paul, Minn.	
A. M.	9	Chicago, Ill., via Milwaukee and La Crosse, Wis., and Rochester and Minneapolis, Minn., to St. Paul, Minn.; St. Paul via Minneapolis, Minn., and Fargo and Grand Forks to Pembina, N. Dak., and return; with spur lines from Milwaukee via Fond du Lac, Oshkosh and Appleton to Green Bay, Wis., and return; from St. Paul via Minneapolis to Duluth, Minn., and return; from Chicago via Elgin and Rockford, Ill., and Janesville and Beloit, Wis., to Madison, Wis., and return, and from Fargo via Valley City, Jamestown and Bismarck to Mandan, N. Dak., and return	1,620 Miles
C. A. M.	10	**Discontinued**	

Pennsylvania Air Lines, Inc.

724 Oliver Bldg., Pittsburgh, Pa.

A. M.	11	Cleveland, Ohio, via Akron, Ohio, and McKeesport and Pittsburgh, Pa., to Washington, D. C., and return.....	326 Miles

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Western Air Express, Inc.

United Airport, Burbank, Calif.

A. M.	12	Cheyenne, Wyo., via Denver, Colorado Springs, Pueblo and Trinidad, Colo., and Santa Fe, to Albuquerque, N. Mex., and return; and from Pueblo, Colo., to Amarillo, Tex., and return.....	771 Miles

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C. A. M.	13	**Discontinued**	

C. A. M.	14	**Cancelled**	

C. A. M.	15	**Discontinued**	

A. M.	16	**Consolidated with Route A. M.-20**	

National Air Transport, Inc.

5936 So. Cicero Avenue, Chicago, Ill.

A. M.	17	New York, N. Y., via Cleveland and Toledo, Ohio, to Chicago, Ill., and return.....	736 Miles

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Boeing Air Transport, Inc.

38th Floor, LaSalle-Wacker Bldg., Chicago, Ill.

A. M.	18	Chicago, Ill., via Iowa City and Des Moines, Iowa; Omaha, Lincoln and North Platte, Nebr.; Cheyenne and Rock Springs, Wyo.; Salt Lake City, Utah; Elko and Reno, Nev.; and Sacramento, to San Francisco and Oakland, Calif., and return.....	2,027 Miles

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Eastern Air Transport, Inc.

Sperry Building, Manhattan Bridge Plaza, Brooklyn, N. Y.

A. M.	19	New York, N. Y., via Camden, N. J.; Philadelphia, Pa.; Baltimore, Md.; Washington, D. C.; Richmond, Va.; Greensboro and Charlotte, N. C.; and Spartanburg and Greenville, S. C., to Atlanta, Ga., and return; Atlanta via Macon, Ga.; Jacksonville, Daytona Beach and West Palm Beach to Miami, Fla., and return; with spur lines from Richmond, Va., via Raleigh, N. C., Florence and Charleston, S. C., and Savannah, Ga., to Jacksonville, Fla., and return; from Daytona Beach via Orlando and Tampa to St. Petersburg, Fla., and return, and from New York, N. Y., to Atlantic City, N. J., and return.....	2,254 Miles

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American Airways, Inc.

122 East 42nd Street, New York, N. Y.

A. M.	20	New York, N. Y., via Albany, Schenectady, Utica, Rome, Syracuse, Rochester and Buffalo, N. Y.; Cleveland, Akron, Columbus, Dayton and Cincinnati, Ohio; Louisville, Ky.; Nashville and Memphis, Tenn.; Little Rock, Ark.; Texarkana, Ark., Tex., and Dallas, Tex., to Fort Worth, Tex., and return.....	1,793 Miles

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Texas Air Transport, Inc.

Love Field, Dallas, Texas

A. M. 21 Dallas, via Fort Worth, Waco, Houston, to Galveston, Texas, and return..... 333 Miles

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Texas Air Transport, Inc.

Love Field, Dallas, Texas

A. M. 22 Dallas, via Fort Worth, Waco, Austin, and San Antonia, Texas, to Brownsville, Texas, and return..... 547 Miles

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Gulf Coast Airways, Inc.

P. O. Box 2400, Dallas, Texas

A. M. 23 Atlanta, Ga., via Birmingham and Mobile, Ala., to New Orleans, La., and return..... 488 Miles

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Embry-Riddle Company

Lunken Airport, Cincinnati, Ohio

A. M. 24 Chicago, Ill., via Indianapolis, Ind., to Cincinnati, Ohio, and return 274 Miles

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A. M. 25 **Consolidated with Route A. M. 19**

National Parks Airways, Inc.

Salt Lake City, Utah

A. M. 26 Great Falls, via Helena and Butte, Mont., Pocatello, Idaho, and Ogden, Utah, to Salt Lake City, Utah, and return..... 509 Miles

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Transamerican Airlines Corp.

2011 Union Trust Bldg., Cleveland, Ohio

A. M. 27 Bay City, via Saginaw, Flint, and Lansing, to Kalamazoo, Mich.; Pontiac, via Detroit, Ann Arbor, Jackson, Battle Creek, to Kalamazoo, Mich.; Muskegon via Grand Rapids, to Kalamazoo, Mich.; and from Kalamazoo, Mich., via South Bend and Mishawaka, Ind., to Chicago, Ill., and return, with a spur line from Bay City via Saginaw, Pontiac, Detroit and Toledo, to Cleveland, Ohio, and return; a spur line from Pontiac via Lansing and Grand Rapids to Muskegon, Mich., and return, and a spur line from South Bend (Mishawaka) to Fort Wayne, Ind., and return. Direct service is maintained between Chicago and Detroit and between Cleveland and Detroit..... 1,331 Miles

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A. M. 28 **Consolidated with Route A. M. 30**

Gulf Coast Airways, Inc.

P. O. Box 2400, Dallas, Texas

A. M. 29 New Orleans, La., via Beaumont, Tex., to Houston, Tex., and return 325 Miles

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American Airways, Inc.

122 East 42nd Street, New York, N. Y.

A. M.	30	Omaha, Nebr., via St. Joseph, Kansas City and St. Louis, Mo., to Evansville, Ind., and return; Chicago, Ill., via Terre Haute and Evansville, Ind., and Nashville and Chattanooga, Tenn., to Atlanta, Ga., and return	1,208 Miles

United States Airways, Inc.

207 Midland Bldg., Kansas City, Mo.

A. M.	30 (Part)	Denver, Colo., via Salina, Kansas, to Kansas City, Mo., and return	544 Miles

C. A. M.	31	**Discontinued**	

C. A. M.	32	**Consolidated**	

American Airways, Inc.

122 East 42nd Street, New York, N. Y.

A. M.	33	Atlanta, Ga., via Birmingham, Ala.; Jackson, Miss.; Monroe and Shreveport, La.; Dallas, Fort Worth, Abilene, Big Spring and El Paso, Tex.; Douglas, Tucson and Phoenix, Ariz., to Los Angeles, Calif., and return; with a spur line from Jackson, Miss., to Memphis, Tenn., and from Jackson, Miss., to New Orleans, La., and return; from Big Spring via San Angelo to San Antonio, Tex., and return; and from Dallas and Fort Worth via Wichita Falls, to Amarillo, Tex., and return	3,052 Miles

Western Air Express, Inc.

United Airport, Burbank, Calif.

A. M.	33 (Part)	El Paso, Tex., to Albuquerque, N. Mex., and return	219 Miles

Transcontinental and Western Air, Inc.

Graybar Building, New York, N. Y.

A. M.	34	New York, N. Y., via Philadelphia, Harrisburg, and Pittsburgh, Pa.; Columbus, Ohio; Indianapolis, Ind.; St. Louis and Kansas City, Mo.; Wichita, Kans.; Amarillo, Tex.; Albuquerque, N. Mex.; Winslow, Ariz., to Los Angeles, Calif., and return, and from St. Louis, Mo., via Springfield, Mo., and Tulsa and Oklahoma City, Okla., to Amarillo, Texas, and return	3,339 Miles

FOREIGN AIR MAIL ROUTES

U. S. Post Office Department

Route No.	*Contractor*	*One Way Distance*

Colonial Division

American Airways

122 East 42nd Street, New York, N. Y.

F. A. M.	1	New York, N. Y., via Albany, N. Y., to Montreal, Canada	334 Miles

Pan American Airways, Inc.

122 East 42nd Street, New York, N. Y.

F. A. M. 4 Miami, Florida, to Havana, Cuba, one way. (Cuban mail carried on return trip) ..... 251 Miles

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Pan American Airways, Inc.

122 East 42nd Street, New York, N. Y.

F. A. M. 5 Miami, Florida, to Cristobal, Canal Zone, via Central America ... 2,220.5 Miles
Miami, Florida, to Barranquilla, Colombia ..... 1,211 Miles
Miami, Florida, to Barranquilla, Colombia, to Cristobal, Canal Zone ..... 1,667.5 Miles
Miami, Florida, to Barranquilla, Colombia, to Port-of-Spain, Trinidad ..... 2,380.5 Miles

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Pan American Airways, Inc.

122 East 42nd Street, New York, N. Y.

F. A. M. 6 Miami, Florida, to Paramaribo, Dutch Guiana ..... 2,546 Miles

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Pan American Airways, Inc.

122 East 42nd Street, New York, N. Y.

F. A. M. 7 Miami, Florida, to Nassau, Bahama Islands (Bahamas mail carried on return trip) ..... 193.5 Miles
(Service suspended July 1–December 31)

Pan American Airways, Inc.

122 East 42nd Street, New York, N. Y.

F. A. M. 8 Brownsville, Texas, via Tampico, Mexico, to Mexico City, Mexico 501 Miles
Brownsville, Texas, via Tampico, Veru Cruz, San Geronimo and Tapachula, Mexico; and Guatemala City, Guatemala, to San Salvador, El Salvador, and return ..... 1,256 Miles

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Pan American-Grace Airways, Inc.

122 East 42nd Street, New York, N. Y.

F. A. M. 9 Cristobal, Canal Zone, to Montevideo, Uruguay ..... 4,545.5 Miles
(Connects at Cristobal with Route F. A. M. 5)

Pan American Airways, Inc.

122 East 42nd Street, New York, N. Y.

F. A. M. 10 Paramaribo, Dutch Guiana, to Buenos Aires, Argentina ..... 4,840.5 Miles
(Connects at Paramaribo with Route F. A. M. 6)

Pan American Airways, Inc.

122 East 42nd Street, New York, N. Y.

F. A. M. 12 Bangor, Maine, to Halifax, Nova Scotia ..... 281 Miles

(Discontinued for the winter)

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; Cents
Argentina	$ .55
Bahamas	.05
Barbados	.20
Bolivia (by ordinary means from Arequipa, Peru)	.40
Brazil	.50
Canal Zone	.20
Chile	.50
Colombia	.35
Costa Rica	.20
Cuba	.05
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 of	.15
Jamaica	.10
Leeward Islands:	
Anguilla, Antigua, Barbuda, Dominica, Montserrat, Nevis, Redonda, St. Christopher or St. Kitts	.20
British Virgin Islands	.10
Martinique	.20
Nicaragua	.15
Panama	.20
Paraguay (by ordinary means from Buenos Aires)	.55
Peru	.40
Porto Rico	.10
Salvador (El)	.15
Trinidad	.20
Uruguay	.55
Venezuela	.30
Virgin Islands, U. S.	.10
Windward Islands:	
Grenada, Grenadines, St. Lucia, St. Vincent	.20

The rate (postage plus fee for air service) to CANADA is 6 cents for the first ounce or fraction and 10 cents for each additional ounce or fraction, and to MEXICO it is 5 cents for the first ounce or fraction, and 10 cents for each additional ounce or fraction.

The above rates include dispatch by the United States domestic air routes, where available, as well as by the international routes, and in the case of articles for delivery in Canada, Colombia and Mexico, dispatch by the domestic air routes of Canada, Colombia and Mexico respectively where available.

Strength of the Army Air Corps

Dec. 31, 1931

Commissioned Officers		1,373
Student Officers	98	
Pilots	1,243	
Enlisted men (includes flying cadets)		13,524
Civilians		3,515

Strength of Air Corps Organized Reserves

Officers	5,972
Pilots and Observers	3,894
Number of Civilian Employees, Dec. 31, 1931	3,515

Army Flying Time and Distances

1931

Heavier-than-air	396,961	hours
Lighter-than air	2,572	hours
Total flying time	399,533	hours
Miles flown	44,000,000	miles

Trend of Aircraft Accident Rates

In the U. S. Army Air Corps

Fiscal Years	*1921*	*1922*	*1923*	*1924*	*1925*	*1926*	*1927*	*1928*	*1929*	*1930*	*1931*
Aircraft hours	77,351	65,214	65,750	97,834	150,319	158,402	140,402	182,903	263,381	325,224	396,961
Fatal accidents	45	24	33	23	29	27	28	25	42	37	21
Rate per 1000 hours	.582	.368	.502	.235	.193	.171	.199	.137	.230	.114	.053
Hours per fatal accident	1,718	2,714	1,992	4,250	5,180	5,865	5,030	7,320	4,355	8,785	18,900
All accidents	361	330	283	275	311	334	227	249	390	468	456
Rate per 1000 hours	4.67	5.06	4.31	2.81	2.07	2.11	1.61	1.36	1.48	1.44	1.15
Hours per accident	214	198	232	356	483	474	620	734	675	695	870
Ratio—accidents to fatal accidents	1 to 8	1 to 13.8	1 to 8.6	1 to 12.0	1 to 10.7	1 to 12.4	1 to 8.1	1 to 10.0	1 to 9.3	1 to 12.6	1 to 21.7

Strength of Naval Aviation

Fiscal Years 1922–1931

Officers Attached to Aviation

	June 30, 1922	*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*
Naval aviators	314	326	328	382	426	472	466	520	614	737
Student naval aviators	61	33	47	35	71	28	73	116	184	149
Line, ground	105	91	42	17	14	12	24	54*	69	254
Staff, ground	115	134	101	99	129	138	128	101*	98	120
Naval observers	.....	6	5	5	11	12	11	11	9	5
Student naval observers	.....	.....	.....	.....	.....	.....	2	.....	.....	.....
Officers having flight orders	.....	10	13	16	19	15	33	41	45	48
Total	595	600	536	554	670	677	737	843	1,019	1,313

* Approximate figures.

Enlisted Men on Duty

	June 30, 1922	*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*
Aviation ratings	2,209	1,612	1,788	1,711	1,722	2,092	2,785	3,067	2,895	3,136
General service ratings	2,422	2,104	1,814	1,597	2,155	2,333	8,636	8,575	7,874	9,503
Total	4,631	3,716	3,602	3,308	3,877	4,425	11,421	11,642	10,769	12,639

Marine Corps Aviation

	Officers	*Enlisted Men*	*Total*		*Officers*	*Enlisted Men*	*Total*
Pilots	98	33	131	Flight orders	7	157	164
Student pilots	10	0	10	Nonflyers	8	842	850
Observers	0	0	0				
Student observers	0	0	0	Total	123	1,032	1,155

Navy Flying Time and Distances

Heavier-than-air	272,455 hours
Lighter-than-air	3,134 hours
Total flying time	275,589 hours
Miles flown	28,889,835 miles

PART V

Aeronautical Directory and Trade Index

Aeronautical Directory

Trade Index

AERONAUTICAL CHAMBER OF COMMERCE OF AMERICA, INC.

10 East Fortieth Street, New York

Officers 1931

President ..... Charles L. Lawrance
Vice President, Northeast Division ..... Geoffrey S. Childs
Vice President, Southeast Division ..... Thomas B. Doe
Vice President, East Central Division ..... Clayton J. Brukner
Vice President, North Central Division ..... E. L. Cord
Vice President, Northwest Division ..... P. G. Johnson
Vice President, Southwest Division ..... H. M. Hanshue
Secretary ..... William B. Mayo
Treasurer ..... Jerome C. Hunsaker
General Manager and Assistant Secretary ..... Luther K. Bell

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R. B. Barnitz
P. R. Beasley
L. H. Brittin
C. J. Brukner
J. R. Cautley
Reed M. Chambers
G. S. Childs
F. G. Coburn
C. H. Colvin
E. L. Cord
Thomas B. Doe
Carl F. Egge
J. R. Fitzpatrick
G. B. Grosvenor
H. M. Hanshue
J. C. Hunsaker
P. G. Johnson
C. L. Lawrance
Grover Loening
L. H. Merrill
R. B. C. Noorduyn
J. M. Schoonmaker, Jr.
J. A. B. Smith
J. T. Trippe
G. W. Vaughan
George S. Wheat

The Council

(Past Presidents)

S. S. Bradley
L. D. Gardner
Paul Henderson
C. L. Lawrance
Grover Loening
F. B. Rentschler
F. H. Russell
I. M. Uppercu

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Charles L. Lawrance, Chairman; C. H. Colvin, G. B. Grosvenor, H. M. Hanshue, J. C. Hunsaker, J. A. B. Smith, G. S. Wheat.

Airplane Manufacturers Section

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Airplane Engine Manufacturers Section

Don L. Brown, Chairman; W. H. Beals, Louis Chevrolet, Robert Insley, Edward Macauley, Robert Porter, Guy W. Vaughan, W. A. Warner.

Airship Manufacturers Section

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Aircraft and Engine Manufacturers

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Aircraft Development Corporation, Detroit, Mich.
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Allison Engineering Company, Indianapolis, Ind.
American Aeronautical Corporation, Port Washington, N. Y.
American Airplane & Engine Corporation, Farmingdale, N. Y.
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B/J Aircraft Corporation, Baltimore, Md.
Bellanca Aircraft Corporation, New Castle, Del.
Bird Aircraft Corporation, Brooklyn, N. Y.
E. W. Bliss Company, Brooklyn, N. Y.
Boeing Airplane Company, Seattle, Wash.
Buhl Aircraft Company, Detroit, Mich.
Cessna Aircraft Corporation, Wichita, Kans.
Continental Aircraft Engine Company, Detroit, Mich.
Curtiss Aeroplane & Motor Company, Buffalo, N. Y.
Curtiss-Wright Airplane Company, Robertson, Mo.
Detroit Aircraft Corporation, Detroit, Mich.
Fairchild Aviation Corporation, New York, N. Y.
Ford Motor Company, Dearborn, Mich.
General Aviation Manufacturing Corporation, Dundalk, Md.

Goodyear-Zeppelin Corporation, New York, N. Y.
Great Lakes Aircraft Corporation, Cleveland, Ohio
Grover Loening Aircraft Company, Inc., Garden City, L. I., N. Y.
Hall-Aluminum Aircraft Corporation, Buffalo, N. Y.
Inland Aviation Company, Kansas City, Kans.
Kellett Aircraft Corporation, Philadelphia, Pa.
Keystone Aircraft Corporation, Bristol, Pa.
Kinner Airplane & Motor Corporation, Glendale, Calif.
Lawrance Engineering & Research Corporation, New York, N. Y.
Light Manufacturing & Foundry Company, Pottstown, Pa.
Lycoming Manufacturing Company, Williamsport, Pa.
Monocoupe Corporation, Robertson, Mo.
Nicholas-Beazley Airplane Company, Inc., Marshall, Mo.
Northrop Aircraft Corporation, Burbank, Calif.
Packard Motor Car Company, Detroit, Mich.
Pitcairn Aircraft, Inc., Willow Grove, Pa.
The Pratt & Whitney Aircraft Company, East Hartford, Conn.
Rearwin Airplanes, Inc., Kansas City, Kans.
St. Louis Aircraft Corporation, St. Louis, Mo.
Sikorsky Aviation Corporation, Bridgeport, Conn.
Solar Aircraft Company, San Diego, Calif.
Spartan Aircraft Company, Tulsa, Okla.
Stearman Aircraft Company, Wichita, Kans.
Stinson Aircraft Corporation, Wayne, Mich.
Stout Engineering Laboratories, Inc., Dearborn, Mich.
Szekely Aircraft & Engine Company, Holland, Mich.
Verville Aircraft Company, Detroit, Mich.
Chance Vought Corporation, Hartford, Conn.
Waco Aircraft Company, Troy, Ohio.
Warner Aircraft Corporation, Detroit, Mich.
Wright Aeronautical Corporation, Paterson, N. J.

Air Transport Operators

American Airways, Inc., New York, N. Y.
Boeing Air Transport, Inc., Chicago, Ill.
Bowen Air Lines, Inc., Ft. Worth, Texas.
Century Air Lines, Inc., Chicago, Ill.
Eastern Air Transport, Inc., Brooklyn, N. Y.
Ludington Airlines, Inc., South Washington, Va.
National Air Transport, Inc., Chicago, Ill.
National Parks Airways, Inc., Salt Lake City, Utah.
Northwest Airways, Inc., St. Paul, Minn.
Pacific Air Transport, Chicago, Ill.
Pan American Airways, Inc., New York, N. Y.
Pennsylvania, Airlines, Pittsburgh, Pa.
Rapid Air Lines Corporation, Omaha, Nebr.
Thompson Aeronautical Corporation, Cleveland, Ohio
Transcontinental & Western Air, Inc., New York, N. Y.
Varney Airlines, Chicago, Ill.
Western Air Express, Inc., Burbank, Calif.

Aeronautical Exporters

Curtiss-Wright Export Corporation, New York, N. Y.
United Aircraft Exports, Inc., New York, N. Y.

Manufacturers of Accessories, Materials and Supplies

A. C. Spark Plug Company, Flint, Mich.
Aero Supply Manufacturing Co., Inc., Corry, Pa.
Aircraft Radio Corporation, Boonton, N. J.
Air Reduction Sales Co., New York, N. Y.
Aircraft Products Corporation of America, Detroit, Mich.
Airplane Wheel & Rim Corporation, Binghampton, N. Y.
Aluminum Company of America, Pittsburgh, Pa.
American Askania Corporation, Houston, Texas.
American Gas Accumulator Company, Elizabeth, N. J.
American Telephone & Telegraph Company, New York, N. Y.
Aqua Systems, Inc., New York, N. Y.
Austin Company, The, Cleveland, Ohio.
"Automatic" Sprinkler Corporation of America, Cleveland, Ohio.
B. G. Corporation, The, New York, N. Y.
Balsa Wood Company, Inc., Brooklyn, N. Y.
Seymour J. Baum, Inc., Elmhurst, L. I., N. Y.
Bendix Brake Company, South Bend, Ind.
Bendix Stromberg Carburetor Company, South Bend, Ind.
Berry Brothers, Inc., Detroit, Mich.
Black & Decker Manufacturing Company, Towson, Md.
Bohn Aluminum & Brass Corporation, Detroit, Mich.
Breeze Corporations, Inc., Newark, N. J.
Brewster & Company, Long Island City, N. Y.
Canton Drop Forging & Manufacturing Co., Canton, Ohio.
Carpenter Steel Company, The, Reading, Pa.
Champion Spark Plug Co., Toledo, Ohio.
Cleveland Pneumatic Tool Company, Cleveland, Ohio.
Detroit Steel Products Company, Detroit, Mich.
Eastman Kodak Company, Rochester, N. Y.
Eclipse Aviation Corporation, E. Orange, N. J.
Edo Aircraft Company, College Point, L. I., N. Y.
Egyptian Lacquer Manufacturing Company, Inc., New York, N. Y.
Electric Storage Battery Company, Philadelphia, Pa.
Elgin National Watch Company, Elgin, Ill.
Ex-Cell-O Aircraft & Tool Corporation, Detroit, Mich.
Federal Aviation Corporation, New York, N. Y.
Firestone Tire & Rubber Company, The, Akron, Ohio.
Flexlume Corporation, Buffalo, N. Y.
Follmer, Clogg & Co., Lancaster, Pa.
General Electric Company, Schenectady, N. Y.

General Tire & Rubber Company, Akron, Ohio.
Gilbert & Barker Manufacturing Company, Springfield, Ohio.
B. F. Goodrich Company, The, Akron, Ohio.
Goodyear Tire & Rubber Co., Inc., Akron, Ohio.
Gruss Air Spring Company of America, Los Angeles, Calif.
Hamilton Standard Propeller Corporation, Homestead, Pa.
Stewart Hartshorn Company, New York, N. Y.
Haskelite Manufacturing Corporation, Chicago, Ill.
Hill Aircraft Streamliners Company, Cincinnati, Ohio.
Hurley-Townsend Corporation, New York, N. Y.
Imperial Brass Manufacturing Company, Chicago, Ill.
International Flare-Signal Company, Tippecanoe City, Ohio.
Irving Air Chute Company, Inc., Buffalo, N. Y.
Johnson Airplane & Supply Company, Dayton, Ohio.
Walter Kidde & Co., Inc., New York, N. Y.
Leece-Neville Company, The, Cleveland, Ohio.
Linde Air Products, The, New York, N. Y.
McKay Company, The, Pittsburgh, Pa.
Macwhyte Company, Kenosha, Wisc.
Main Aeronautics Company, Pittsburgh, Pa.
Meisel Press Manufacturing Company, Boston, Mass.
E. B. Meyrowitz, Inc., New York, N. Y.
Moto Meter Gauge & Equipment Corporation, Toledo, Ohio.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Ohio Seamless Tube Company, The, Shelby, Ohio.
Parker Appliance Company, Cleveland, Ohio.
Pioneer Instrument Company, Brooklyn, N.Y.
Pyle-National Company, The, Chicago, Ill.
Radiomarine Corporation of America, New York, N. Y.
John A. Roebling's Sons Company, Trenton, N. J.
Russell Manufacturing Company, Middleton, Conn.
SKF Industries, Inc., New York, N. Y.
Scintilla Magneto Company, Sidney, N. Y.
Sky Specialties Corporation, Detroit, Mich.
A. G. Spalding & Bros., New York, N. Y.
Sperry Gyroscope Company, Inc., Brooklyn, N. Y.
Steel & Tubes, Inc., Cleveland, Ohio.
Summerill Tubing Company, Bridgeport, Pa.
Switlik Parachute & Equipment Company, Trenton, N. J.
Thompson Products, Inc., Cleveland, Ohio.
Thurston Cutting Corporation, New York, N. Y.
Timken Roller Bearing Company, Canton, Ohio.
Titanine, Inc., Union, N. J.
Triangle Parachute Company, Cincinnati, Ohio.
Tubular Rivet & Stud Company, Boston, Mass.
United Aircraft Products, Inc., Dayton, Ohio.
United States Rubber Company, Detroit, Mich.
Vellumoid Company, The, Worcester, Mass.
Viking Corporation, The, Hastings, Mich.
Wellington Sears &Company, New York, N. Y.
Western Electric Company, Inc., New York, N. Y.
Westinghouse Electric & Manufacturing Company, Cleveland, Ohio.
Westinghouse Lamp Company, Bloomfield, N. J.
Wood & Spencer Company, The, Cleveland, Ohio.
Wyman-Gordon Company, Worcester, Mass.

Aircraft Fuels and Lubricants

Cities Service Company, New York, N. Y.
Gulf Refining Company, Pittsburgh, Pa.
Kendall Refining Company, Bradford, Pa.
Richfield Oil Company of California, Los Angeles, Calif.
Richfield Oil Corporation of N. Y., New York, N. Y.
Shell Petroleum Corporation, St. Louis, Mo.
Sinclair Refining Company, New York N. Y.
Standard Oil Company of Calif., San Francisco, Calif.
Standard Oil Company of Indiana, Chicago, Ill.
Standard Oil Company of Louisiana, New Orleans, La.
Standard Oil Company of New Jersey, New York, N. Y.
Standard Oil Company of N. Y., New York, N. Y.
Texas Company, The, New York, N. Y.
Vacuum Oil Company, New York, N. Y.

Airports

Agawam Airport, Springfield, Mass.
Boeing Field, Seattle, Wash.
Central Airport, Inc., Camden, N. J.
Cleveland Municipal Airport, Cleveland, Ohio.
Concordia Municipal Airport Company, Concordia, Kans.
Detroit City Airport, Detroit, Mich.
Ft. Wayne Board of Aviation Commissioners, Ft. Wayne, Ind.
Grand Central Air Terminal, Los Angeles, Calif.
Hartford Municipal Airport, Hartford, Conn.
Indianapolis Municipal Airport, Indianapolis, Ind.
Kansas City Municipal Airport, Kansas City, Mo.
Kellogg Airport Association, Battle Creek, Mich.
Los Angeles Airport, Inglewood, Calif.
Los Angeles Metropolitan Airport, Van Nuys, Calif.
Mercer County Airport, Trenton, N. J.
Miami, City of, Miami, Fla.
Municipal Airport, Birmingham, Ala.
Newark, N. J., Department of Public Affairs, Newark, N. J.
New York City Airport, Flushing, N Y.
Orlando, City of, Orlando, Fla.
Roosevelt Field, Inc., Mineola, L. I., N. Y.
Sacramento Municipal Airport, Sacramento, Calif.
St. Paul Municipal Airport, St. Paul, Minn.
San Francisco Bay Airdome, Inc., Alameda, Calif.
San Francisco Municipal Airport, San Bruno, Calif.
Tacoma Field, Tacoma, Wash.
Tulsa Municipal Airport, Tulsa, Okla.
United Airports Company of California, Ltd., Burbank, Calif.
Utica, City of, Utica, N. Y.
Wayne County Airport, Detroit, Mich.
Westchester Airport Corp., Armonk, N. Y.

Aerial Service

Abrams Aerial Survey Corp., Lansing, Mich.
Airtech Flying Service, Ltd., San Diego, Calif.
American School of Welding, Inc., St. Louis, Mo.
Associated Aircraft, Inc., Chicago, Ill.
Bredouw-Hilliard Aeromotive Corp., Kansas City, Mo.
California Aerial Transport, Inglewood, Calif.
California Panel & Veneer Company, Los Angeles, Calif.
Central Air Terminal Company, Chicago, Ill.
Eastern Aeronautical Corp., Newark, N. J.
Fogg, R. S., Concord, N. H.
Giro Sales & Service, Inc., Garden City, L. I., N. Y.
Daniel Guggenheim School of Aeronautics, Atlanta, Ga.
Inter-Island Airways, Ltd., Honolulu, T. H.
Jefferson Airways, Inc., Jefferson City, Mo.
F. Myrten Johnson, Alameda, Calif.
Knickerbocker Aviation, Inc., Flushing, N. Y.
Ward S. Lent, Poughkeepsie, N. Y.
Floyd J. Logan Aviation Company, Cleveland, Ohio.
Edward Lowe Motors Company, San Francisco, Calif.
Macbeth Brothers, Dallas, Texas.
Michigan Aeronautical Corporation, Ypsilanti, Mich.
Mid West Airways Corp., Aurora, Ill.
Midwest Airways, Inc., Cudahy, Wisc.
Nepco Tri-City Flying Service, Inc., Wisconsin Rapids, Wisc.
Newark Air Service, Inc., Newark, N. J.
Northwest Air Service, Inc., Seattle, Wash.
Allen Nutter, Redlands, Calif.
Pacific Aeromotive Corp., Inglewood, Calif.
Pal-Waukee Airports, Inc., Chicago, Ill.
Parks Air College, Inc., E. St. Louis, Ill.
George M. Pynchon, Jr., Inc., New York, N. Y.
Rankin School of Flying, Portland, Ore.
Rogers Aircraft Company, Inc., Burbank Calif.
Skyways, Inc., Boston, Mass.
Skyways, Inc., Cleveland, Ohio.
Starlighters, Inc., Philadelphia, Pa.
Stewart Technical Trade School, New York, N. Y.
Utah Pacific Airways, Inc., Ogden, Utah.
Von Hoffmann Aircraft Company, Robertson, Mo.
George A. Wies, Inc., Garden City, L. I., N. Y.
Wings Corporation of Philadelphia, Blue Bell, Pa.
Wright & Essenwein, Inc., Buffalo, N. Y.
Yellow Cab Airways, Inc., Des Moines, Ia.

Aeronautical Engineers

A. A. Bigelow & Company, Inc., New York, N. Y.
Day & Zimmerman, Philadelphia, Pa.
B. Russell Shaw Company, The, St. Louis, Mo.

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Air Associates, Inc., Garden City, L. I., N. Y.
Air Transport Equipment, Inc., Garden City, L. I., N. Y.
Airport Advertising, Inc., New York, N. Y.
Barr Shipping Corporation, New York, N. Y.
Beech-Nut Packing Company, Canajoharie, N. Y.
Bigham, Englar, Jones & Houston, New York, N. Y.
Brenack, Inc., Brooklyn, N. Y.
Champion Model Aircraft Supply, Chillicothe, Ohio.
Cram's Automotive Reports, Inc., Detroit, Mich.
Cutajar & Provost, Inc., New York, N. Y.
Fishler, Farnsworth & Company, Inc., New York, N. Y.
Thayer P. Gates, New York, N. Y.
Globe Mail Service, Inc., New York, N. Y.
Harwen Products Corporation, New York, N. Y.
International Seed Service Company, Inc., New York, N. Y.
Johnson Company, New York, N. Y.
Junior Air Service of America, Inc., Chicago, Ill.
Loomis, Suffern & Fernald, New York, N. Y.
Luke, Banks & Weeks, New York, N. Y.
Marketing Associates, Inc., Cleveland, Ohio.
McCann-Erikson, Inc., New York, N. Y.
National Credit Office, Inc., Cleveland, Ohio.
Nott Plant Company, Meriden, Conn.
Pedlar & Ryan, Inc., New York, N. Y.
Poirier Aircraft Model Company, East Hartford, Conn.
Queens Boxing Corporation, Long Island City, N. Y.
Rand McNally & Company, Chicago, Ill.
Robbins Company, The, New York, N. Y.
Ronald Press, The, New York, N. Y.
Universal Accounting Systems, Inc., Washington, D. C.
Willson Flying Corporation, New York, N. Y.

Aero Insurers and Financial Institutions

Aero Underwriters Corporation, New York, N. Y.
Aetna Casualty & Surety Co., Hartford, Conn.
Air Investors, Inc., New York, N. Y.
Associated Aviation Underwriters, New York, N. Y.
Automobile Insurance Co., The, Hartford, Conn.
Crum & Forster, New York, N. Y.
Hartford Accident & Indemnity Co., Hartford, Conn.
Maryland Casualty Company, Baltimore, Md.
National Aviation Corporation, New York, N. Y.
New Amsterdam Casualty Company, Baltimore, Md.
Pacific Fire Insurance Company, New York, N. Y.
Phoenix Insurance Company, The, Hartford, Conn.
St. Paul Fire & Marine Insurance Co., St. Paul Minn.
Travelers Insurance Company, Hartford, Conn.
United States Aviation Underwriters, Inc., New York, N. Y.

Aeronautical Periodicals and Trade Papers

Aero Digest, New York, N. Y.
Airports, Flushing, L. I., N. Y.
Airport Directory, New York, N. Y.
Aviation, New York, N. Y.
Aviation Engineering, New York, N. Y.
Model Airplane News, New York, N. Y.
National Glider & Airplane News, New York, N. Y.
Pacific Flyer, San Francisco, Calif.
Popular Science Monthly, New York, N. Y.
Southern Aviation, Atlanta, Ga.
U. S. Air Services, Washington, D. C.
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Aeronautical Engineering, American Society of Mechanical Engineers, 29 West 39th Street, New York, N. Y.
Air Law Review, Washington Square East, New York, N. Y.
Aircraft Age, 113 East 31st Street, Kansas City, Mo.
Airports and Airlines, Bank of Manhattan Building, Flushing, L. I., N. Y.
Aviation, 330 West 42nd Street, New York, N. Y.
Aviation Engineering, Bank of Manhattan Building, Flushing, L. I., N. Y.
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National Aeronautic Magazine, National Aeronautic Association, Du Pont Circle, Washington, D. C.
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Official Aviation Guide of the Airways, 105 West Adams Street, Chicago, Ill.
Pacific Flyer, 526 Financial Center Building, San Francisco, Calif.
Popular Aviation, 608 S. Dearborn Street, Chicato, Ill.
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ARGENTINA

Aviacion, Calle Jose Pedro Varela, 3762, Buenos Aires.
Boletin del Aero-Club Argentino, Avenida de Mayo, 646, Buenos Aires.

AUSTRALIA

Aircraft, 62 Flinders Street, Melbourne, C. I.
Flying, Box 2597 NN, G.P.O., Sydney, N.S.W.

AUSTRIA

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BRAZIL

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CZECHOSLOVAKIA

Flugwesen, Konviktská 22, Prague I.
Letec, Dejvice, Palác Bajkal, Prague XIX.
Letectvi, Celetná 13, Prague II.
Le Mois Aéronautique Tchecoslovaque, Celetná 13, Prague I.

DENMARK

Flyv, Vesterbrogade 60, Copenhagen.

FINLAND

Aero, Ilmavoimien Esikunta, Helsingfors.

FRANCE

L'Aéroauto, 139 Quai d'Orsay, Paris.
L'Aéronautique, 55 Quai des Grands-Augustins, Paris.
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Les Ailes, 65 Faubourg Poissonniére, Paris 9e.
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Bulletin de la Chambre Syndicale des Industries Aéronautique, 4 Rue Galilée, Paris.
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Luftschau, Blumes Hof 17, Berlin W. 35.
Luftwacht, Blumes Hof 17, Berlin W. 35.
Mitteldeutsche Luftfahrt, Laasenerstrasse 29, Gera.
Nachrichten für Luftfahrer, Wilhelmstr. 86, Berlin W. 8.
Revue der Luftfahrt, Belle-Alliancestrasse 100, Berlin S. W. 61.
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Zeitschrift für Flugtechnik und Motorluftschiffahrt, Gluckstr. 8, Munich.

GREAT BRITAIN

Aerial A. B. C., 4 Duke Street, Adelphi, London W. C. 2.
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Flight, 36 Great Queen Street, Kingsway, London W. C. 2.
Journal of the Royal Aeronautical Society, 7 Albemarle Street, London W. 1.
Royal Air Force Quarterly, 2 Amen Corner, London E. C. 4.
Sailplane and Glider, Cannon House, Pilgrim St., Ludgate Circus, London E. C. 4.

HUNGARY

Aviatika, Lónyay-utca 17, Budapest IX.

INDIA

Indian Aviation, Stephen House, 5 Dalhousie Square East, Calcutta.

ITALY

Aeronautica, Via Gesu 6, Milan.
L'Aerotecnica, Via delle Coppelle 35, Rome.
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Il Diritto Aeronautico, Piazza Foro Traiano 1, Rome.
Notiziario Tecnico di Aeronautica, Via Agostina De Pretis 45–A, Rome.
Rassegna Marittima Aeronautica, Via Ulisse Seni 5, Rome.
Rivista Aeronautica, Via Agostino De Pretis 45–A, Rome.
La Via Azzura, 28 Via Cuma, Naples.
Le Vie dell'Aria, Via Piacenza 6, Rome.

JAPAN

Hiko, Teikoku-Hiko-Kyokwai, 7 Sakuradahongo-cho, Shiba-Ku, Tokio.
Koku-Jidai, 1 Chome, Ginza, Kyobashi, Tokio.

MEXICO

Aviacion, San Juan de Lotran 6, Mexico City.
Boletin de la Associacion Mexicana de Aeronautica, Av. Madero 32, Mexico City.
El Piloto, Tiajuana B. C.
Revista Aerea, Departmento Aeronautica, Mexico City.

NETHERLANDS

Het Vliegveld, Singel 464, Amsterdam.

PERU

El Motor, 694 Lampa, Lima.

POLAND

Lot Polski, Dluga 50, Warsaw.
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PORTUGAL

Revista Aeronautica, Traversa de Gloria 22 A 2° D, Lisbon.

ROUMANIA

Aripa, Str. Clemenceau 10, Bucharest.
Aeronautica, 128 Calea Grivitei, Bucharest.

RUSSIA

Aviatzia i Chimia, Ilinka, Khrustalny per, Moscow.
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Icaro, Calle de Alberto Bosch, 3, Madrid.

SWEDEN

Flygning, Birgerjarlsgatan 6, Stockholm.

SWITZERLAND

Aero Revue, Bergstrasse 22, Oerlikon.

URUGUAY

Revista del Centro Militar y Naval, Convencion 1332, Montevideo.

AIRPORTS AND AIRPORT MANAGERS IN THE UNITED STATES

January 1, 1932

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 1932. All airports listed have sufficient landing area for normal landings and take-offs. No intermediate or auxiliary fields are included. Municipally owned fields are indicated by (*m*) preceding the name of the airport.

Location	*Name of Port*	*Manager*
ALABAMA:		
Atmore	Perido Hills Airport	J. M. Barrington
Auburn	Pace Field	
Birmingham (*m*)	Municipal Airport	Steadham Acker
Birmingham	Roberts Field	
Citronelle	Citronelle Airport	
Gadsden	Gulf State Steel Co. Airport	
Mobile (*m*)	Bates Field	O. N. Barney
Montgomery (*m*)	Montgomery Airport	Lion G. Mason
ARIZONA		
Ajo (*m*)	Ajo Airport	W. R. Devison
Casa Grande (*m*)	Casa Grande Mun. Airport	S. J. Norman, C.E.
Chandler (*m*)	Chandler Municipal Airport	Marg. K. Stewart
Douglas (*m*)	Douglas Int. Airport	B. R. Russell, Supt.
Flagstaff (*m*)	Koch Field	Ross Sampson, Crtkr.
Fredonia (*m*)	Fredonia Airport	Jensen & Brooksby
Gila Bend (*m*)	Gila Bend Airport	
Grand Canyon	Grand Canyon Airport	
Holbrook (*m*)	Holbrook Municipal	
Kingman	Kingman Field	
Maricopa (*m*)	Maricopa Airport	
Phoenix (*m*)	Municipal Airport	George Todd, C. M.
	Sky Harbor	
Prescott (*m*)	Ernest A. Love Airport	S. A. Spear
Quartzite	Conner Field	Geo. W. Conner

Location	*Name of Port*	*Manager*
Safford	Wickersham Airport	P. C. Merrill
Springerville	Springerville Airport	Melvin Brown
Tucson (m)	Davis-Monthan Airport	R. L. Andrick, S.S.
	Mayse Field	
Vail (m)	Vail Airport	
Williams (m)	Weber Field	J. C. Butler, T.C.
Winslow (m)	Barrigan Field	C. W. Helm, C.A.C.
Yuma (m)	Fly Field	Yuma C. of C.
ARKANSAS:		
Conway	Conway Airport	
Ft. Smith	Alexander Airport	
Hot Springs (m)	Chamber of Commerce Airport	John R. Tate
Little Rock	Little Rock Airport	
Monticello (m)	Monticello Mun. Airport	Frank Horsfall
Pine Bluff R No. 4 B 94	Toney Field	Kenneth Garrett
Texarkana (m)	Municipal Airport	J. B. Newbauer, Op.
CALIFORNIA:		
Alameda	San Francisco Bay Airdrome	R. U. St. John
	Curtiss-Wright Alameda Airport	Capt. Chadwick Thompson
Amboy	Amboy Airport	
Bakersfield (m)	Kern County Airport	H. B. Griffis, Supt.
Banning	Banning Airport	H. F. Wiefels
Barstow	Barstow Airport	Russell E. Riley
Brawley (m)	Brawley Airport	C. E. Carroll
Burbank	United Airport	Fred Denslow
Calexico (m)	Calexico Mun. Airport	Roy E. Saddler
Calipatria (m)	Calipatria Airport	
Chowchilla (m)	Chowchilla Airport	
Chula Vista (m)	Chula Vista Airport	R. Tyce, Mgr.
Coalinga (m)	Chamber of Commerce Airport	F. E. Butler
Culver City	Culver City Airport	
Elsinore (m)	Lake Elsinore Airport	O. W. Graham
Escondido (m)	Howell Airport	Gordon Prentice
Fresno (m)	Fresno Chandler Airport	Geo. T. Johnson, Supt.
Fullerton (m)	Fullerton Mun. Airport	
Galt	MacCracken Field	
Glendale	Grand Central Air Terminal	Maj. C. C. Moseley
Hanford (m)	Hanford Airport	A. C. Hanford
Hollister	Hollister Airport	
Imperial (m)	Imperial County Airport	Chas. M. Sproule
Indio	Indio Airport	
Inglewood (m)	Los Angeles Mun. Airport	R. B. Barnitz, Dir.
Lakeport (m)	Lakeport Mun. Airport	T. V. Ferron
Lancaster (m)	Lancaster Airport	
Long Beach (m)	Long Beach Mun. Airport	W. J. Putman, Supt.
Los Angeles	Aero Corporation Field	Paul E. Richter, Jr.
	Dycer Field	Edw. A. Dycer
	Metropolitan Airport	N. R. Wells, Mgr.
Maricopa (m)	Maricopa Airport	
Marysville (m)	Cheim Airport	W. A. Kynoch, C.C.
Merced	Merced Airport	
Mineral (m)	Mineral Airport	Arthur G. Holmes
Montague (m)	Montague Airport	Charles E. Schock
Modesto (m)	Bud Coffee Field	F. J. Rossi, C.E.
Needles (m)	Needles Mun. Airport	George Morden
Oakland (m)	Oakland Mun. Airport	G. B. Hegardt
Ontario (m)	Ontario Mun. Airport	
Palmdale (m)	Palmdale Airport	Fred A. Alley
Palo Alto	Palo Alto Airport	
Petaluma	Petaluma Airport	
Pomona	Burnley Airport	E. H. Rathbun, Mgr.
Porterville	Porterville Airport	Maj. Leighroy Miller
Quincy (m)	Quincy Mun. Airport	H. H. Bar
Red Bluff (m)	Bidwell Field	Raines F. Griffin
Redding (m)	Benton Field	L. D. Sarvis, C.A.C.
Redwood	Redwood Airport	
Riverside	Riverside Airport	Thornton Rhodes
San Bruno (m)	San Francisco Mun. Airport	Capt. Roy N. Francis
Sacramento (m)	Sacramento Mun. Airport	Donald B. Smith
San Diego (m)	Lindbergh Field	John Van Horn, Supt.
San Bernardino	Big Bear Airport	Calif. Peter Pan Woodland Club
San Jacinto (m)	Harmon Field	C. N. Parker, Mayor
San Mateo	Curtiss-Wright San Mateo Airport	Capt. F. M. Bartlett
San Pedro (m)	Allen Field	Traf. Mgr. Bd. of Harbor Comm.

Location	*Name of Port*	*Manager*
San Pedro.....(m)	San Pedro Airport	
Santa Ana.....	Eddie Martins Airport	Eddie Martin
Santa Barbara.....	Ovington Airport	Earle Ovington
Santa Clara.....	Santa Clara Airport	
Santa Monica.....(m)	Clover Field	Rufus J. Pilcher
Santa Rosa.....(m)	Santa Rosa Mun. Airport	L. E. Newton
Seal Beach.....	Seal Beach Airport	W. F. Crawford
Sebastapol.....(m)	Sebastopol Mun. Airport	L. C. Cnoplus
Selma.....(m)	Eagle Field	E. J. Neilsen
Spadra.....(m)	W. K. Kellogg Airport	E. H. Rathbun
Stockton.....(m)	Stockton Mun. Airport	Henry Nordwick
Strathmore.....(m)	Strathmore Airport	C. W. Bouldin
Tracy.....(m)	Tracy Airport	W. H. DeVries, Supt.
Tulare.....(m)	Tulare Mun. Airport	R. M. Perryhill, C.M.
Visalia.....(m)	Visalia Mun. Airport	L. E. Crowder
Weed.....	Weed Airport	W. H. King
Westwood.....(m)	Westwood Airport	
Woodland.....(m)	Woodland Airport	
Yreka.....(m)	Yreka Airport	Irving L. Eddy
COLORADO:		
Colorado Springs.....	Alexander Airport	Pikes Peak Air Com. Inc.
R1-Bx. 7.....(m)	Colorado Springs Mun. Airport	Max Piele
Denver.....	Colorado Airways Field	A. F. Joseph
Denver.....	Curtiss Field	
Denver—32nd & Ulster St.....(m)	Denver Mun. Airport	W. F. Wunderlich
Fort Collins.....(m)	Fort Collins Airport	
Grand Junction.....(m)	Grand Junction Airport	J. H. Sackett
Monte Vista.....(m)	Monte Vista Airport	W. F. Bowers, C.M.
Otis.....(m)	Otis Mun. Airport	Dee Unger
Pueblo.....(m)	Pueblo Airport	
Trinidad.....	Holloway Field	Midcontinent Air Express
CONNECTICUT:		
Bridgeport.....	Bridgeport Airport	T. D. Moller
Danbury.....(m)	Danbury Airport	Henry Taylor
Groton.....	Turnbull Field	
Hartford.....(m)	Brainard Field	Herbert H. Mills
Hartford.....	Rentschler Field	Bernard Whalen
Meriden.....(m)	Meriden Airport	E. L. Markham
Wallingford.....(m)	Wallingford Airport	
DELAWARE:		
New Castle.....	Bellanca Field	Del. Flying Service
DISTRICT OF COLUMBIA:		
S. Wash. Va. Bx. 101...	Washington Hoover Airport	John S. Wynne
FLORIDA:		
Bradenton.....(m)	Wallace Field	Harry L. Land, Mgr.
Clearwater.....(m)	Clearwater Mun. Airport	Tropical Airways, Inc. Mgr.
Daytona Beach.....(m)	Bethune Point Airport	A. C. Banks
DeLand.....(m)	Municipal Airport	Aviation Comm. of C. of C.
Fort Meyers.....(m)	Fort Meyers Airport	
Inverness.....	Inverness Airport	A. Noble
Jacksonville.....(m)	Municipal Airport	J. R. Griffis, Mgr.
	Paxon Field	
Key West.....	Key West Airport	
Lakeland.....(m)	Lakeland Airport	
Lake Wales.....(m)	Lake Wales Mun. Airport	
Leesburg.....	Leesburg Airport	
Melbourne.....(m)	Melbourne Airport	Clair A. Inskeep, C.M.
Miami.....(m)	Miami Municipal Airport	A. H. Heermance
	Pan American Airport	
Ocala.....	Ocala Airport	
Orlando.....(m)	Orlando Airport	
St. Petersburg.....(m)	Albert Whitted Airport	J. B. Meares
Sarasota.....(m)	Sarasota Mun. Airport	Dr. J. R. Scully, G.P.W.
Stuart.....(m)	Stuart Airport	A. P. Krueger, Mgr.
Tallahassee.....(m)	Dale Mabry Airport	Wm. R. Gault, C.M.
Titusville.....(m)	Titusville Airport	N. T. Froscher, Mgr.
Tampa.....(m)	Drew Field	I. G. Hedrick
W. Palm Beach.....	W. Palm Beach Airport	
W. Palm Bch., Drawer E-10.....	Roosevelt Marine Base	C. S. Collar

Location		Name of Port	Manager
GEORGIA:			
Albany	(m)	Albany Airport	
Athens	(m)	Epps Field	Benn Epps, Mgr.
Atlanta	(m)	Municipal Airport	J. H. Gray, Mgr.
Augusta	(m)	Daniel Field	J. B. Lee, Mgr.
Brunswick	(m)	Redfern Field	
Cedartown	(m)	Adamson Field	C. Adamson, Jr., Mgr.
Columbus	(m)	Columbus Airport	H. B. Crawford, C. M.
Douglas	(m)	State College Airport	J. M. Thrash, Pres., S. G. S. C.
Macon	(m)	Miller Field	R. J. Litteen
Rome	(m)	Rome Airport	Rome Airport Assn.
Savannah	(m)	Savannah Airport	
Thomasville	(m)	Thomasville Airport	H. Wimpy
Valdosta	(m)	Valdosta Airport	P. W. Robertson, Chrm.
IDAHO:			
Boise	(m)	Boise Mun. Airport	Ivan Nelson, Mgr.
Caldwell	(m)	Walker Field	
Coeur D'Alene	(m)	Coeur D'Alene Airport	George Natwick, Mayor
Pocatello	(m)	Pocatello Mun. Airport	E. L. Anderson, Mgr.
Twin Falls	(m)	Twin Falls Airport	Twin Falls C. of C.
ILLINOIS:			
Aurora		Midwest Airport	John H. Livingston, Mgr.
Cairo	(m)	Cairo Landing Field	
Champaign		Chamber of Commerce Airport	
Chicago		Aero Club Field	
5932 S. Cicero Ave.	(m)	Chicago Mun. Airport	John Allen Casey
Danville	(m)	Chamber of Commerce Airport	
East St. Louis		Curtiss-Steinberg Airport	David Visel
East St. Louis		Parks Airport	Oliver L. Parks
Elgin	(m)	Elgin Airport	Jake Lubbers
Elmhurst		Elmhurst Airport	
Galena		Galena Airport	
Glenview		Curtiss Reynolds Airport	Karl S. Day
Harrisburg		Harrisburg Airport	Harvey Scouton
Hillside		Westchester Airport	Jack Oates
Hinckley		Eagle Airport	Dr. Neubauer, Owner
Joliet		Joliet Airport	
Joliet	(m)	Joliet Mun. Airport	Harry B. Ohlhauer
Lansing		Ford Airport	
Marion	(m)	Marion Airport	
Moline		Moline Airport	Bernard Sewerkrup
Monmouth		Monmouth Airport	G. Craig
Mt. Prospect		Pal-Waukee Airport	Duncan Hodges, Mgr.
Oaklawn		Harlem Airport	C. S. Strong
Peoria		Lufberry Flying Field	
Peoria	(m)	Peoria Airport	
Quincy		Monroe Airport	Neil Monroe
Rockford		Rockford Airport	F. E. Machesney
St. Elmo		Smith Field	Reginal Pattinson
Springfield		Commercial Airport	Craig Isabel, Mgr.
Sterling	(m)	Sterling Airport	E. P. Jacoby, Mgr.
Stockton		Stockton Airport	R. L. Hanson
INDIANA:			
Anderson	(m)	Welch Airport	
Bedford		Bedford Airport	
Crawfordsville	(m)	Crawfordsville Airport	Herbert Morrison
Evansville	(m)	Evansville Airport	W. R. Genot
Fort Wayne	(m)	Baer Field	Robert R. Bartel, Mgr.
Fort Wayne		Guy Means Airport	Capt. C. F. Corrish
Frankfort	(m)	Frankfort Airport	
Gary		Gary Airport	
Indianapolis		Capital Airways Field	
Indianapolis, R.R. 18, Bx. 300R		Hoosier Airport, Inc.	Bob Shank, Mgr.
Indianapolis	(m)	Municipal Airport	Maj. C. E. Cox, Jr.
Knox		Knox Airport	
Kokomo		Shockley Field	Clyde Shockley
Lafayette		Shambaugh Airport	
Peru		Peru Airport	
Richmond		Richmond Airport	Claud Berry
Seymour		Seymour Airport	Larne Coy
South Bend	(m)	Municipal Airport	George E. Davies
Terre Haute	(m)	Dresser Field	J. H. Haxton
Valparaiso		Valparaiso Airport	
Vincennes	(m)	Vincennes Airport	
Wabash, 485 W. Canal St.		Rettig Airport	Geo. O. Rettig

Location	*Name of Port*	*Manager*
IOWA:		
Ames	American Legion Airport	Wilkin N. Harper
Battle Creek	Battle Creek Airport	
Belle Plaine	Belle Plaine Airport	D. A. Newland
Burlington (*m*)	Burlington Mun. Airport	A. J. Hartman
Centreville (*m*)	Centreville Airport	V. C. Price
Clarinda	Clarinda Airport	E. L. Downing
Council Bluffs	Council Bluffs Airport	
Davenport	Cram Field	L. M. Pedigo, Mgr.
Des Moines (*m*)	Municipal Airport	E. R. Ahlberg, Mgr.
Dubuque (*m*)	Dubuque Airport	
Fort Dodge	Fort Dodge Airport	C. I. Sherwood
Iowa City (*m*)	Smith Field	Jack Curtis
Muscatine (*m*)	Muscatine Airport, Inc.	S. G. Stein, Mgr.
Ottumwa	Ottumwa Airport	C. P. Kysor
Rockwell City (*m*)	Stewart Airport	A. R. Eno, Mgr.
Shenandoah (*m*)	Kiwanis Airport	Louis Koenecke, Mgr.
Sioux City	Rickenbacker Airport	A. S. Hanford, Jr.
Waterloo (*m*)	Chapman Field	A. B. Livingston, Mgr.
Wesley	Wesley Airport	J. A. Hauptman
KANSAS:		
Arkansas City	Arkansas City Airport	L. H. Lawson
Chanute, Box 514 (*m*)	Chanute Mun. Airport	Vern Carstens, Mgr.
Coffeyville (*m*)	Municipal Airport	Lynn Berentz
Concordia	Municipal Airport	
Dodge City	McCoy Airport	
Garden City (*m*)	Garden City Mun. Airport	Charles B. Eggen
Goodland (*m*)	Goodland Mun. Airport	W. F. Kelley
Great Bend (*m*)	Great Bend Mun. Airport	Bd. of Commissioners
Hays (*m*)	Hays Airport	E. J. Haffamier, C.M.
Hosington (*m*)	Hosington Airport	
Hutchinson	Albright Field	
Kansas City	Fairfax Airport	R. F. Craig
Larned (*m*)	Larned Airport	Sec., C. of C.
Lawrence	Allison Field	
Manhattan (*m*)	Manhattan Mun. Airport	C. of P. and Mayor
Newton (*m*)	Newton Airport	
Parsons (*m*)	Ryan Field	
Pittsburg	Pittsburg Airport, Inc.	L. M. Atkinson, Pres.
Plainville (*m*)	Gilbert Field	V. A. Perkin, Mgr.
Pratt	Pratt Airport	F. F. Swinson
Salina (*m*)	Salina Airport	
Sedan (*m*)	Sedan Airport	W. T. Collier
Washington (*m*)	Washington Airport	Edgar Bennett
Wichita	Swallow Field	Geo. R. Bassett
Wichita (*m*)	Municipal Airport	H. L. Mellor, Supt. Parks
Wichita	Swift Airport	
Winfield (*m*)	Winfield Airport	
KENTUCKY:		
Hopkinsville	Hopkinsville Airport	C. M. Baker
Lexington (*m*)	Lexington Airport	Woodford N. Baxter
Louisville (*m*)	Bowman Field	Lt.-Col. H. W. Rogers, Supt.
Middlesboro (*m*)	Middlesboro Airport	
Newport	Boyers Airport	
Owensboro	Sheehan Field	
LOUISIANA:		
Baton Rouge (*m*)	Baton Rouge Airport	
Chalmett	Chalmett Airport	
Crowley (*m*)	Crowley Airport	Geo. C. Merkel, Sec. C. of C.
Lafayette (*m*)	Lafayette Airport	R. E. Chaplin, C. A. Comm.
Mansfield (*m*)	Herndon Field	T. B. Herndon
Monroe (*m*)	Selman Field	Travis Oliver
Natchitoches	Natchitoches Airport	
New Orleans (*m*)	New Orleans Mun. Airport	Geo. A. Hero, Jr.
New Orleans, P. O. Box 783	Menefee Airport	Harry B. Austin
Patterson	Patterson Airport	
Shreveport	Texaco Airport	
MAINE:		
Bangor	Bangor Airport	E. Godfrey
Caribou (*m*)	Caribou Airport	G. W. Shaw
Portland	Stroudwater Field	
Presque Isle	Presque Isle Airport	M. S. W. Dingwall
W. Scarboro	Portland Airport	S. B. Chandler
Rockland, Bx. 280	Curtiss-Wright Airport	W. H. Wincapaw

Location	Name of Port	Manager
MARYLAND:		
Baltimore	Curtiss-Wright Airport	Maj. W. D. Tipton, Mgr.
Baltimore (Dundalk) (m)	Logan Field	L. M. Rawlins, Jr.
Hagerstown	Kreider-Reisner Airport	
Pikeville	Park Heights Flying Field	Lt. Otto Melamet
Rockville	Congressional Airport	
MASSACHUSETTS:		
Beverly (m)	Beverly Airport	Elton S. MacNeal, Pres. B. A. C.
Boston (N. Quincy)	Dennison Airport	
Boston (m)	Boston Mun. Airport	Albert L. Edson
Brockton	Brockton Airport	
Edgarstown	Martha's Vineyard Airport	
Fall River	Brockton Airport	
Hyannis	Hyannis Airport	Alton B. Sherman
Lawrence	Lawrence Airport	
Lowell	Lowell Airport	
Mendon	Mendon Airport	
Norwood	Met. Air Terminal	L. M. Clark, Mgr.
Revere	Revere Airport	Al. Zewink
Seekonk	Seekonk Airport	
Springfield	Bowles Agawam Airport	Capt. Harry J. Hermann
Springfield, 1211 Liberty St.	Springfield Airport	Edmund Fischer
Taunton	King Field	
Westfield (m)	Barnes Airport	Chas. O'Connor
MICHIGAN:		
Ann Arbor (m)	Ann Arbor Mun. Airport	L. S. Flo, Pres. F.F.S.
Balwdin (m)	Baldwin Airport	H. W. Davis, Mgr.
Battle Creek	Kellogg Airport	Randolph Russell
Bay City (m)	James Clements Airport	Henry Dora
Benton Harbor	Benton Harbor Airport	
Caro (m)	Caro Airport	Glenn W. Owen
Dearborn	Ford Airport	W. W. Mounts
Detroit, 400 City Hall (m)	Detroit City Airport	Perry A. Fellows
Detroit	Grosse Ille Airport	O. Y. Fetterman
East Lansing	East Lansing Airport	A. J. Davis
Flint	Flint Airport	F. M. Davy
Grand Haven (m)	Grand Haven Airport	W. E. Baumgardner, C.M.
Grand Rapids (m)	Grand Rapids Airport	Thomas Walsh
Iron Mountain (Bessemer)	Iron Mountain Airport	
Ironwood (m)	Gogebic County Airport	Geo. Kionski
Jackson (m)	Reynolds Field	Ross Beckner
Kalamazoo (m)	Lindbergh Field	Waldo S. Goodyear
Lansing (m)	Capital City Airport	Fostor Airways
Manistique (m)	Schoolcraft Airport	
Marysville (m)	Marysville Airport	Marysville Improv. Co.
Menominee (m)	Menominee Airport	S. Justema, Supt.
Midland	Midland Airport	Merle Newkirk
Muskegon (m)	Muskegon County Airport	James Kukla
Newberry (m)	Luce County Airport	S. C. Sleeper
Niles (m)	Niles Airport	Willis E. Kysor, Mgr.
Northville	Stinson-Northville Airport	
Petoskey (m)	Emmet County Airport	Robert D. Trippe
Pontiac (m)	Pontiac Mun. Airport	G. D. Kennedy, Dir.
Romulus (m)	Wayne County Airport	H. E. Baker, Eng.
Saginaw (m)	Junior Board of Commerce Airport	Jos. E. Behse
Sault Ste. Marie (m)	Sault Ste Marie Airport	H. A. Sherman
Traverse City (m)	Ranson Field	Don Clothier
Wayne	Detroit Wayne Industrial Airport	E. J. Smith
Ypsilanti R.R. No. 4 (m)	Ypsilanti Airport	M. E. Oliphant, Mgr.
MINNESOTA:		
Alexandria (m)	Alexandria Airport	
Brainerd	Rosko's Airport	Henry Rosko
Coleraine (m)	Coleraine Airport	C. M. Murphy
Duluth (m)	Williamson-Johnson Airport	Harry T. Peterson
Fergus Falls (m)	Fergus Falls Airport	Gustav O. Imm
Mankato	Mankato Airport	L. J. Sohler
Maynard	Maynard Airport	
Minneapolis (m)	Wold-Chamberlain Field	L. D. Hammond, Dir.
St. Cloud (m)	Albert G. Whitney Mem. Airport	
St. Paul (m)	St. Paul Airport	F. J. Geng, Master
Virginia	Virginia Airport	Clinton H. Sigel

Location		*Name of Port*	*Manager*
MISSISSIPPI:			
Greenville		Greenville Airport	T. White
Greenwood	(m)	Leflore County Airport	
Grenada		Borden Field	
Gulfport		Gulfport Airp rt	
Hattiesburg	(m)	Municipal Airport	
Jackson	(m)	Jackson Airport	Lt. R. H. Ranney, Mgr.
Meridian		Meridian Airport	
Pascagoula	(m)	Raby Field	John R. Watts, Mayor
MISSOURI:			
Anglum	(m)	Anglum Airport	
Bucklin		Van Osdee Field	
Carthage		Carthage Airport	
Joplin	(m)	Joplin Airport	Ralph L. Nolan, Mgr.
Kansas City	(m)	Municipal Airport	Roy C. Farrell
Kansas City		Richards Field	
Kirksville		Dodson Airport	
Marshall		Nicholas-Beazley Airport	R. A. Faust, Mgr.
St. Joseph		Rosecrans Field	J. C. Shelton, Jr.
St. Louis	(m)	Lambert-St. Louis Airport	O. R. Parks
Springfield	(m)	Springfield Mun. Airport	Carl McClure
MONTANA:			
Belgrade	(m)	Belgrade Airport	E. A. Stiefel, C. A. Comm.
Billings	(m)	Billings Airport	Dick Logan
Butte	(m)	Butte Airport	J. K. Heslet
Dillon		Dillon Airport	
Froid		Schnitzler Field	
Great Falls	(m)	Great Falls Airport	
Great Falls		Vance Airport	
Helena	(m)	Helena Mun. Airport	Fred. B. Sheriff, Chrm.
Kalispell	(m)	Kalispell Aviation Park	C. E. Trekell, Clerk
Livingston	(m)	Tollman Field	T. A. Ross, C. C.
Miles City	(m)	Municipal Airport	
Missoula	(m)	Missoula Airport	
Sidney		Sidney Airport	W. M. Combes
Terry	(m)	Terry Airport	F. L. Patterson
Wolf Point	(m)	Wolf Point Airport	James F. Cook
NEBRASKA:			
Alliance		Alliance Airport	
Falls City	(m)	Municipal Airport	Airport Com. of Council
Grand Island	(m)	Municipal Airport	Stober Deats, Mgr.
Hastings	(m)	Hastings Mun. Airport	H. J. Dunn, Chrm.
Havelock		Arrow Airport	James Fisher
Kearney	(m)	Municipal Airport	J. D. Wolf, Mgr.
Lincoln	(m)	Municipal Airport	D. L. Erickson, C. E.
Lincoln		Page Airport	
McCook	(m)	American Legion Airport	
North Platte	(m)	North Platte Airport	C. H. Sluder
Ogallala		Ogallala Airport	
Omaha	(m)	Omaha Mun. Airport	Jay Dudley, Mgr.
NEVADA:			
Caliente	(m)	Caliente Municipal Airport	Willard W. Smith
Elko	(m)	Keddie Field	M. O. Wignall
Ely	(m)	Ely Airport	Harold Deeyle, Mgr.
Las Vegas	(m)	Las Vegas Airport	
Reno	(m)	Blanch Field	Robert E. Overman
Reno		Hubbard Field	
Yerington	(m)	Kelly Field	L. B. Miller, C. P.
NEW HAMPSHIRE:			
Claremont	(m)	Claremont Airport	Claremont Aero. Service
Concord	(m)	Concord Airport	Horton Chandler, Mgr.
Manchester	(m)	Manchester Airport	
Newport	(m)	Albert N. Parlin Field	J. M. Barton, Pres.
NEW JERSEY:			
Arcola		Arcola Airport	A. Eugene Davies
Atlantic City	(m)	Atlantic City Airport	H. B. Baldwin, Supt.
Caldwell		Curtiss-Essex Airport	Robert Christie
Camden		Central Airport	J. W. Markeim
Dover		Dover Airport	
Freehold		Patten Field	
Hasbrouck Heights		Teterboro Airport	G. D. Dardis

Location	Name of Port	Manager
Keyport	Keyport Airport	Everitt Fisher
Lakehurst	Lakehurst Airport	
New Brunswick	Hadley Field	C. W. Geo. Chegen
Newark (m)	Newark Met. Airport	R. Aldworth
Red Bank	Airview Flying Field	J. F. Casey, Pres.
Trenton (m)	Mercer Airport	William S. Borden, Dir.
NEW MEXICO:		
Albuquerque	T. & W. A. Airport	
Albuquerque	Albuquerque Airport	D. E. Dalby
Carlsbad (m)	Carlsbad Airport	
Clayton (m)	Clayton Mun. Airport	W. H. Hollingsworth, C. M.
Clovis	T. A. T. Airport	
Deming (m)	Deming Airport	G. D. Robinson, Sec. C. of C.
Gallup (m)	Gallup Airport	
Roswell	Roswell Airport	
Silver City (m)	Silver City Airport	Sam W. Agee
Socorro (m)	Socorro Airport	W. E. West, Sec. S. B. M. C.
NEW YORK:		
Albany (m)	Albany Mun. Airport	J. F. Fitzgerald, Jr.
Angola	Angola Airport	Harold Clobes
Armonk	Westchester Airport	D. J. Barrett, Jr.
Binghamton	Bennett Field	R. Bennett
Brooklyn (m)	Floyd Bennett Field	J. N. Kelly
Buffalo	Becker's Airport	E. J. Becker
Buffalo (m)	Buffalo Mun. Airport	N. E. Duffy, Dir.
Cortland (m)	Cortland County Airport	H. R. Mell
Dansville (m)	Dansville Airport	L. E. Pickard
Elmira	Elmira Airport	Gardner Nagle
Endicott	Endicott Airport	
Farmingdale	American Airport	M. Gauld Beard
Flushing	New York City Airport	W. W. Lewis
Garden City	Roosevelt Field	George W. Orr, Pres.
Geneva	Finger Lakes Airport	
Glen Falls (m)	Glen Falls Airport	
Gloversville	Gloversville Airport	
Hammondsport	Mercury Field	H. Mummeth
Hemlock	Hemlock Airport	Dr. Harold Nott
Islip, L. I.	Islip Airport	A. I. Theis
Jackson Hgts., Queens	Holmes Airport	E. H. Holmes
Jamestown	Jamestown Airport	
LeRoy	D. W. Flying Field	Capt. Russell Holderman
Massapequa, L. I.	Fitzmaurice Field	M. L. Brady
Niagara Falls (m)	Niagara Falls Mun. Airport	
North Beach, Queens	Glenn Curtiss Airport	Capt. Harry Rodgers
Norwich	Norwich Airport	Warren Eaton, Pres.
Pittsford	Pittsford Airport	
Poughkeepsie	Poughkeepsie Airport	Ward S. Lent
Riverhead, L. I.	Suffold Airport	H. N. Beers
Rochester (m)	Rochester Airport	Howard M. Shaffer
Rochester	Rouse Partridge Airport	
Saratoga Springs	Saratoga Springs Airport	
Schnectady	Schnectady Airport	Clarence B. Coombs
Silver Creek	Silver Creek Airport	Chas. T. Howson
Syracuse (m)	Syracuse Mun. Airport	R. L. Kincaid
Tonawanda	Consolidated Aircraft Airport	
Utica (m)	Utica Airport	Reginald J. Heath
Valley Stream	Curtiss-Wright Airport	Kester Lindsay
Watertown (m)	Watertown Mun. Airport	F. H. Taylor
Wellsville (m)	Wellsville Airport	
NORTH CAROLINA:		
Asheville (m)	Asheville Airport	
Charlotte	Charlotte Airport	
Greensboro (m)	Greensboro Airport	Henry W. Rafus
Goldsboro (m)	Municipal Airport	Z. G. Hellowell, C. M.
Marion (m)	Francis Marion Field	W. F. Shiflett
Monroe	Monroe Airport	
Pinehurst (m)	Knollwood Airport	Lloyd O. Yost
Raleigh	Raleigh Airport	Elmer A. Myers
Reidsville	Reidsville Airport	
Rockingham	Rockingham Airport	V. Ratliff
Rocky Mount	Eagle Airport	J. D. Winstead, Owner
Shelby (m)	Shelby Airport	
Tarboro (m)	Tarboro Airport	
Wilmington (m)	Wilmington Airport	
Winston-Salem (m)	Miller Mun. Airport	Herman B. Leeth

Location	Name of Port	Manager
NORTH DAKOTA:		
Bismarck.....(m)	Bismarck Mun. Airport	H. T. Perry
Fargo.....(m)	Hector Airport	Titus Richards
Grand Forks.....	Grand Forks Mun. Airport	E. L. Lium, Act. Mgr.
Jamestown.....	Jamestown Airport	C. A. Henderson, Sec.
Linton.....	Seeman Park Airport	
Minot.....(m)	Port of Minot	C. O. Shupe
Pembina.....(m)	Ashley Airport	Mun. Airport Comm.
Towner.....	Jake's Airport	
Valley City.....(m)	Valley City Mun. Airport	
Williston.....(m)	Williston Airport	E. M. Canfield
OHIO		
Akron.....(m)	Municipal Airport	B. E. Fulton
Akron.....	Stow Field	N. C. Robbins
Alliance.....	Alliance Airport	
Bryan.....	Bryan Air Park	
Bucyrus.....	Port Bucyrus Field	Lauretta M. Schimmoler, Mgr.
Canton.....	Canton Airport	J. Curtis
Cincinnati.....	Frank Airport	
Cincinnati.....(m)	Lunken Field	Albert B. Wunder, Supt.
Cleveland.....(m)	Cleveland Mun. Airport	John Berry, Mgr.
Cleveland.....	Great Lakes Airport	
Columbus.....(m)	Port of Columbus Airport	Maj. Wm. F. Centner, Supt.
Coshocton.....	Coshocton Airport	
Defiance.....	Defiance-Simplex Airport	
Findlay.....	Rummell Aviation Park	
Gallipolis.....(m)	Twin City Airport	Stanley B. Huntington, Mgr.
Greenville.....	Lansdowne Airport	
Hamilton.....	Hamilton Airport	C. R. Muhlberger
Hudson.....	Mid City Airport	D. B. Peat
Lima.....	Thompson Airport	Rollie Thompson
Lorain.....	Port Mills Airport	W. W. Doty
Mansfield.....(m)	Municipal Airport	F. D. Wolff, S. S. D.
Martins Ferry.....	Scott Field	J. R. Adams
Marietta.....(m)	Ohio Valley Airport	Chris. Matthews
Marion.....(m)	Marion Airport	
Middletown.....(m)	Middletown Airport Park	Geo. J. Wedekind
Sandusky.....	Parker Field	
Springfield.....(m)	Springfield Mun. Airport	W. B. Little
Steubenville.....	Steubenville Airport	
Toledo.....	Transcontinental Airport	C. J. Fenton
Vandalia.....	Dayton Airport	E. A. Johnson, Pres.
Van Wert.....(m)	Municipal Airport	J. H. Weaver
Willoughby.....	Lake County Airport	Harry R. Playford
Youngstown.....	Bernard Airport	
Youngstown.....(m)	Youngstown Airport	
OKLAHOMA:		
Ada.....(m)	Ada Mun. Airport	Lt. Paul Hinds
Altus.....(m)	Altus Airport	
Ardmore.....	Ardmore Airport	A. Oakley
Bartlesville.....	Bartlesville Airport	Wm. Parker
Blackwell.....(m)	Municipal Airport	C. A. Bradfield
Bristow.....	Bristow Airport	G. C. Kittelsen
Chickasha.....(m)	Municipal Airport	Paul Rider
Clinton.....(m)	Clinton Airport	Tim T. Warren, Sec. C. of C.
Coalgate.....	Coalgate Airport	C. Carson
Duncan.....(m)	Halliburton Field	J. H. Bender, C. M.
Elk City.....(m)	Municipal Airport	Walter D. Mauk
El Reno.....(m)	Reno Airport	H. M. Woods, C. A. C.
Enid.....(m)	Enid Air Park	Capt. Hugh Askew
Mangum.....(m)	Ponder Field	Ray Shiffett
McAlester.....	Legion Field	
Miami.....	Miami Airport	H. G. Freehauf
Muskogee.....(m)	Muskogee Municipal Airport	L. L. Rupert
Oklahoma City R5.....(m)	Oklahoma City Airport	Wm. E. Fletcher
Oklahoma City.....	Curtiss Airport	J. H. Burke
Pauls Valley.....(m)	Pauls Valley Airport	Earl Witten
Ponca City.....(m)	Everett Taylor Airport	T. D. Harris
Stillwater.....(m)	Stillwater Airport	L. M. McGoodwin
Tulsa.....	McIntyre Airport	D. A. McIntyre
Tulsa, Box 3156.....(m)	Tulsa Mun. Airport	C. W. Short, Jr.
OREGON:		
Albany.....(m)	Albany Mun. Airport	F. E. Bloom, C. A. Comm.
Arlington.....	Arlington Airport	H. Weatherford
Baker.....	Baker Airport	H. & C. Wendt

Location	*Name of Port*	*Manager*
Burns.....(*m*)	Burns Airport	Wm. Hanley
Canyon.....(*m*)	Canyon City Airport	I. B. Hazeltine, C. A. Com.
Corvallis.....	Corvallis Airport	
Eugene.....(*m*)	Eugene Mun. Airport	T. C. DeVaney, Supt.
Grants Pass.....(*m*)	Josephine County Airport	Josephine County A. C.
Klamath Falls.....(*m*)	Klamath Falls Airport	C. Golden
Lakeview.....(*m*)	Lakeview Airport	Harry Ballard
Lebanon.....(*m*)	Lebanon Airport	R. B. Miller
Medford, Bx. 1016.....(*m*)	Medford Mun. Airport	Phil Sharp
Portland.....(*m*)	Portland Airport	James H. Polhemus
Portland.....	Rankin Airport	Tex Rankin
Roseburg.....(*m*)	Roseburg Mun. Airport	A. J. Geddes, Sec. A. C.
Salem.....(*m*)	Salem Mun. Airport	Lee Eyerly
Silverton.....(*m*)	Silverton American Legion Airport	C. A. Reynolds, C. A. C.
Springfield.....(*m*)	Springfield Mun. Airport	
North Bend.....(*m*)	Municipal Airport	Frank L. Black
PENNSYLVANIA:		
Allentown.....	Allentown Airport	Sidney A. Riley, Jr.
Altoona-Tyrone.....	Stultz Field	
Bethlehem, Box 93.....(*m*)	Bethlehem Mun. Airport	
Bradford.....	Harri Emery Airport	John J. Moore
Bridgeville.....	Mayer Field	
Connellsville.....(*m*)	American Legion Airport	H. C. Haddock
Conway.....	Conway Airport	A. J. Moore
Erie.....	Griswold Field	
Fairview.....	Erie County Airport	R. N. McCray
Gettysburg.....	Gettysburg Airport	M. S. Kleinfelter
Greensburg.....	Pittsburgh-Greensburg Airport	
Harrisburg.....	Penn-Harris Airport	Pat Brooks, Mgr.
Honesdale.....	Matter Airport	Paul C. Matter
Johnstown.....(*m*)	Johnstown Mun. Airport	J. H. Ritter
Jones Mills.....	Pike Run Airport	
Lancaster.....	Lancaster Airport	
Latrobe.....	J. D. Hill Airport	
Leighton.....(*m*)	Martin Jensen Airport	Jensen Aviation Corp.
Marchand.....	Punxsutawney Brae-Breeze Airport	H. W. Smeaton
McKeesport.....	Bettis Field	
Moscow.....	Moscow Airport	
Mount Union.....(*m*)	Mount Union Airport	
New Castle.....	Jackson Field	
New Castle.....	New Castle Airport	
Norristown.....	Patco Field	
Parkesburg.....	Robb Field	
Philadelphia, Island Rd.(*m*)	Philadelphia Airport	R. P. Hewitt
Philadelphia, Willow Grove.....	Pitcairn Field	George E. Chambliss
Pittsburgh.....(*m*)	Allegheny County Airport	C. W. Forcier
Pottstown.....	Pottstown Airport	
Reading.....	Whander Field	
Selingsgrove.....(*m*)	Selingsgrove Airport	
Sharpsburg, R. D. # 2..(*m*)	Rodgers Field	1st Lt. S. C. Eaton, Jr.
Somerset.....	Rhoades Field	Alfred K. Young (operator)
Sunbury.....	Wesley L. Smith Field	
Towanda.....(*m*)	Towanda Legion Airport	
Waynesburg.....	Worley Field	Waynesburg C. of C.
Waynesboro.....	Waynesboro Airport	
Wilkes-Barre.....	Wyoming Valley Airport	Geo. S. Eckman
Williamsport.....	Williamsport Airport	T. H. Kinkade
RHODE ISLAND:		
Pawtucket.....	Pawtucket Airport	
Providence.....	Providence Airport	
Providence.....	Rhode Island State Airport	
Westerly.....	Westerly Airport	
SOUTH CAROLINA:		
Camden.....(*m*)	Woodward Airport	
Charlestown.....(*m*)	Charlestown Airport	
Cheraw.....	Excelsior Airport	
Florence.....(*m*)	Florence Airport	D. L. Husband
Fort Mills.....	Spring Field	E. W. Springs
Greenville.....(*m*)	Greenville Mun. Airport	
Mrytle Beach.....	Myrtle Beach Airport	C. G. Brown
Seneca.....	Seneca Airport	R. M. Tribble
Spartenburg.....(*m*)	Municipal Airport	

Location	*Name of Port*	*Manager*
SOUTH DAKOTA:		
Aberdeen.....(*m*)	Aberdeen Airport	B. J. Coombs
Belle Fourche	Belle Fourche Airport	Clyde Ice
Lemmon.....(*m*)	Lemmon Airport	C. of C.
Mitchell.....(*m*)	Mitchell Airport	H. Bowring
Mobridge	Mobridge Airport	I. L. Hagen
Pierre.....(*m*)	Walter J. Smith Airport Pk.	City of Pierre
Rapid City	Rapid City Airport	Rapid Air Lines
Tyndal	Tyndal Airport	
Vermillion.....(*m*)	Municipal Airport	R. V. Newcomb, C. E.
Volga	Volga Airport	L. W. Lieb
Wagner.....(*m*)	Wagner Mun. Airport	C. W. Knight, Secy.
Watertown.....(*m*)	Watertown Airport	R. C. Hubbard
TENNESSEE:		
Chattanooga.....(*m*)	Lovell Field	W. Deland Dyke
Covington.....(*m*)	Covington Airport	Roy Boyd
Kingsport.....(*m*)	Municipal Airport	S. A. Dorsett
Knoxville.....(*m*)	McGhee-Tyson Airport	
Memphis.....(*m*)	Memphis Mun. Airport	B. B. Holmes
Nashville.....(*m*)	McConnell Field	W. L. Hethcote
Nashville	Skyharbor	
TEXAS:		
Albany.....(*m*)	Plane Haven	J. P. Alexander
Abilene	Kinsolving Field	T. E. Derryberry
Amarillo	English Field	Harold W. English
Austin	Robert Mueller Airport	
Austin	University Airport	
Beaumont.....(*m*)	Beaumont Airport	Frank L. Bertschler
Big Springs	Big Springs Airport	
Bonham.....(*m*)	Jones Field	L. K. Crawford
Breckenridge.....(*m*)	Breckenridge Airport	C. H. Clark
Brownsville.....(*m*)	Municipal Airport	T. E. Gilmore
Cisco.....(*m*)	Cisco Airport	
Corpus Christi.....(*m*)	Corpus Christi Airport	W. C. Maus
Dallas.....(*m*)	Love Field	Preston Sneed, Dir.
Del Rio.....(*m*)	Warner Airport	John Y. Long, Mayor
Denison.....(*m*)	Gray Airport	R. Gray
Denton.....(*m*)	Denton Mun. Airport	Smoot & Hundley
El Paso.....(*m*)	Municipal Airport	A. E. Johnson
El Paso	Standard Airport	
Fort Worth.....(*m*)	Meachem Field	William G. Fuller
Harlingen	Harlingen Airport	
Houston	Houston Airport	C. P. Neuhaus
Jasper.....(*m*)	Jasper Mun. Airport	Goldman S. Drury
Kerrville.....(*m*)	Louis Schreiner Airport	C. L. Mason, C. A. Com.
Lubbock.....(*m*)	Municipal Airport	H. P. Bradley, City Mgr.
Midland.....(*m*)	Midland Airport	H. M. Becherer
Pecos.....(*m*)	Pecos Airport	Ralph Sparke
Port Arthur, P. O. Box 712	Texaco Airport	F. P. Dodge
Ranger.....(*m*)	Ranger-Haughland Airport	C. J. Moore, Mgr.
San Angelo.....(*m*)	Municipal Airport	Autrey Monsey
San Antonio.....(*m*)	Winburn Field	J. Wayne Parks
Sherman.....(*m*)	Sherman Airport	
Stamford.....(*m*)	Swenson Airport	D. T. Perkins & J. C. Watson
Sweetwater.....(*m*)	Municipal Airport	
Texarkana.....(*m*)	Texarkana Airport	
Vernon.....(*m*)	Vernon Airport	M. K. Berry, C. A. Com.
Waco.....(*m*)	Rich Field	C. E. Coder
Wichita Falls.....(*m*)	Municipal Airport	C. P. Logan
UTAH:		
Ogden.....(*m*)	Ogden Airport	Harold R. Tripp
Salt Lake City.....(*m*)	Salt Lake Mun. Airport	Gilbert R. Rich
VERMONT:		
Burlington.....(*m*)	Burlington Airport	S. E. Astles
Manchester	Equinox Airport	F. W. Orvis
Newport	Newport Airport	
Springfield.....(*m*)	Hartness Municipal Airport	R. M. Wilcomb
White River Junction	Twin State Airport	A. W. Stone, Pres.
VIRGINIA:		
Alexandria	Alexandria Airport	
Bristol	Bristol Airport	Wm. F. Mitchell
Clifton Forge	Clifton Forge Airport	
Danville.....(*m*)	Danville Mun. Airport	M. G. Robinson

Location	*Name of Port*	*Manager*
Fredericksburg	Shannon Field	
Hopewell	Hopewell Airport	
Lynchburg, Box 782...(*m*)	Preston Glenn Airport	R. D. Apperson
Norfolk	Grand Central Air Terminal	
Port Richmond...(*m*)	Thompson Field	Grosby Thompson, Mayor
Richmond...(*m*)	Richard E. Byrd Field	C. H. Schutte
Richmond	Charles Field	
Richmond	Richmond Air Junction	
Roanoke...(*m*)	Roanoke Airport	Clayton Lemon
Waynesboro	Valley Airport	C. C. Loth
Winchester...(*m*)	Bowler Field	Roy W. Richards
WASHINGTON:		
Aberdeen...(*m*)	Grays Harbor Airport	F. D. Hobi, Hobi Airways, Inc.
Bellingham	Graham Field	R. C. Graham
Bellingham	Tulip Field	
Centralia...(*m*)	Centralia Airport	T. R. Patton
Chehalis...(*m*)	Chehalis Mun. Airport	A. C. St. John, Pres.
Ellensberg	Ellensberg Airport	
Everett...(*m*)	Everett Airport	
Kennewick...(*m*)	Kennewick Airport	
Olympia...(*m*)	Olympia Airport	E. N. Steele
Pasco...(*m*)	Franklin County Airport	A. E. Wehe
Pt. Angeles	Pt. Angeles Airport	John Blum
Renton	Renton Airport	A. Blum
Seattle...(*m*)	Boeing Field	Maj. David G. Logg
Spokane...(*m*)	Felts Field	Andrew J. Fabian, C. P. U.
Tacoma, P. O. Box 1183 (*m*)	Tacoma Field	F. W. Morrow
Tacoma	Miller-Harkins Airport	
Walla Walla...(*m*)	Walla Walla Airport	
Wenatchee	Wenatchee Airport	
Yakima...(*m*)	Yakima County Airport	County Commissioners
WEST VIRGINIA:		
Bluefield	College Field	
Moundsville	Langin Field	
Morgantown...(*m*)	Morgan Field	W. E. Brooks, C. M.
White Sulphur Springs	Greenbrier Airport	R. H. Patterson
WISCONSIN:		
Appleton	Appleton Airport	E. West
Appleton...(*m*)	Geo. A. Whiting Airport	Eluryn West
Athelstane	Athelstane Airport	R. H. Schaf
Delavan	Delavan Airport	J. D. Campbell
Eagle River	Keystone Airport	
Eagle River	Otter Rapids Airport	
Fond du Lac	Fond du Lac Airport	T. W. Meikeljohn
Green Bay	Green Bay Airport	
Janesville	Janesville Airport	
Kilbourn	Kilbourn Airport	C. Berry
Kohler...(*m*)	Kohler Airport	Anton F. Brotz
LaCrosse...(*m*)	LaCrosse Mun. Airport	Board Pub. Works
Land O'Lakes...(*m*)	Land O'Lakes Airport	J. F. Handhos
Madison	Madison Airport	L. F. Schoelkopf
Madison	Royal Airport	Howard A. Marey
Manitowoc...(*m*)	Manitowoc Airport	F. Shoblaska
Marshfield	Miners Airport	W. Miner
Milwaukee	Curtiss-Wright Airport	P. W. Trier
Milwaukee...(*m*)	Milwaukee County Airport	Maj. Stanley E. Piasecki
Milwaukee (City Hall, R. 711)	Air Marine Airport	G. W. Lewis
Mosinee	Mosinee Airport	
Oshkosh	Oshkosh Airport	R. A. Mensing, Jr.
Portage, 130 E. Cook St.	Miller & Winkler Airport	E. L. Zastrow
Princeton...(*m*)	Princeton Airport	G. V. Kelly
Rhinelander...(*m*)	Rhinelander Airport	Steve Shadbreck
Sheboygan...(*m*)	Sheboygan Airport	Kohler-Sheboygan
Stevens Point	Stevens Point Airport	
Three Lakes...(*m*)	Three Lakes Airport	H. L. Grandy
Washington Island	Washington Island Airport	Wm. Jess
Wausau...(*m*)	Alexander Airport	H. D. Putnam
Wisconsin Rapids	Tri City Airport	Maj. L. G. Mulzer
WYOMING:		
Casper...(*m*)	Wardell Field	R. Leferink
Cheyenne...(*m*)	Cheyenne Airport	Boeing Air Transport
Gillett	Gillett Airport	

Location	*Name of Port*	*Manager*
Lander.....(*m*)	Lander Airport.....	Hugh D. Spangler, C. A Comm.
New Castle.....(*m*)	New Castle Airport.....	
Parco.....(*m*)	Parco Airport.....	
Rock Springs.....(*m*)	Rock Springs Mun. Airport.....	E. S. Maroney
Sheridan.....(*m*)	Sheridan Airport.....	Bob Garrett
Wheatland.....(*m*)	Wheatland Airport.....	

ALASKAN FLYING FIELDS

List Supplied by Aeronautics Branch, Department of Commerce

Anchorage, Anchorage Municipal Airport and Seaplane Base
Fairbanks, Weeks Field, commercial
Fort Yukon, Fort Yukon Aviation Field, commercial
American Creek, American Creek Field, auxiliary
Bettles River, Bettles River Field, auxiliary
Bluff, Bluff Field, auxiliary
Cache Creek, Cache Creek Field, auxiliary
Candle, Candle Field, auxiliary
Cantwell, Cantwell Field, auxiliary
Chandalar, Chandalar Field, auxiliary
Chena Hot Springs, Chena Hot Springs Field, auxiliary
Chicken, Chicken Field, auxiliary
Chisana, Chisana Field, auxiliary
Circle Hot Springs, Circle Hot Springs Field, auxiliary
Copper Center, Copper Center Field, auxiliary
Cordova, Cordova Municipal Airport and Seaplane Base
Curry, Curry Field, auxiliary
Council, Council Field, auxiliary
Deering, Deering Field, auxiliary
Eagle, Eagle Field, auxiliary
Flat, Flat Field, auxiliary
Golovin, Golovin Field, auxiliary
Healy, Healy Field, auxiliary
Hot Springs, Manley Hot Springs Field, auxiliary
Kasilof, Kasilof Field, auxiliary
Kenai, Kenai Field, auxiliary
Kiwalik, Kiwalik Field, auxiliary
Kobuk, Kobuk Field, auxiliary (formerly Khumgnak)
Kotzebue, Kotzbue Field, auxiliary
Koyuk, Koyuk Field, auxiliary
Lake Minchumina, Lake Minchumina Field, auxiliary
Livengood, Livengood Field, auxiliary
Lost River, Lost River Field, auxiliary
Lower Tonsina, Lower Tonsina Field, auxiliary
McCarthy, McCarthy Field, auxiliary
McGrath, McGrath Field, auxiliary
Medfra, Medfra Field, auxiliary
Moose Creek, Moose Creek Field, auxiliary
Moses, Moses Field, auxiliary
Nabesna, Nabesna Field, auxiliary
Nenana, Nenana Field, auxiliary
Ninilchik, Ninilchik Field, auxiliary
Nome, Nome Field, auxiliary
Nulato, Nulato Field, auxiliary
Palmer Creek, Palmer Creek Field, auxiliary
Pilgrim Springs, Pilgrim Hot Springs Field, auxiliary
Ruby, Ruby Field, auxiliary
Seward, Seward Airport
Skagway, Skagway Municipal Landing Field
Solomon, Solomon Field, auxiliary
Susitna Station, Sustina Station Field. auxiliary
Takotna, Takotna Field, auxiliary
Tanana, Tanana Field, auxiliary
Telida, Telida Field, auxiliary
Teller, Teller Field, auxiliary
Unalakleet, Unalakleet Field, auxiliary
Upper Tonsina, Upper Tonsina Field, auxiliary
Valdez, Valdez Field, auxiliary
Valdex Creek, Valdex Creek Field, auxiliary
Cape Prince of Wales, Cape Prince of Wales Field, auxiliary
Wasilla, Wasilla Field, auxiliary
Willow Creek, Willow Creek Field, auxiliary
Wiseman, Wiseman Field, auxiliary
Wrangell, Wrangell Municipal Hydro-airport

SEAPLANE ANCHORAGES IN THE UNITED STATES

List Supplied by Hydrographic Office, Navy Department, Washington, D. C.

CLASS I. ANCHORAGES WITH RAMP, ETC.

Atlantic Coast

Maine

Bar Harbor (Hadley Point)
Rockland

Maryland

Baltimore (Middle River; Martin Airport)

Rhode Island

Newport (Gould Island Naval Torpedo Station)

Connecticut

Bridgeport
New Haven

New York

Croton-on-Hudson
Lake George
Port Washington, Long Island
North Beach, Long Island
Amityville, Long Island
New Dorp, Staten Island

District of Columbia

Washington —(Naval Air Station, Anacostia)

Massachusetts

Gloucester (Coast Guard Air Station)
Boston (Municipal Airport)
Squantum (Naval Reserve Air Station)
South Dartmouth (Round Hill Airport)

New Jersey

Atlantic City
Cape May (Coast Guard Air Station)

Pennsylvania

Bristol
Philadelphia (Naval Aircraft Factory)
Essington

Virginia

Hampton (Langley Field)
Hampton Roads (Naval Air Station)
Hopewell (Municipal Airport)
Quantico (Marine Barracks)
Dahlgren (Naval Proving Station)

North Carolina

Beaufort

Florida

West Palm Beach
Miami (4)
Key West (Naval Station)

Gulf Coast

Florida

St. Petersburg
Pensacola (Naval Air Station)

Louisiana

New Orleans

Pacific Coast

California

San Diego (Naval Air Station)
Santa Monica
Oakland (Oakland Municipal Airport)

Washington

Seattle (5), (Sand Point Naval Reserve Air Station); (Benton Airport); (Elliott Bay); (Lake Union) (2).
Port Townsend (Floating Hangar)

CLASS 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, Long Island
Amityville, Long Island
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
Bushwick

Florida

*Fernandina
*Jacksonville
*St. Augustine
*Daytona Beach
*Titusville
*Fort Pierce

Gulf Coast

Florida

*Fort Myers
*Sarasota
*Tampa
*Cedar Keys
Panama City

Alabama

Mobile

Mississippi

Pascagoula
Biloxi
Gulfport
Bay St. Louis

Louisiana

Weeks

Texas

Port Arthur
Houston
Corpus Christi
Rockport
Point Isabel

* Description of anchorage published in The Naval Air Pilot—East and Gulf Coasts of the United States. H. O. Publication 190.

Pacific Coast

California

Los Angeles
Port San Luis
Monterey
Santa Cruz
San Francisco
Sausalito
Alameda
Eureka
Crescent City

Oregon

Port Oxford
Marshfield
Reedsport
Astoria

Washington

Grays Harbor
Port Angeles
Blaine
Bellingham
Anacortes
New Dungeness
Everett
Bremerton (Navy Yard)

U. S. AIR CORPS, WAR DEPARTMENT

Officers on Duty in Washington

F. Trubee Davison.....Assistant Secretary of War
Maj. Gen. Benjamin D. Foulois.....Chief of the Air Corps
Brig. Gen. Oscar Westover.....Assistant Chief of the Air Corps

Lieut. Colonels—F. M. Andrews; J. E. Fickel; G. I. Jones(MC); Ira Longanecker.
Majors—C. L. Beaven(MC); J. E. Chaney; W. H. Frank; W. H. Hale; A. H. Hobley; H. V. Hopkins; B. Q. Jones; J. W. Jones; J. C. McDonnell; Leslie MacDill; J. H. Pirie; J. H. Rudolph; W. F. Volandt; Walter Weaver.
Captains—J. H. Beveridge, Jr.; A. W. Brock, Jr.; Isaiah Davies; A. N. Duncan; I. H. Edwards; H. M. Elmendorff; W. J. Flood; E. E. Hildreth; Ed. House; D. L. Hutchings; L. B. Jacobs; A. B. McDaniel; P. J. Mathis; C. P. Prime.
Lieutenants—Evers Abbey; C. E. Archer; R. Birnn; H. Brand; D. H. Dunten; J. B. Haddon; W. B. Hough; F. Kimble; N. Longfellow; T. M. Lowe; R. L. Owens; O. K. Robbins; C. W. Sullivan; L. P. Whitten; M. R. Wood.

Air Corps Posts

AKRON, OHIO—(Chief of the Air Corps) Balloon Production and Inspection, Procurement Section, District Office, P. O. c/o Goodyear Tire & Rubber Co., Akron, Ohio.
BARKSDALE FIELD (Fourth Corps Area) P. O. Barksdale, La.
BENNING, FT., GA.—Flight B, 16th Observation Squadron.
BIGGS FIELD—(Eight Corps Area) P. O. Ft. Bliss, Texas. Intermediate Landing Field.
BOLLING FIELD—(Chief of the Air Corps) P. O. Anacostia, D. C. Air Corps Detachment Flying Field.
BOSTON AIRPORT—(First Corps Area) P. O. Boston, Mass. Air Corps Detachment. 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. Sqdn.
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, 22nd, 88th Obs. Sqdns. 1st Photo Section. 58th, 62nd Service Sqdns. Border Patrol Station, Airdrome. Intermediate Landing Field.
BUFFALO, N. Y.—(Chief of the Air Corps) P. O. 398 Ellicott Sq., Buffalo, N. Y. Procurement Planning Representative. Air Corps Rep. 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. Air Corps Band.
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 Rd., Municipal Airport. Reserve Airdrome. Procurement Planning Rep. Air Corps, Procurement District at 59 East Van Buren.
CLARK FIELD—(P. Dept.) P. O. Camp Statsenburg, P. I. 3d Pursuit Sqdn.
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. Sqdn. 15th Photo Section.

CROCKETT, FT.—(Eighth Corps Area) P. O. Galveston, Texas. Hq. 3d Attack Group, 8th, 13th, 90th Attack Sqdns. 60th Service Sqdn., Air Corps Band.
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 Dist.
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. Air Corps Training Center. 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, 44th Obs. Sqdns. 12th Photo Section. 63d Service Sqdn. 24th, 78th Pursuit Sqdns. 25th Bomb. Sqdn. Aerial Coast Defense. Air Corps Band. Panama Air Depot.
GARDEN CITY—(Chief of the Air Corps) P. O. Long Island, N. Y. Air Corps Rep. Curtiss Aeroplane & Motor Corp.
HATBOX FIELD—(Eighth Corps Area) P. O. Muskogee, Okla. Intermediate Landing Field. Reserve Airdrome.
HENSLEY FIELD—(Eighth Corps Area) P. O. Dallas, Texas. Intermediate Landing Field. Reserve Airdrome.
HOUSTON, FT. SAM—(Eighth Corps Area) P. O. Ft. Sam Houston, Texas. Airway Control Officer.
KELLY FIELD—(Chief of the Air Corps) P. O. Kelly Field, Texas. Advanced Flying School. 40th, 41st, 42nd, 43d School Sqdns. 68th Service Sqdn. 22nd Photo Sec. 39th School Sqdn. Flying Cadet Detachment. Air Corps Band.
LANGLEY FIELD—(Third Corps Area) P. O. Hampton, Va. Hq. 2nd Bomb. Wing. 19th Airship Co. Hq. 2nd Bomb. Group. 20th, 49th, 96th Bomb. Sqdns. A. C. Band. 59th Service Sqdn. 2nd Photo Section. Flying Field, Flight A, 16th Obs. Sqdn. 8th Pursuit Group Hq.
LEAVENWORTH, FT.—P. O. Ft. Leavenworth, Kansas. Air Corps Detachment. Intermediate Landing Field.
LITTLE ROCK AIR DEPOT—(Chief of the Air Corps) P. O. Little Rock, Ark. Supply Depot. Flying Field.
LONG BEACH, CAL.—(Formerly Clover Field) Municipal Airport. Reserve Airdrome.
LOGAN FIELD—(Third Corps Area) P. O. Dundalk, Md. Intermediate Landing Field. Flying Field for 104th Obs. Sqdn. Md. National Guard.
LORDSBURG—(Eighth Corps Area) P. O. Lordsburg, N. M. Airdrome. Intermediate Landing Field.
LUKE FIELD—(Hawaiian Dept.) P. O. Honolulu, T. H. Hq. 5th Composite Group. 4th Obs. Sqdn. 50th Obs. Sqdn. 23d, 72nd Bomb. Sqdns. 65th Service Sqdn. 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. Group. Hq. 11th Bomb. Sq. 9th, 31st Bomb. Sqdns. 17th Pursuit Gp. Hq. 34th, 73d, 95th Pursuit Sqdns. 64th, 70th Service Sqdns. 23d Photo Section. Air Corps Band.
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 Sqdns. 80th Service Sqdn.
MAXWELL FIELD—(Chief of the Air Corps) P. O. Montgomery, Ala. 4th Photo Sec. Hq. Tactical School. 51st, 54th School Sqdns.
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. Sqdns. 8th, 14th Photo Sections. 61st Service Sqdn. A. C. Band. 19th Composite Wing Hq.
NEW YORK—(Chief of the Air Corps) P. O. 39 Whitehall Street, New York, N. Y. District Office Procurement Section (Materiel Division) Procurement Planning Rep. Air Corps Procurement District.
NICHOLS FIELD—(Philippine Dept.) P. O. Maricaban, Rizal, P. I. Hq. 4th Composite Gp. 66th Service Sq. 6th Photo Section. 28th Bomb. Sq. 2nd Obs. Sq. Philippine Air Depot.
NORTON FIELD—(Fifth Corps Area) P. O. Columbus, Ohio. Corps Area. Hq. Flight. Intermediate Landing Field. Reserve Airdrome.
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 and 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 Detachment.
PITTSBURGH AIRPORT—(Third Corps Area) R. D. #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.

POST FIELD—P. O. Ft. Sill, Okla. Flight E, 16th Obs. Sqdn. 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. Sqdn. 46th, 47th, 52nd & 53d School Sqdns. 67th Service Sqdn. 20th Photo Sec. Flying Cadet Detachment. 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. 76th Service Sqdn.

ROSS FIELD—(Ninth Corps Area) P. O. Arcadia, Calif. Det. 91st Obs. Sqdn. 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, San Antonio, 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 Rep. Air Corps Procurement District.

SANTA MONICA—(Chief of the Air Corps) P. O. 2435 Wilshire Blvd., Santa Monica, Calif. District Procurement Office. Production Manager, Air Corps Rep. 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. Sqd. 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, 36th, 94th Pursuit Sqdns. 57th Service Sqdn. Flying Field.

SHAFTER, FT.—(Hawaiian Dept.) P. O. 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.

WHEELER FIELD—(Hawaiian Dept.) P. O. Schofield Barracks, Honolulu, T. H. Hq. 18th Pursuit Gp. 6th, 19th Pursuit Sqdns. 26th Attack Sqdn. 75th Service Sqdn. Flying Field.

WRIGHT FIELD—(Chief of the Air Corps) P. O. Dayton, Ohio. Materiel Division. Engineering School. Experimental Engineering Section. Procurement Planning Rep. Repair & Maintenance Section. Industrial War Plans. Field Service Sec. Procurement Sec. A. C. Procurement District.

Organized Reserve Airdromes and Stations for Reserve Flying.—Boston Airport, Bowman Field, Candler Field, Hatbox Field, Hensley Field, Kansas City Airport, Lunken Airport, Norton Field, Pearson Field, Pittsburgh Airport, Schoen Field. Also municipal airports—Chicago, Ill.; Long Beach, Calif.; Salt Lake City, Utah; Seattle, Wash.

Air Depots.—Fairfield, Little Rock, Middletown, 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.
103nd Obs. Sq..... Penn. Nat. Guard,	Municipal Airport, 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 570, Birmingham, Ala.
107th Obs. Sq. & Photo Sec., Mich. Nat. Guard,	Wayne Co. Airport, Route #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,	208 S. 12th St., St. Louis, Mo.
111th Obs. Sq. & Photo Sec., Tex. Nat. Guard,	Route #1, Box 655, Houston, Texas
112th Obs. Sq..... Ohio Nat. Guard,	Cleveland Airport, Cleveland, Ohio
113th Obs. Sq. & Photo Sec., Ind. Nat. Guard,	RR #3. Box 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 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.
154th Obs. Sq..... Ark. Nat. Guard,	Room 428, State Capitol, Little Rock, Ark.

District Procurement and Planning Representatives

Buffalo	Wright Field
Chicago	New York
Detroit	San Francisco

Air Corps Procurement Districts

Buffalo, N. Y.	65 Franklin St.
Chicago, Ill.	1212 & 1213 Buckingham Bldg., 59 East Van Buren
Cleveland, Ohio	Wright Field, Dayton, Ohio
Detroit, Mich.	802 Farwell Bldg.
New York, N. Y.	39 Whitehall St.
San Francisco, Calif.	369 Pine St.

Corps Area and Department Air Officers

First Corps Area	Army Base, Boston 9, Mass.
Second Corps Area	Governors Island, N. Y.
Third Corps Area	311 St. Paul Place, Baltimore, Md.
Fourth Corps Area	Hq. Ft. McPherson, Ga. Mail Address: Oakland City Station, 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 Department	Quarry Heights, C. Z.

Materiel Division

Wright Field, Dayton, Ohio

Brig. Gen. Henry C. Pratt, Chief of the Division

Asst. Executive	Major Robert Walsh
Asst. Executive	Captain A. E. Jones
Commanding Officer	Major Robert Goolrick
Chief, Engineering Section	Major Clinton W. Howard
Chief of Procurement	Major Roy M. Jones
Chief of Field Service Section	Major Hugh J. Knerr
Chief of Industrial War Plans	Captain R. B. Hough, Jr.
Finance Officer	Captain Louis H. Price
Asst. Commandant Air Corps Engineering School	Captain G. Gardner
Adjutant	Captain J. G. Whitesides
Quartermaster	Captain Elmer Hostetter
Constructing Quartermaster	Captain R. C. Bower
Signal Officer	Lieut. Kenneth S. Stice
Station Supply Officer	Lieut. Harold R. Wells
Engineer Corps Representative	Captain H. C. Hill
Ordnance Corps Representative	Major J. L. Hatcher
Navy Representative	Lieut. W. D. Sample

AVIATION EDITORS OF PRINCIPAL AMERICAN NEWSPAPERS AND PRESS ASSOCIATIONS

The following directory of aviation editors of principal newspapers and press associations listed by states and supplying additional information as to whether the paper has a daily, weekly or Sunday aviation column or page and has chartered airplanes to speed the getting of news or photographs during 1931 was prepared by the Aeronautical Chamber of Commerce of America with the cooperation of the newspapers in a survey made especially for "The Aircraft Year Book."

Alabama

Name of Newspaper	*Name of Aviation Editor*	*Aviation Column or Page*	*Chartered Planes in 1931*
Birmingham News and Age-Herald	Ralph E. Hurst	Sundays	No
Mobile Press	C. D. Nowlin		

Arizona

Tucson Citizen	H. G. Wilson		

Name of Newspaper	Name of Aviation Editor	Aviation Column or Page	Chartered Planes in 1931
Arkansas			
Arkansas (Little Rock) Gazette	John O'Brien	Daily	No
Pine Bluff Graphic	Edgar B. Chesnutt		
California			
Los Angles Evening Express	Charles B. Dawson	Semi-weekly	Yes
Los Angeles Times	Al Parmenter	Sundays	Yes
Oakland Tribune	Sherman Carash	Daily	Yes
Sacramento Bee	Hamilton Hintz		
Sacramento Union	Leonard J. Hintz		
San Diego Sun	Max Miller	Weekly	Yes
San Francisco Chronicle	Harry Hall	Sundays	Yes
San Francisco Examiner	Frank Lyman		
San Jose Mercury Herald	Robert E. Ryan	Sundays	Yes
Colorado			
Denver Rocky Mountain News	C. E. Lounsbury		
Denver Post	James Irwin		
Pueblo Star Journal	Herbert A. Foster		
Connecticut			
Hartford Times	Burton E. Moore, Jr.	Weekly	Yes
District of Columbia			
Washington Daily News	Ernie Pyle	Daily	Yes
Washington Evening Star	Joseph S. Edgerton	Sundays	Yes
Illinois			
Bloomington Pantagraph	Maxwell E. H. Pyle		Own Plane
Chicago Herald and Examiner	William Westlake	Semi-weekly	No
Chicago Tribune	Hugh Sexton	Daily	Yes
Chicago Evening Post	George Robbins	Weekly	No
Rockford Register Republic	Allen O. Brophy	Irregular	Yes
Illinois State Register	James Graham	Sundays	No
Indiana			
Fort Wayne Journal Gazette	H. K. Milks		
Fort Wayne News Sentinel	Robert Schott	Saturdays	Own Plane
Indianapolis Star	Walter Morris		
Indianapolis Times	Lowell Nussbaum		
Iowa			
Des Moines Register and Tribune	Charles W. Gatschet		Own Planes
Mason City Globe Gazette	W. Earl Hall		Yes
Kansas			
Topeka Capital	Harry Elliott		
Topeka State Journal	Walter M. Markley		
Wichita Beacon	James Woods		
Wichita Eagle	Will Cunningham	Daily	Own Plane
Kentucky			
Lexington Leader	Frederick Jackson	No	No
Louisiana			
New Orleans Times Picayune	George Healy, Jr.		Yes
Maine			
Portland Press Herald	Charles Cutter	Weekly	No
Massachusetts			
Boston Christian Science Monitor	Volney D. Hurd		
Boston Evening Transcript	Franklin Jordan	Weekly	No
Pittsfield Berkshire Eagle	Ted Giddings	None	No

Name of Newspaper	Name of Aviation Editor	Aviation Column or Page	Chartered Planes in 1931
Michigan			
Detroit News	James V. Piersol	Sundays	Own Planes
Detroit Free Press	Royce Howes	Weekly	
Detroit Times	Robert Ross	Weekly	
Grand Rapids Press	H. Wendell Spencer	Weekly	Yes
Pontiac Daily Press	None	Weekly	No
Minnesota			
St. Paul Dispatch-Pioneer Press		Sundays	Yes
Minneapolis Star	James Sutherland	Daily	No
Missouri			
Kansas City Star	R. S. Knowlson	Weekly	Yes
St. Louis Times	Frank Sullivan		Yes
Nebraska			
Nebraska State Journal (Lincoln)	Richard O. Bennett		Yes
New Jersey			
Newark Evening News	Roger Garis	Saturdays	Yes
New Mexico			
N. M. State Tribune (Albuquerque)	George Fitzpatrick	Irregular	No
New York			
Brooklyn Eagle	Fred Lang	Sundays	
Brooklyn Times	Jack Riordan	Sundays	
Buffalo News	Charles A. Michie	Daily	Yes
Buffalo Times	Gordon Davis	Sundays	Yes
New York Herald Tribune	Francis D. Walton	Sundays	
New York Sun	Sherman B. Altick	Semi-weekly	
New York World-Telegram	Carl Allen		
New York Times	L. D. Lyman R. M. Cleveland	Sundays	Yes
New York Wall Street Journal	Walter H. Neff		
Utica Observer Dispatch		Sundays	No
North Carolina			
Charlotte Observer		Irregular	Yes
Ohio			
Akron Beacon Journal	Harold J. Taylor	Daily	Yes
Akron Times-Press	William Shenkel	Daily	Yes
Cincinnati Enquirer	James T. Golden, Jr.	Weekly	No
Cleveland Plain Dealer	James D. Hartshorne		
Cleveland Press	Julian Griffin		
Cleveland News			Own Plane
Columbus Citizen	Francis Lauffer		
Columbus Dispatch	Charles Williams	Daily	
Ohio State Journal (Columbus)	Harold W. Carlisle		
Toledo Blade	R. E. Roberts		Yes
Oklahoma			
Oklahoma City Oklahoman			Yes
Tulsa Tribune	Virgil Curry		
Oregon			
Portland Oregonian	Webb Jones		
Portland Oregon Journal	Richard M. Rummel		
Pennsylvania			
Erie Times	Earl Harvey	Daily	No
Erie Dispatch Herald	Barbara Hawley	Daily	
Philadelphia Public Ledger			Yes
Philadelphia Record	Patrick J. O'Brien	Daily in Summer	Yes
Tennessee			
Nashville Banner	Brainard Cheney		
Nashville Tennessean	Jack Munroe		

Texas

Name of Newspaper	*Name of Aviation Editor*	*Aviation Column or Page*	*Chartered Planes in 1931*
Dallas Times Herald	Gerald Forbes		
El Paso Herald and Times	Hal Rush		
Fort Worth Star Telegram	James Calvert		
San Antonio Light	R. G. Fraim		

Virginia

Richmond News Leader	W. L. Oliver		Yes

Washington

Seattle Post-Intelligencer	A. H. Norton		Yes
Spokane Press	Wafford Conrad		

Wisconsin

Madison State Journal	Don Anderson		
Milwaukee Journal	C. F. Butcher	Sundays	Yes
Milwaukee Leader	Burdette Kirkham		

Press Associations

The Associated Press, Washington, D. C.	Oscar Leiding
National Enterprise Association, Cleveland, Ohio	Israel Klein

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551 Fifth Avenue, New York City

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George Gardner.....Chief, Editorial Section

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C. J. Stanton.....Airways Engineer
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H. J. Walls.....Radio Engineer
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A. J. LaBaie.....Chief, Construction Section
W. T. Miller.....Supt. Airways Extension

Air Mapping Section (Coast and Geodetic Survey)
Raymond L. Ross.....Chief, Air Mapping Section

Aeronautical Research Division (Bureau of Standards)
Dr. L. J. Briggs.....Chief, Aeronautical Research

DIPLOMATIC SERVICE TO THE UNITED STATES

Mexico.....Señor Coronel Don Francisco J. Aguilar, Military Attaché.
Italy.....Commander Paolo Sbernadori, Air Attaché.
Spain.....Major Joaquin Planell Riera, Spanish Army, Military Attaché.
Cuba.....Captain Enrique A. Prieto, Military Attaché.
France.....Major Georges Thenault, Air Attaché.
Chile.....Señor Don Carlos H. Lee, Commercial Attaché.
Japan.....Colonel Shohei Washizu, I. J. A., Military Attaché.
Poland.....Mr. Andrew Sapieha, Commercial Counselor.
Great Britain.....Group Captain The Honorable L. J. Fiennes, R. A. F., Air Attaché.
Argentina.....Lieutenant Colonel Don Ricardo Miro, Military Attaché.
Hungary.....Major Count Marcel Stomm, Military Attaché.
Colombia.....Colonel Don Jorge Mercado, Military Attaché.

DIPLOMATIC SERVICE OF THE UNITED STATES

Army

Berlin, Germany.....Lt. Col. Jacob W. S. Wuest, U. S. A., Assistant Military Attaché for Air; Germany, Austria, Czechoslovakia, and Denmark.
Paris, France.....Lt. Col. Frank P. Lahm, U. S. A., Assistant Military Attaché for Air; France and Spain.
London, England.....Maj. Martin F. Scanlon, U. S. A., Assistant Military Attaché for Air; Great Britain.
Rome, Italy.....Capt. F. M. Brady, U. S. A., Assistant Military Attaché for Air; Italy and Greece.

Navy

London.....Comdr. R. T. Hanson, Assistant Naval Attaché for Aviation. (Also accredited to Paris, The Hague, Berlin, Madrid, and Lisbon.)
Rome.....Lt. Comdr. F. W. Pennoyer, Jr., Assistant Naval Attaché for Aviation.

FOREIGN AERONAUTICAL OFFICIALS AND BUREAUS

COMPILED BY BUREAU OF FOREIGN AND DOMESTIC COMMERCE
DEPARTMENT OF COMMERCE, WASHINGTON, D. C.

The following list is prepared for the convenience of American exporters and manufacturers of aircraft, parts, accessories, and supplies who wish to place information regarding their products before aeronautical officials and bureaus abroad.

ARGENTINA

Lieutenant Colonel Angel Maria Zuloaga, Director General of Aeronautics, Ministry of War, Calle Charcas 628, Buenos Aires, Argentina.
Captain Marcos Zar, Director General of Aeronautics, Ministry of Marine, Calle Cordoba 2257, Buenos Aires, Argentina.
Mr. Juan Jose Mundin Schasster, Director General of Civil Aeronautics, Calle Ascuenaga 957, Buenos Aires, Argentina.
Lieutenant Colonel Jorge A. Mani, Director General of the Army Air Service, Argentine Army Air Base, El Palomar, Argentina.
Mr. Bme. de la Colina, Aeronautic Engineer, Director of The Military Aircraft Factory "Aero Tecnica," Cordoba, Argentina.

AUSTRALIA

Wing Commander W. H. Anderson, Third Air Member, Air Board (Supplies), Department of Defense, Melbourne, Australia.
Hon. Albert E. Green, Minister of Defense, Melbourne, Australia.
Colonel H. C. Brinsmead, Controller of Civil Aviation, Department of Defense, St. Kilda Road, Melbourne, Australia.
Air Commodore Richard Williams, Chief of Staff, Royal Australian Air Force, Victoria Barracks, Melbourne, Australia.

AUSTRIA

Ministerial Councillor Dr. Victor von Krauss, Ministry of Commerce and Transportation, Section 49, Aviation Department, 1, Stubenring 1, Vienna, Austria.
Ing. Karl Tindl, Technical Chief, Aviation Department, Ministry of Commerce and Transportation, 1, Stubenring 1, Vienna, Austria.

BELGIUM

Mr. Maurice Lippens, Minister of Transports, Brussels, Belgium.
Captain Kervyn de Lettenhove, Minister of National Defense, Purchasing Bureau of Aeronautic Equipment, 11 Rue Leonard de Vinci, Brussels, Belgium.
Professor Emile Allard, Director of Technical Service, Chausee de Waterloo, Rhode St. Genese, Belgium.

General Van Crombugghe (R. P. A. J.), Director General of Aeronautics, 90 Rue de la Loi, Brussels, Belgium.
Lieutenant General Pierret, Inspector General of Aeronautics, 23 Place Dailly, Brussels, Belgium.
Captain-Commandant Crabbe, Director of Air Navigation Service, 90 Rue de la Loi, Brussels, Belgium.

BOLIVA

Minister of War, La Paz, Bolivia.
Lieutenant Colonel Bernardino Bilbao R., Director, School of Aviation, La Paz, Bolivia.

BRAZIL

General Victoriano Aranha, Director de Aviacao Militar, Ministerio de Guerra, Rio de Janeiro, Brazil.
Major Plinio, Commandante da Escola de Aviacao Militar, Campo dos Affonsos, Rio de Janeiro, Brazil.
Almirante Protogenes Guimaraes, Director General de Aviacao Naval, Ministerio da Marinha, Rio de Janeiro, Brazil.
Capitao de Corveta Augusto Short, Director de Aeronautica Naval, Ilha do Governador, Rio de Janeiro, Brazil.
Dr. Cesar Grillo, Director de Aeronautica Civil, Ministerio de Viacao e Obras Publicas, Rio de Janeiro, Brazil.
Dr. Luciano Koeler, Chief of Traffic Division, Departamento de Aeronautica Civil, Ministerio da Viacao e Obras Publicas, Rio de Janeiro, Brazil.
Dr. Furtado Reis, Chief of Administrative Division, Departamento de Aeronautica Civil, Ministerio da Viacao e Obras Publicas, Rio de Janeiro, Brazil.
Commandante do Servico Aereo, Forca Publica, Sao Paulo, Brazil.

BRITISH EAST AFRICA (RHODESIA)

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CANADA

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Wing Commander G. O. Johnson, Acting Director of Civil Government Air Operations, Department of National Defence, Ottawa, Ontario, Canada.
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Sr. Frederico Baraona W., Director of Aeronautics, Ministry of Interior, Santiago, Chile.
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CHINA

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Mr. Wang Pei Chun, Minister of Communications, Nanking, China.
General Chang Hwei Chang, Director of Aviation, War Department, Nanking, China.
Mr. Nieh Kai Ih, Director Air Mail Bureau, Ministry of Communications, Nanking, China.
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COLOMBIA

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Dr. Alberto Pumarejo, Ministro de Correos y Telegraphos, Bogota, Colombia.
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General Alberto Herrera, Chief of Staff, Ministry of War and Marine, Habana, Cuba.
Colonel Julio Saaguily, Chief of Air Corps, Secretaria de la Guerra y Marina, Habana, Cuba.
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Commandante da Escola Militar de Aeronautica, Alverca, Portugal.
Director do Parque do Material Aeronautico, Alverca, Portugal.
Commandante do Grupo de Esquadrilhas de Aviacao, "Republica," Amadora, Portugal.
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Dr. Rafael Requena, Secretary to General Gomez, Caracas, Venezuela.
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Colonel A. Ch. Cardona, Director of War, Ministry of War and Navy, Caracas, Venezuela.

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Captain Tadija Sondermayer, Chief of Civil Aviation, 1 Njegoseva, Belgrade, Yugoslavia.

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