AIRCRAFT YEAR BOOK, 1932
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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,

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.

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

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 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 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 28,833,676 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.

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 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 flyer 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 67,855 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-
AVIATION'S BAROMETERS OF BUSINESS

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

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](image_url)

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
AVIATION'S BAROMETERS OF BUSINESS

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
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 $2,351,657 in 1930 and $2,252,268 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 184,509 miles daily within the continental limits of the United States. An additional 18,371 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
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

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.


**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 affiliated 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 Compañía Nacional Cubana de Aviación 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-four-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
<table>
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<td>National Air Trans., Co. Inc. (United Air Lines)</td>
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<td>Seattle to Victoria</td>
<td>74 MPE</td>
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<td>Ford Airways</td>
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<td>Varney Air Lines (United Air Lines)</td>
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<td>Fargo to Minot, N. D.</td>
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<td>Kansas City to Denver</td>
<td>577 M</td>
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SCHEDULED AIRWAY OPERATORS
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 routes operated which are listed in order of the 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
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.

Maner 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."
A. LEERIC GROJNG

AIR WORK 45 NEW YORK'S AIR FERRY

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

NEW YORK'S AIR FERRY

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, coordinated 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 trimotored 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 inter-line 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 Compañía Nacional Cubana de Aviación 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


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 Winnipeg 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
AIRCRAFT YEAR BOOK

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

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 Winnipeg, 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 amphibians 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) amphibious, 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 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

Compañía Nacional Cubana de Aviación Curtiss, controlled by North American Aviation Corporation, extended its service April 1 from Santiago to Baracoa, using Sikorsky amphibians, 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 Holguín.

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 Holguín.

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 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 Latecoère 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.
experienced 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 2,300 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 Empeza de Viation Aerea Rio Grandense, S. A., carried passengers,
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, 10,504,991 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 7, 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 Kimmers) 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 Aerospot (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 Compañía Aérea Hondureña, 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 Compañía 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 Alemana 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 Caribbean.

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 Caribbean 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-
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 airfield 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,
ARMY AIR CORPS FLIES ON

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 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 allotment 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 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 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 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-

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**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 earth-
quake 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 organiza-
tion 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.
Keystone Loeening (Wright Cyclone) amphibian of the Navy's Porto Rican-Nicaraguan Aerial Survey seen over Porto Rico making maps.

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.
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

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 reconnaissance 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
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.

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
AMERICA TAKES LEAD IN AIRSHIPS

“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 with 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 were 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
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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
HISTORY-MAKING FLIGHTS OF 1931

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

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 sub-
contract, 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 to-
morrow 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 high-
way 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 fêté, 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

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 feted, 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](image)

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 Jetiaigari 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

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 flyers 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 flyers 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 flyers’ 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, averag-
ing 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 Schnei-
der 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 per-
formance, diving six times across the short course to average 379.05 miles an
hour and reach 385.6 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 horse-power, 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 mess-room. 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

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

VIKINGS OF THE AIR

Parker D. Cramer (right) and Oliver Paquette who were lost after proving the feasibility of the Transamerican Airlines’ Atlantic route.
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 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,
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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-
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,
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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 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 (Salmon) 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, 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 fèted 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
HISTORY-MAKING FLIGHTS OF 1931

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 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) 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 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 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 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...
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
AIRPORTS: TERMINALS OF THE AIRWAYS

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 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-I-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 acres of area and the installation of additional lighting facilities. Records showed 16,295 passengers handled during the year.

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 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](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 $7,590, 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.
AIRPORTS: TERMINALS OF THE AIRWAYS

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

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

AKRON GETS DIRECT SERVICE

Akron’s municipal airport becomes a regular stop for Stinson (3 Lycomings) Airliners of Pennsylvania Airlines, Inc., carrying passengers.
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 airport; by flying less
RESORT OPENS AIRPORT

Private Ford (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
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 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.
FLYING FOR SPORT AND BUSINESS

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.
FLYING FOR SPORT AND BUSINESS

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 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

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

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


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


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.
modernity 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.
AVIATION AND THE PRESS

The Herndon-Pangborn landing at Wenatchee, Wash., to complete the first non-stop flight across the Pacific, was flown to San Francisco and telephoteed 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 Francisquito 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 (III.) Register Republic dispatched its
PANTAGRAPHS "SCOOPE III"
Stinson (Lycoming) monoplane "Scoop III" of the Bloomington Pantagraph landing at home airport after returning from big news story.

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) amphibian 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) amphibian 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 wit­
nessed an unprecedented amount of activity in aeronautical legis­
lation. 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 impossible 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 informa­
tion 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 legisla­
tures will be found in convenient form in Part IV, Flying Facts and Figures
For 1931, in this volume. The information there supplements that dis­
cussed in this chapter.

Speaking generally, the laws enacted might fairly be considered favor­
able 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 impor­
tant subjects for consideration by the states. At the beginning of the
legislative year, six states—Alabama, Georgia, Louisiana, Oklahoma, Ten­
nessee 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-

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 unfunded 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, 217 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 Curiae 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 classroom 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 Airplane.

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.
AERONAUTICS ON THE CAMPUS

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 hurling 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 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 aircraft 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 Österreichische 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 7,889 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-Innsbruck, Vienna-Graz-Klagenfurt, and Innsbruck-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 Avio linee Italiana, service was maintained thrice weekly throughout the year on the Munich-Innsbruck-Bolzano-Trento-Milano route; while daily summer service was operated jointly by the Austrian company and the Société de Navigation Aérienne Jugoslaive 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 maintained 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 2,988,951 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 Liège, Liège 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 Romanian
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

Spanish

Swiss

Yugoslav

French

German

Italian

British

Hungarian

Danish

Czechoslovak

Austrian

Belgian

African

Note: Paris-Brindisi Section of London-Delhi Service, by Rail

Swiss-French

Swiss-Czechoslovak
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 registry 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 ($197,200) 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 Aerienne, 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 Luftfartsskab, 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 network 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 2,994 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.

Aéropostale, 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 Air." Its principal routes were: Marsèilles-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 Akth. 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 Transafriquaine 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
WORLD AVIATION IN 1931

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
AIRCRAFT YEAR BOOK

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

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 Friedrichschnaufen, 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, 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; 36,474 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-

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-

![Handley Page "Hannibal" 42 of Imperial Airways, Ltd., showing luxurious aft cabin of 40-passenger liner in London-Paris service.](image)

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 18,434 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 $2,900,000, 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) amphibians 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 pengő ($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, Sigulfjord 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 airfields 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, “barn-
storming” 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 Fascists 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 develop­
ment, undertaking several important missions during 1931, the most spec­
tacular 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 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 Aerea 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 Servizi 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, Jodhpur, Allahabad, Calcutta, Akyab, Rangoon, Bangkok, Sengora, Medan, Palembang, Bandeong 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 Netherlands 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-Singapore 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 19,927 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 Luftreter (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 Göteborg, 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 kilolgrams 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 Aéreas, 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 Aéreos, 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.


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.I.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.

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 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

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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 mili­
tary. 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 re­
finements 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 per­
formances, 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 Ap­
proved 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 load­
ing 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 cleanliness so that increasing the speed range through the use of automatic "slots" and "flaps" can be effected only on machines having a cleanliness 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 watertight 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 under-surface 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 previ­
ous years were very much refined in detail and their speeds increased con­
siderably. 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 Aeronau­
tical 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 trans­
port 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
OUT OF THE ENGINEERING LABORATORY

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, Consolidated 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 weight of 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
wings.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 6 1/2 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 1937. 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


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-
Perfecting Component Parts for Aircraft

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 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-
completed 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
PERFECTING COMPONENT PARTS FOR AIRCRAFT

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 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 duraluminum anodized to prevent corrosion. A new aircraft primer, patterned after the Imperial Auto Primer, was perfected for the market.

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.
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 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 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 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 prospects 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
New Chance Vought Corp. factory at East Hartford, Conn., is illustrative of the up-to-date plants manufacturing American planes.

Air view of the Douglas Aircraft Corp. plant at Clover Field, Santa Monica, Cal., typical of West Coast aircraft factories.
AIRCRAFT YEAR BOOK

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 NORTHOPI 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.

**Amphibians, 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.
Looking across the world’s largest flying field center, the Army Air Corps’ training school at Randolph Field, from the southwest.

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 0-19C 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, Jr.s., 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
MANUFACTURING AMERICAN AIRPLANES

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 2Tr-A, a two-place open cockpit biplane powered with an Upright American Cirrus engine, and the 2Tr-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 Hornet. 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 produc-
tion 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, Jr.
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

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AMERICAN AIRPLANE & ENGINE CORPORATION
Farmingdale, L. I., N. Y.
PILGRIM 100-A — 10 PLACE
ENGINE: PRATT & WHITNEY HORNET
MAIL TRANSPORTS

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
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

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BELLANCA AIRCRAFT CORPORATION
New Castle, Del.

PACEMAKER — 6 Place

Engine: PACKARD DIESEL
PRATT & WHITNEY WASP, JR.
WRIGHT WHIRLWIND 300
BELLANGA 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
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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 ALT AIR — 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.
PRIVATE OPERATION AND AERIAL SERVICE

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 G 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
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Troy, Ohio
Model INF, RNF — 3 Place
Engine: Kinner B 5
Warner Scarab
WACO AIRCRAFT COMPANY
Troy, Ohio
Model 2FG — 3 Place
Engine: Continental A-70-2
Jacobs LA-1
## PRIVATE OPERATION AND AERIAL SERVICE

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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
FIGHTER XF9C-1
ENGINE: WRIGHT WHIRLWIND
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Buffalo, N. Y.
Observation 01-G
Engine: Curtiss D-12
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Buffalo, N. Y.
Observation O2G-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 194

ENGINE: PRATT & WHITNEY HORNET

WRIGHT CYCLONE
THE GLENN L. MARTIN COMPANY
Baltimore, Md.
Model 125, Diving Bomber
Engine: WRIGHT CYCLONE
MILITARY PLANES

CHANGE 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 investiga-
tions 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 an-
nounced 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 prob-
lems 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
THE AUTOGIRO: NEWCOMER IN THE SKIES

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
THE AUTOGIRO: NEWCOMER IN THE SKIES

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 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.
PITCAIRN AIRCRAFT, INCORPORATED
Autogiro PCA-2, PCA-3 — 3 Place
Engine: Pratt & Whitney Wasp, Jr.
Wright Whirlwind 300
PITCAIRN AIRCRAFT, INCORPORATED
AUTOGIRO PAA-1 — 2 PLACE
ENGINE: KINNER B-5
## AUTOGIROS

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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
Szekely, 70 horsepower (upper left); Continental A-70, 165 horsepower (upper right); Aeronca E-113, 90 horsepower (center); Szekely, 40 horsepower (lower left); and Continental A-49, 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
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.
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 babbit 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–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-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 — 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

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### CHRONOLOGY FOR 1931

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<th>Date</th>
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<tr>
<td>Jan. 4–9</td>
<td>Evelyn Trout and Edna May Cooper establish women’s refueling duration record of 123 hrs. at Los Angeles, Cal. (Curtiss-Robin, Curtiss Challenger motored.)</td>
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<tr>
<td>Jan. 7–10</td>
<td>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.)</td>
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<tr>
<td>Jan. 15</td>
<td>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. (Savoini-Marchetti S-55, Fiat A-22 motored.)</td>
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<td>Jan. 29</td>
<td>Election of officers of Aeronautical Chamber of Commerce.</td>
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<td>Feb. 2</td>
<td>Northwest Airways, Inc., extends mail service from St. Paul, Minn., to Pembina, N. D., where connections are made with Canadian air mail service.</td>
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<tr>
<td>Feb. 11</td>
<td>Pan American Airways, Inc., extends air mail service from Puerto Cabello, Venezuela, to Fort of Spain, Trinidad.</td>
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<td>Feb. 26–Mar. 1</td>
<td>Lucien Bossoutrot and Aime Rossi establish closed circuit distance record of 5,468 miles at Oran, Algeria. (Bleriot 110, Hispano-Suiza motored.)</td>
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<td>Mar. 3–5</td>
<td>Thirty-second International Aeronautical Conference held in London.</td>
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<td>Mar. 5</td>
<td>Seventeen representatives of the Aeronautical Chamber of Commerce call on President Hoover to present report of conditions in aeronautical industry.</td>
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<td>Mar. 6</td>
<td>Ruth Nichols establishes women’s altitude record of 28,743 ft. at Jersey City Airport, N. J. (Lockheed Vega, Pratt &amp; Whitney Wasp motored.)</td>
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<tr>
<td>Mar. 25–27</td>
<td>Third National Airport Conference held at Tulsa, Okla., under auspices of Aeronautical Chamber of Commerce.</td>
</tr>
<tr>
<td>Mar. 30–Apr. 2</td>
<td>Jean Mermoz and Anthoine Paillard establish closed circuit distance record of 5,679 miles at Oran, Algeria. (Bernard 80, Hispano-Suiza motored.)</td>
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<tr>
<td>Mar. 31</td>
<td>Maclay Trophy for 1929 is awarded to Capt. Albert W. Stevens in recognition of his high altitude photography.</td>
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<tr>
<td>Mar. 31–Apr. 6</td>
<td>Lt. Comdr. Glen Kidston flies from London to Cape Town, South Africa, in 6 days 10 hrs., establishing new record. (Lockheed Vega, Pratt &amp; Whitney Wasp motored.)</td>
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<tr>
<td>Apr. 1</td>
<td>Eastern Air Transport, Inc., inaugurates air mail service between Richmond, Va., and Jacksonville, Fla., via Charleston, S. C.</td>
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<td>Apr. 1–10</td>
<td>Charles W. A. Scott flies from London to Australia in 9 days 7 hrs. 40 min., establishing new record. (DeHavilland Moth 60 M, DeHavilland Gipsy II motored.)</td>
</tr>
<tr>
<td>Apr. 8</td>
<td>Amelia Earhart establishes autogiro altitude record of 18,415 ft. at Willow Grove, Pa. (Pitcairn, Wright Whirlwind motored.)</td>
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<tr>
<td>Apr. 11–19</td>
<td>National Aircraft Show held at Detroit, Mich., under auspices of Detroit Board of Commerce and Aeronautical Chamber of Commerce.</td>
</tr>
<tr>
<td>Apr. 12–15</td>
<td>Walter E. Lees and Frederick A. Brosy establish unofficial duration record of 74 hrs. 12 min. at Jacksonville, Fla. (Bellanca Pacemaker, Packard Diesel motored.)</td>
</tr>
<tr>
<td>Apr. 13</td>
<td>Ruth Nichols establishes women’s speed record of 210.636 m.p.h. at Carlton, Mich. (Lockheed Vega, Pratt &amp; Whitney Wasp motored.)</td>
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May 3
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 Lynne, England, in 10 days 13 hrs. 25 min., establishing new record. (DeHavilland Gipsy II motored.)

May 27
Auguste Picard, 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 Pargo 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. (Lalicoare 28-3, Hispano-Suiza motored.)

June 6–14
Annual F. A. I. congress held at Bucharest, Romania.

June 7–10
Joseph LeBrix and Marcel Doré 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 Haiilip establishes women's altitude record for light airplanes of 18,097 ft. at St. Clair, Mich. (Buhl Bull Pup, Seekely 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 Beadmore 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 Hoiriss and Otto Hilleg 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 Basting establishes women's distance record of 1,849.763 miles from Le Bourget, Paris, France, to Urinso, Russia. (Klemm, Salson 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.
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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 Aeronautical 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 Paquette 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 40 hrs. 20 min., establishing distance record of 3,011.8 miles. (Bellanca CH, Wright J-6 motored.)

July 28-29 Hugh Herndon, Jr., and Clyde Panchen fly from Floyd Bennett Field, Brooklyn, N. Y., to Moleygrove, 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. Mollyson 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 Albuquerque, 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. 27 Dornier Do-X arrives in New York, having left Altenhein, 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 returns.

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 Mayo and Cecil A. Allen are forced down in Siberia on attempted transpacific flight from Tokyo, Japan, to the United States. (Emisco, Pratt & Whitney Wasp motorced.)


Sept. 13-14 Willy Rody, Christian Johansen, and Fernando Corsta Viega, flying from Junca 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 1936 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.


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 1,077.6 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 motor.)

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.
AVIATION CHRONOLOGY AND RECORDS

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
CONFIRMED BY FEDERATION AERONAUTIQUE INTERNATIONALE

AMERICAN RECORDS
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. Brosy, Bellanca
Time, 84H. 32M.
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 (Airline) (United States)—Russell N. Boardman and John Polan, Bellanca
monoplane, Wright 360 HP, from Brooklyn, N. Y., to Istanbul, Turkey,
July 28–29, 1931.
Distance, 8,065.736 Kilo. (5,040.85 Miles).

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).

Maximum Speed (France)—Warrant Officer Bonnett, Ferbois monoplane, Hispano-
Suiza, 550 HP, at Istres, December 19, 1924.
Speed, 448.51 KPH (278.48 MPH).

WORLD RECORDS

Speeds for Specified Distances Without Payload

Speed for 100 Kilometers (United States)—Lt. Cyrus Bettis, U. S. A. S., Curtis R3C-1,
Curtis V-1,400 HP, at Mitchel Field, L. I., N. Y., October 12, 1925.
Speed, 401.279 KPH (249.34 MPH).

Speed for 500 Kilometers (France)—Sadi-Le-Cointe, Nieuport-Delage, Hispano-
Suiza, 500 HP, at Istres, June 23, 1924.
Speed, 306.696 KPH (190.56 MPH).

Speed for 1,000 Kilometers (France)—Marcel
Doret, Dewoitine type 26, No. 7 Hispano-
Suiza, 500 HP, on the Villepeugue-La
Marne course, November 15, 1929.
Speed, 286.227 KPH (177.85 MPH).

Speed for 2,000 Kilometers (France)—Lt. de
Vaisseau, Paris, No. 28, Hispano-
Suiza 550 HP, at Toulouse, April 11, 1931.
Speed, 232.627 KPH (144.83 MPH).

Speed for 5,000 Kilometers (Spain)—Carlos de Haya Gonzales and Ciriario Rodriguez
Diaz, Breguet, Hispano-Suiza 600
HP, on the Seville-Utrera-Carmona course,
October 7, 8, 1930.
Speed, 208.152 KPH (129.18 MPH).
CLASS C—WITH PAY LOAD OF 500 KILOGRAMS

(1,102.31 Lbs.)

WORLD 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.
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).
Altitude (France)—J. Burtin, Breguet 19, Farman 500 HP, at Toussus-le-Noble, August 23, 1929.
Height, 9,374 Meters (30,654 Feet).

AMERICAN RECORDS

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, 33.4S.
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—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, 275.580 KPH (171.24 MPH).

Speed, 275.160 KPH (171.044 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, 275.260 KPH (171.044 MPH).

Speed for 2,000 Kilometers (France)—Lt. de Valseau Paris, Latécoère 28, Hispano-Suiza 650 HP, at Toulouse, April 11, 1931.
Speed, 228.267 KPH (141.838 MPH).
Speed for 5,000 Kilometers—(No Record).

CLASS C—WITH PAY LOAD OF 1,000 KILOGRAMS

(2,204.12 Lbs.)

RETURNING TO POINT OF DEPARTURE

WORLD 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.
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).
Altitude (France)—J. Burtin, Breguet 19, Farman 600 HP, at Toussus-le-Noble, July 26, 1929.
Height, 8,089 Meters (26,538 Feet).

AMERICAN RECORDS

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.
(No Record.)

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).

Speed for 500 Kilometers (France)—J. LeBrix 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).

Altitude (France)—Lucien Coupet, Farman 160 biplane No. 3, 2 Farman 300 HP ea., at Toulouse-le-Noble, April 28, 1931.

Height, 7,597 Meters (24,629 Feet).

SPEEDS FOR SPECIFIED DISTANCES


Speed, 256.628 KPH (162.432 MPH).

Speed for 500 Kilometers (France)—Dubordieu, Latécoère 28-2 monoplane, Hispano-Suiza 650 HP, at Toulouse, March 29, 1931.

Speed, 226.073 KPH (140.475 MPH).

Speed for 1,000 Kilometers (France)—Dubordieu, Latécoère 28-2 monoplane, Hispano-Suiza 650 HP, at Toulouse, March 29, 1931.

Speed, 224.723 KPH (139.642 MPH).

Speed for 2,000 Kilometers (France)—J. LeBrix 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).

Speed for 5,000 Kilometers—(No Record).

World and American Record.

World and American Record.

World and American Record.
CLASS C—WITH PAY LOAD OF 5,000 KILOGRAMS
(11,023 Lbs.)

WORLD RECORDS

Duration (Germany)—Wilhelm Zimmerman, Junkers J-38, 2 Junkers L-55, 900 HP ea., 2 Junkers L-8, 400 HP ea., at Dessau-Leipzig, April 10, 1930.
Time, 3H. 3M.

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, 507.590 Kilo. (311.672 Miles).

Altitude (France)—L. Bossoutrot, super Farman-Goliath, 4 Farman 300 HP ea., at Le Bourget, November 16, 1925.
Height, 3,586 Meters (11,705 Feet).

AMERICAN RECORDS

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (Germany)—Wilhelm Zimmerman, Junkers J-38, 2 Junkers L-55, 900 HP ea., 2 Junkers L-8, 400 HP ea., at Dessau-Leipzig, April 10, 1930.
Speed, 184.464 KPH (114.62 MPH).

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 10, 1930.
Speed, 172.950 KPH (107.466 MPH).

Speed for 1,000 Kilometers—(No Record).
Speed for 2,000 Kilometers—(No Record).
Speed for 5,000 Kilometers—(No Record).

CLASS C—WITH PAY LOAD OF 10,000 KILOGRAMS

WORLD 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.

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 (10,625 Feet).
Distance—(No Record).

AMERICAN RECORDS

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers—(No Record).
Speed for 500 Kilometers—(No Record).
Speed for 1,000 Kilometers—(No Record).
Speed for 2,000 Kilometers—(No Record).
Speed for 5,000 Kilometers—(No Record).

CLASS C—GREATEST PAY LOAD CARRIED TO AN ALTITUDE OF 2,000 METERS
(6,671.7 Feet)

WORLD 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.).

AMERICAN RECORDS

Lt. H. R. Harris, U. S. A. S., Barling Bomber, 6 Liberty 400 HP ea., at Wright Field, Dayton, O., October 28, 1923.
Weight, 2,000 Kgs. (4,409 Lbs.).
AVIATION CHRONOLOGY AND RECORDS

AIRPLANES—CLASS C—REFUELING IN FLIGHT
RETURNING TO POINT OF DEPARTURE

WORLD 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, 53H. 41M. 30S.
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).

AMERICAN RECORDS

World and American Record.

AIRPLANES—CLASS C—WOMEN’S CATEGORY

WORLD RECORDS

Duration (France)—Mme. Maryse Bastie, Klemm, Salmson 40 HP, at Le Bourget, September 2, 3, 4, 1930.
Time, 37H. 55M.
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, 121H.
Distance (Airline) (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).
Speed (United States)—Miss Ruth Nichols, Lockheed Vega monoplane, Pratt & Whitney “Wasp” 420 HP, at Detroit, Mich., June 25, 1930.
Speed, 281.470 KPH (174.897 MPH).

AMERICAN RECORDS

World and American Record.

WITH PAY LOAD OF 500 KILOGRAMS

WORLD 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 (174.438 MPH).

AMERICAN RECORDS

World and American Record.

LIGHT AIRPLANES—THIRD CATEGORY

WORLD RECORDS

Distance (Airline) (France)—Mme. Maryse Bastie, Klemm, Salmson 40 HP, from Le Bourget to Urino, Russia, June 28, 29, 1931.
Distance, 2,076.910 Kilo. (1,293.763 Miles).
Height, 5,510 Meters (18,097 Feet).

AMERICAN RECORDS

World and American Record.
LIGHT AIRPLANES—CLASS C—FIRST CATEGORY

Two seaters weight empty less than 400 Kgs. (881 Lbs.)

WORLD RECORDS

Duration (Closed Circuit) (France)—Freton and de La Vergne, Farman 231, Renault 95 HP, at Istres-Nîmes and Fosse Jumeaux-Aries courses, April 8, 9, 1931.
Time, 20½H, 38 M.
Distance (Closed Circuit) (France)—Freton and de La Vergne, Farman 231, Renault 95 HP, at Istres-Nîmes and Fosse Jumeaux-Aries courses, April 8, 9, 1931.
Distance, 3,465.211 Kilo (2,153.178 Miles).
Distance (Airline) (France)—Lalouette and de Permangle, Farman 230, Renault 95 HP, from Istres airport to Villa-Cissneros, January 11, 12, 1931.
Distance, 2,071 Kilo. (1,290.429 Miles).
Altitude (Germany)—Woldemar Voigt and K. H. Gaulle, Akademische Fliegergruppe Darmstadt, D-18, Armstrong Siddeley, Genet Major 100 HP, at Darmstadt, April 21, 1930.
Height, 7,521 Meters (24,672 Feet).

AMERICAN RECORDS

Duration (Closed Circuit) (France)—Freton and de La Vergne, Farman 231, Renault 95 HP, at Istres-Nîmes and Fosse Jumeaux-Aries courses, April 8, 9, 1931.
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Height, 7,521 Meters (24,672 Feet).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 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).

CLASS C—SECOND CATEGORY

Two seaters weight empty less than 280 Kgs. (617 Lbs.)

WORLD RECORDS

Duration (Closed Circuit) (France)—Reginensi and de Viscaya, Farman 230, Salmon 40 HP, at Ville sauvage-La Marmogne course, December 27, 1930.
Time, 7H, 34 M.
Distance (Closed Circuit) (France)—Reginensi and de Viscaya, Farman 230, Salmon 40 HP, at Ville sauvage-La Marmogne course, December 27, 1930.
Distance, 1,000 Kilo. (621.37 Miles).
Distance (Airline) (France)—Reginensi and Lecointe, Farman 230, Salmon 40 HP, Toussus-le-Noble to Marignane (Marseilles), February 18, 1931.
Distance, 636.050 Kilo. (395.222 Miles).
Altitude (France)—Reginensi and de Viscaya, Farman 230, Salmon 40 HP, at Toussus le-Noble, April 12, 1931.
Height, 5,305 Meters (17,404.820 Feet).

AMERICAN RECORDS

Duration (Closed Circuit) (France)—Reginensi and de Viscaya, Farman 230, Salmon 40 HP, at Ville sauvage-La Marmogne course, December 27, 1930.
Time, 7H, 34 M.
Distance (Closed Circuit) (France)—Reginensi and de Viscaya, Farman 230, Salmon 40 HP, at Ville sauvage-La Marmogne course, December 27, 1930.
Distance, 1,000 Kilo. (621.37 Miles).
Distance (Airline) (France)—Reginensi and Lecointe, Farman 230, Salmon 40 HP, Toussus-le-Noble to Marignane (Marseilles), February 18, 1931.
Distance, 636.050 Kilo. (395.222 Miles).
Altitude (France)—Reginensi and de Viscaya, Farman 230, Salmon 40 HP, at Toussus le-Noble, April 12, 1931.
Height, 5,305 Meters (17,404.820 Feet).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers—Willfred G. Moore, pilot; W. S. Glodferty, passenger; Inland Sport monoplane, Warner 110 HP, at Kansas City, Mo., September 30, 1929.
Speed, 204.313 KPH (126.95 MPH).

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).
AVIATION CHRONOLOGY AND RECORDS

CLASS C—THIRD CATEGORY


WORLD RECORDS

Duration (France)—Madame Maryse Bastie, Klemm, Salomon 40 HP, at Le Bourget, September 24, 1930.
Time, 37 H.

Distance (Closed Circuit) (France)—Laulhe, Albert, Salomon 40 HP, at Le Bourget, September 4, 1930.
Distance, 2,714.400 Kilo. (1,686.646 Miles).

Distance (Airline) (France)—Madame Maryse Bastie, Klemm, Salomon 40 HP, from Le Bourget to Urino, Russia, June 28, 29, 1931.
Distance, 2,076.010 Kilo. (1,294.763 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).

AMERICAN RECORDS

(No Record.)

(No Record.)

(No Record.)

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—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).

CLASS C—FOURTH CATEGORY

Single seaters weight empty less than 200 Kgs. (440 Lbs.)

WORLD RECORDS

Duration (France)—G. Fauvel, Peyret-Mauboussin, A. B. C. Scorpion 34 HP, at Le Bourget, September 12, 1930.
Time, 12 H, 33 M.

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).

Distance (Airline) (France)—G. Fauvel, Peyret-Mauboussin Type 10, A. B. C. Scorpion, at Le Bourget, September 6, 1929.
Distance, 852.100 Kilo. (529.49 Miles).

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).

AMERICAN RECORDS

(No Record.)

(No Record.)

(No Record.)

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)—
Speed, 169.21 KPH (100.79 MPH).
SEAPLANES—CLASS C2

RETURNING TO POINT OF DEPARTURE WITHOUT REFUELING

WORLD RECORDS

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CLASS C2—WITH PAY LOAD OF 500 KILOGRAMS (1,102.31 Lbs.)

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS

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World and American Record.
AVIATION CHRONOLOGY AND RECORDS

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (Germany)—Rolf Starke, Heinkel HD-38, BMW-6, 600 HP, at Warnemünde, May 7, 1929.
Speed, 259.927 KPH (161.310 MPH).

Speed for 300 Kilometers (Germany)—Rolf Starke, Heinkel HE-9, BMW-6, 600 HP, at Warnemünde, 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 Warnemünde, June 10, 1929.
Speed, 222.227 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 24, 1930.
Speed, 185.931 KPH (117.956 MPH).

Speed for 5,000 Kilometers—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, 2,853.244 Kilometer (1,773.563 Miles).
Altitude (United States)—Boris Sergievsky, Sikorsky S-38, 2 Pratt & Whitney "Horns" 575 HP ea., at Bridgeport, Conn., July 21, 1930.
Height, 8,208 Meters (26,929.680 Feet).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (Germany)—Rolf Starke, Heinkel, BMW VI 600 HP, at Warnemünde, May 27, 1929.
Speed, 235.294 KPH (146.265 MPH).

Speed for 500 Kilometers (Germany)—Rolf Starke, Heinkel HE-9, BMW-6, 600 HP, at Warnemünde, May 7, 1929.
Speed, 235.041 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 (118.685 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, 185.031 KPH (117.396 MPH).

Speed for 5,000 Kilometers—No Record.

AMERICAN RECORDS

Speed, 236.998 KPH (147.263 MPH).

Speed, 218.000 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, 145.75 KPH (88.69 MPH).

Speed, 126.567 KPH (78.664 MPH).

(No Record.)

SPEEDS FOR SPECIFIED DISTANCES

Speed, 236.998 KPH (147.263 MPH).

Speed, 218.000 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, 145.75 KPH (88.69 MPH).

Speed, 126.567 KPH (78.664 MPH).

(No Record.)
CLASS C2—WITH PAY LOAD OF 2,000 KILOGRAMS (4,400.24 Lbs.)

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS


Distance (Closed Circuit) (France)—Lt. de Prevoit, 2 Hispano-Suiza 650 HP ea., on the Cape Magnan-Cape Martin Lion de Terre course, September 2, 1931.

Distance, 2,208.420 Kilometres (1,372.246 Miles).

Altitude (United States)—Borin 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).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 1,000 Kilometers (France)—Prevot, Latécocè 28, Hispano-Suiza 650 HP, at St. Laurent de la Salanque, March 5, 1930. Speed, 220.626 KPH (136.715 MPH).

Speed for 500 Kilometers (France)—Prevot, Latécocè 26 monoplane, Hispano-Suiza 650 HP, at St. Laurent de la Salanque, March 5, 1930. Speed, 202.062 KPH (125.573 MPH).

Speed for 1,000 Kilometers (Germany)—Richard Wagner, Dornier Superval, DR-142, 4 Gnome-Rhône-Jupiter 480 HP ea., at Friedrichshaven-Lindau, February 2, 1928. Speed, 277.379 KPH (172.155 MPH).

Speed for 2,000 Kilometers (France)—Lt. de Vaissseau Demougeot and M. Gonord, Latécocè 38, 2 Hispano-Suiza 650 HP ea., on the Cape Magnan-Cape Martin Lion de Terre course, September 2, 1931. Speed, 198.048 KPH (123.674 MPH).

Speed for 3,000 Kilometers—(No Record).

CLASS C2—WITH PAY LOAD OF 5,000 KILOGRAMS (11,023 Lbs.)

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS

Duration—(No Record).

Distance—(No Record).

Altitude (Germany)—Steindorff, Rohrbach Romar, 2 BMW 500 HP ea., at Travemunde, April 17, 1929.

Height, 2,000 Meters (6,562 Feet).

Speed for 100 Kilometers—(No Record).

Speed for 500 Kilometers—(No Record).

Speed for 1,000 Kilometers—(No Record).

Speed for 2,000 Kilometers—(No Record).

Speed for 3,000 Kilometers—(No Record).

Speed for 5,000 Kilometers—(No Record).

CLASS C2—WITH PAY LOAD OF 10,000 KILOGRAMS (22,046 Lbs.)

RETURNING TO POINT OF DEPARTURE WITHOUT REFUELING

WORLD RECORDS

Duration—(No Record).

Distance—(No Record).

Altitude—(No Record).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers—(No Record).

Speed for 500 Kilometers—(No Record).

Speed for 1,000 Kilometers—(No Record).

Speed for 2,000 Kilometers—(No Record).

Speed for 3,000 Kilometers—(No Record).

Speed for 5,000 Kilometers—(No Record).

AMERICAN RECORDS


Distance, 2,150 Kilometres (1,336 Miles).

World and American Record.

SPEEDS FOR SPECIFIED DISTANCES


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).


(No Record.)

CLASS C2—WITH PAY LOAD OF 5,000 KILOGRAMS (11,023 Lbs.)

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS

Duration—(No Record).

Distance—(No Record).

Altitude (Germany)—Steindorff, Rohrbach Romar, 2 BMW 500 HP ea., at Travemunde, April 17, 1929.

Height, 2,000 Meters (6,562 Feet).

Speed for 100 Kilometers—(No Record).

Speed for 500 Kilometers—(No Record).

Speed for 1,000 Kilometers—(No Record).

Speed for 2,000 Kilometers—(No Record).

Speed for 3,000 Kilometers—(No Record).

Speed for 5,000 Kilometers—(No Record).

AMERICAN RECORDS

Distance—(No Record).

Duration—(No Record).

Distance—(No Record).

Altitude—(No Record).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers—(No Record).

Speed for 500 Kilometers—(No Record).

Speed for 1,000 Kilometers—(No Record).

Speed for 2,000 Kilometers—(No Record).

Speed for 3,000 Kilometers—(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
(Germany)—Steindorff, Rohrbach Romar, 3 B.HF. 500 HP ea., at Travemuende. April 17, 1929.
Weight, 6,450 Kgs. (14,220 Lbs.).

AMERICAN RECORDS
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 (13,461.250 Feet).

CLASS C2—LIGHT SEAPLANES—FIRST CATEGORY
Two seaters weight empty less than 500 Kgs. (1,102 Lbs.)

WORLD RECORDS
Duration (France)—Lallouette and Boulanger, Farman, Renault 95 HP, on the Le Pecq-Mantes course, April 24, 1931.
Time, 11H, 6M.
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).
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).
Altitude (Italy)—Domenico Antonini, pilot; Spartaco Trevisan, passenger; Caproni Ca 100 Idro, Cirrus Hermes 105 HP, at LAMBRENT Airport, Milan, February 27, 1931.
Height, 5,324 Meters (17,467.156 Feet).
Speed for 100 Kilometers (France)—Lallouette and Boulanger, Farman, Renault 95 HP, on the Draveil-Monceau course, March 28, 1931.
Speed, 189.433 KPH (117.708 MPH).

AMERICAN RECORDS
(No Record.)

CLASS C2—LIGHT SEAPLANES—SECOND CATEGORY
Two seaters weight empty less than 350 Kgs. (771 Lbs.)

WORLD RECORDS
Duration (France)—De Viscaya and Chaudet, Farman 230, Salmond 40 HP, Le Pecq-Bonnieres-Le Rhoule, June 26, 1931.
Time, 11H, 31M, 32S.
Distance (Closed Circuit) (France)—De Viscaya and Chaudet, Farman 230, Salmond 40 HP, Le Pecq-Bonnieres-Le Rhoule, June 26, 1931.
Distance, 1,184.256 Kilo. (735.861 Miles).
Distance (Airline)—(No Record).
Altitude (France)—Jean de Viscaya and Foretay, Parman P-231, Salmond 40 HP, on the Farman to Le Pecq course, June 11, 1931.
Height, 3,231 Meters (10,600.66 Feet).
Speed for 100 Kilometers (France)—De Viscaya and Chaudet, Farman 230, Salmond 40 HP, Le Pecq-Bonnieres-Le Rhoule, June 26, 1931.
Speed, 143.540 KPH (89.191 MPH).

AMERICAN RECORDS
(No Record.)
CLASS C2—LIGHT SEAPLANES—THIRD CATEGORY

Single seater weight empty between 250—487.5 Kgs. (551—965 Lbs.)

WORLD RECORDS

Duration (France)—Jean de Viscaya, Farman 230, Salms 40 HP, on the Bonnieres-Le Rhoule and Pont de St. Germain—Pont de Sartrouville courses, September 28, 1931.
Time, 12H. 39M.
Distance (Closed Circuit) (France)—Jean de Viscaya, Farman 230, Salms 40 HP, on the Bonnieres-Le Rhoule and Pont de St. Germain—Pont de Sartrouville courses, September 28, 1931.
Distance, 2,910.749 Kilo (1,372.867 Miles).
Distance (Airline)—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).
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).

AMERICAN RECORDS

CLASS C2—LIGHT SEAPLANES—FOURTH CATEGORY

Single seater weight empty less than 250 Kgs. (551 Lbs.)

WORLD RECORDS

Duration—(No Record).
Distance (Closed Circuit) (France)—Vercreuyse, Peyret-Mauboussin, A. B. C. Scorpion 34 HP on the Chatou—Epigny course, December 22, 1930.
Distance, 250 Kilo. (341.753 Miles).
Distance (Airline)—No Record.
Speed for 100 Kilometers (France)—Vercreuyse, Peyret-Mauboussin, A. B. C. Scorpion 34 HP at Chatou—Epigny course, December 24, 1930.
Speed, 122.783 KPH (76.293 MPH).
Altitude—(No Record).
Time, 19H.
Distance, 660 Kilo (410 Miles).

AMERICAN RECORDS

CLASS A—BALLOONS

FIRST CATEGORY (600 CUBIC METERS)

WORLD RECORDS

Duration (France)—G. Cormier, August 10, II, 1924.
Time, 22H, 34M.
Distance (France)—Georges Cormier, July 1, 1922.
Distance, 804.173 Kilo. (499.69 Miles).
Altitude—(No Record).

SECOND CATEGORY (601—900 CUBIC METERS)

Duration (France)—Jules Dubois, May 14, 15, 1922.
Time, 23H, 28M.
Distance (France)—Georges Cormier, July 1, 1922.
Distance, 804.173 Kilo. (499.69 Miles).
Altitude—(No Record).
AVIATION CHRONOLOGY AND RECORDS

THIRD CATEGORY (501-1,200 CUBIC METERS)

Duration (United States)—E. J. Hill and A. G. Schlosser, Ford Airport to Montvale, Va., July 4, 5, 1927.
Time, 26H, 46M.
Distance (United States)—S. A. U. Rasmussen, Ford Airport to Hookerton, N. C., July 4, 5, 1927.
Distance, 920.438 Kilo (571 Miles).
Altitude—(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.
Distance (United States)—S. A. U. Rasmussen, Ford Airport to Hookerton, N. C., July 4, 5, 1927.
Distance, 920.438 Kilo (571 Miles).
Altitude—(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, 40H.
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).
Altitude—(No Record).

SIXTH CATEGORY (2,201-3,000 CUBIC METERS)

Duration (France)—Georges Blanchet and Dr. Geo. LeGallee, Gordon Bennett, Detroit to Waverly Hall, Ga., September 10, 11, 12, 1927.
Time, 40H.
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).
Altitude (United States)—Capt. Hawthorne C. Gray, at Scott Field, Belleville, Ill., March 9, 1927.
Height, 8,690 Meters (28,510 Feet).

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, 40H.
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).
Altitude (United States)—Capt. Hawthorne C. Gray, at Scott Field, Belleville, Ill., March 9, 1927.
Height, 8,690 Meters (28,510 Feet).

EIGHTH CATEGORY (4,001-5,000 CUBIC METERS)

Duration (Germany)—H. Kaulen, December 13-17, 1913.
Time, 87H.
Distance (Germany)—Berliner, February 8-10, 1914.
Distance, 3,652.7 Kilo. (1,866.9 Miles).
Altitude (Switzerland)—World Altitude Record, Professor Piccard and Paul Kipfer, at Augsburg—Glacier d’Obergurgl, May 27, 1931.
Height, 15,782 Meters ($51,775 Feet).

Duration—C. B. Harmon, St. Louis to Edina, Mo., October 4, 1909.
Time, 48H, 26M.
Distance—A. R. Hawley, St. Louis to Lake Tschetotgama, October 17-19, 1910.
Distance, 1,887.6 Kilo. (1,172.9 Miles).
Altitude—Capt. Hawthorne C. Gray, at Scott Field, Belleville, Ill., March 9, 1927.
Height, 8,690 Meters (28,510 Feet).
AIRCRAFT YEAR BOOK

CLASS B—AIRSHIPS

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS

Duration (Germany)—Dr. Hugo Eckener, "Graf Zeppelin," Maybach, Lakehurst, N. J., to Fredrickshaven, Germany, November 29, 30, 31, 1928.
Time, 71H, 7M.

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).

Altitude (France)—Cohen, at Conde, June 18, 1912.
Height, 3,089 Meters (10,102 Feet).

AMERICAN RECORDS

Duration—Ensign Mayham, Navy A-236, at Miami, Fla., December 24, 25, 1918.
Time, 40H, 26M.

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers—(No Record.)
Speed for 500 Kilometers—(No Record.)
Speed for 1,000 Kilometers—(No Record.)
Speed for 5,000 Kilometers—(No Record.)
Speed for 10,000 Kilometers—(No Record.)

CLASS D—GLIDERS

WORLD 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, Nassau to la Wolzauerhammer, August 24, 1930.
Distance, 164.5 Kilo. (102.22 Miles).

AMERICAN RECORDS

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, 5,589 Meters (18,424 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, 1,078.69 Meters (3,538.706 Feet).

Altitude above point of take-off (Italy)—Marinello Nelli, Ascanio, Fiat A 50, at Graf Zeppelin, 13, Maybach, Lakehurst.
Height, 18 Meters (59.055 Feet).
## NATIONAL BALLOON RACE

**Akron, Ohio, July 19, 1931**

**Official Standing of Contestants**

<table>
<thead>
<tr>
<th>Place</th>
<th>Entrant</th>
<th>Pilot and Aide</th>
<th>Place of Landing</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Goodyear-Zeppelin Corp.</td>
<td>F. A. Trotter, R. J. Blair</td>
<td>9 1/4 mi. NW of Buffalo, N.Y.</td>
<td>185 mi.</td>
</tr>
</tbody>
</table>
# NATIONAL AIR TOUR, 1931

<table>
<thead>
<tr>
<th>Place at Finish</th>
<th>Plane</th>
<th>Motor Used</th>
<th>Rated H.P.</th>
<th>Gross Weight</th>
<th>Empty Weight</th>
<th>Useful Load</th>
<th>Unstick Time</th>
<th>Stick Time</th>
<th>Average Speed</th>
<th>Pilot</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Ford Tri-Motor</td>
<td>1 Wright J6</td>
<td>1.175</td>
<td>13,000</td>
<td>7,844</td>
<td>5,156</td>
<td>12.2</td>
<td>11.5</td>
<td>143.20</td>
<td>Harry Russell</td>
<td>63,764.3</td>
</tr>
<tr>
<td>2nd</td>
<td>Ford Tri-Motor</td>
<td>1 Wright Cyclone</td>
<td>1.260</td>
<td>13,500</td>
<td>7,060</td>
<td>5,440</td>
<td>10.3</td>
<td>9.7</td>
<td>143.20</td>
<td>J. H. Smart</td>
<td>53,812.0</td>
</tr>
<tr>
<td>3rd</td>
<td>Cessna</td>
<td>1 Warner</td>
<td>1.10</td>
<td>2,260</td>
<td>1,267</td>
<td>993</td>
<td>15.3</td>
<td>10.3</td>
<td>120.99</td>
<td>Eddie Schneider</td>
<td>44,343.7</td>
</tr>
<tr>
<td>4th</td>
<td>G. B. Speedster</td>
<td>1 Warner</td>
<td>1.10</td>
<td>1,400</td>
<td>912</td>
<td>488</td>
<td>10.7</td>
<td>8.1</td>
<td>140.75</td>
<td>L. R. Bayles</td>
<td>44,160.3</td>
</tr>
<tr>
<td>5th</td>
<td>Buhl Air Sedan</td>
<td>1 Wright J6</td>
<td>300</td>
<td>4,200</td>
<td>2,475</td>
<td>1,722</td>
<td>14.6</td>
<td>11.5</td>
<td>120.66</td>
<td>J. B. Story</td>
<td>42,019.6</td>
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<tr>
<td>6th</td>
<td>Bird</td>
<td>1 Kinner</td>
<td>125</td>
<td>2,303</td>
<td>1,318</td>
<td>985</td>
<td>14.1</td>
<td>9.2</td>
<td>97.35</td>
<td>Capt. Wm. Lancaster</td>
<td>40,488.4</td>
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<tr>
<td>7th</td>
<td>Bird</td>
<td>1 Kinner</td>
<td>125</td>
<td>2,303</td>
<td>1,318</td>
<td>985</td>
<td>14.1</td>
<td>9.2</td>
<td>97.35</td>
<td>Lee Gehlbach</td>
<td>40,147.9</td>
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<tr>
<td>8th</td>
<td>Stinson Junior</td>
<td>1 Lycoming</td>
<td>215</td>
<td>3,268</td>
<td>2,222</td>
<td>1,043</td>
<td>13.9</td>
<td>7.2</td>
<td>119.48</td>
<td>Eddie Stinson</td>
<td>38,237.0</td>
</tr>
<tr>
<td>9th</td>
<td>Great Lakes</td>
<td>1 Cirrus</td>
<td>90</td>
<td>1,580</td>
<td>1,010</td>
<td>564</td>
<td>13.9</td>
<td>8.9</td>
<td>100.34</td>
<td>Joe Meehan</td>
<td>39,197.2</td>
</tr>
<tr>
<td>10th</td>
<td>Aeronca</td>
<td>1 Aeronca</td>
<td>30</td>
<td>875</td>
<td>451</td>
<td>414</td>
<td>12.3</td>
<td>10.5</td>
<td>64.10</td>
<td>G. E. Dickson</td>
<td>32,514.0</td>
</tr>
</tbody>
</table>

* 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

<table>
<thead>
<tr>
<th>Donor</th>
<th>Trophy</th>
<th>Awarded to</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Cord Corporation</td>
<td>Special Cord Front Wheel Drive Cabriolet</td>
<td>Phoebe F. Omie</td>
<td>Sweepstakes Prize—Transcontinental Handicap Air Derby</td>
</tr>
<tr>
<td>Bendix Corporation</td>
<td>Vincent Bendix Trophy</td>
<td>J. H. Doolittle</td>
<td>Transcontinental Free-for-All Speed Dash to Cleveland</td>
</tr>
<tr>
<td>Ohio Seamless Tube Co.</td>
<td>Ohio Seamless Tube Trophy</td>
<td>Harold Johnson</td>
<td>Transcontinental Free-for-All Speed Dash to Cleveland—non-stop</td>
</tr>
<tr>
<td>Shell Eastern Petroleum Products, Inc.</td>
<td>Shell Trophy</td>
<td>M. Lambert</td>
<td>Event No. 101</td>
</tr>
<tr>
<td>Shell Eastern Petroleum Products, Inc.</td>
<td>Shell Trophy</td>
<td>Ray Moore</td>
<td>Event No. 102</td>
</tr>
<tr>
<td>Shell Eastern Petroleum Products, Inc.</td>
<td>Shell Trophy</td>
<td>John Livingston</td>
<td>Event No. 103</td>
</tr>
<tr>
<td>Shell Eastern Petroleum Products, Inc.</td>
<td>Shell Trophy</td>
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<td>Event No. 104</td>
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<tr>
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<td>Event No. 105</td>
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<tr>
<td>Shell Eastern Petroleum Products, Inc.</td>
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<td>Phoebe Omie</td>
<td>Event No. 109</td>
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<tr>
<td>Shell Petroleum Corporation, St. Louis</td>
<td>Shell Trophy</td>
<td>Lowell Bayles</td>
<td>Event No. 108</td>
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<tr>
<td>Shell Petroleum Corporation, St. Louis</td>
<td>Shell Trophy</td>
<td>Maude Tait</td>
<td>Event No. 111</td>
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<tr>
<td>B. F. Goodrich Co., Akron, Ohio</td>
<td>B. F. Goodrich Trophy</td>
<td>Duke Muller</td>
<td>Event No. 4</td>
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<tr>
<td>Goodyear Tire &amp; Rubber Co., Akron, Ohio</td>
<td>Goodyear Tire &amp; Rubber Co. Trophy</td>
<td>M. Lambert</td>
<td>Event No. 1</td>
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<td>Universal Valve &amp; Fitting Co.</td>
<td>Universal Valve &amp; Fitting Trophy</td>
<td>Vernon Roberts</td>
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<td>General Tire &amp; Rubber Co., Akron, Ohio</td>
<td>General Tire &amp; Rubber Co. Trophy</td>
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<td>J. H. Williams Co.</td>
<td>J. H. Williams Trophy</td>
<td>R. L. Hall</td>
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<td>Clifford W. Henderson</td>
<td>Clifford W. Henderson Trophy</td>
<td>John Livingston</td>
<td>Event No. 5</td>
</tr>
<tr>
<td>B. F. Goodrich Co., Akron, Ohio</td>
<td>B. F. Goodrich Trophy</td>
<td>John Livingston</td>
<td>Event No. 6</td>
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<tr>
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<td>General Tire &amp; Rubber Trophy</td>
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<td>Goodyear Tire &amp; Rubber Co.</td>
<td>Goodyear Tire &amp; Rubber Trophy</td>
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<td>Carey Machine Trophy</td>
<td>Ray Moore</td>
<td>Event No. 9</td>
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<td>Goodyear Tire &amp; Rubber Trophy</td>
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<td>General Tire &amp; Rubber Trophy</td>
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<td>The Webb C. Ball Co., Cleveland, Ohio</td>
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<td>Jim Hurlip</td>
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<td>Goodyear Tire &amp; Rubber Trophy</td>
<td>Lowell Bayles</td>
<td>Event No. 14</td>
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<td>Goodyear Tire &amp; Rubber Co., Akron, Ohio</td>
<td>Goodyear Tire &amp; Rubber Trophy</td>
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<td>Phoebe Omie</td>
<td>Event No. 26</td>
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<td>Clifford W. Henderson</td>
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<td>Gladys O'Donnell</td>
<td>Event No. 27</td>
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<tr>
<td>B. F. Goodrich Co., Akron, Ohio</td>
<td>B. F. Goodrich Trophy</td>
<td>Gladys O'Donnell</td>
<td>Event No. 28</td>
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<td>Charles E. Thompson, Cleveland, Ohio</td>
<td>Charles E. Thompson Trophy</td>
<td>Lowell Bayles</td>
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<tr>
<td>Cleveland Pneumatic Tool Co., Cleveland, Ohio</td>
<td>Cleveland Pneumatic Acrol Trophy</td>
<td>Phoebe Omie</td>
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<tr>
<td>The Higbee Company, Cleveland, Ohio</td>
<td>The Higbee Trophy</td>
<td>Eldon Cessna</td>
<td>Event No. 36A</td>
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<tr>
<td>Senator Hiram Bingham, Washington, D.C.</td>
<td>Senator Hiram Bingham Trophy</td>
<td>Lloyd Lane</td>
<td>Special Sportsman Pilot Race—Free-for-All</td>
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<tr>
<td>Douglas Aircraft Company</td>
<td>Douglas Trophy</td>
<td>Capt. J. K. Gill, Ohio</td>
<td>Event No. 38</td>
</tr>
<tr>
<td>National Guard</td>
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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

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Percentage</th>
<th>Cash Prize</th>
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<tbody>
<tr>
<td>1st</td>
<td>Phoebe Omlie</td>
<td>Monocoupe</td>
<td>Warner</td>
<td>106.19</td>
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<tr>
<td>2nd</td>
<td>Mae Hatfield</td>
<td>Monocoupe</td>
<td>Lambert</td>
<td>69.42</td>
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<tr>
<td>3rd</td>
<td>Martie Bowman</td>
<td>Inland Sport</td>
<td>Warner</td>
<td>98.98</td>
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<tr>
<td>4th</td>
<td>Edith Poitcz</td>
<td>Bird</td>
<td>Kinmer</td>
<td>97.43</td>
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</tr>
<tr>
<td>5th</td>
<td>Louise Thaden</td>
<td>Thaden-R-4</td>
<td>Wright J-6</td>
<td>94.55</td>
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TRANSCONTINENTAL HANDICAP AIR DERBY—SANTA MONICA, CALIFORNIA TO CLEVELAND, OHIO
MEN'S DIVISION

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Percentage</th>
<th>Cash Prize</th>
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<tbody>
<tr>
<td>1st</td>
<td>D. C. Warren</td>
<td>D. H. Moth</td>
<td>Gipsy</td>
<td>103.59</td>
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<tr>
<td>2nd</td>
<td>Lee Brusie</td>
<td>Waco F.</td>
<td>Kinmer</td>
<td>102.06</td>
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<tr>
<td>3rd</td>
<td>Eldon Cessna</td>
<td>Cessna</td>
<td>Warner</td>
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<tr>
<td>4th</td>
<td>Marcellus King</td>
<td>Monocoupe</td>
<td>Warner</td>
<td>100.76</td>
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<tr>
<td>5th</td>
<td>Chas. Goldtrap</td>
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TRANSCONTINENTAL FREE-FOR-ALL SPEED DASH—BENDIX TROPHY RACE
LOS ANGELES, CALIFORNIA TO CLEVELAND, OHIO

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<tr>
<th>Place</th>
<th>Pilot</th>
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<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
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</thead>
<tbody>
<tr>
<td>1st</td>
<td>J. H. Doolittle</td>
<td>Laird</td>
<td>Wasp</td>
<td>9:10:21</td>
<td>223.938</td>
<td>$7,500.00</td>
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<tr>
<td>2nd</td>
<td>H. S. Johnson</td>
<td>Lockheed</td>
<td>Wasp</td>
<td>10:14:22</td>
<td>200.816</td>
<td>4,500.00</td>
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<tr>
<td>3rd</td>
<td>Beeler Blevins</td>
<td>Lockheed</td>
<td>Wasp</td>
<td>10:49:13</td>
<td>188.902</td>
<td>3,000.00</td>
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<tr>
<td>4th</td>
<td>Ira C. Baker</td>
<td>Lockheed</td>
<td>Wasp</td>
<td>10:59:45</td>
<td>186.070</td>
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EVENT "A"—MEN'S 115 CU. IN. FREE-FOR-ALL—6 LAPS 5 MILE COURSE

<table>
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<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Duke Muller</td>
<td>Heath</td>
<td>Continental</td>
<td>10:15:21</td>
<td>91.123</td>
<td>$3,000.00</td>
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<tr>
<td>2nd</td>
<td>W. Franklin</td>
<td>Church J-3</td>
<td>Church</td>
<td>10:11:09</td>
<td>89.133</td>
<td>2,400.00</td>
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<tr>
<td>3rd</td>
<td>M. Lambert</td>
<td>Heath</td>
<td>Continental</td>
<td>21:55:42</td>
<td>82.103</td>
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EVENT "B"—MEN'S 115 CU. IN. A.T.C. RACE—6 LAPS 5 MILE COURSE

<table>
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<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
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</thead>
<tbody>
<tr>
<td>1st</td>
<td>H. A. Speer</td>
<td>Aeronea</td>
<td>Aeronea</td>
<td>23:46:11</td>
<td>75.574</td>
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<tr>
<td>2nd</td>
<td>Theo. Cushman</td>
<td>Aeronea</td>
<td>Aeronea</td>
<td>24:01:07</td>
<td>74.944</td>
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<td>3rd</td>
<td>H. Eichhammer</td>
<td>Aeronea</td>
<td>Aeronea</td>
<td>24:30:28</td>
<td>73.455</td>
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<tr>
<td>4th</td>
<td>Freddie Lund</td>
<td>Aeronea</td>
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<td>24:25:56</td>
<td>73.091</td>
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### EVENT NO. 1—MEN’S 275 CU. IN. FREE-FOR-ALL—5 LAPS 5 MILE COURSE

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<th>Speed</th>
<th>Cash Prize</th>
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<tbody>
<tr>
<td>1st</td>
<td>M. Lambert</td>
<td>Heath</td>
<td>Heath 4-in-L</td>
<td>12:30.16</td>
<td>119.974</td>
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<tr>
<td>2nd</td>
<td>B. Stevenson</td>
<td>Monocoupe</td>
<td>Lambert</td>
<td>12:53.00</td>
<td>116.420</td>
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<tr>
<td>3rd</td>
<td>Art. C. Chester</td>
<td>Davis</td>
<td>LeBlond</td>
<td>13:05.22</td>
<td>114.617</td>
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### EVENT NO. 2—MEN’S 276 CU. IN. A.T.C.—5 LAPS 5 MILE COURSE

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<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Vernon Roberts</td>
<td>Monocoupe</td>
<td>Lambert</td>
<td>12:53.06</td>
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<td>2nd</td>
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<td>12:54.08</td>
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<td>3rd</td>
<td>Art. C. Chester</td>
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### EVENT NO. 3—MEN’S 400 CU. IN. FREE-FOR-ALL—5 LAPS 5 MILE COURSE

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<th>Place</th>
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<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Ray Moore</td>
<td>Keith Rider</td>
<td>Menasco C4</td>
<td>9:34.01</td>
<td>150.546</td>
<td>$500.00</td>
</tr>
<tr>
<td>2nd</td>
<td>Ben O. Howard</td>
<td>Howard</td>
<td>Gipsy</td>
<td>9:38.07</td>
<td>150.484</td>
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<tr>
<td>3rd</td>
<td>S. J. Wittman</td>
<td>Wittman R.</td>
<td>Citrus</td>
<td>9:38.01</td>
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### EVENT NO. 4—MEN’S 400 CU. IN. A.T.C. RACE—5 LAPS 5 MILE COURSE

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<th>Place</th>
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<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>R. L. Hall</td>
<td>Gee Bee D</td>
<td>Menasco C4</td>
<td>13:59.89</td>
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<td>15:27.12</td>
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<tr>
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### EVENT NO. 5—MEN’S 510 CU. IN. FREE-FOR-ALL—6 LAPS 5 MILE COURSE

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<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
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<td>Monocoupe</td>
<td>Warner</td>
<td>12:51.00</td>
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<td>2nd</td>
<td>Ben O. Howard</td>
<td>Howard</td>
<td>Gipsy</td>
<td>13:09.20</td>
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<tr>
<td>3rd</td>
<td>Vernon Roberts</td>
<td>Monocoupe</td>
<td>Warner</td>
<td>13:32.16</td>
<td>132.978</td>
<td>200.00</td>
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<tr>
<td>4th</td>
<td>Jim Haislip</td>
<td>Laird</td>
<td>Ranger 6</td>
<td>13:37.48</td>
<td>132.113</td>
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### EVENT NO. 6—MEN’S 510 CU. IN. A.T.C. RACE—6 LAPS 5 MILE COURSE

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<th>Place</th>
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<th>Time</th>
<th>Speed</th>
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<tbody>
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<td>Peter Brooks</td>
<td>Monocoupe</td>
<td>Warner</td>
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<td>4th</td>
<td>Z. Granville</td>
<td>Gee Bee</td>
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### EVENT NO. 7—MEN’S 650 CU. IN. FREE-FOR-ALL—6 LAPS 5 MILE COURSE

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<tr>
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<td>Warner</td>
<td>12:54.15</td>
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<td>Gipsy</td>
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<td>13:25.64</td>
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<td>Jim Haislip</td>
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<td>Ranger 6</td>
<td>13:32.45</td>
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### EVENT NO. 8—MEN'S 660 CU. IN. A.T.C. RACE—6 LAPS 5 MILE COURSE

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<th>Time</th>
<th>Speed</th>
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<tbody>
<tr>
<td>1st.</td>
<td>John Livingston</td>
<td>Monocoupe</td>
<td>Warner</td>
<td>13:34.75</td>
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<td>13:51.02</td>
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<td>14:37.54</td>
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<td>Gee Bee D.</td>
<td>Menasco</td>
<td>14:55.43</td>
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</tr>
</tbody>
</table>

### EVENT NO. 9—MEN'S 800 CU. IN. FREE-FOR-ALL—5 LAPS 5 MILE COURSE

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st.</td>
<td>Ray Moore</td>
<td>Keith Rider</td>
<td>Menasco</td>
<td>8:06.23</td>
<td>185.097</td>
<td>$1,200.00</td>
</tr>
<tr>
<td>3rd.</td>
<td>Ben O. Howard</td>
<td>Howard</td>
<td>Gipsy</td>
<td>10:04.00</td>
<td>138.784</td>
<td>$480.00</td>
</tr>
<tr>
<td>4th.</td>
<td>Arthur J. Davis</td>
<td>Waco 10 T.</td>
<td>Wright J-6</td>
<td>10:07.93</td>
<td>148.043</td>
<td></td>
</tr>
</tbody>
</table>

### EVENT NO. 10—MEN'S 800 CU. IN. A.T.C. RACE—10 LAPS 5 MILE COURSE

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st.</td>
<td>John Livingston</td>
<td>Monocoupe</td>
<td>Warner</td>
<td>20:30.49</td>
<td>145.221</td>
<td>$500.00</td>
</tr>
<tr>
<td>2nd.</td>
<td>Arthur Davis</td>
<td>Waco 10 T.</td>
<td>Wright J-6</td>
<td>21:07.81</td>
<td>141.977</td>
<td>$480.00</td>
</tr>
<tr>
<td>3rd.</td>
<td>Lloyd O'Donnell</td>
<td>Waco 10 T.</td>
<td>Wright J-6</td>
<td>21:16.21</td>
<td>141.708</td>
<td>$320.00</td>
</tr>
<tr>
<td>4th.</td>
<td>Vernon Roberts</td>
<td>Monocoupe</td>
<td>Warner</td>
<td>21:27.66</td>
<td>138.711</td>
<td></td>
</tr>
</tbody>
</table>

### EVENT NO. 11—MEN'S 1000 CU. IN. FREE-FOR-ALL—5 LAPS 5 MILE COURSE

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st.</td>
<td>R. L. Hall</td>
<td>Gee Bee</td>
<td>Wasp Jr.</td>
<td>7:54.82</td>
<td>180.545</td>
<td>$1,500.00</td>
</tr>
<tr>
<td>2nd.</td>
<td>Ray Moore</td>
<td>Keith Rider</td>
<td>Menasco</td>
<td>8:26.16</td>
<td>177.809</td>
<td>$600.00</td>
</tr>
<tr>
<td>3rd.</td>
<td>W. J. Wedell</td>
<td>Wedell Williams</td>
<td>Wasp</td>
<td>8:38.58</td>
<td>167.166</td>
<td>$600.00</td>
</tr>
<tr>
<td>4th.</td>
<td>Ben O. Howard</td>
<td>Howard</td>
<td>Gipsy</td>
<td>10:16.10</td>
<td>140.080</td>
<td></td>
</tr>
</tbody>
</table>

### EVENT NO. 12—MEN'S 1000 CU. IN. A.T.C. RACE—5 LAPS 5 MILE COURSE

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st.</td>
<td>Jim Haislip</td>
<td>Laird</td>
<td>Wasp Jr.</td>
<td>10:55.14</td>
<td>137.240</td>
<td>$1,000.00</td>
</tr>
<tr>
<td>2nd.</td>
<td>John Livingston</td>
<td>Monocoupe</td>
<td>Warner</td>
<td>11:05.45</td>
<td>135.240</td>
<td>$600.00</td>
</tr>
<tr>
<td>3rd.</td>
<td>Art. J. Davis</td>
<td>Waco 10 T.</td>
<td>Wright J-6</td>
<td>11:25.70</td>
<td>131.252</td>
<td>$400.00</td>
</tr>
<tr>
<td>4th.</td>
<td>Arthur Killips</td>
<td>Waco 10 T.</td>
<td>Wright</td>
<td>11:31.35</td>
<td>131.800</td>
<td></td>
</tr>
</tbody>
</table>

### EVENT NO. 13—MEN'S 1875 CU. IN. FREE-FOR-ALL—5 LAPS 10 MILE COURSE

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st.</td>
<td>Lowell Bayles</td>
<td>Gee Bee S</td>
<td>Wasp Jr.</td>
<td>14:33.78</td>
<td>205.009</td>
<td>$1,500.00</td>
</tr>
<tr>
<td>2nd.</td>
<td>Jim Haislip</td>
<td>Laird</td>
<td>Wasp Jr.</td>
<td>20:09.71</td>
<td>149.947</td>
<td>$1,080.00</td>
</tr>
<tr>
<td>3rd.</td>
<td>Ben O. Howard</td>
<td>Howard</td>
<td>Gipsy</td>
<td>20:20.84</td>
<td>147.449</td>
<td>$720.00</td>
</tr>
</tbody>
</table>
EVENT NO. 14—MEN'S 1200 CU. IN. A.T.C. RACE—5 LAPS 5 MILE COURSE

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>John Livingston</td>
<td>Monocoupe</td>
<td>Warner</td>
<td>10:23:58</td>
<td>144.347</td>
<td>$1,200.00</td>
</tr>
<tr>
<td>2nd</td>
<td>George Harte</td>
<td>Cessna</td>
<td>Wright J-6</td>
<td>10:30:28</td>
<td>142.793</td>
<td>720.00</td>
</tr>
<tr>
<td>3rd</td>
<td>Arthur Davis</td>
<td>Laird</td>
<td>Wright J-6</td>
<td>11:21:72</td>
<td>132.019</td>
<td>480.00</td>
</tr>
<tr>
<td></td>
<td>Jim Hartzlip</td>
<td>Wasp Jr.</td>
<td>Wright J-6</td>
<td>10:20:44</td>
<td>145.128</td>
<td>800.00</td>
</tr>
</tbody>
</table>

* Cut scattering pylon—disqualified.

EVENTS NOS. 15, 16, 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

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Phoebe Omlie</td>
<td>Monocoupe</td>
<td>LeBlond</td>
<td>13:55:50</td>
<td>129.885</td>
<td>$500.00</td>
</tr>
<tr>
<td>2nd</td>
<td>Mae Haizlip</td>
<td>Gee Bee</td>
<td>Menasco</td>
<td>13:53:08</td>
<td>129.483</td>
<td>300.00</td>
</tr>
<tr>
<td>3rd</td>
<td>Maude Tait</td>
<td>Gee Bee</td>
<td>Warner</td>
<td>14:01:59</td>
<td>128.233</td>
<td>200.00</td>
</tr>
</tbody>
</table>

EVENT NO. 25—WOMEN'S 510 CU. IN. FREE-FOR-ALL—5 LAPS 5 MILE COURSE

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Phoebe Omlie</td>
<td>Monocoupe</td>
<td>Warner</td>
<td>13:15:21</td>
<td>132.491</td>
<td>$750.00</td>
</tr>
<tr>
<td>2nd</td>
<td>Mae Haizlip</td>
<td>Gee Bee D</td>
<td>Menasco</td>
<td>13:18:68</td>
<td>131.915</td>
<td>450.00</td>
</tr>
<tr>
<td>3rd</td>
<td>Maude Tait</td>
<td>Gee Bee E</td>
<td>Warner</td>
<td>13:43:33</td>
<td>131.174</td>
<td>300.00</td>
</tr>
<tr>
<td>4th</td>
<td>Jean LaRene</td>
<td>Rearwin</td>
<td>Challenger</td>
<td>13:33:43</td>
<td>115.702</td>
<td>300.00</td>
</tr>
</tbody>
</table>

EVENT NO. 26—WOMEN'S 650 CU. IN. A.T.C. RACE—6 LAPS 5 MILE COURSE

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Gladys O'Donnell</td>
<td>Waco</td>
<td>Wright</td>
<td>11:06:27</td>
<td>134.394</td>
<td>$1,000.00</td>
</tr>
<tr>
<td>2nd</td>
<td>Mae Haizlip</td>
<td>Travelair</td>
<td>Wright</td>
<td>11:23:27</td>
<td>133.187</td>
<td>500.00</td>
</tr>
<tr>
<td>3rd</td>
<td>Opal Kunz</td>
<td>Waco</td>
<td>Wright</td>
<td>11:26:24</td>
<td>137.435</td>
<td>400.00</td>
</tr>
<tr>
<td>4th</td>
<td>F. Klingensmith</td>
<td>Cessna</td>
<td>Wright</td>
<td>12:03:09</td>
<td>144.362</td>
<td>300.00</td>
</tr>
</tbody>
</table>

EVENT NO. 27—WOMEN'S 800 CU. IN. FREE-FOR-ALL—5 LAPS 5 MILE COURSE

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Gladys O'Donnell</td>
<td>Waco</td>
<td>Wright</td>
<td>10:29:47</td>
<td>138.638</td>
<td>$1,250.00</td>
</tr>
<tr>
<td>2nd</td>
<td>Mae Haizlip</td>
<td>Travelair</td>
<td>Wright</td>
<td>10:57:49</td>
<td>139.884</td>
<td>750.00</td>
</tr>
<tr>
<td>3rd</td>
<td>Florence Klingensmith</td>
<td>Cessna</td>
<td>Wright</td>
<td>11:24:88</td>
<td>133.387</td>
<td>500.00</td>
</tr>
<tr>
<td>4th</td>
<td>Mildred Morgan</td>
<td>Travelair</td>
<td>Wright</td>
<td>11:31:08</td>
<td>104.519</td>
<td>300.00</td>
</tr>
</tbody>
</table>

EVENT NO. 28—WOMEN'S 1000 CU. IN. A.T.C. RACE—5 LAPS 5 MILE COURSE
### EVENT NO. 29—WOMEN'S 1875 CU. IN. A.T.C. RACE—5 LAPS 5 MILE COURSE

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>F. Klingensmith</td>
<td>Cessna</td>
<td>Wright J-6</td>
<td>10:37.31</td>
<td>141.218</td>
<td>$1,500.00</td>
</tr>
<tr>
<td>2nd</td>
<td>Mae Haislip</td>
<td>Laird</td>
<td>Ranger</td>
<td>10:41.09</td>
<td>140.180</td>
<td>900.00</td>
</tr>
<tr>
<td>3rd</td>
<td>Gladys O’Donnell</td>
<td>Waco</td>
<td>Wright J-5</td>
<td>11:00.31</td>
<td>136.320</td>
<td>600.00</td>
</tr>
</tbody>
</table>

### EVENT NO. 30—MEN'S AND WOMEN'S MIXED RACE—5 LAPS 10 MILE COURSE

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Robert Hall</td>
<td>Gee Bee</td>
<td>Wasp Jr</td>
<td>13:28.54</td>
<td>222.562</td>
<td>$1,250.00</td>
</tr>
<tr>
<td>2nd</td>
<td>J. Wedell</td>
<td>Wed. Williams</td>
<td>Wasp Jr</td>
<td>13:34.39</td>
<td>221.048</td>
<td>750.00</td>
</tr>
<tr>
<td>3rd</td>
<td>Jim Haislip</td>
<td>Laird</td>
<td>Wasp Jr</td>
<td>18:16.92</td>
<td>164.194</td>
<td>600.00</td>
</tr>
<tr>
<td>4th</td>
<td>Opal Kunz</td>
<td>Travelair</td>
<td>Wright J-6</td>
<td>20:52.47</td>
<td>143.716</td>
<td></td>
</tr>
</tbody>
</table>

### EVENT NO. 31—CIVILIAN ACROBATIC EXHIBITION—DEMONSTRATIONS BY INVITATION

**August 29**
- John Livingston, Waco
- Freddie Lund, Waco
- Arthur David, Waco

**August 30**
- Peter Brooks, Monocoupe
- Lowell Bayles, Gee Bee
- Milton Hersberger, Travelair

**August 31**
- H. A. Speer, Aeronca
- Thomas Cushman, Aeronca
- Owen Lazenby, Aeronca

**September 1**
- Lowell Bayles, Gee Bee
- Doug. Davis, Travelair
- Roy Hunt, Great Lakes Tr.

**September 3**
- Freddie Lund, Waco TW
- Milton Hersberger, Travelair
- John Livingston, Monoplane

**September 5**
- Freddie Lund, Waco TW
- Peter Brooks, Monocoupe
- Arthur Killips, Waco TW
### EVENT NO. 32—MEN'S FREE-FOR-ALL THOMPSON RACE—10 LAPS 10 MILE COURSE

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st.</td>
<td>Lowell Bayles</td>
<td>Gee Bee</td>
<td>Wasp C</td>
<td>20:24.81</td>
<td>201.251</td>
<td>$7,500.00</td>
</tr>
<tr>
<td>2nd.</td>
<td>J. Wedell</td>
<td>Wed. Williams</td>
<td>Wasp C</td>
<td>20:17.00</td>
<td>207.924</td>
<td>4,500.00</td>
</tr>
<tr>
<td>3rd.</td>
<td>Dale Jackson</td>
<td>Laird</td>
<td>Wright J-6</td>
<td>20:11.58</td>
<td>211.183</td>
<td>3,000.00</td>
</tr>
<tr>
<td>4th.</td>
<td>K. L. Hall</td>
<td>Gee Bee</td>
<td>Wasp C</td>
<td>20:11.58</td>
<td>207.924</td>
<td>3,000.00</td>
</tr>
<tr>
<td>5th.</td>
<td>Ira C. Eacker</td>
<td>Lockheed</td>
<td>Wasp</td>
<td>20:17.00</td>
<td>207.924</td>
<td></td>
</tr>
<tr>
<td>6th.</td>
<td>Ben O. Howard</td>
<td>Howard</td>
<td>Gipsy</td>
<td>20:12.18</td>
<td>213.049</td>
<td></td>
</tr>
<tr>
<td>7th.</td>
<td>Wm. Ong</td>
<td>Laird</td>
<td>Wright J-6</td>
<td>20:12.18</td>
<td>213.049</td>
<td></td>
</tr>
</tbody>
</table>

*J. H. Doolittle* out in seventh lap.

### EVENT NO. 33—WOMEN'S FREE-FOR-ALL CLEVELAND PNEUMATIC AERIAL TROPHY RACE—5 LAPS 10 MILE COURSE

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st.</td>
<td>Maude Tuit</td>
<td>Gee Bee Y</td>
<td>Wasp C</td>
<td>14:39.52</td>
<td>187.574</td>
<td>$1,750.00</td>
</tr>
<tr>
<td>2nd.</td>
<td>Mae Hazlip</td>
<td>Laird</td>
<td>Wasp C</td>
<td>14:09.56</td>
<td>187.574</td>
<td>1,250.00</td>
</tr>
<tr>
<td>3rd.</td>
<td>F. Klingensmith</td>
<td>Cessna</td>
<td>Wasp C</td>
<td>13:24.70</td>
<td>190.327</td>
<td>1,000.00</td>
</tr>
<tr>
<td>4th.</td>
<td>Joan Shankle</td>
<td>Lockheed</td>
<td>Wasp</td>
<td>13:35.15</td>
<td>153.071</td>
<td></td>
</tr>
<tr>
<td>5th.</td>
<td>Phoebe Omile</td>
<td>Monocoupe</td>
<td>Wasp</td>
<td>13:00.65</td>
<td>149.039</td>
<td></td>
</tr>
<tr>
<td>6th.</td>
<td>Bettie Lund</td>
<td>Waco TW</td>
<td>Wright J-6</td>
<td>13:03.75</td>
<td>145.773</td>
<td></td>
</tr>
<tr>
<td>7th.</td>
<td>Opal Kunz</td>
<td>Travelair</td>
<td>Wasp C</td>
<td>12:34.35</td>
<td>144.272</td>
<td></td>
</tr>
<tr>
<td>8th.</td>
<td>Gladys O'Donnell</td>
<td>Waco</td>
<td>Wasp C</td>
<td>12:47.04</td>
<td>144.272</td>
<td></td>
</tr>
</tbody>
</table>

### EVENT NO. 34—MEN'S DEAD STICK LANDING CONTEST—WITH AND WITHOUT BRAKES

#### August 30

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st.</td>
<td>John Livingston</td>
<td>Monocoupe</td>
<td>Warner</td>
<td>$100.00</td>
</tr>
<tr>
<td>2nd.</td>
<td>Lloyd Yest</td>
<td>Waco</td>
<td>Warner</td>
<td>60.00</td>
</tr>
<tr>
<td>3rd.</td>
<td>Arthur Davis</td>
<td>Waco</td>
<td>Wright J-6</td>
<td>40.00</td>
</tr>
</tbody>
</table>

#### August 31

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st.</td>
<td>Thos. Cushman</td>
<td>Aeroplane</td>
<td>$100.00</td>
</tr>
<tr>
<td>2nd.</td>
<td>H. A. Speer</td>
<td>Aeroplane</td>
<td>60.00</td>
</tr>
<tr>
<td>3rd.</td>
<td>Roger Don Rae</td>
<td>Challenger</td>
<td>40.00</td>
</tr>
</tbody>
</table>

### September 1

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st.</td>
<td>Eldon Cessna</td>
<td>Cessna</td>
<td>$100.00</td>
</tr>
<tr>
<td>2nd.</td>
<td>J. Livingston</td>
<td>Monocoupe</td>
<td>60.00</td>
</tr>
<tr>
<td>3rd.</td>
<td>Wm. Ong</td>
<td>Cessna</td>
<td>40.00</td>
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</table>
### EVENT NO. 34—MEN'S DEAD STICK LANDING CONTEST—WITH AND WITHOUT BRAKES—(Continued)

**September 3 (With Brakes)**

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>John Livingston</td>
<td>Monocoupe</td>
<td>Warner</td>
<td>$100.00</td>
</tr>
<tr>
<td>2nd</td>
<td>George L. Harte</td>
<td>Cessna</td>
<td>Wright J-6</td>
<td>60.00</td>
</tr>
<tr>
<td>3rd</td>
<td>George Quick</td>
<td>Bellanca</td>
<td>Wright J-6</td>
<td>40.00</td>
</tr>
</tbody>
</table>

**Without Brakes**

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Freddie Lund</td>
<td>Aeronca</td>
<td>Aeronca</td>
<td>$100.00</td>
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<tr>
<td>2nd</td>
<td>T. Cushman</td>
<td>Aeronca</td>
<td>Aeronca</td>
<td>60.00</td>
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<tr>
<td>3rd</td>
<td>Hugh Spooner</td>
<td>Curtiss-Reid</td>
<td>Gipsy</td>
<td>40.00</td>
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</table>

**September 4 (With Brakes)**

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Winston Kratz</td>
<td>Monocoupe</td>
<td>Warner</td>
<td>$100.00</td>
</tr>
<tr>
<td>2nd</td>
<td>G. M. Johnson</td>
<td>Cessna</td>
<td>Wright J-6</td>
<td>60.00</td>
</tr>
<tr>
<td>3rd</td>
<td>Arthur Davis</td>
<td>Stinson</td>
<td>Wasp Jr.</td>
<td>40.00</td>
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</table>

**September 4 and 5 (Without Brakes)**

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>C. P. Kysor</td>
<td>Cessna</td>
<td>Wright J-5</td>
<td>$100.00</td>
</tr>
<tr>
<td>2nd</td>
<td>Lloyd Yost</td>
<td>Waco</td>
<td>Warner</td>
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<tr>
<td>3rd</td>
<td>Lester Glasscock</td>
<td>Stinson</td>
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</table>

**September 5 (With Brakes)**

<table>
<thead>
<tr>
<th>Place</th>
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<th>Engine</th>
<th>Cash Prize</th>
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<tbody>
<tr>
<td>1st</td>
<td>Roger Don Rae</td>
<td>Challenger</td>
<td>Curtiss OX</td>
<td>$100.00</td>
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<tr>
<td>2nd</td>
<td>Winston Kratz</td>
<td>Aeronca</td>
<td>Aeronca</td>
<td>60.00</td>
</tr>
<tr>
<td>3rd</td>
<td>Russell Holderman</td>
<td>Fleet</td>
<td>Kinner</td>
<td>40.00</td>
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**September 6 (Without Brakes)**

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Arthur Davis</td>
<td>Buhl Pup</td>
<td>Szekely</td>
<td>$100.00</td>
</tr>
<tr>
<td>2nd</td>
<td>H. A. Speer</td>
<td>Aeronca</td>
<td>Aeronca</td>
<td>60.00</td>
</tr>
<tr>
<td>3rd</td>
<td>Russell Holderman</td>
<td>Fleet</td>
<td>Kinner</td>
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### EVENT NO. 35—WOMEN'S DEAD STICK LANDING CONTEST—WITH AND WITHOUT BRAKES

**August 31 (Without Brakes)**

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Cash Prize</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Bettie Lund</td>
<td>Aeronca</td>
<td>Aeronca</td>
<td>$100.00</td>
</tr>
<tr>
<td>2nd</td>
<td>Mrs. A. Davis</td>
<td>Buhl</td>
<td>Szekely</td>
<td>60.00</td>
</tr>
<tr>
<td>3rd</td>
<td>Mary Charles</td>
<td>Swallow</td>
<td>Kinner</td>
<td>40.00</td>
</tr>
</tbody>
</table>
September 1 (With Brakes)
1st... F. Klingensmith .......... Whirlwind J-5 ........... 500.00
2nd... Edith Foltz ............... Bird ............... Kinner .......... 60.00
3rd... Joan Shankle ............. Stearman .......... Whirlwind J-5 .......... 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 Pup .......... Szekely .......... 60.00
3rd... F. Klingensmith .......... Stearman .......... Wright J-6 .......... 40.00

September 7
Mildred Morgan ........... Travelair .......... Wright J-5
Joan Shankle ............... Stearman .......... Wright J-5
Edith Foltz ............... Bird ............... Kinner .......... $40.00

These two contestants tied for first place and agreed to divide prize money.

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 | 122.609 | $1,000.00
2nd... Waldo Waterman .......... Bach .......... 1 Wasp, 2 Kinner .......... 12:25.70 | 120.601 | 600.00
3rd... Wm. Atwell ............... Sikorsky .......... Wasp .......... 15:00.76 | 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. Ailor .......... Waco .......... Continental .......... 1549.400 | 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

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Handicap</th>
<th>Time</th>
<th>Plus Handicap</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Capt. J. K. Gill</td>
<td>O-38</td>
<td>50.68</td>
<td>20:56.24</td>
<td>142.284, Douglas Trophy</td>
</tr>
<tr>
<td>2nd</td>
<td>Lt. Wm. Newhall</td>
<td>O-38B</td>
<td>Scratch</td>
<td>21:06.14</td>
<td>142.841</td>
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<td>3rd</td>
<td>Lt. W. K. Ebel</td>
<td>O-38</td>
<td>50.68</td>
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EVENT NO. 39—PARACHUTE JUMPING CONTEST FOR MEN

August 30

<table>
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<tr>
<th>Place</th>
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<tr>
<td>1st</td>
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<td>2nd</td>
<td>J. Wessling</td>
<td>2</td>
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<td>3rd</td>
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August 31

<table>
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<tr>
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<th>Points</th>
<th>Cash Prize</th>
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<tr>
<td>1st</td>
<td>Joe Sir!</td>
<td>3</td>
<td>$100.00</td>
</tr>
<tr>
<td>2nd</td>
<td>Ev. Stewart</td>
<td>2</td>
<td>60.00</td>
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<tr>
<td>3rd</td>
<td>Dale Dryer</td>
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September 3

<table>
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<th>Points</th>
<th>Cash Prize</th>
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<tbody>
<tr>
<td>1st</td>
<td>Roger Don Rae</td>
<td>3</td>
<td>$100.00</td>
</tr>
<tr>
<td>2nd</td>
<td>B. Rowe</td>
<td>2</td>
<td>60.00</td>
</tr>
<tr>
<td>3rd</td>
<td>W. C. Hartley</td>
<td>1</td>
<td>40.00</td>
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September 4—2 Contests—Morning

<table>
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<th>Place</th>
<th>Pilot</th>
<th>Points</th>
<th>Cash Prize</th>
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</thead>
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<tr>
<td>3rd</td>
<td>Shirley Rauner</td>
<td>1</td>
<td>$10.00</td>
</tr>
<tr>
<td>1st</td>
<td>Joe Crane</td>
<td>3</td>
<td>100.00</td>
</tr>
<tr>
<td>2nd</td>
<td>W. C. Hartley</td>
<td>2</td>
<td>60.00</td>
</tr>
<tr>
<td>3rd</td>
<td>Roger Don Rae</td>
<td>1</td>
<td>40.00</td>
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</table>

September 4—2 Contests—Evening

<table>
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<th>Points</th>
<th>Cash Prize</th>
</tr>
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<tbody>
<tr>
<td>1st</td>
<td>Roger Don Rae</td>
<td>3</td>
<td>$100.00</td>
</tr>
<tr>
<td>2nd</td>
<td>Joe Crane</td>
<td>2</td>
<td>60.00</td>
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</table>

September 5

<table>
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<th>Pilot</th>
<th>Points</th>
<th>Cash Prize</th>
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<tbody>
<tr>
<td>1st</td>
<td>Joe Crane</td>
<td>3</td>
<td>$100.00</td>
</tr>
<tr>
<td>2nd</td>
<td>Roger Don Rae</td>
<td>2</td>
<td>60.00</td>
</tr>
<tr>
<td>3rd</td>
<td>Shelton Jenkins</td>
<td>1</td>
<td>40.00</td>
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</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Place</th>
<th>Pilot</th>
<th>Plane</th>
<th>Engine</th>
<th>Time</th>
<th>Speed</th>
<th>Cash Prize</th>
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</thead>
<tbody>
<tr>
<td>1st</td>
<td>Lloyd Lane</td>
<td>Laird</td>
<td>Wasp Jr.</td>
<td>10:12.75</td>
<td>146.878</td>
<td>Senator Hiram Bingham Trophy</td>
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<tr>
<td>2nd</td>
<td>W. L. Stribling</td>
<td>Travelair</td>
<td>Wright</td>
<td>10:21.05</td>
<td>144.915</td>
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<tr>
<td>3rd</td>
<td>P. W. Zelcer</td>
<td>Laird</td>
<td>Wright J-6</td>
<td>10:30.82</td>
<td>138.287</td>
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<tr>
<td>4th</td>
<td>Henry Timken, Jr</td>
<td>Ford Tri-motor</td>
<td>Wasp C</td>
<td>11:39.20</td>
<td>125.086</td>
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</table>
### PART IV

**Flying Facts and Figures**

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>PAGE</th>
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<tbody>
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<td>Flying in the United States</td>
<td>519</td>
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<td>Air Transport—Aerial Service—Private Flying—</td>
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<td>Government Operations—General Summary</td>
<td></td>
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<td>Production and Sales of Aircraft in U. S.</td>
<td>520</td>
</tr>
<tr>
<td>Statistical Comparison of 1931 with 1930</td>
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<tr>
<td>Aircraft Production in U. S., 1925 to 1931, Incl.</td>
<td>521</td>
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<td>Production of Engines in U. S., 1926 to 1931, Incl.</td>
<td>522</td>
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<td>Production and Sales of Engines in U. S.</td>
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<td>Statistical Comparison of 1931 with 1930</td>
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<td>Exports of Aircraft, Engines and Parts</td>
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<td>Comparison of U. S. Exports, 1929 to 1931, Incl.</td>
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<tr>
<td>Airplane Licenses in U. S., December 15, 1931</td>
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<tr>
<td>Analysis by States, Types and Age</td>
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<td>Airplane Licenses and Identifications in U. S.</td>
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<td>Analysis by States, Types and Age, Dec. 15, 1931</td>
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<td>Analysis by States, Types and Age</td>
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<td>Aircraft Appropriations in U. S., 1922 to 1933, Incl.</td>
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<tr>
<td>Army, Navy, Air Mail, N. A. C. A., Commerce</td>
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<td>Air Mail Operations by Routes in U. S., 1931</td>
<td>531</td>
</tr>
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<td>Monthly Air Transport Operations, 1930 and 1931</td>
<td>531</td>
</tr>
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<td>Airway Marking and Lighting in U. S. in 1931</td>
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<td>537</td>
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<td>State Aeronautical Legislation Analyzed for 1931</td>
<td>537</td>
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<td>540</td>
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<td>Analysis of State Licensing Laws</td>
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<td>Military Purchases and Deliveries in 1931</td>
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<td>Army and Navy Aircraft and Engines</td>
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<td>Air Mail Operators on January 1, 1932</td>
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<td>Names of Contractors by Routes, Cities Served and Route Mileage</td>
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<td>Foreign Air Mail Operators on January 1, 1932</td>
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<tr>
<td>Names of Contractors by Routes, Cities Served and Route Mileage</td>
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<td>Air Mail Postage Rates to Foreign Countries</td>
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<td>Army Air Corps Operations Statistics for 1931</td>
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<td>Strength, Flying Time and Distances</td>
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<tr>
<td>Army Air Corps Accidents Analysis, 1921-1931</td>
<td>552</td>
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<tr>
<td>Naval Aviation Operations Statistics for 1931</td>
<td>553</td>
</tr>
<tr>
<td>Strength, Flying Time and Distances of Navy and Marine Corps</td>
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FLYING IN THE UNITED STATES

Summary of Air Transport Operations

<table>
<thead>
<tr>
<th>Year</th>
<th>Operators reporting</th>
<th>Planes in service</th>
<th>Miles flown</th>
<th>Passenger miles</th>
<th>Express (pounds)</th>
<th>Mail (pounds)</th>
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<td>1926</td>
<td>19</td>
<td>95</td>
<td>4,608,889(a)</td>
<td>5,782</td>
<td>6,667(c)</td>
<td>433,640</td>
</tr>
<tr>
<td>1927</td>
<td>24</td>
<td>144</td>
<td>5,467,439(b)</td>
<td>12,594</td>
<td>12,845(c)</td>
<td>1,222,843(d)</td>
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<tr>
<td>1928</td>
<td>32</td>
<td>204</td>
<td>10,472,024(a)</td>
<td>52,614</td>
<td>35,376(c)</td>
<td>3,032,050(e)</td>
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<tr>
<td>1929</td>
<td>27</td>
<td>619</td>
<td>10,212,863(a)</td>
<td>165,253</td>
<td>197,258(c)</td>
<td>7,772,014(f)</td>
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<tr>
<td>1930</td>
<td>35</td>
<td>685</td>
<td>12,833,867(a)</td>
<td>185,910</td>
<td>256,708(c)</td>
<td>6,513,675(g)</td>
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<td>1931</td>
<td>41</td>
<td>720</td>
<td>13,395,478(a)</td>
<td>157,753</td>
<td>885,164(c)</td>
<td>9,351,195(h)</td>
</tr>
</tbody>
</table>

(a) Includes 2,583,050 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 346,116 pounds mail flown on F.A.M. routes.

Summary of Aerial Service

<table>
<thead>
<tr>
<th>Year</th>
<th>Operators reporting</th>
<th>Planes in service</th>
<th>Miles flown</th>
<th>Hours flown</th>
<th>Passengers carried</th>
<th>Employees</th>
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<tbody>
<tr>
<td>1926</td>
<td>420</td>
<td>969</td>
<td>7,666,492</td>
<td>1,988</td>
<td>480,201</td>
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<tr>
<td>1927</td>
<td>527</td>
<td>768</td>
<td>8,314,537</td>
<td>2,040</td>
<td>476,724</td>
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<tr>
<td>1928</td>
<td>1,068</td>
<td>249</td>
<td>8,411,380</td>
<td>2,036</td>
<td>526,203</td>
<td>1,088</td>
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<td>800</td>
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<td>104,385,560</td>
<td>1,304,207</td>
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<tr>
<td>1930*</td>
<td>600</td>
<td>3,324</td>
<td>95,959,645</td>
<td>1,128,037</td>
<td>2,611,709</td>
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<td>1931*</td>
<td>357</td>
<td>3,738</td>
<td>71,353,730</td>
<td>842,150</td>
<td>1,875,992</td>
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* Statistical estimates based on a large number of typical reports.

Summary of Private Flying

(Corporate and Personal)

Estimated

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<th>Year</th>
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<td>1928</td>
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<td>1929</td>
<td>25,000,000</td>
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<td>1930</td>
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<td>30,000,000</td>
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Government Flying Operations

Miles Flown

<table>
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<tr>
<th>Year</th>
<th>U.S. Army</th>
<th>U.S. Navy</th>
<th>U.S. Coast Guard</th>
<th>U.S. Dept. of Commerce</th>
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<td>1926</td>
<td>16,764,540</td>
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<tr>
<td>1927</td>
<td>14,977,850</td>
<td>10,432,720</td>
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<tr>
<td>1928</td>
<td>19,546,450(a)</td>
<td>14,135,490(b)</td>
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<tr>
<td>1929</td>
<td>27,465,720(a)</td>
<td>19,513,095(b)</td>
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<td>83,083</td>
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<td>39,500,000</td>
<td>26,478,720(b)</td>
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<tr>
<td>1931</td>
<td>44,000,000</td>
<td>28,889,835(b)</td>
<td>53,440</td>
<td>969,000</td>
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(a) Includes National Guard.
(b) Includes Marine Corps and Naval Reserve.

General Flying Summary

<table>
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<tr>
<th>Year</th>
<th>1928</th>
<th>1929</th>
<th>1930</th>
<th>1931</th>
</tr>
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<tr>
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<td>140,579,451</td>
<td>164,703,612</td>
<td>144,978,228</td>
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<td>Government</td>
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<td>47,967,139</td>
<td>60,473,355</td>
<td>73,912,275</td>
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§19
## PRODUCTION AND SALES OF SALABLE AIRCRAFT IN THE UNITED STATES

### COMMERCIAL AND MILITARY

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<th>Type</th>
<th>Places</th>
<th>Production—1930</th>
<th>Sales—1930</th>
<th>Production—1931</th>
<th>Sales—1931</th>
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<tr>
<td></td>
<td>Number</td>
<td>Value*</td>
<td>Number</td>
<td>Value*</td>
<td>Number</td>
</tr>
<tr>
<td></td>
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<tr>
<td><strong>Biplanes</strong></td>
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<tr>
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<td>8</td>
<td>7</td>
<td>$55,370.00</td>
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<td>1,127</td>
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<td>595,581.00</td>
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<td>58</td>
<td>101,658.00</td>
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<td>166</td>
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<td>3</td>
<td>22</td>
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<tr>
<td>Sub-total</td>
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</tr>
<tr>
<td>Cabin Single Engine</td>
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<td>2</td>
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<td>112,701.00</td>
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<td>5</td>
<td>9</td>
<td>86,729.00</td>
<td>11</td>
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<td>6</td>
<td>169</td>
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<td>Sub-total</td>
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<td></td>
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<td>Cabin Multi-Engine</td>
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<td>$5,790,334.00</td>
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</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial Total</td>
<td>1,937</td>
<td>10,746,043.00</td>
<td>2,324</td>
<td>11,660,200.00</td>
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</tr>
<tr>
<td>Military Total</td>
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<td>10,723,720.00</td>
<td>801</td>
<td>11,272,343.00</td>
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<td><strong>Grand Total</strong></td>
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<td>$21,569,761.00</td>
<td>3,125</td>
<td>$22,918,552.00</td>
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</tr>
</tbody>
</table>

*Values represent planes less engines.
### MONTHLY PRODUCTION AND SALES STATISTICS

**Military and Salable Commercial Aircraft**

#### PRODUCTION

<table>
<thead>
<tr>
<th>Month</th>
<th>Military Units</th>
<th>Military Value</th>
<th>Commercial Units</th>
<th>Commercial Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>43</td>
<td>$440,573</td>
<td>120</td>
<td>$857,243</td>
</tr>
<tr>
<td>February</td>
<td>47</td>
<td>428,637</td>
<td>171</td>
<td>1,078,451</td>
</tr>
<tr>
<td>March</td>
<td>52</td>
<td>380,969</td>
<td>198</td>
<td>1,199,722</td>
</tr>
<tr>
<td>April</td>
<td>56</td>
<td>731,171</td>
<td>217</td>
<td>1,320,959</td>
</tr>
<tr>
<td>May</td>
<td>52</td>
<td>642,241</td>
<td>243</td>
<td>1,330,037</td>
</tr>
<tr>
<td>June</td>
<td>57</td>
<td>411,005</td>
<td>213</td>
<td>1,249,038</td>
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<tr>
<td>July</td>
<td>69</td>
<td>1,309,625</td>
<td>190</td>
<td>915,244</td>
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<tr>
<td>August</td>
<td>53</td>
<td>1,105,439</td>
<td>198</td>
<td>706,855</td>
</tr>
<tr>
<td>September</td>
<td>71</td>
<td>1,055,755</td>
<td>175</td>
<td>533,831</td>
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<tr>
<td>October</td>
<td>72</td>
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<td>174</td>
<td>728,573</td>
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<tr>
<td>November</td>
<td>73</td>
<td>801,785</td>
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<tr>
<td>December</td>
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<td>74</td>
<td>385,331</td>
</tr>
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<td><strong>747</strong></td>
<td><strong>$10,723,720</strong></td>
<td><strong>1,937</strong></td>
<td><strong>$10,746,043</strong></td>
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</tbody>
</table>

#### SALES

<table>
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<tr>
<th>Month</th>
<th>Military Units</th>
<th>Military Value</th>
<th>Commercial Units</th>
<th>Commercial Value</th>
</tr>
</thead>
<tbody>
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<td>January</td>
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<td>673,349</td>
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<td>544,471</td>
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<td>February</td>
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<td>693,937</td>
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<td>739,816</td>
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<tr>
<td>March</td>
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<td>770,969</td>
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<tr>
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<td>642,241</td>
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<td>June</td>
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<tr>
<td>November</td>
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<td>285,310</td>
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<td>618,059</td>
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<td>December</td>
<td>132</td>
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<td><strong>Total</strong></td>
<td><strong>801</strong></td>
<td><strong>$11,272,343</strong></td>
<td><strong>2,324</strong></td>
<td><strong>$11,666,209</strong></td>
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</table>

#### REVIEW OF ANNUAL MILITARY AND COMMERCIAL PRODUCTION IN THE UNITED STATES

#### AIRPLANE PRODUCTION

**Annual Totals**

<table>
<thead>
<tr>
<th>Year</th>
<th>Units</th>
<th>Value</th>
<th>Units</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925</td>
<td>447 (1)</td>
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<td>268 (1)</td>
<td>$1,499,634 (1)</td>
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<tr>
<td>1926</td>
<td>532 (1)</td>
<td>6,154,708 (1)</td>
<td>604 (1)</td>
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<tr>
<td>1927</td>
<td>621 (1)</td>
<td>7,528,383 (1)</td>
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<tr>
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<td>677</td>
<td>10,832,544</td>
<td>5,357</td>
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<td>747</td>
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<td>1,937</td>
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<td>812</td>
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<td>6,655,738</td>
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</table>

*All values represent planes less motors.*

(1) Source: Derived from U. S. Census Reports.
AIRCRAFT YEAR BOOK

AIRPLANE ENGINE PRODUCTION

Annual Totals

<table>
<thead>
<tr>
<th>Year</th>
<th>Units</th>
<th>Value</th>
<th>Year</th>
<th>Units</th>
<th>Value</th>
</tr>
</thead>
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<td>$5,556,343</td>
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<td>1,801</td>
<td>$5,090,530</td>
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<td>1,800</td>
<td>$10,417,718</td>
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</table>

(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

<table>
<thead>
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<th>Units</th>
<th>Value</th>
<th>Units</th>
<th>Value</th>
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<td>1931</td>
<td></td>
</tr>
<tr>
<td>Military</td>
<td>Commercial</td>
<td>Military</td>
<td>Commercial</td>
</tr>
<tr>
<td>January</td>
<td>157</td>
<td>$877,110</td>
<td>977</td>
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<tr>
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## FLYING FACTS AND FIGURES

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# FLYING FACTS AND FIGURES

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**December 15, 1931**

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AIRCRAFT YEAR BOOK
AIRPLANE LICENSES AND IDENTIFICATIONS
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*Airplanes licensed in name of Transport Companies, but used for non-scheduled work,
listed under Aerial Service.


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**Total** 2,990 612 245 83 287 514 420 563 266 292 11 18 587 2,082
### AIRCRAFT APPROPRIATIONS, UNITED STATES
#### 1922-1933

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<th>Increase or Decrease</th>
<th>Net</th>
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<td>$14,683,500</td>
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<td>1927-28</td>
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<td>+$18,699,633</td>
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<tr>
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<td>Army</td>
<td>35,413,473</td>
<td>+$1,132,688</td>
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<tr>
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<td>Air Mail</td>
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<td>32,943,473</td>
<td>+$600,211</td>
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<td>21,600,000(6)</td>
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<td>1930-31</td>
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<td>Navy</td>
<td>31,470,635(9)</td>
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<td>10,302,390(12)</td>
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<td>+$1,052,891</td>
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<td>8,929,600(14)</td>
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</tbody>
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(1) Plus $2,215,500 "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 $1,000,000 for printing.
(8) Includes $7,944,000 for new and improved air navigation facilities.
(9) Not less than $1,000,000,000 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 $3,000,000 for printing.
(12) Includes $5,000,000 for new and improved air navigation facilities.
(13) Includes $7,000,000 for Foreign Air Mail.
(14) Includes $1,301,700 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

**Length of Route (Miles)**

- Boston-New York: 200
- Chicago-Memphis: 573
- Chicago-Dallas: 1,041
- Salt Lake City-San Diego: 618
- Salt Lake City-Seattle: 1,107
- Seattle-San Diego: 1,138
- Chicago-Pembina: 1,120
- Washington-Cleveland: 326
- Cheyenne-Albuquerque-Amarillo: 771
- Cleveland-Louisville: 351
- New York-Chicago: 736
- Chicago-San Francisco: 2,027
- New York-Miami: 2,254
- New York-Port Worth: 1,793
- Dallas-Galveston: 333
- February-Brownsville: 547
- Atlanta-New Orleans: 488
- Chicago-Cincinnati: 274
- Atlanta-Miami: 777
- Great Falls-Salt Lake City: 509
- Bay City-Chicago: 1,384
- St. Louis-Omaha: 404
- New Orleans-Houston: 345
- Omaha-Atlanta (part): 1,208
- Kansas City-Denver (part): 544
- Los Angeles (part): 3,052
- Albuquerque-El Paso (part): 222
- New York-Los Angeles: 3,339

**Miles Actually Flown**

- Boston-New York: 224,263
- Chicago-Memphis: 437,549
- Chicago-Dallas: 1,073,011
- Salt Lake City-San Diego: 1,217,227
- Seattle-San Diego: 1,130,193
- Chicago-Pembina: 1,122,130
- Washington-Cleveland: 388,804
- Cheyenne-Albuquerque-Amarillo: 335,597
- Cleveland-Louisville: 111,874
- New York-Chicago: 1,813,590
- Chicago-San Francisco: 4,088,695
- New York-Miami: 2,085,161
- New York-Port Worth: 1,000,469
- Dallas-Galveston: 733,233
- February-Brownsville: 395,092
- Atlanta-New Orleans: 392,947
- Chicago-Cincinnati: 375,654
- Atlanta-Miami: 258,828
- Great Falls-Salt Lake City: 634,009
- Bay City-Chicago: 1,151,721
- St. Louis-Omaha: 190,847
- New Orleans-Houston: 230,170
- Omaha-Atlanta (part): 1,030,203
- Kansas City-Denver (part): 210,850
- Los Angeles (part): 1,888,820
- El Paso (part): 65,069
- New York-Los Angeles: 3,073,553

**Pounds of Mail Dispatched to Carrier**

- Boston-New York: 137,112
- Chicago-Memphis: 84,424
- Chicago-Dallas: 1,101,452
- Salt Lake City-San Diego: 337,016
- Seattle-San Diego: 490,715
- Chicago-Pembina: 276,891
- Washington-Cleveland: 91,111
- Cheyenne-Albuquerque-Amarillo: 201,625
- Cleveland-Louisville: 30,160
- New York-Chicago: 1,709,864
- Chicago-San Francisco: 5,674,803
- New York-Miami: 847,817
- New York-Port Worth: 175,031
- Dallas-Galveston: 37,203
- February-Brownsville: 83,042
- Atlanta-New Orleans: 109,867
- Chicago-Cincinnati: 81,222
- Atlanta-Miami: 87,756
- Great Falls-Salt Lake City: 62,247
- Bay City-Chicago: 181,352
- St. Louis-Omaha: 90,543
- New Orleans-Houston: 71,108
- Omaha-Atlanta (part): 250,250
- Kansas City-Denver (part): 13,993
- Los Angeles (part): 210,230
- Albuquerque-El Paso (part): 3,123
- New York-Los Angeles: 587,624

**Amount Paid to Carrier**

- Boston-New York: $163,267.35
- Chicago-Memphis: 262,130.28
- Chicago-Dallas: 1,113,400
- Salt Lake City-San Diego: 930,486.07
- Seattle-San Diego: 951,541.59
- Chicago-Pembina: 801,102.09
- Washington-Cleveland: 917,557.92
- Cheyenne-Albuquerque-Amarillo: 201,625.17
- Cleveland-Louisville: 83,074.16
- New York-Chicago: 1,482,720.98
- Chicago-San Francisco: 3,747,952.83
- New York-Miami: 1,816,614.45
- New York-Port Worth: 615,750.00
- Dallas-Galveston: 139,799.03
- February-Brownsville: 248,538.91
- Atlanta-New Orleans: 215,800.76
- Chicago-Cincinnati: 243,935.77
- Atlanta-Miami: 137,591.44
- Great Falls-Salt Lake City: 365,668.23
- Bay City-Chicago: 612,711.65
- St. Louis-Omaha: 55,987.25
- New Orleans-Houston: 111,923.38
- Omaha-Atlanta (part): 688,316.83
- Kansas City-Denver (part): 80,742.40
- Los Angeles (part): 1,615,028.71
- Albuquerque-El Paso (part): 52,259.09

**Total**

26,560 30,821.032 28,205,533 9,005,079 $19,858,869.87

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* 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 (Atlanta-Atlantic Port) effective June 1, 1931.
§ Operations started June 1, 1931.
|| Operations started Aug. 1, 1931.

### Monthly Air Transport Operations

#### American Air Lines

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<th>Months</th>
<th>Miles Scheduled</th>
<th>Miles Flown</th>
<th>Passengers</th>
<th>Passenger Miles</th>
<th>Air Express</th>
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<td>1,607,340</td>
<td>35,514</td>
<td>4,088,695</td>
<td>62,445</td>
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<td>1,255,207</td>
<td>29,124</td>
<td>4,979,872</td>
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<td>1,854,065</td>
<td>33,902</td>
<td>5,953,703</td>
<td>35,811</td>
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<td>2,154,077</td>
<td>36,873</td>
<td>7,193,937</td>
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<td>2,074,803</td>
<td>31,799</td>
<td>7,053,952</td>
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<td>2,120,405</td>
<td>34,121</td>
<td>7,331,842</td>
<td>47,358</td>
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<td>1,832,349</td>
<td>34,611</td>
<td>7,101,514</td>
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<td>11,813,580</td>
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<td>111,141,031</td>
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<td>2,690,890</td>
<td>21,780</td>
<td>9,493,425</td>
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<td>2,595,513</td>
<td>17,715</td>
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<td>2,351,342</td>
<td>15,062</td>
<td>4,954,435</td>
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<td>28,833,997</td>
<td>385,910</td>
<td>94,554,784</td>
<td>8,428,118*</td>
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#### Total 1931

47,463,673 43,395,478 457,753 116,232,153 9,351,105 885,164

* 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

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<th>WEATHER</th>
<th>RADIO</th>
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<td>ROUTES In Service</td>
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<td>WEATHER</td>
<td>RADIO</td>
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<td>San Diego—Los Angeles</td>
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<td>St. Louis—Chicago</td>
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<td>St. Louis—Evansville</td>
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<td>St. Louis—Indianapolis</td>
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<td>Tulsa—Ponca City</td>
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<td>320</td>
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<tr>
<td>Washington—Cleveland</td>
<td>735</td>
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<tr>
<td>Total</td>
<td>18,160</td>
<td>16,082</td>
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<td>Under construction:</td>
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<td>646</td>
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<td>Fort Worth—Atlanta</td>
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<td>Jackson ville—Richmond</td>
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<td>720</td>
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<td>New Orleans—Atlanta Cut Off</td>
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<td>Total under construction</td>
<td>3,604</td>
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<td>as of June 30, 1931</td>
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<tr>
<td>Grand Total</td>
<td>21,764</td>
<td>18,790</td>
<td>21,270</td>
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## 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

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<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Miles flown in scheduled transport operations</td>
<td>4,484,612</td>
<td>6,188,838</td>
<td>9,201,338</td>
<td>15,040,161</td>
<td>16,092,728</td>
<td>20,042,475</td>
<td>20,304,439</td>
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<tr>
<td>Miles flown in miscellaneous operations, including student instruction and experimental flying</td>
<td>12,000,000</td>
<td>48,000,000</td>
<td>47,000,000</td>
<td>63,000,000</td>
<td>51,707,200</td>
<td>56,502,560</td>
<td>43,282,505</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16,484,612</td>
<td>54,188,838</td>
<td>56,201,338</td>
<td>78,940,161</td>
<td>68,699,928</td>
<td>76,545,035</td>
<td>63,587,025</td>
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<tr>
<td>Accidents, all services</td>
<td>430</td>
<td>692</td>
<td>774</td>
<td>924</td>
<td>936</td>
<td>1,153</td>
<td>6,052</td>
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<tr>
<td>Miles flown per accident, all services</td>
<td>38,337</td>
<td>78,308</td>
<td>72,612</td>
<td>85,433</td>
<td>73,839</td>
<td>477,006</td>
<td>376,356</td>
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<td>Accidents, scheduled transport operations</td>
<td>35</td>
<td>51</td>
<td>61</td>
<td>76</td>
<td>47</td>
<td>47</td>
<td>61</td>
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<tr>
<td>Miles flown per accident, scheduled transport operations</td>
<td>128,132</td>
<td>121,350</td>
<td>150,812</td>
<td>209,730</td>
<td>384,152</td>
<td>426,436</td>
<td>332,869</td>
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<tr>
<td>Accidents, miscellaneous operations</td>
<td>35</td>
<td>651</td>
<td>713</td>
<td>848</td>
<td>886</td>
<td>1,110</td>
<td>901</td>
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<td>Miles flown per accident, miscellaneous operations</td>
<td>30,380</td>
<td>74,883</td>
<td>65,919</td>
<td>74,292</td>
<td>58,427</td>
<td>50,630</td>
<td>43,676</td>
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<tr>
<td>Fatal accidents, all services§</td>
<td>97</td>
<td>139</td>
<td>127</td>
<td>184</td>
<td>150</td>
<td>153</td>
<td>114</td>
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<tr>
<td>Miles flown per fatal accident all services</td>
<td>416,837</td>
<td>444,530</td>
<td>431,567</td>
<td>457,890</td>
<td>7,033,966</td>
<td>4,457,974</td>
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<td>Fatal accidents, scheduled transport operations§</td>
<td>109,944</td>
<td>146</td>
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<td>5</td>
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<tr>
<td>Miles flown per fatal accident, scheduled transport operations</td>
<td>88,812</td>
<td>444,530</td>
<td>431,567</td>
<td>457,890</td>
<td>7,033,966</td>
<td>4,457,974</td>
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<td>Fatal accidents, miscellaneous operations§</td>
<td>92</td>
<td>123</td>
<td>118</td>
<td>158</td>
<td>144</td>
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<tr>
<td>Miles flown per fatal accident, miscellaneous operations</td>
<td>120,435</td>
<td>390,244</td>
<td>398,305</td>
<td>375,000</td>
<td>359,494</td>
<td>353,141</td>
<td>397,088</td>
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<td>Pilot fatalities, all services</td>
<td>69</td>
<td>92</td>
<td>87</td>
<td>140</td>
<td>140</td>
<td>1,133</td>
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<tr>
<td>Miles flown per pilot fatality, all services</td>
<td>238,967</td>
<td>589,099</td>
<td>645,902</td>
<td>563,853</td>
<td>558,292</td>
<td>7,115,400</td>
<td>4,541,804</td>
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<td>Pilot fatalities, scheduled transport operations</td>
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<td>3</td>
<td>5</td>
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<tr>
<td>Miles flown per pilot fatality, scheduled transport operations</td>
<td>1,121,153</td>
<td>1,237,768</td>
<td>1,022,371</td>
<td>1,138,583</td>
<td>3,380,545</td>
<td>6,680,825</td>
<td>4,060,886</td>
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<td>Pilot fatalities, miscellaneous operations</td>
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<td>87</td>
<td>78</td>
<td>126</td>
<td>118</td>
<td>130</td>
<td>90</td>
</tr>
<tr>
<td>Miles flown per pilot fatality, miscellaneous operations</td>
<td>184,615</td>
<td>551,724</td>
<td>602,564</td>
<td>500,000</td>
<td>438,705</td>
<td>434,635</td>
<td>480,918</td>
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</table>

*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 r or more persons (passengers, pilot, or crew) were killed or fatally injured.
### Causes of Accidents

#### Scheduled Air Transport Operations

<table>
<thead>
<tr>
<th>Causes</th>
<th>January-June, 1928</th>
<th>July-December, 1928</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of accidents involved</td>
<td>35</td>
<td>51</td>
</tr>
</tbody>
</table>

**PERSONNEL:**

<table>
<thead>
<tr>
<th>Pilot:</th>
<th>Jan-June 1928</th>
<th>July-Dec 1928</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error of judgment</td>
<td>9.14</td>
<td>5.88</td>
</tr>
<tr>
<td>Poor technique</td>
<td>6.14</td>
<td>7.16</td>
</tr>
<tr>
<td>Disobedience of orders</td>
<td>3.14</td>
<td>0.98</td>
</tr>
<tr>
<td>Carelessness or negligence</td>
<td>4.00</td>
<td>8.61</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>0.00</td>
<td>3.93</td>
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</table>

**Total pilot errors:** 22.42

<table>
<thead>
<tr>
<th>Other personnel:</th>
<th>Jan-June 1928</th>
<th>July-Dec 1928</th>
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</thead>
<tbody>
<tr>
<td>Supervisory</td>
<td>1.43</td>
<td>1.96</td>
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<tr>
<td>Miscellaneous</td>
<td>1.43</td>
<td>2.94</td>
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</table>

**Total personnel errors:** 25.28

**MATERIAL:**

<table>
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<tr>
<th>Power Plant:</th>
<th>Jan-June 1928</th>
<th>July-Dec 1928</th>
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</thead>
<tbody>
<tr>
<td>Fuel system</td>
<td>2.00</td>
<td>1.47</td>
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<tr>
<td>Cooling system</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>Ignition system</td>
<td>0.86</td>
<td>1.47</td>
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<tr>
<td>Lubrication system</td>
<td>0.71</td>
<td>0.00</td>
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<tr>
<td>Engine structure</td>
<td>3.49</td>
<td>1.57</td>
</tr>
<tr>
<td>Propellers and accessories</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>Engine-control system</td>
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<td>0.98</td>
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<tr>
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<td>6.37</td>
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**Total power-plant failures:** 7.86

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<th>July-Dec 1928</th>
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<td>Flight-control system</td>
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<td>0.00</td>
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<tr>
<td>Movable surfaces</td>
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<td>0.00</td>
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<tr>
<td>Stabilizing surfaces</td>
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<td>0.00</td>
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<tr>
<td>Wings, struts, and bracings</td>
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<td>3.28</td>
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<tr>
<td>Undercarriage</td>
<td>7.14</td>
<td>5.88</td>
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<tr>
<td>Wheels, tires, and brakes</td>
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<td>1.67</td>
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<tr>
<td>Pontoon or boats</td>
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<td>0.00</td>
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<tr>
<td>Fuselage, engine mountings and fittings</td>
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<td>0.00</td>
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<tr>
<td>Tail-skid assembly</td>
<td>2.14</td>
<td>1.90</td>
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<tr>
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<td>0.00</td>
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<tr>
<td>Undetermined</td>
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<td>0.00</td>
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**Total structural failures:** 11.42

<table>
<thead>
<tr>
<th>Handling qualities:</th>
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<th>July-Dec 1928</th>
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<tr>
<td>Instruments</td>
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**Total airplane failures:** 11.42

**MISCELLANEOUS:**

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<th>July-Dec 1928</th>
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<td>Darkness</td>
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<td>37.45</td>
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<tr>
<td>Airport and terrain</td>
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<td>3.65</td>
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<tr>
<td>Other</td>
<td>13.20</td>
<td>6.75</td>
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</table>

**Total miscellaneous causes:** 48.87

<table>
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<tr>
<th>Undetermined and doubtful</th>
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<th>July-Dec 1928</th>
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<tbody>
<tr>
<td></td>
<td>6.57</td>
<td>5.88</td>
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*Figures for 1928 include a small percentage of minor mishaps.*
### Causes of Accidents

#### Non-Scheduled Air Transport Operations

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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of accidents involved</td>
<td>395</td>
<td>641</td>
<td>713</td>
<td>873</td>
<td>917</td>
<td>1,116</td>
<td>991</td>
</tr>
<tr>
<td><strong>PERSONNEL:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pilot:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error of judgment</td>
<td>8.87</td>
<td>13.32</td>
<td>12.86</td>
<td>12.15</td>
<td>11.17</td>
<td>7.17</td>
<td>9.23</td>
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<tr>
<td>Poor technique</td>
<td>25.80</td>
<td>31.75</td>
<td>34.66</td>
<td>29.78</td>
<td>36.85</td>
<td>35.75</td>
<td>32.08</td>
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<td>Disobedience of orders</td>
<td>4.75</td>
<td>2.78</td>
<td>2.90</td>
<td>4.03</td>
<td>2.11</td>
<td>1.77</td>
<td>3.53</td>
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<tr>
<td>Carelessness or negligence</td>
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<td>6.72</td>
<td>6.07</td>
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<td>6.26</td>
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<td>5.22</td>
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*Figures for 1928 include a small percentage of minor mishaps.*
### Injuries Classified

January to June, 1931, Inclusive

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<th>Pilots</th>
<th>Co-Pilots or Students</th>
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<td>1940</td>
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### Kind of Flying

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<th>Aircraft Crew</th>
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<td>Schedule</td>
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<td>476</td>
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<td>Pleasure</td>
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<tr>
<td>Total</td>
<td>1940</td>
<td>70</td>
<td>54</td>
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### 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

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<th>Licensing Bills</th>
<th>Favorable Action</th>
<th>Unfavorable Action</th>
<th>Total</th>
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<td>7. Massachusetts</td>
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<td>8. Minnesota</td>
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<td>9. Missouri</td>
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**Note:** The total number of favorable and unfavorable actions is 18 and 25, respectively, making a total of 43 actions.
### AIRPORT ENABLING ACTS

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Total: 24

### REGULATION OF AERONAUTICS; AIR TRAFFIC RULES; REGULATORY BODIES; AIDS TO AIR NAVIGATION

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Total: 39
### FLYING FACTS AND FIGURES

#### Taxation

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<th>State</th>
<th>Appropriations for Aeronautics</th>
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#### Appropriations for Aeronautics

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#### Liability

<table>
<thead>
<tr>
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<td>New Mexico</td>
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#### Insurance

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<tr>
<th>State</th>
<th>Appropriations for Aeronautics</th>
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<tbody>
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<td>Idaho</td>
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<td>Massachusetts</td>
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<td>Montana</td>
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<td>New Hampshire</td>
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## 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.

<table>
<thead>
<tr>
<th>State</th>
<th>Tax</th>
<th>Disposition of Receipts</th>
<th>Applicable to Aircraft Fuel</th>
<th>Exemption or Refund</th>
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<tbody>
<tr>
<td>1. Alabama</td>
<td>4¢</td>
<td>Highways</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>2. Arizona</td>
<td>5¢</td>
<td>Highways, Highways, Airports</td>
<td>Yes, No</td>
<td>Refund</td>
</tr>
<tr>
<td>3. Arkansas</td>
<td>5¢</td>
<td>Highways</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>4. California</td>
<td>3¢</td>
<td>Highways</td>
<td>Yes</td>
<td>Refund</td>
</tr>
<tr>
<td>5. Colorado</td>
<td>4¢</td>
<td>Highways</td>
<td>Yes</td>
<td>Refund</td>
</tr>
<tr>
<td>6. Connecticut</td>
<td>3¢</td>
<td>Highways</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>7. Delaware</td>
<td>3¢</td>
<td>Highways</td>
<td>Yes</td>
<td>Refund</td>
</tr>
<tr>
<td>8. Dist. of Columbia</td>
<td>3¢</td>
<td>Roads—Schools</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>9. Florida</td>
<td>4¢</td>
<td>Roads—Schools</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>10. Georgia</td>
<td>5¢</td>
<td>Airfuel Tax to Aeronaut. Fund</td>
<td>Yes, unless interstate flying</td>
<td>Refund</td>
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<td>11. Idaho</td>
<td>5¢</td>
<td>Highways</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>12. Illinois</td>
<td>3¢</td>
<td>Highways</td>
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<td>13. Indiana</td>
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<td>14. Iowa</td>
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<td>Highways</td>
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<td>15. Kansas</td>
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<td>Highways</td>
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<td>No</td>
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<td>16. Kentucky</td>
<td>5¢</td>
<td>Highways</td>
<td>Yes</td>
<td>Fed. Gov't only</td>
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<td>17. Louisiana</td>
<td>5¢</td>
<td>Highways</td>
<td>Yes</td>
<td>1/2 of tax</td>
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<td>18. Maine</td>
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<td>Highways</td>
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<td>19. Maryland</td>
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<td>Yes</td>
<td>Refund</td>
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<td>20. Massachusetts</td>
<td>3¢</td>
<td>Highways</td>
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<td>No</td>
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<tr>
<td>21. Michigan</td>
<td>3¢</td>
<td>Highways—Aeronautics</td>
<td>Yes</td>
<td>No</td>
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<td>22. Minnesota</td>
<td>5¢</td>
<td>Highways</td>
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<td>23. Mississippi</td>
<td>5¢</td>
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<td>24. Missouri</td>
<td>3¢</td>
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<td>Yes</td>
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<td>25. Montana</td>
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<td>26. Nebraska</td>
<td>4¢</td>
<td>Highways</td>
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<td>27. Nevada</td>
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<td>Refund</td>
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<td>28. New Hampshire</td>
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<td>Highways</td>
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<td>Refund</td>
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<td>29. New Jersey</td>
<td>3¢</td>
<td>Traffic—Waterways</td>
<td>Yes, unless interstate flying</td>
<td>Refund</td>
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<td>30. New Mexico</td>
<td>5¢</td>
<td>Highways</td>
<td>Yes</td>
<td>No</td>
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<td>31. New York</td>
<td>3¢</td>
<td>Highways</td>
<td>Yes</td>
<td>Refund</td>
</tr>
<tr>
<td>32. North Carolina</td>
<td>5¢</td>
<td>Highways</td>
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<td>33. North Dakota</td>
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<td>34. Ohio</td>
<td>4¢</td>
<td>Highways</td>
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<td>Refund</td>
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<tr>
<td>35. Oklahoma</td>
<td>3¢</td>
<td>Highways</td>
<td>Yes, unless interstate flying</td>
<td>Refund</td>
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<tr>
<td>36. Oregon</td>
<td>4¢</td>
<td>Highways—Aeronautics</td>
<td>Yes</td>
<td>All but 1¢</td>
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<td>37. Pennsylvania</td>
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<td>Highways—Aeronautics</td>
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<td>No</td>
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<td>38. Rhode Island</td>
<td>2¢</td>
<td>Highways</td>
<td>Yes</td>
<td>Refund</td>
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<td>39. South Carolina</td>
<td>6¢</td>
<td>Highways</td>
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<td>40. South Dakota</td>
<td>4¢</td>
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<td>Yes</td>
<td>Refund</td>
</tr>
<tr>
<td>41. Tennessee</td>
<td>6¢</td>
<td>Highways, except $50,000 to Airways</td>
<td>Yes</td>
<td>Refund and exemption</td>
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<td>Highways—Schools</td>
<td>Yes, unless interstate flying</td>
<td>Refund</td>
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<td>43. Utah</td>
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<td>44. Vermont</td>
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<tr>
<td>45. Virginia</td>
<td>5¢</td>
<td>Highways and Bridges</td>
<td>Yes</td>
<td>Refund and exemption</td>
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<td>46. Washington</td>
<td>3¢</td>
<td>Highways</td>
<td>Yes</td>
<td>Refund</td>
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<td>47. West Virginia</td>
<td>4¢</td>
<td>Highways</td>
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<td>No</td>
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<td>48. Wisconsin</td>
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<td>Highways</td>
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<td>Refund</td>
</tr>
<tr>
<td>49. Wyoming</td>
<td>4¢</td>
<td>Highways—Airports</td>
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</tbody>
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FLYING FACTS AND FIGURES

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 (1926)
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 (1926) (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 (1920)
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 (1926)
24. South Carolina (1930)
25. South Dakota (1929)
26. Texas (1920) (Except public aircraft of U. S. or Texas)
27. Utah (1931) (a—1st paragraph only)
28. Washington (1920)
29. 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 (1926)
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 (1920)
5. New Hampshire (1926)
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 (1930)
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."

(b) "... or to persons operating aircraft licensed by a foreign country with which the United States has a reciprocal agreement covering the operation of licensed aircraft."

(c) Aircraft, and pilots thereof, used exclusively in the governmental service of the United States or of any of the States are excepted, as are pilots without passengers.

(d) Law 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 Air Corps and the Bureau of Aeronautics of the Navy Department.

Army Air Corps Aeronautical Contracts

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<thead>
<tr>
<th>Contract No.</th>
<th>Contractor</th>
<th>Article</th>
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<tr>
<td>W 335 ac-3113</td>
<td>Douglas Aircraft Co., Inc.</td>
<td>146 BT-28 Airplanes</td>
</tr>
<tr>
<td>W 335 ac-3173</td>
<td>Boeing Airplane Company</td>
<td>131 P-12C Airplanes</td>
</tr>
<tr>
<td>W 335 ac-3307</td>
<td>Consolidated Aircraft Corp.</td>
<td>71 O-19C Airplanes</td>
</tr>
<tr>
<td>W 335 ac-3465</td>
<td>Fokker Aircraft Corp. of America</td>
<td>20 Y-1C-14 Airplanes</td>
</tr>
<tr>
<td>W 335 ac-3492</td>
<td>Ford Motor Co. (Stout Metal Airplane Company Division)</td>
<td>4 C-4A Cargo Airplanes</td>
</tr>
<tr>
<td>W 335 ac-3533</td>
<td>Detroit Aircraft Corp.</td>
<td>1 Y-1C-12 Airplane</td>
</tr>
<tr>
<td>W 335 ac-3923</td>
<td>Detroit Aircraft Corp.</td>
<td>1 Y-1C-17 Airplane</td>
</tr>
<tr>
<td>W 335 ac-3768</td>
<td>Douglas Aircraft Co., Inc.</td>
<td>30 O-28E Airplanes</td>
</tr>
<tr>
<td>W 335 ac-3775</td>
<td>The Stearman Aircraft Co.</td>
<td>20 BT-2C Airplanes</td>
</tr>
<tr>
<td>W 335 ac-3780</td>
<td>Fairchild Airplane Mfg. Corp.</td>
<td>1 Model 6-A Airplane</td>
</tr>
<tr>
<td>W 335 ac-3791</td>
<td>Consolidated Aircraft Corp.</td>
<td>3 YPT-9 Airplanes</td>
</tr>
<tr>
<td>W 335 ac-3825</td>
<td>Curtiss Aer., &amp; Motor Co., Inc.</td>
<td>6 P-1A Airplanes</td>
</tr>
<tr>
<td>W 335 ac-3848</td>
<td>Beech Aircraft Corp. P. &amp; F. Aviation Corp.</td>
<td>3 Y-1C-22 Airplanes</td>
</tr>
<tr>
<td>W 335 ac-3894</td>
<td>Verville Aircraft Company</td>
<td>30 O-19G Airplanes</td>
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<td>W 335 ac-3895</td>
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<td>Consolidated Aircraft Corp.</td>
<td>3 YB-8 Airplanes</td>
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<td>W 335 ac-4153</td>
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<td>4 YPT-11 Airplanes</td>
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<td>W 335 ac-4320</td>
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<td>2 YO-27 Airplanes</td>
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<td>W 335 ac-4553</td>
<td>Fokker Aircraft Corp. of America</td>
<td>5 YO-21A Airplanes</td>
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Engines and Spares

* 88 Curtiss V-1570
* 60 Curtiss V-1590
* 60 Pratt-Whitney R-1600
* 16 Wright R-540
* 892 Pratt-Whitney R-1340
* 10 Liberty engines reconditioned
* 3 Wright R-1820
* 5 Continental J-549
* 9 Curtiss V-1570-C
* 4 Continental YR-540
* 4 Wright R-975

* Initial equipment for new airplanes.
### AIRPLANES DELIVERED TO ARMY AIR CORPS

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<th>Quantity</th>
<th>Type</th>
<th>Contractor</th>
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<td>131</td>
<td>R-12C</td>
<td>Boeing Airplane Co., Seattle, Wash.</td>
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<tr>
<td>74</td>
<td>R-1800</td>
<td>Thomas-Morse Aircraft Corp., Buffalo, N. Y.</td>
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<tr>
<td>33</td>
<td>O-38</td>
<td>Douglas Aircraft Co., Inc., Santa Monica, Calif.</td>
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<tr>
<td>1</td>
<td>Fleetster Y-C-11</td>
<td>Consolidated Aircraft Corp., Buffalo, N. Y.</td>
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<tr>
<td>16</td>
<td>Y-1C-14</td>
<td>Fokker Aircraft Corp. of America, New York, N. Y.</td>
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<tr>
<td>4</td>
<td>O-29 Cargo</td>
<td>Ford Motor Co. (Stout Metal Airplane Co. Division), Dearborn, Mich.</td>
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<td>Y-C-12</td>
<td>Detroit Aircraft Corp., Detroit, Mich.</td>
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<td>Y-C-17</td>
<td>Detroit Aircraft Corp., Detroit, Mich.</td>
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<td>30</td>
<td>O-38B</td>
<td>Douglas Aircraft Co., Inc., Santa Monica, Calif.</td>
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<td>20</td>
<td>BT-2C</td>
<td>The Stearman Aircraft Co., Wichita, Kansas.</td>
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<td>Model 6A</td>
<td>Fairchild Airplane Mfg. Corp., Farmingdale, N. Y.</td>
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<td>P-1A</td>
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<td>Y-1G</td>
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<td>Verville Aircraft Co., Detroit, Mich.</td>
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<td>Y-C-19</td>
<td>Northrop Aircraft Corp., Burbank, Calif.</td>
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<td>YPT-11</td>
<td>Consolidated Aircraft Corp., Buffalo, N. Y.</td>
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Total Cost of Airplanes ............... $1,740,888.61
Total Cost of Spare Parts .......... 328,273.19

### NAVY PURCHASES OF AERONAUTICAL EQUIPMENT

#### Aircraft

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<th>Contractor</th>
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<td>1</td>
<td>Grumman fighter with Wright Cyclone engine.</td>
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</tr>
<tr>
<td>30</td>
<td>Aircraft fighters with P &amp; W Wasp engines.</td>
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</tr>
<tr>
<td>1</td>
<td>Boeing fighter with Curtiss R-1535 engine.</td>
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<tr>
<td>1</td>
<td>B/F fighter with Wright Cyclone engine.</td>
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</tr>
<tr>
<td>1</td>
<td>Navy fighter (engine not known at this time).</td>
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<tr>
<td>1</td>
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<tr>
<td>3</td>
<td>Curtiss observations with Wright Cyclone engines.</td>
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</tr>
<tr>
<td>51</td>
<td>Vought observations with P &amp; W Wasp engines.</td>
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<tr>
<td>14</td>
<td>Vought observations with P &amp; W Hornet engines.</td>
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</tr>
<tr>
<td>1</td>
<td>Pitsaah Autogiro with Wright 975-E engine.</td>
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<tr>
<td>2</td>
<td>Pitsaah Autogiros with Wright 975-E engines.</td>
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<tr>
<td>1</td>
<td>Loening amphibian observation with P &amp; W R-985 engine.</td>
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<tr>
<td>1</td>
<td>Sikorsky amphibion observation with P &amp; W Wasp engines.</td>
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<tr>
<td>1</td>
<td>Great Lakes amphibian observation with Wright R-975 engine.</td>
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<tr>
<td>1</td>
<td>DelHaviland Puss-Moth observation with Gypsy III engine.</td>
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<td>1</td>
<td>Grumman scout with P &amp; W Hornet engine.</td>
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<tr>
<td>1</td>
<td>Consolidated patrol boat with 2 Wright Cyclone engines.</td>
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<tr>
<td>32</td>
<td>Detroit Aircraft torpedoes with Wright Cyclone engines.</td>
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<tr>
<td>12</td>
<td>Martin bombers with P &amp; W Hornet engines.</td>
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<tr>
<td>1</td>
<td>Consolidated bomber with Wright Cyclone engine.</td>
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<tr>
<td>1</td>
<td>Stout all-metal transport with 3 P &amp; W Wasp engines.</td>
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<tr>
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<td>Fokker transport with 3 P &amp; W Wasp engines.</td>
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</tr>
<tr>
<td>1</td>
<td>Sikorsky amphibion transport with 2 P &amp; W Hornet engines.</td>
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<tr>
<td>1</td>
<td>Curtiss-Wright transport with 2 R-975-E Hornet engines.</td>
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<td>1</td>
<td>Douglas transport with 2 R-975-E engines.</td>
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<td>1</td>
<td>Bellanca transport with P &amp; W Wasp engine.</td>
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<td>2</td>
<td>Sikorsky amphibion transport with 2 P &amp; W Wasp engines.</td>
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Total Cost of Airplanes ............... $3,211,398.04
Total Cost of Spare Parts .......... 486,205.30

#### Engines

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<td>1</td>
<td>Armstrong &quot;Jaguar.&quot;</td>
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<td>3</td>
<td>Rolls Royce</td>
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<td>1</td>
<td>V-1570-Curtiss</td>
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<tr>
<td>12</td>
<td>R-1800-P &amp; W Hornets.</td>
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<tr>
<td>10</td>
<td>R-1340-D-P &amp; W Wasp</td>
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<tr>
<td>5</td>
<td>R-975-Wright Whirlwinds.</td>
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<tr>
<td>14</td>
<td>R-760-D-Wright Whirlwinds.</td>
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<tr>
<td>2</td>
<td>R-1340-E-P &amp; W Wasp</td>
<td></td>
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<tr>
<td>1</td>
<td>Steel Prod. (12 cyl.-in-line).</td>
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<tr>
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<td>R-680-Lycomings.</td>
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<td>4</td>
<td>R-1535-P &amp; W</td>
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<td>1</td>
<td>GV-1570-C-Wright Conqueror.</td>
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<tr>
<td>2</td>
<td>Wright 12-cylinder Vee.</td>
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<tr>
<td>2</td>
<td>Wright 12-cyl., liquid cooled.</td>
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Total Engines Purchased ............... 256
Total Cost of Engines ............... $1,740,888.61
AIRCRAFT YEAR BOOK

Aircraft Delivered to U. S. Navy

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<td>F8C-4</td>
<td>26</td>
<td>Curtiss Aeroplane &amp; Motor Co.</td>
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<td>F8C-5</td>
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<td>Curtiss Aeroplane &amp; Motor Co.</td>
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<tr>
<td>XF8C-7</td>
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<tr>
<td>F4-B</td>
<td>46</td>
<td>Boeing Aircraft Co.</td>
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<tr>
<td>XF1-1</td>
<td>1</td>
<td>Berliner-Joyce Aircraft Corp.</td>
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<td>O3U-1</td>
<td>73</td>
<td>Chance Vought Corp.</td>
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<tr>
<td>O2C-1</td>
<td>52</td>
<td>Curtiss Aeroplane &amp; Motor Co.</td>
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<td>O2C-2</td>
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<td>XSL-1</td>
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<td>Loening Aeronautical Eng. Corp.</td>
</tr>
<tr>
<td>OL-9</td>
<td>1</td>
<td>Keystone Aircraft Corp., Inc.</td>
</tr>
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<td>XOP-1</td>
<td>1</td>
<td>Pitcairn Autogiro</td>
</tr>
<tr>
<td>XOJ-1</td>
<td>1</td>
<td>Stout Metal Airplane Co.</td>
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<td>RR-4</td>
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<td>RS-3</td>
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<td>Glenn L. Martin Co.</td>
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<td>XP2M-1</td>
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<tr>
<td>XF4N-1</td>
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<td>TG-1</td>
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<td>Glenn L. Martin Co.</td>
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<td>XT6M-1</td>
<td>1</td>
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<td>N9C-3</td>
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Miscellaneous

Free Balloons ............................ 1
Kite Balloons ............................ 2

Goodyear Zeppelin Corp.

Aircraft Engines Delivered to U. S. Navy

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<td>R-1340-C</td>
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<td>Pratt &amp; Whitney Aircraft Co.</td>
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<td>R-1340-D</td>
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<td>R-85</td>
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<td>R-1850</td>
<td>11</td>
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<td>R-975</td>
<td>19</td>
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<td>R-760-D</td>
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<tr>
<td>R-975-E</td>
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<td>R-1820-B DD</td>
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<td>Warner</td>
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<td>Bliss Jupiter</td>
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<td>Warner Aircraft Corp.</td>
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<td>E. W. Bliss Co.</td>
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AERONAUTICAL EDUCATION IN AMERICAN UNIVERSITIES AND COLLEGES

The following table of statistics on aeronautical 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.

<table>
<thead>
<tr>
<th>Name of Institution</th>
<th>Full Time Students</th>
<th>Part Time Students</th>
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<th>Students Enrolled</th>
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544
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Totals: 86 247 2,243 5,179 7,020

x Courses introduced in 1932.

y Courses not given 1931-32.
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<tr>
<th>Route No.</th>
<th>Contractor</th>
<th>One Way Distance</th>
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<tbody>
<tr>
<td>A. M. 1</td>
<td>Colonial Air Transport, Inc.</td>
<td>200 Miles</td>
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<tr>
<td></td>
<td>Newark Airport, Newark, N. J.</td>
<td></td>
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<tr>
<td>A. M. 2</td>
<td>American Airways, Inc.</td>
<td>523 Miles</td>
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<td></td>
<td>122 East 42nd Street, New York, N. Y.</td>
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<td>A. M. 3</td>
<td>National Air Transport, Inc.</td>
<td>1,078 Miles</td>
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<tr>
<td></td>
<td>5936 So. Cicero Avenue, Chicago, Ill.</td>
<td></td>
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<tr>
<td>A. M. 4</td>
<td>Western Air Express, Inc.</td>
<td>782 Miles</td>
</tr>
<tr>
<td></td>
<td>United Airport, Burbank, Calif.</td>
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</tr>
<tr>
<td>A. M. 5</td>
<td>Varney Air Lines, Inc.</td>
<td>1,017 Miles</td>
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<tr>
<td></td>
<td>38th Floor, LaSalle-Wacker Bldg., Chicago, Ill.</td>
<td></td>
</tr>
<tr>
<td>C. A. M. 6</td>
<td>Discontinued</td>
<td></td>
</tr>
<tr>
<td>C. A. M. 7</td>
<td>Discontinued</td>
<td></td>
</tr>
<tr>
<td>A. M. 8</td>
<td>Pacific Air Transport, Inc.</td>
<td>1,238 Miles</td>
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<td>38th Floor, LaSalle-Wacker Bldg., Chicago, Ill.</td>
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<tr>
<td>A. M. 9</td>
<td>Northwest Airways, Inc.</td>
<td>1,620 Miles</td>
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<td>Municipal Airport, St. Paul, Minn.</td>
<td></td>
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<tr>
<td>A. M. 10</td>
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</tbody>
</table>

Discontinued
# Flying Facts and Figures

**Pennsylvania Air Lines, Inc.**  
724 Oliver Bldg., Pittsburgh, Pa.

<table>
<thead>
<tr>
<th>A.M.</th>
<th>Route Description</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Cleveland, Ohio, via Akron, Ohio, and McKeesport and Pittsburgh, Pa., to Washington, D.C., and return</td>
<td>326 Miles</td>
</tr>
</tbody>
</table>

**Western Air Express, Inc.**  
United Airport, Burbank, Calif.

<table>
<thead>
<tr>
<th>A.M.</th>
<th>Route Description</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>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</td>
<td>771 Miles</td>
</tr>
</tbody>
</table>

C. A. M. 13  
Discontinued

C. A. M. 14  
Cancelled

C. A. M. 15  
Discontinued

<table>
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<tr>
<th>A.M.</th>
<th>Route Description</th>
<th>Distance</th>
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<tbody>
<tr>
<td>16</td>
<td>Consolidated with Route A. M.-20</td>
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**National Air Transport, Inc.**  
5936 S. Cicero Avenue, Chicago, Ill.

<table>
<thead>
<tr>
<th>A. M.</th>
<th>Route Description</th>
<th>Distance</th>
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<tbody>
<tr>
<td>17</td>
<td>New York, N.Y., via Cleveland and Toledo, Ohio, to Chicago, Ill., and return</td>
<td>736 Miles</td>
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</table>

**Boeing Air Transport, Inc.**  
38th Floor, LaSalle-Wacker Bldg., Chicago, Ill.

<table>
<thead>
<tr>
<th>A. M.</th>
<th>Route Description</th>
<th>Distance</th>
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</thead>
<tbody>
<tr>
<td>18</td>
<td>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</td>
<td>2,027 Miles</td>
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</table>

**Eastern Air Transport, Inc.**  
Sperry Building, Manhattan Bridge Plaza, Brooklyn, N.Y.

<table>
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<th>A. M.</th>
<th>Route Description</th>
<th>Distance</th>
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<tr>
<td>19</td>
<td>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</td>
<td>2,254 Miles</td>
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**American Airways, Inc.**  
122 East 42nd Street, New York, N.Y.

<table>
<thead>
<tr>
<th>A. M.</th>
<th>Route Description</th>
<th>Distance</th>
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</thead>
<tbody>
<tr>
<td>20</td>
<td>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</td>
<td>1,793 Miles</td>
</tr>
</tbody>
</table>
Texas Air Transport, Inc.
Love Field, Dallas, Texas
A. M. 21 Dallas, via Fort Worth, Waco, Houston, to Galveston, Texas, and return ........................................ 333 Miles

Texas Air Transport, Inc.
Love Field, Dallas, Texas
A. M. 22 Dallas, via Fort Worth, Waco, Austin, and San Antonio, Texas, to Brownsville, Texas, and return .......................... 547 Miles

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

Emby-Riddle Company
Lunken Airport, Cincinnati, Ohio
A. M. 24 Chicago, Ill., via Indianapolis, Ind., to Cincinnati, Ohio, and return ........................................ 274 Miles

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

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

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
FLYING FACTS AND FIGURES

American Airways, Inc.
122 East 42nd Street, New York, N. Y.

A. M. 30 Omaha, Neb., 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. 1,268 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

Discontinued

C. A. M. 31

Consolidated

C. A. M. 32

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

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<th>Route No.</th>
<th>Contractor</th>
<th>One Way Distance</th>
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<td>Colonial Division</td>
<td>American Airways</td>
<td>334 Miles</td>
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<tr>
<td>122 East 42nd Street, New York, N. Y.</td>
<td>New York, N. Y., via Albany, N. Y., to Montreal, Canada</td>
<td>334 Miles</td>
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<tr>
<td>Route Number</td>
<td>Description</td>
<td>Distance</td>
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<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>F. A. M. 4</td>
<td>Miami, Florida, to Havana, Cuba, one way. (Cuban mail carried on return trip)</td>
<td>251 Miles</td>
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<tr>
<td>F. A. M. 5</td>
<td>Miami, Florida, to Cristobal, Canal Zone, via Central America</td>
<td>2,220.5 Miles</td>
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<tr>
<td></td>
<td>Miami, Florida, to Barranquilla, Colombia</td>
<td>1,211 Miles</td>
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<tr>
<td></td>
<td>Miami, Florida, to Barranquilla, Colombia, to Cristobal, Canal Zone</td>
<td>1,667.5 Miles</td>
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<tr>
<td></td>
<td>Miami, Florida, to Barranquilla, Colombia, to Port-of-Spain, Trinidad</td>
<td>2,380.5 Miles</td>
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<tr>
<td>F. A. M. 6</td>
<td>Miami, Florida, to Paramaribo, Dutch Guiana</td>
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<td>F. A. M. 7</td>
<td>Miami, Florida, to Nassau, Bahama Islands (Bahamas mail carried on return trip)</td>
<td>103.5 Miles</td>
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<tr>
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<td>(Service suspended July 1–December 31)</td>
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<td>F. A. M. 8</td>
<td>Brownsville, Texas, via Tampico, Mexico, to Mexico City, Mexico</td>
<td>501 Miles</td>
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<td>Brownsville, Texas, via Tampico, Veracruz, San Geronimo and Tapachula, Mexico; and Guatemala City, Guatemala, to San Salvador, El Salvador, and return</td>
<td>1,256 Miles</td>
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<td>F. A. M. 9</td>
<td>Cristobal, Canal Zone, to Montevideo, Uruguay</td>
<td>4,545.5 Miles</td>
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<td>(Connects at Cristobal with Route F. A. M. 5)</td>
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<td>F. A. M. 10</td>
<td>Paramaribo, Dutch Guiana, to Buenos Aires, Argentina</td>
<td>4,840.5 Miles</td>
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<td>(Connects at Paramaribo with Route F. A. M. 6)</td>
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<td>F. A. M. 12</td>
<td>Bangor, Maine, to Halifax, Nova Scotia</td>
<td>281 Miles</td>
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<td>(Discontinued for the winter)</td>
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FLYING FACTS AND FIGURES

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:

<table>
<thead>
<tr>
<th>Country</th>
<th>Each Half Ounce</th>
<th>Cents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>$0.55</td>
<td></td>
</tr>
<tr>
<td>Bahamas</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Barbados</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>Bolivia (by ordinary means from Arequipa, Peru)</td>
<td>0.40</td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>Canal Zone</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>Colombia</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>Costa Rica</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>Cuba</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Dutch West Indies:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curacao, Bonaire, Aruba</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>St. Martin, St. Bartsius, Saba</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Ecuador</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>Guadeloupe (including Desirade, Les Saintes, Marie Galante, Petite Terre, St. Bartholomew (Barthélemy) and the French part of St. Martin)</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>Guatemala</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Guianas (British, Dutch, French)</td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>Haiti</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Honduras, British</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Honduras, Republic of</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>Jamaica</td>
<td>0.10</td>
<td></td>
</tr>
</tbody>
</table>

Leeward Islands:

Anguilla, Antigua, Barbuda, Dominica, Montserrat, Nevis, Redonda, St. Christopher or St. Kitts.

British Virgin Islands.

Marigot.

Nicaragua.

Panama.

Paraguay (by ordinary means from Buenos Aires).

Peru.

Porto Rico.

Salvador (El).

Trinidad.

Uruguay.

Venezuela.

Virgin Islands, U. S.

Windward Islands:

Grenada, Grenadines, St. Lucia, St. Vincent.

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

<table>
<thead>
<tr>
<th>Classification</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Officers</td>
<td>1,373</td>
</tr>
<tr>
<td>commissioned officers</td>
<td>98</td>
</tr>
<tr>
<td>student officers</td>
<td>905</td>
</tr>
<tr>
<td>enlisted men (includes flying cadets)</td>
<td>1,243</td>
</tr>
<tr>
<td>civilians</td>
<td>13,524</td>
</tr>
<tr>
<td></td>
<td>3,515</td>
</tr>
</tbody>
</table>

Strength of Air Corps Organized Reserves

<table>
<thead>
<tr>
<th>Classification</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>officers</td>
<td>5,972</td>
</tr>
<tr>
<td>pilots and observers</td>
<td>3,864</td>
</tr>
<tr>
<td>number of civilian employees, Dec. 31, 1931</td>
<td>3,518</td>
</tr>
</tbody>
</table>

Army Flying Time and Distances

1931

<table>
<thead>
<tr>
<th>Classification</th>
<th>Hours</th>
<th>Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>heavier-than-air</td>
<td>396,961</td>
<td>44,000,000</td>
</tr>
<tr>
<td>lighter-than-air</td>
<td>2,572</td>
<td></td>
</tr>
<tr>
<td>total flying time</td>
<td>399,533</td>
<td></td>
</tr>
</tbody>
</table>
Trend of Aircraft Accident Rates
In the U.S. Army Air Corps

<table>
<thead>
<tr>
<th>Fiscal Years</th>
<th>1921</th>
<th>1922</th>
<th>1923</th>
<th>1924</th>
<th>1925</th>
<th>1926</th>
<th>1927</th>
<th>1928</th>
<th>1929</th>
<th>1930</th>
<th>1931</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft hours</td>
<td>77,351</td>
<td>65,214</td>
<td>65,750</td>
<td>97,834</td>
<td>150,319</td>
<td>158,302</td>
<td>140,402</td>
<td>182,903</td>
<td>263,381</td>
<td>325,224</td>
<td>390,961</td>
</tr>
<tr>
<td>Fatal accidents</td>
<td>45</td>
<td>24</td>
<td>33</td>
<td>23</td>
<td>29</td>
<td>27</td>
<td>28</td>
<td>25</td>
<td>42</td>
<td>37</td>
<td>21</td>
</tr>
<tr>
<td>Rate per 1000 hours</td>
<td>.582</td>
<td>.368</td>
<td>.502</td>
<td>.235</td>
<td>.193</td>
<td>.171</td>
<td>.199</td>
<td>.137</td>
<td>.230</td>
<td>.114</td>
<td>.053</td>
</tr>
<tr>
<td>Hours per fatal accident</td>
<td>1,718</td>
<td>2,714</td>
<td>1,992</td>
<td>4,250</td>
<td>5,186</td>
<td>5,865</td>
<td>5,030</td>
<td>7,320</td>
<td>4,355</td>
<td>8,785</td>
<td>18,000</td>
</tr>
<tr>
<td>All accidents</td>
<td>361</td>
<td>330</td>
<td>283</td>
<td>275</td>
<td>311</td>
<td>334</td>
<td>227</td>
<td>249</td>
<td>390</td>
<td>468</td>
<td>456</td>
</tr>
<tr>
<td>Rate per 1000 hours</td>
<td>4.67</td>
<td>5.06</td>
<td>4.31</td>
<td>2.81</td>
<td>2.07</td>
<td>2.11</td>
<td>1.61</td>
<td>1.36</td>
<td>1.48</td>
<td>1.44</td>
<td>1.15</td>
</tr>
<tr>
<td>Hours per accident</td>
<td>214</td>
<td>108</td>
<td>232</td>
<td>356</td>
<td>483</td>
<td>474</td>
<td>620</td>
<td>734</td>
<td>675</td>
<td>695</td>
<td>870</td>
</tr>
<tr>
<td>Ratio—accidents to fatal accidents</td>
<td>1 to 8</td>
<td>1 to 13.8</td>
<td>1 to 8.6</td>
<td>1 to 12.0</td>
<td>1 to 10.7</td>
<td>1 to 12.4</td>
<td>1 to 8.1</td>
<td>1 to 10.0</td>
<td>1 to 9.3</td>
<td>1 to 12.6</td>
<td>1 to 21.7</td>
</tr>
</tbody>
</table>
## Strength of Naval Aviation

### Fiscal Years 1922-1931

#### Officers Attached to Aviation

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Naval aviators</td>
<td>314</td>
<td>326</td>
<td>328</td>
<td>382</td>
<td>426</td>
<td>472</td>
<td>466</td>
<td>520</td>
<td>614</td>
<td>737</td>
</tr>
<tr>
<td>Student naval aviators</td>
<td>61</td>
<td>33</td>
<td>47</td>
<td>35</td>
<td>71</td>
<td>28</td>
<td>73</td>
<td>116</td>
<td>181</td>
<td>149</td>
</tr>
<tr>
<td>Line, ground</td>
<td>105</td>
<td>91</td>
<td>42</td>
<td>17</td>
<td>14</td>
<td>12</td>
<td>24</td>
<td>54*</td>
<td>69</td>
<td>354</td>
</tr>
<tr>
<td>Staff, ground</td>
<td>115</td>
<td>134</td>
<td>101</td>
<td>99</td>
<td>129</td>
<td>138</td>
<td>128</td>
<td>101*</td>
<td>98</td>
<td>120</td>
</tr>
<tr>
<td>Naval observers</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>11</td>
<td>12</td>
<td>11</td>
<td>11</td>
<td>9</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Student naval observers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Officers having flight orders</td>
<td>19</td>
<td>13</td>
<td>16</td>
<td>19</td>
<td>15</td>
<td>33</td>
<td>41</td>
<td>45</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>595</strong></td>
<td><strong>600</strong></td>
<td><strong>536</strong></td>
<td><strong>554</strong></td>
<td><strong>670</strong></td>
<td><strong>677</strong></td>
<td><strong>737</strong></td>
<td><strong>843</strong></td>
<td><strong>1,019</strong></td>
<td><strong>1,313</strong></td>
</tr>
</tbody>
</table>

* Approximate figures.

#### Enlisted Men on Duty

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Aviation ratings</td>
<td>2,200</td>
<td>1,612</td>
<td>1,788</td>
<td>1,711</td>
<td>1,722</td>
<td>2,092</td>
<td>2,785</td>
<td>3,067</td>
<td>2,895</td>
<td>3,136</td>
</tr>
<tr>
<td>General service ratings</td>
<td>2,422</td>
<td>2,104</td>
<td>1,814</td>
<td>1,597</td>
<td>2,155</td>
<td>2,333</td>
<td>8,636</td>
<td>8,575</td>
<td>7,874</td>
<td>9,593</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,621</strong></td>
<td><strong>3,716</strong></td>
<td><strong>3,602</strong></td>
<td><strong>3,308</strong></td>
<td><strong>3,877</strong></td>
<td><strong>4,425</strong></td>
<td><strong>11,421</strong></td>
<td><strong>11,642</strong></td>
<td><strong>10,769</strong></td>
<td><strong>12,639</strong></td>
</tr>
</tbody>
</table>
## Marine Corps Aviation

<table>
<thead>
<tr>
<th>Category</th>
<th>Officers</th>
<th>Enlisted Men</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilots</td>
<td>98</td>
<td>33</td>
<td>131</td>
</tr>
<tr>
<td>Student pilots</td>
<td>10</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Observers</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Student observers</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Flight orders</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonflyers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>123</td>
</tr>
</tbody>
</table>

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**

**Trade Index**

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aeronautical Chamber of Commerce of America, Inc.</td>
<td>557</td>
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<tr>
<td>Officers, Governors, Council, Committees, Members, Associate Members</td>
<td></td>
</tr>
<tr>
<td>and Affiliate Members.</td>
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</tr>
<tr>
<td>Aeronautical Expositions Corporation</td>
<td>564</td>
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<tr>
<td>Officers and Directors.</td>
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<td>Aeronautical Magazines in U. S.</td>
<td>564</td>
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<tr>
<td>Aeronautical Magazines in Foreign Countries</td>
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<td>Airports and Airport Managers in U. S. by States</td>
<td>566</td>
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<td>Airports in Alaska</td>
<td>578</td>
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<tr>
<td>Anchorages for Seaplanes in U. S.</td>
<td>578</td>
</tr>
<tr>
<td>Army Air Corps Officials, Divisions, Posts, Etc.</td>
<td>580</td>
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<tr>
<td>Aviation Editors of Newspapers and Press Assns.</td>
<td>583</td>
</tr>
<tr>
<td>Aviation Country Clubs</td>
<td>586</td>
</tr>
<tr>
<td>National Officers and Advisory Board.</td>
<td></td>
</tr>
<tr>
<td>Aviation Country Club of Long Island</td>
<td>586</td>
</tr>
<tr>
<td>Aviation Country Club of New Jersey</td>
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</tr>
<tr>
<td>Aviation Country Club of Westchester</td>
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<tr>
<td>Aviation Country Club of Philadelphia</td>
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</tr>
<tr>
<td>Aviation Country Club of Lake Champlain</td>
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<tr>
<td>Department of Commerce Aeronautical Officials</td>
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<tr>
<td>Diplomatic Service to the U. S.</td>
<td>588</td>
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<tr>
<td>Diplomatic Service of the U. S.</td>
<td>588</td>
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<tr>
<td>Foreign Aeronautical Officials and Bureaus</td>
<td>588</td>
</tr>
<tr>
<td>List by Countries.</td>
<td></td>
</tr>
<tr>
<td>Flying Schools Granted Approved Certificates in U. S.</td>
<td>593</td>
</tr>
<tr>
<td>Manufacturers Aircraft Association</td>
<td>593</td>
</tr>
<tr>
<td>Officers, Directors, and Licensees.</td>
<td></td>
</tr>
<tr>
<td>National Advisory Committee for Aeronautics</td>
<td>596</td>
</tr>
<tr>
<td>Committee, Officers and Executives.</td>
<td></td>
</tr>
<tr>
<td>National Aeronautical Association of U. S. A., Inc.</td>
<td>597</td>
</tr>
<tr>
<td>Officers and Advisory Board.</td>
<td></td>
</tr>
<tr>
<td>Navy and Marine Corps Officials, Stations, Etc.</td>
<td>597</td>
</tr>
<tr>
<td>Post Office Department Air Mail Officials</td>
<td>598</td>
</tr>
<tr>
<td>Society of Automotive Engineers, Inc.</td>
<td>598</td>
</tr>
<tr>
<td>Officers, Council and Committees.</td>
<td></td>
</tr>
<tr>
<td>Weather Bureau Officials in U. S.</td>
<td>599</td>
</tr>
</tbody>
</table>

## Trade Index

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>PAGE</th>
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</thead>
<tbody>
<tr>
<td>Aircraft and Engine Manufacturers</td>
<td>600</td>
</tr>
<tr>
<td>Accessories, Materials and Supply Manufacturers</td>
<td>603</td>
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<tr>
<td>Air Transport, Aerial Service, and Distributor-Dealers</td>
<td>609</td>
</tr>
<tr>
<td>Exporters, Fuels and Lubricants, Publishers and Special Services</td>
<td>611</td>
</tr>
</tbody>
</table>
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. Bruknner
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 ................ L. E. Bell

Governors 1931

E. E. Aldrin ................................................. C. H. Colvin
R. B. Barnitz .............................................. E. L. Cord
P. R. Beasley .............................................. Thomas B. Doe
L. H. Brittin ............................................. Carl F. Egge
C. J. Bruknner ............................................. J. R. Fitzpatrick
J. R. Cautley ............................................. G. B. Grosvenor
Reed M. Chambers ......................................... H. M. Hanshue
G. S. Childs .............................................. J. C. Hunsaker
F. G. Coburn .............................................. P. G. Johnson

The Council

(Past Presidents)

S. S. Bradley ............................................. Grover Loening
L. D. Gardner ............................................. F. B. Rentschler
Paul Henderson ........................................... F. H. Russell
C. L. Lawrance ........................................... I. M. Uppereu

Executive


Airplane Manufacturers Section


Airplane Engine Manufacturers Section


Airship Manufacturers Section

J. C. Hunsaker, Chairman; C. B. Fritsche.

Air Transport Section


Air Traffic Committee

AIRCRAFT YEAR BOOK

Business Practices Committee

Maintenance Committee

Operations Committee

Accessory-Material Section
David Becroft, Chairman; L. W. Greve, F. A. Morgan, G. B. Post, G. J. Stanley, Raymond Walsh, W. C. Young.

Airport Section

Fuels and Lubricants Section

Aerial Service Section

Aeronautical Education Committee

Arbitration Committee
Alfred Frank, Chairman; C. F. Egge, E. B. Meissner, Milton Tibbetts, G. A. Vaughan, Jr.

Entertainment Committee

Export Committee

General Insurance Committee

Insurance Committee
Reed M. Chambers, Chairman; F. N. Davey, R. J. Sullivan.

Legal and Legislative Committee
C. W. Cuthell, Chairman; Frederick W. Jackson, George B. Logan, W. P. MacCracken, Jr., H. Stewart McDonald, Jr., Raymond S. Pruitt, Prof. Alison Keppy, R. Dwight Sullivan, Mrs. Mabel Walker Willebrandt.

Membership Committee
G. V. Vorville, Chairman; Clyde V. Cessna, R. H. Depew, Jr., J. R. Fitzpatrick, P. G. Johnston, Robert Porter, R. S. Saltus.

Merchandising Committee

Show Committee

Organization Members

Aircraft and Engine Manufacturers

AERONAUTICAL DIRECTORY AND TRADE INDEX

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.
Keystone Aircraft Corporation, Bristol, Pa.
Kinner Airplane & Motor Corporation, Glandale, Calif.
Lawrence Engineering & Research Corporation, New York, N. Y.
Monocoupe Corporation, Robertson, Mo.
Northrop Aircraft Corporation, Burbank, Calif.
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 Corporation, Wichita, Kans.
Stinson Aircraft Corporation, Wayne, Mich.
Verville Aircraft Company, Detroit, Mich.
Wright Aeronautical Corporation, Paterson, N. J.

Air Transport Operators

American Airways, Inc., New York, N. Y.
Boeing Air Transport, Inc., Chicago, Ill.
Eastern Air Transport, Inc., Brooklyn, N. Y.
National Air Transport, Inc., Chicago, Ill.
National Parks Airways, Inc., Salt Lake City, Utah.
Northwest Airways, Inc., St. Paul, Minn.

Aeronautical Exporters

Curtiss-Wright Export Corporation, New York, N. Y.

Manufacturers of Accessories, Materials and Supplies

Aircraft Radio Corporation, Boon ton, N. J.
Air Reduction Sales Co., New York, N. Y.
Aircraft Products Corporation of America, Detroit, Mich.
Aluminum Wheel & Rim Corporation, Birmingham, N. Y.
Aluminum Company of America, Pittsburgh, Pa.
American Askania Corporation, Houston, Texas.
American Gas Accumulator Company, Elizabethtown, 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.
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.
General Electric Company, Schenectady, N. Y.
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General Tire & Rubber Company, Akron, Ohio.
Goodyear Tire & Rubber Co., Inc., Akron, Ohio.
Gruss Air Spring Company of America, Los Angeles, Calif.
Stewart Hartshorn Company, New York, N. Y.
Haskellite Manufacturing Corporation, Chicago, Ill.
Hill Aircraft Streamliners Company, Cincinnati, Ohio.
Hurley-Townsend Corporation, New York, N. Y.
International Brass Manufacturing Company, Chicago, Ill.
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.
Maebyhsy Company, Kenosha, Wis.
McAeronautics Company, Pittsburgh, Pa.
E. H. 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.

Aircraft Fuels and Lubricants

Citiés Service Company, New York, N. Y.
Gulf Refining Company, Pittsburgh, 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.

Agawam Airport, Springfield, Mass.
Boeing Field, Seattle, Wash.
Central Airport, Inc., Camden, N. J.
Cleveland Municipal Airport, Cleveland, Ohio.
Cordelia Municipal Airport Company, Cordelia, Kans.
Detroit City Airport, Detroit, Mich.
P. T. Wayne Board of Aviation Commissioners, Pt. 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.
Pioneer Instrument Company, Brooklyn, N. Y.
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.
Swetlik Parachute & Equipment Company, Trenton, N. J.
Thompson Products, Inc., Cleveland, Ohio.
Thornton Cutlure Corporation, New York, N. Y.
Timken Roller Bearing Company, Canton, Ohio.
Titane, 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.
Wellingdon Sear's & 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.

Airports

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 Airways Company of California, Ltd., Burbank, Calif.
Utica, City of, Utica, N. Y.
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Westchester Airport Corp., Armonk, N. Y.
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<td>San Diego, Calif.</td>
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<td>American School of Welding, Inc.</td>
<td>St. Louis, Mo.</td>
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<tr>
<td>Associated Aircraft, Inc.</td>
<td>Chicago, Ill.</td>
</tr>
<tr>
<td>Brearley-Hillard Automotive Corp.</td>
<td>Kansas City, Mo.</td>
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<tr>
<td>California Aerial Transport, Inglewood, Calif.</td>
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</tr>
<tr>
<td>California Panel &amp; Veneer Company, Los Angeles, Calif.</td>
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<tr>
<td>Central Air Terminal Company, Chicago, Ill.</td>
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<tr>
<td>Eastern Aeronautical Corp., Newark, N. J.</td>
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<tr>
<td>Fogg, R. S., Concord, N. H.</td>
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<tr>
<td>Giro Sales &amp; Service, Inc., Garden City, L. I., N. Y.</td>
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<tr>
<td>Daniel Guggenheim School of Aeronautics, Atlanta, Ga.</td>
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<tr>
<td>Inter-Island Airways, Ltd., Honolulu, T. H.</td>
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<td>Knickerbocker Aviation, Inc., Flushing, N. Y.</td>
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<td>Ward S. Lent, Poughkeepsie, N. Y.</td>
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<tr>
<td>Floyd J. Logan Aviation Company, Cleveland, Ohio.</td>
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<td>Edward Lowe Motors Company, San Francisco, Calif.</td>
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<td>Macbeth Brothers, Dallas, Texas.</td>
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<td>Mid West Airways Corp., Aurora, Ill.</td>
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<td>Midwest Airways, Inc., Cudahy, Wis.</td>
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<tr>
<td>Nepco Tri-City Flying Service, Inc., Wisconsin Rapids, Wise.</td>
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<td>Newark Air Service, Inc., Newark, N. J.</td>
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<td>Allen Nutter, Redlands, Calif.</td>
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<td>Pacific Aeronautical Corp., Inglewood, Calif.</td>
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<td>Parks Air College, Inc., E. St. Louis, Ill.</td>
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<tr>
<td>George M. Pynchon, Jr., Inc., New York, N. Y.</td>
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<tr>
<td>Rankin School of Flying, Portland, Ore.</td>
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<tr>
<td>Rogers Aircraft Company, Inc., Burbank Calif.</td>
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<tr>
<td>Skyways, Inc., Cleveland, Ohio.</td>
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<tr>
<td>Stewart Technical Trade School, New York, N. Y.</td>
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<tr>
<td>Utah Pacific Airways, Inc., Ogden, Utah.</td>
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<td>Von Hoffman Aircraft Company, Robertson, Mo.</td>
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<td>George A. Wies, Inc., Garden City, L. I., N. Y.</td>
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<tr>
<td>Wings Corporation of Philadelphia, Blue Bell, Pa.</td>
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<td>Wright &amp; Esswein, Inc., Buffalo, N. Y.</td>
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<td>Yellow Cab Airways, Inc., Des Moines, Ia.</td>
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## Aeronautical Engineers

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<th>Name</th>
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<tbody>
<tr>
<td>A. A. Bigelow &amp; Company, Inc.</td>
<td>New York, N. Y.</td>
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<td>B. Russell Shaw Company, The, St. Louis, Mo.</td>
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## Special Service to Aviation

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<th>Name</th>
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<td>Air Associates, Inc., Garden City, L. I., N. Y.</td>
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<td>Air Transport Equipment, Inc., Garden City, L. I., N. Y.</td>
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<tr>
<td>Airport Advertising, Inc., New York, N. Y.</td>
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<td>Barr Shipping Corporation, New York, N. Y.</td>
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<td>Beech-Nut Packing Company, Camajoharie, N. Y.</td>
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<td>Bigham, Engra, Jones &amp; Houston, New York, N. Y.</td>
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<td>Bruennick, Inc., Brooklyn, N. Y.</td>
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<td>Champion Model Aircraft Supply, Chilliacothe, Ohio.</td>
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<td>Crans Automotive Reports, Inc., Detroit, Mich.</td>
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<td>CutaJar &amp; Provost, Inc., New York, N. Y.</td>
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<td>Thayer P. Gates, New York, N. Y.</td>
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<td>Globe Mail Service, Inc., New York, N. Y.</td>
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<td>Harman Products Corporation, New York, N. Y.</td>
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<td>International Seed Service Company, Inc., New York, N. Y.</td>
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<td>Johnson Company, New York, N. Y.</td>
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<td>Junior Air Service of America, Inc., Chicago, Ill.</td>
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<td>Loomis, Suffern &amp; Fernald, New York, N. Y.</td>
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<td>Marketing Associates, Inc., Cleveland, Ohio.</td>
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<td>Mccann-Erickson, Inc., New York, N. Y.</td>
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<td>National Credit Office, Inc., Cleveland, Ohio.</td>
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<td>Nott Plant Company, Meriden, Conn.</td>
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<td>Pedlar &amp; Ryan, Inc., New York, N. Y.</td>
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<tr>
<td>Peirier Aircraft Model Company, East Hartford, Conn.</td>
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<td>Queens Boxing Corporation, Long Island City, N. Y.</td>
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<td>Rand McNally &amp; Company, Chicago, Ill.</td>
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<td>Robbins Company, The, New York, N. Y.</td>
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<td>Ronald Press, The, New York, N. Y.</td>
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<tr>
<td>Universal Accounting Systems, Inc., Washington, D. C.</td>
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<tr>
<td>Willson Flying Corporation, New York, N. Y.</td>
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## Aero Insurers and Financial Institutions

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Aero Underwriters Corporation, New York, N. Y.</td>
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<tr>
<td>Aetna Casualty &amp; Surety Co., Hartford, Conn.</td>
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<tr>
<td>Air Investors, Inc., New York, N. Y.</td>
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<tr>
<td>Associated Aviation Underwriters, New York, N. Y.</td>
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<tr>
<td>Automobile Insurance Co., The, Hartford, Conn.</td>
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<tr>
<td>Cram &amp; Forster, New York, N. Y.</td>
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<tr>
<td>Hartford Accident &amp; Indemnity Co., Hartford, Conn.</td>
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<tr>
<td>Maryland Casualty Company, Baltimore, Md.</td>
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<td>National Aviation Corporation, New York, N. Y.</td>
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<tr>
<td>National Casualty Corporation, New York, N. Y.</td>
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<tr>
<td>New Amsterdam Casualty Company, Baltimore, Md.</td>
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<td>Pacific Fire Insurance Company, New York, N. Y.</td>
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<td>Phoenix Insurance Company, The, Hartford, Conn.</td>
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<tr>
<td>Travelers Insurance Company, Hartford, Conn.</td>
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<tr>
<td>United States Aviation Underwriters, Inc., New York, N. Y.</td>
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</tbody>
</table>
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Aeronautical Periodicals and Trade Papers

Aero Digest, New York, N. Y.
Airports, flushing, L. I., N. Y.
Aircraft 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 Service, Washington, D. C.
Western Flying, Los Angeles, Calif.

Associate Members

American Road Builder's Association, Washington, D. C.
Aviation Commissioner, Charles L. Morris, Hartford, Conn.
Baltimore Association of Commerce, Baltimore, Md.
Buffalo Municipal Airport, East Buffalo, N.Y.
Chicago Association of Commerce, Chicago, Ill.
Chicago Institute of Commerce, Chicago, Ill.
Cincinnati Chamber of Commerce, Cincinnati, Ohio.
City of Denver, Colorado, Denver, Colo.
City of Oakland, California, Oakland, Calif.
Cleveland Chamber of Commerce, Cleveland, Ohio.
College of Engineering, University of Oklahoma, Norman, Okla.
College of Engineering & Architecture, University of Minnesota, Minneapolis, Minn.
Detroit Board of Commerce, Detroit, Mich.
Hamilton Chamber of Commerce, Hamilton, Ohio.
Hartford Chamber of Commerce, Hartford, Conn.
Hotel Hussmann, El Paso, Texas.
Houston Chamber of Commerce, Houston, Texas.
Indianapolis Chamber of Commerce, Indianapolis, Ind.
Industrial Bureau of Columbus, Columbus, Ohio.

Industrial Bureau of the Industrial Club, St. Louis, Mo.
Los Angeles Chamber of Commerce, Los Angeles, Calif.
Los Angeles Public Library, Los Angeles, Calif.
Manufacturers Aircraft Association, New York City.
Milwaukee Association of Commerce, Milwaukee, Wis.
National Air Pilots Association, Cleveland, Ohio.
National Lumber Manufacturers Association, Washington, D. C.
Ohio Bureau of Aeronautics, Columbus, Ohio.
Oklahoma City Chamber of Commerce, Oklahoma City, Okla.
Pioneer (The), Tucson, Ariz.
Rochester Municipal Airport, Rochester, N. Y.
State Aviation Commission of New Jersey, Trenton, N. J.
Transcontinental Airport of Toledo, Inc., Toledo, Ohio.
Tri-State College of Engineering, Angola, Ind.
Wichita Chamber of Commerce, Wichita, Kansas.

Affiliate Members

Adams, Porter H.
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Allison, James H.
Allwine, E. Ernest
Althouse, Andrew D.
Anderson, J. Roscoe
Arend, A. Drew
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Beesly, David C.
Benham, David
Belknap, Mrs. William
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Bell, Luther K.
Bellanca, G. M.
Bennett, Charles H., Jr.
Bent, Charles Edward, Jr.
Bernard, Pierre Arnold
Berry, Major John
Berry, R. H.
Bertschler, Frank L.
Biche, Jean
Bigelow, Anson A.
Blankinster, Sherman W.
Blee, Harry H.
Biodgett, R. C.
Blumenthal, H. W.
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Bradley, S. S.
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Brown, D. L.
Brown, Fred L.
Brownell, Dr. E. Garney
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Bunch, Clair W.
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Calendar, Sue-Louise
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Callan, J. Lansing
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Chandler, Col. Do.P.
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Chatfield, Charles H.
Chevalier, John B.
Clark, Col. V. E.
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Colvin, C. H.
Conner, George B.
Cowdin, J. Cheever
Cram, Ralph W.
Craw, Henry M.
Cuthell, Chester W.
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Jerome C. Hunsaker
Spaulding.
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Stinson, Karl W.
Stone, Fowler, P., Jr.
Stout, W. B.
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Strong, Harold P.
Stuart, Clinton W.
Sullivan, John Dwight
Sundmark, Eugene
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Teeter, Ralph R.
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Tidmarsh, G. P.
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Timpson, L. G. Morris
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Turner, Lawrence
Tuttle, Horace Burt
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Upton, Ralph
Urban, Maj. Edward M.
Valentine, Stephen, Jr.
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Vaughan, G. W.
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Vissering, Harry
Waddington, Wm. H.
Wall, William Guy
Wallace, William J.
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Wals, Edward J.
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Waters, Everett O.
Wendock, Arthur
Webb, J. Griswold
Webster, James McK.
Welch, Raymond W.
Wennerman, Joseph H.
Wertensson, F.
Wheat, George S.
West, Howard J., Jr.
Whitbeck, John E.
White, Ernest M.
Whitman, Roscoe, M.D.
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Williams, H. L.
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Worthington, John C.
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Young, Foster V.
Young, W. C.
Zimmermann, Paul G.

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AERONAUTICAL MAGAZINES OF THE UNITED STATES

Aero Digest, 220 West 42nd Street, New York, N. Y.
Aeronautical Engineering, American Society of Mechanical Engineers, 29 West 39th Street, New York, N. Y.
Aircraft Age, 113 East 32nd 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.
Journal of Air Law, 357 East Chicago Avenue, Chicago, Ill.
Model Airplane News, 570 Seventh Avenue, New York, N. Y.
National Glider and Airplane News, 370 Seventh Avenue, New York, N. Y.
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, Chicago, Ill.
Southern Aviation, Grant Building, Atlanta, Ga.
Sportsman Pilot, 220 West 42nd Street, New York, N. Y.
U. S. Air Services, Transportation Building, Washington, D. C.
Western Flying, 145 S. Spring Street, Los Angeles, Calif.
FOREIGN AERONAUTICAL MAGAZINES

AFRICA
Aviation in Africa, Fischer’s Buildings, Main Street, Port Elizabeth, South Africa.

ARGENTINA
Aviación, Calle Jose Pedro Varela, 3762, Buenos Aires.

AUSTRALIA
Aircraft, 62 Flinders Street, Melbourne, C. I.
Flying, Box 2597 N.N., G.P.O., Sydney, N.S.W.

AUSTRIA
Flug, Traungasse 11, Vienna III.
Österreichische Touring Zeitung, Peregrin-gasse 2, Vienna IX.

BELGIUM
Bulletin Mensuel d’Informations du Service de Propagande Aéronautique, 90 Rue de la Loi, Brussels.
Conquête de l’Air, 16 Rue de Namur, Brussels.

BRAZIL
Aeronautica, 151 Avenida Rio Branco, Rio de Janeiro.
Aviação, Escola do Aviação Militar, Rio de Janeiro.

CANADA
Canadian Air Review, Grosvenor at Bay Street, Toronto.
Canadian Aviation, 143 University Avenue, Toronto 2.

CHILE
Auto y Turismo, Casilla 3319, Santiago.
Chile Aéreo, Casilla 913, Santiago.

CZECHOSLOVAKIA
Flugwesen, Konviktská 22, Prague I.
Letecký, Dějvice, Palác Bajkal, Prague XIX.
Letecký, Celetná 13, Prague II.
Le Mas Aéronautique Tchécoslovaque, Celetná 13, Prague I.

DENMARK
Flyv, Vesterbrogade 60, Copenhagen.

FINLAND
Aero, Timavoimien Esikunta, Helsinki.

FRANCE
L’Aéroauto, 139 Quai d’Orsay, Paris.
L’Aérophile, 6 Rue Galilée, Paris.
Les Ailes, 62 Faubourg Poissonnière, Paris 9e.
L’Air, 2 Rue Blanche, Paris.
Bulletin de la Fédération Aéronautique Internationale, 6 Rue Galilée, Paris.

GERMANY
Der Adler, Seyfferstrasse 66, Stuttgart.
Deutsche Luftfahrt, Augustastrasse 18, Berlin-Lichterfelde.
Deutsche Motor Zeitschrift, Müller-Ber- setzstr. 17, Dresden A. 10.
Flugsport, Bahnhofsvorplatz 8, Frankfurt.
Luft und Kraftfahrt, Michaeliskirchplatz 1, Berlin SO. 16.
Luftschau, Blumen Hof 17, Berlin W. 35.
Luftwacht, Blumen Hof 17, Berlin W. 35.
Mitteldeutsche Luftfahrt, Laasenerstrasse 29, Gera.
Revue der Luftfahrt, Belle-Alliancestrasse 100, Berlin S. W. 61.
Zeitschrift für Flugtechnik und Motorluftfahrt, Glückstr. 8, Munich.

GREAT BRITAIN
Air and Airways, 6 Norfolk St., London W. C. 2.
Aircraft Engineering, 6 Norfolk St., London W. C. 2.
Flight, 36 Great Queen Street, Kingsway, London W. C. 2.

HUNGARY
Aviatika, Lőnyay-utca 17, Budapest IX.

INDIA
Indian Aviation, Stephen House, 5 Dalhousie Square East, Calcutta.

ITALY
Aeronautica, Via Gesù 6, Milan.
L’Aerotecnia, Via delle Coppelle 35, Rome.
L’Aia d’Italia, Via Settala 22, Milan.
L’Aviazione, Corso Umberto 112, Rome.
Bollettino dell’Aviazione Civile e del Traffico Aereo, Via dell’Merced 9, Rome.
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.

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**COLORADO:**
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- R1-Bx. 7: Colorado Springs Municipal Airport, Max Pfele
- Denver: Colorado Airways Field, A. F. Joseph
- Denver: Curtis Field
- Denver: Denver Municipal Airport, W. F. Wunderlich
- Grand Junction: Grand Junction Airport, H. J. Sackett
- Montezuma: Montezuma Municipal Airport, W. F. Bowes, C. M.
- Otis: Otis Municipal Airport, Dec Unger
- Pueblo: Pueblo Airport, Howard Field
- Trinidad: Trinidad Airport, Midcontinental Air Express

**CONNECTICUT:**
- Bridgeport: Bridgeport Airport, T. D. Moller
- Danbury: Danbury Airport, Henry Taylor
- Groton: Groton Municipal Airport, E. H. Rattray
- Hartford: Hartford Municipal Airport, H. H. Mills
- Hartford Municipal Airport: Rentschler Field, Bernard Whalen
- Middletown: Middletown Municipal Airport, E. L. Cauley
- Wallingford: Wallingford Municipal Airport

**DELAWARE:**
- Bellanca Field: Bellanca Field, Del. Flying Service

**DISTRICT OF COLUMBIA:**

**FLORIDA:**
- Bradenton: Wallace Field, Harry L. Land, Mgr.
- Clearwater: Clearwater Municipal Airport, Inc., Mgr.
- Daytona Beach: Daytona Beach Municipal Airport, A. C. Banks
- DeLand: DeLand Municipal Airport, Aviation Comm. of C. of C.
- Fort Myers: Fort Myers Municipal Airport, J. R. Griffin, Mgr.
- Inverness: Inverness Municipal Airport, Paxon Field
- Key West: Key West Airport
- Lakeland: Lakeland Airport
- Lake Wales: Lake Wales Municipal Airport
- Leesburg: Leesburg Airport
- Melbourne: Melbourne Airport, Clair A. Inakep, C. M.
- Miami: Miami Municipal Airport, A. H. Heerman
- Oska: Oska Airport
- Orlando: Orlando Airport
- St. Petersburg: St. Petersburg Municipal Airport, J. B. Meares
- Sarasota: Sarasota Municipal Airport, Dr. J. R. Scully, G. P. W.
- St. Augustine: St. Augustine Airport, A. F. Krueger, Mgr.
- Tallahassee: Tallahassee Municipal Airport, Wm. R. Gaunt, C. M.
- Titusville: Titusville Airport, N. T. Foschera, Mgr.
- Titusville: Titusville Municipal Airport, O. B. Newcomb
- W. Palm Beach: W. Palm Beach Airport
- W. Palm Bch., Drawer: Roosevelt Marine Base, C. S. Collar
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**Pennsylvania:**

- Allentown: Allentown Airport, Sidney A. Riley, Jr.
- Altoona-Tyrone: Stultz Field,                        
- Bethlehem, Box 93: Bethlehem Mun. Airport,          
- Bradford: Harri Emery Airport, John J. Moore        
- Bridgeville: Mayer Field,                           
- Conshohocken: American Legion Airport, H. C. Haddock
- Conway: Conway Airport, A. J. Moore                 
- Erie: Erie County Airport, X. Y. McCauley          
- Fairview: Gettysburg International Airport, F. S. Kleinefield
- Greensburg: Pittsburgh-Greensburg Airport,          
- Harrisburg: Penn-Harris Airport, Pat Brooks, Mgr.
- Hanover Falls: Matter Airport, Paul C. Miller      
- Johnstown: Johnstown Mun. Airport, J. H. Ritter     
- Jones Mills: Pike Run Airport,                       
- Lancaster: Lancaster Airport,                        
- Latrobe: J. D. Hill Airport,                         
- Leighton: Martin J. Jensen Airport, Jensen Aviation Corp.
- Marchand: Punxsutawney Brae-Breeze Airport, H. W. Smeaton
- McKeesport: Bettis Field,                           
- Moscow: Moscow Airport,                              
- Mount Union: Mount Union Airport,                    
- New Castle: Jackson Field,                           
- New Castle: New Castle Airport,                      
- Norristown: Pateo Field,                             
- Parkesburg: Robb Field,                              
- Philadelphia, Island Rd.: Philadelphia Airport, R. P. Hewitt
- Philadelphia, Willow Grove: Pitcairn Field, George E. Chambliss
- Pittsburgh: Allegheny County Airport, C. W. Forcier
- Pottstown: Pottstown Airport,                        
- Reading: Whander Field,                              
- Selingsgrove: Selingsgrove Airport,                   
- Somerset: Rhode Island Airport, Alfred K. Young (operator) 
- Towanda: Towanda Legion Airport,                      
- Wayne: Wayne Field,                                  
- 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,                        
- Charleston: (m) Charleston Airport,                  
- Cheraw: (m) Exscizzor Airport,                       
- Florence: (m) Florence Airport,                      
- Fort Mills: Spring Field,                             
- Greenville: Greenville Mun. Airport,                 
- Myrtle Beach: Myrtle Beach Airport, C. G. Beck       
- Seneca: Seneca Airport, R. M. Tribble
- Spartanburg: Municipal Airport,                      

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**WASHINGTON:**

- Aberdeen: Grays Harbor Airport - F. D. Hobl, Hobi Airways, Inc.
- Bellingham: Tulip Field - R. C. Graham
- Centralia: Centralia Airport - T. A. Patton
- Chehalis: Chehalis Mun. Airport - A. D. Campbell
- Ellensburg: Ellensburg Airport - E. N. Stoddard
- Everett: Everett Airport -
- Kennewick: Kennewick Airport -
- Olympia: Olympia Airport -
- Pasco: Franklin County Airport - A. E. Wehe
- P. T. Angeles: Pt. Angeles Airport - John Blum
- Renton: Renton Airport - A. Blum
- Spokane: Boeing Field - Maj. David G. Logg
- Yakima: Y. A. A. Airport -

**WEST VIRGINIA:**

- Bluefield: College Field -
- L. L. Field: Lang Island Field -
- Morgantown: Morgan Field - W. E. Brooks, C. M.
- White Sulphur Springs: Greenbrier Airport - R. H. Patterson

**WISCONSIN:**

- Appleton: Appleton Airport - E. West
- Appleton: Geo. A. Whiting Airport - E. R. 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 -
- Green Bay: Green Bay Airport -
- Janesville: Janesville Airport - C. Berry
- Kiel: Kiel Airport -
- Land O' Lakes: Land O' Lakes Airport -
- Madison: Madison Airport -
- Madison: Royal Airport -
- Manitowoc: Manitowoc Airport -
- Marshfield: Miners Airport - W. Miner
- Milwaukee: Curtis-Wright Airport -
- Milwaukee: Milwaukee County Airport - Maj. Stanley E. Piaskecki
- 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: Princeton Airport - G. V. Kelly
- Rhinelander: Rhinelander Airport - Steve Shadbreck
- Sheboygan: Sheboygan Airport - Kohler-Sheboygan
- Stevens Point: Stevens Point Airport -
- Three Lakes: Three Lakes Airport - H. L. Grandy
- Washington Island: Washington Island Airport -
- Wausau: Alexander Airport - H. D. Putnam
- Wisconsin Rapids: Tri City Airport - Maj. L. G. Mulzer

**WYOMING:**

- Casper: Wardell Field - R. Leferink
- Cheyenne: Cheyenne Airport - Boeing Air Transport
- Gillett: Gillett Airport -
### AIRCRAFT YEAR BOOK

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### 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 Kurchungk)
- Kotzebue, Kotzebue 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
- Nabsena, Nabsena Field, auxiliary
- Nenana, Nenana Field, auxiliary
- Ninilchik, Ninilchik Field, auxiliary
- Noble, Noble 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, Susitna Station Field, auxiliary
- Takotna, Takotna Field, auxiliary
- Tanana, Tanana Field, auxiliary
- Telida, Telida Field, auxiliary
- Tellera, Tellera Field, auxiliary
- Unalakleet, Unalakleet Field, auxiliary
- Upper Tonsina, Upper Tonsina Field, auxiliary
- Valdez, Valdez Field, auxiliary
- Valdez Creek, Valdez Creek Field, auxiliary
- Cape Prince of Wales, Cape Prince of Wales Field, auxiliary
- Wasilla, Wasilla Field, auxiliary
- Willow Creek, Willow Creek 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)
  - Croton-on-Hudson
- **Rhode Island**
  - Newport (Gould Island Naval Torpedo Station)
  - Lake George
- **Connecticut**
  - Connecticut
  - Fort Washington, Long Island
  - North Beach, Long Island
  - Amityville, Long Island
- **New York**
  - New Dorp, Staten Island
  - New Haven
  - Washington — (Naval Air Station, Anacostia)

##### District of Columbia

- 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

Florida
St. Petersburg
Pensacola (Naval Air Station)

California
San Diego (Naval Air Station)
Santa Monica
Oakland (Oakland Municipal Airport)

Class II. Anchorages with Ordinary Harbor Facilities

Atlantic Coast

Maine
Calais
*Eastport
*Boothbay
Bath
*Portland

New Hampshire
*Salem
*Provincetown
*New Bedford
*Fall River
*Nantucket
*Edgartown

Rhode Island
*Providence
*New London

Connecticut

New York
*Port Jefferson, Long Island
Amityville, Long Island
*Great Pond (Lake Montauk), L. I.
Brooklyn
*Keyport

New Jersey
*Port Morris
*Saratoga
*Tampa
*Cedar Key
*Panama City

Alabama
Mobile

Massachusetts
Hampton Roads (Naval Air Station)

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

Louisiana
New Orleans

Pacific Coast

Washington
Seattle (s), (Sand Point Naval Reserve Air Station); (Benton Airport); (Elliott Bay);
(Lake Union) (2).
Port Townsend (Floating Hangar)

North Carolina

South Carolina

Georgia
Savannah
Bushwick

Florida

Mississippi

*Description of anchorage published in The Naval Air Pilot—East and Gulf Coasts of
the United States. H. O. Publication 190.
AIRCRAFT YEAR BOOK

Pacific Coast

California

Los Angeles
Port San Luis
Monterey
Santa Cruz
San Francisco
Sausalito
Alameda
Bureka
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

Barksdale Field (Fourth Corps Area) P. O. Barksdale, La.
Benning, Pt., Ga.—Flight B, 16th Observation Squadron
Bolling Field—(Chief of the Air Corps) P. O. Anacostia, D. C. Air Corps Detachment Flying Field.
Bristol, Pa.—(Chief of the Air Corps) P. O. Bristol, Pa. Air Corps Representative Keystone Aircraft Corp.
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.
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. 12th Photo Section.
Pittsburgh Air Force

Detroit, Mich.—(Chief of the Air Corps) P. O. 802 Farwell Bldg., Detroit, Mich. Procurement Planning (On Corps Area) Air Corps Procurement Dist.


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.


Hensley Field—(Eighth Corps Area) P. O. Dallas, Texas. Intermediate Landing Field. Reserve Airdrome.

Houston, P. O. 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, 43rd Sqn. 68th Service Sqn. 22nd Photo Sec. 39th School Sdn. Pursuit Detachment. Air Corps Band.


Long Beach, Cal.—(Formerly Clover Field) Municipal Airport. Reserve Airdrome.


Lordsburg, N. M.—(Eighth Corps Area) P. O. Lordsburg, N. M. Airdrome. Intermediate Landing Field.


McIntosh, P. O.—(Eighth Corps Area) P. O. Ft. McIntosh, Texas. Intermediate Landing Field.


Maxfield Field—(Chief of the Air Corps) P. O. Montgomery, Ala. 4th Photo Sec. Hq. Tactical School. 515th, 515th School Sqn.


Patterson Field—(Chief of the Air Corps) P. O. Fairfield, Ohio. Fairfield Field. Repair & Supply and Repair Depot.


### Air Corps National Guard Units

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District Procurement and Planning Representatives

Buffalo
Chicago
Detroit

Wright Field
New York
San Francisco

Air Corps Procurement Districts

Buffalo, N. Y.
Chicago, III.
Cleveland, Ohio
Detroit, Mich.
New York, N. Y.
San Francisco, Calif.

65 Franklin St.
1212 & 1213 Buckingham Bldg.,
Wright Field, Dayton, Ohio
802 Farwell Bldg.
39 Whitehall St.
369 Pine St.

 Corps Area and Department Air Officers

First Corps Area
Second Corps Area
Third Corps Area
Fourth Corps Area
Fifth Corps Area
Sixth Corps Area
Seventh Corps Area
Eighth Corps Area
Ninth Corps Area
The Philippine Department
The Hawaiian Department
The Panama Department

Army Base, Boston 9, Mass.
Governors Island, N. Y.
311 St. Paul Place, Baltimore, Md.
Hq. F. M. McPherson, Ga. Mail Address:
Oakland City Station, Atlanta, Ga.
Pt. Hayes, Columbus, Ohio
819 W. Pershing Road, Chicago, Ill.
Baird Bldg., Omaha, Nebr.
Pt. Sam Houston, San Antonio, Texas
Presidio of San Francisco, Calif.
Manila, P. I.
Pt. Shafter, T. H.
Quarry Heights, C. Z.

Materiel Division
Wright Field, Dayton, Ohio

Brig. Gen. Henry C. Pratt, Chief of the Division

Asst. Executive ........................................... Major Robert Walsh
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**

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<th>Name of Aviation Editor</th>
<th>Aviation Column or Page</th>
<th>Chartered Planes in 1931</th>
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<tr>
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<td>Ralph E. Hurst</td>
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<td>Mobile Press</td>
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**Arizona**

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<td>Edgar B. Chesnutt</td>
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<td>Sacramento Bee</td>
<td>Hamilton Hintz</td>
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<td>Max Miller</td>
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Texas

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<td>Dallas Times Herald</td>
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Press Associations

The Associated Press, Washington, D. C.
National Enterprise Association, Cleveland, Ohio

Oscar Leiding
Israel Klein

AVIATION COUNTRY CLUBS

551 Fifth Avenue, New York City

National Officers

Charles Lanier Lawrence ........................................... National Chairman
George B. Post .................................................... Vice-Chairman
George M. Pynchon, Jr. ............................................ Treasurer
Earl D. Osborn ..................................................... Secretary
James B. Taylor, Jr. ................................................
John S. Reaves ....................................................

National Advisory Board

Sherman M. Fairchild ........................................... Charles L. Lawrance
Reuben H. Fleet ................................................. C. Townsend Ludington
Richard F. Hoyt .................................................. Robert R. McCormick
Clement M. Keys .................................................. Earl D. Osborn
Robert Law ........................................................ George B. Post

George M. Pynchon, Jr........................................... Frederick B. Rentschler
William A. Rockefeller ........................................ James B. Taylor, Jr.
John T. de Blois Wack ............................................

AVIATION COUNTRY CLUB OF LONG ISLAND

Charles Lanier Lawrence ........................................... President
Edward O. McDonnell ............................................... Vice-President
Roland Palmedo .................................................... Treasurer

Board of Managers

Reginald L. Brooks ........................................ William B. Leeds, III
William Hale Harkness ........................................ Edward O. McDonnell
Charles L. Lawrance ........................................... C. Oliver O'Donnell

Roland Palmedo .................................................... John T. de Blois Wack
James B. Taylor, Jr. ............................................
Cornelius V. Whitney .............................................

AVIATION COUNTRY CLUB OF NEW JERSEY

Charles Lanier Lawrence ........................................... President
Donald D. Cooke ................................................... Vice-President
E. H. Kipstein ..................................................... Treasurer

Donald D. Cooke ................................................. John W. Gillies, Jr.
E. H. Kipstein .................................................... Walter S. Marvin

Wesley Trimpi .....................................................
AVIATION COUNTRY CLUB OF WESTCHESTER

Robert Law ......................................................... President
George M. Pynchon, Jr. ........................................ Vice-President
Elliott S. Phillips ............................................. Secretary and Treasurer

Board of Managers

Richard G. Croft ............................................ Robert Law, Jr.
William S. Gray, Jr. .......................................... Earl D. Osborn
R. Stewart Kilborne, Jr. .................................. Elliott S. Phillips

GEORGE H. TOWNSEND

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<table>
<thead>
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<tr>
<td>Mexico</td>
<td>Señor Coronel Don Francisco J. Aguilar, Military Attaché.</td>
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<td>Italy</td>
<td>Commander Paolo Sbernadori, Air Attaché.</td>
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<td>Spain</td>
<td>Major Joaquin Planell Riera, Spanish Army, Military Attaché.</td>
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<td>Cuba</td>
<td>Captain Enrique A. Prieto, Military Attaché.</td>
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<tr>
<td>France</td>
<td>Major Georges Thienfait, Air Attaché.</td>
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<td>Señor Don Carlos H. Lee, Commercial Attaché.</td>
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<td>Japan</td>
<td>Colonel Shohel Washieu, I. J. A., Military Attaché.</td>
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<td>Poland</td>
<td>Mr. Andrew Saneha, Commercial Counselor.</td>
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<td>Great Britain</td>
<td>Group Captain The Honorable L. J. Fiennes, R. A. F., Air Attaché.</td>
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<td>Argentina</td>
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</tr>
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<td>Colonel Don Jorge Mercedo, Military Attaché.</td>
</tr>
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</table>

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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.

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- Mr. Juan Jose Mundin Schauster, Director General of Civil Aeronautics, Calle Ascuenga 957, Buenos Aires, Argentina.
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BY DEPARTMENT OF COMMERCE

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<td>Curtiss-Wright Flying Service</td>
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<td>Curtiss-Wright Flying Service</td>
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<tr>
<td>Boeing School of Aeronautics</td>
<td>Ground and</td>
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<tr>
<td>Oakland Municipal Airport</td>
<td>Flying</td>
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<tr>
<td>Oakland, Calif.</td>
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<tr>
<td>Spartan School of Aeronautics</td>
<td>Ground and</td>
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<tr>
<td>Apache Blvd. &amp; Chamberlain Dr.</td>
<td>Flying</td>
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<tr>
<td>Tulsa, Oklahoma</td>
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<tr>
<td>Curtiss-Wright Flying Service</td>
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<tr>
<td>Grand Central Air Terminal</td>
<td>Flying</td>
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<tr>
<td>Glendale, Calif.</td>
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<tr>
<td>Roosevelt Aviation School, Inc.</td>
<td>Ground and</td>
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<tr>
<td>110 West 57th Street</td>
<td>Flying</td>
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<tr>
<td>New York, N. Y. (Ground)</td>
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<tr>
<td>Roosevelt Field No. 1</td>
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<td>Mineola, L. I., N. Y. (Flying)</td>
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<tr>
<td>Curtiss-Wright Flying Service</td>
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<tr>
<td>Municipal Airport of South Memphis</td>
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<td>Memphis, Tenn.</td>
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<td>Penn School of Aviation</td>
<td>Ground and</td>
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<td>Pittsburgh-Butler Airport</td>
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<td>Butler, Pa.</td>
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<td>Curtiss-Wright Flying Service</td>
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<tr>
<td>55 Allyn Street (Ground)</td>
<td>Flying</td>
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<tr>
<td>Branford Field (Flying)</td>
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<td>Hartford, Conn.</td>
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<td>Curtiss-Wright Flying Service</td>
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<tr>
<td>48th and Colorado Blvd.</td>
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<td>Denver, Colo.</td>
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<td>Lincoln Airplane &amp; Flying School</td>
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<tr>
<td>2415 O Street</td>
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<td>Lincoln, Nebr. (Ground)</td>
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<td>Municipal Airport</td>
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<td>Lincoln, Nebr. (Flying)</td>
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<td>Yellow Cab School of Aviation</td>
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<td>Des Moines, Iowa</td>
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<tr>
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<tr>
<td>Hancock Foundation College of Aero.</td>
<td>Ground and</td>
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<tr>
<td>Santa Maria Airport</td>
<td>Flying</td>
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<tr>
<td>Santa Maria, Calif.</td>
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</tbody>
</table>
AERONAUTICAL DIRECTORY AND TRADE INDEX

Name and Location
Curtiss-Wright Flying Service
Curtiss-Wright Airport
(Logan Field-Auxiliary)
Baltimore, Md.
Nepeco Tri-City Flying Service
Wisconsin Rapids, Wis.
Curtiss-Wright Flying Service
San Mateo, Calif.
California Aerial Transport Flying School
Los Angeles, Calif.
Furniture Capital Air Service
Grand Rapids Airport
Grand Rapids, Mich.
Dallas Aviation School and Air College
Dallas, Texas
Penn School of Aviation
Curtiss-Bettis Airport
McKeeseport, Pa.
In combination with
Pittsburgh Auto & Aviation School
404 Penn Ave.
Pittsburgh, Pa.
Birmingham Air Service, Inc.
Municipal Airport
Birmingham, Ala.

Ratings
Ground | Flying
Transport | Private
Lim. Commercial | Approved
6-0-30 | 6-6-30 | 6-26-30 | 7-23-30 | 8-21-30 | 1-2-31
9-28-31 | 11-10-31

MANUFACTURERS AIRCRAFT ASSOCIATION, INC.

300 Madison Avenue, New York, N. Y.

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Frank H. Russell
Vice-Presidents
E. T. Asplundh
J. Don Alexander
Eugene E. Wilson
Treasurer
Clayton J. Brukner
Secretary
Walter C. Davis
General Manager
S. S. Bradley
Comptroller
W. Russell Root
Director of Patent Research
John A. Sanborn

Directors
J. Don Alexander
Benj. F. Castle
Harris M. Hanshue
E. T. Asplundh
E. L. Cord
Glenn L. Martin
Peter R. Beasley
Walter C. Davis
Frank H. Russell
Clayton J. Brukner
Reuben H. Fleet
Eugene E. Wilson

The MANUFACTURERS AIRCRAFT ASSOCIATION, INC., organized in July, 1917, had for its primary purpose the administration of a cross-licensing agreement between manufacturers of airplanes owning a group of several hundred patents, including those covering the basic Wright and Curtiss inventions. The Cross-License Agreement of July 24, 1917, was superseded by "The Amended Cross-License Agreement of December 31, 1926," which is now in force. The latter agreement, which is printed in full in the Aircraft Year Book for 1920 (page 552), has been adopted by nearly all airplane manufacturers in the United States. The War and Navy Departments have also contracted with the Association for licenses under patents of all members. The Amended Agreement further provides for the cross-licensing of all new patents acquired by members, with provision for award of royalties, determined by arbitration, on meritorious inventions. The Association maintains a Patent Research Division and publishes
semi-monthly for distribution to members a current Digest of U. S. airplane patents, showing official drawings. The Association also has an extensive library comprised of United States and foreign patents, books, other publications and documents, and renders a general patent service to members.

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Aeromarine Plane & Motor Co., Inc.
Aeronautical Corp. of America
Alexander Industries, Inc.
Alliance Aircraft Corp.
American Aeronautical Corp.
American Eagle Aircraft Corp.
Amphibians, Inc.
Bach Aircraft Company, Inc.
Bird Aircraft Corp.
B/I Aircraft Corp.
Boeing Airplane Company
Breezs Aircraft Corp.
Buhl Aircraft Company
Butler Aircraft Corp.
Cessna Aircraft Company
Chance Vought Corporation
Command-Aire, Inc.
Consolidated Aircraft Corp.
Curtiss Aeroplane & Motor Co., Inc.
Curtiss-Caproni Corp.
Curtiss-Wright Airplane Co.
Davis-Wright Company
Douglas Aircraft Co., Inc.
G. Elias & Bro., Inc.
Fleet Aircraft, Inc.
General Aviation Corporation

Great Lakes Aircraft Corp.
Hall-Aluminum Aircraft Corp.
Hamilton Metalplane Company
Keystone Aircraft Corp.
Leeser Aircraft Company
Lockheed Aircraft Corp.
Leoing Aeronautical Engineering Corp.
Glenn L. Martin Company
Mercury Aircraft, Inc.
Monocoupe Corporation
Navy Department of the U. S.
New Standard Aircraft Corp.
Nicholas-Beazley Airplane Co., Inc.
Packard Motor Car Company
Pittsairn Aircraft, Inc.
Ryan Aircraft Corporation
Sikorsky Aviation Corp.
Spartan Aircraft Company
Stearman Aircraft Company
Stinson Aircraft Corp.
Sturtevant Aircraft Company
Sekely Aircraft & Engine Co.
Thomas-Morse Aircraft Corp.
Viking Flying Boat Company
Waco Aircraft Company
War Department of the U. S.
Wright Aeronautical Corporation

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

3841 Navy Building, Washington, D. C.

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William P. MacCracken, Jr., Ph.B., Washington, D. C.

George W. Lewis, Director of Aeronautical Research.
John F. Victory, Secretary.

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David W. Taylor ................................................. Vice Chairman
John F. Victory .................................................. Secretary

Charles G. Abbot
George K. Burgess
Arthur B. Cook
Benjamin D. Foulois
Col. Charles A. Lindbergh

Orville Wright

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William A. Moffett, Rear Admiral United States Navy, Chief, Bureau of Aeronautics, Navy Department, Washington, D. C.
Henry C. Pratt, Brigadier General, United States Army, Chief, Matorial Division, Air Corps, Wright Field, Dayton, Ohio.
Arthur B. Cook, Captain, United States Navy, Asst. Chief, Bureau of Aeronautics, Navy Department, Washington, D. C.
Colonel Charles A. Lindbergh, New York City.
Orville Wright, Sc.D., Dayton, Ohio.

Henry J. E. Reid, Engineer in Charge, Langley Memorial Aeronautical Laboratory, Langley Field, Va.

### National Aeronautic Association of U.S.A., Inc.

National Headquarters, Dupont Circle, Washington, D.C.

Representative in U.S.A. of Fédération Aéronautique Internationale

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>Hiram Bingham</td>
<td>President</td>
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<tr>
<td>Robert P. Ritchard</td>
<td>Vice President</td>
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<tr>
<td>H. Ralph Badger</td>
<td>Secretary</td>
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<tr>
<td>John F. Vidy</td>
<td>Treasurer</td>
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**Advisory Board**

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<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Joseph S. Ames</td>
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<tr>
<td>Harry H. Beece</td>
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<tr>
<td>Richard E. Byrd</td>
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<tr>
<td>F. Trubee Davison</td>
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<tr>
<td>James H. Doolittle</td>
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<tr>
<td>Amelia Earhart</td>
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<tr>
<td>Benjamin D. Poulois</td>
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<td>W. Irving Glover</td>
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<td>Harry F. Guggenhein</td>
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<tr>
<td>Frank Hawks</td>
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<td>David S. Inagals</td>
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<td>Reed Landis</td>
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<td>Charles A. Lindbergh</td>
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<td>Charles P. Marvin</td>
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<tr>
<td>William A. Moffett</td>
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<td>Clarence M. Young</td>
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**Executive Committee**

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Porter Adams, Chairman</td>
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<tr>
<td>J. W. Beretta</td>
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<tr>
<td>Ray Cooper</td>
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<tr>
<td>Charles L. Lawrence</td>
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<td>George W. Lewis</td>
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<tr>
<td>C. F. Lienesch</td>
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<tr>
<td>Winship Nunally</td>
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<tr>
<td>F. G. Smart, Jr.</td>
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<td>R. F. Taylor</td>
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### NAVAL AVIATION OFFICIALS

#### Bureau of Aeronautics

<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Chief of Bureau</td>
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<tr>
<td>Assistant Chief of Bureau</td>
</tr>
<tr>
<td>Aide to the Chief</td>
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<tr>
<td>Financial Division</td>
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#### General Information

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<tr>
<td>Major W. H. Sitz (USMC)</td>
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<tr>
<td>Marine Corps Aviation</td>
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#### Naval Air Stations

<table>
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<tr>
<th>Name</th>
<th>Commanding Officer</th>
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<tr>
<td>Hampton Roads, Va.</td>
<td>Capt. Kenneth Whiting</td>
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<tr>
<td>San Diego, Calif.</td>
<td>Comdr. Robert R. Patunack</td>
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<tr>
<td>Pensacola, Fla.</td>
<td>Capt. R. P. Zogbaum</td>
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<tr>
<td>Anacosta, D.C.</td>
<td>Capt. Warren G. Child</td>
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<tr>
<td>Seattle, Wash.</td>
<td>Lt. Comdr. Alfred E. Montgomery</td>
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<tr>
<td>Lakehurst, N. J.</td>
<td>Capt. Harry E. Schoemaker</td>
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<tr>
<td>Coco Solo, C. Z.</td>
<td>Comdr. Alva D. Bernhard</td>
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<tr>
<td>Pearl Harbor, T. H.</td>
<td>Comdr. E. W. Tod</td>
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</table>
Marine Flying Fields

Quantico, Va. .......................................................... Maj. Ralph J. Mitchell
San Diego, Calif. .................................................. Maj. Ross E. Rowell
Port au Prince, Haiti ................................................ Maj. James E. Davis
Managua, Nicaragua ................................................ Capt. F. P. Mulcahy

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Chief of Staff ......................................................... Capt. John H. Towers
Commander, Carrier Division One ................................. Capt. G. W. Steele
U.S.S. Lexington—Commanding Officer ......................... Capt. Ernest J. King
U.S.S. Saratoga—Commanding Officer ............................ Capt. Frank R. McCrory
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U.S.S. Akron—Commanding Officer ............................... Lt. Comdr. Charles E. Rosendahl
U.S.S. Los Angeles—Commanding Officer ....................... Capt. H. E. Shoemaker

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Philadelphia, Penna.—Manager ................................... Comdr. S. M. Kraus

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Aide to Commander, Scouting Fleet .............................. Lt. Comdr. Wm. D. Thomas
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Office of Fleet Training ........................................... Lt. Comdr. S. P. Ginder
Board of Inspection & Survey ..................................... Lt. Comdr. T. P. Jeter
Bureau of Navigation ................................................ Comdr. Wadleigh Capelhart
Bureau of Ordnance .................................................. Comdr. E. R. McClung
Hydrographic Office .................................................. Lt. John F. W. Vest

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Second Assistant Postmaster General ......................... W. Irving Glover
Deputy Second Assistant Postmaster General ................. Chase C. Gove
Superintendent ....................................................... J. W. Sutherin
Assistant Superintendent ........................................ B. F. Myers

Joseph Menth, Assistant Superintendent ....................... Chicago, Ill.
A. O. Willoughby, Assistant Superintendent .................. San Francisco, Calif.
Fred M. Hirota, Assistant Superintendent ..................... Atlanta, Ga.
Stephen A. Cisler, Assistant Superintendent .................. Fort Worth, Texas

E. R. White, Director ................................................ Division of International Postal Service

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29 West 39th St., New York, N. Y.

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Wm. B. Stout ............................................................ Vice-President
Chas. L. Lawrance ..................................................... Vice-President (Representing Aircraft-Engine Engineering)
A. J. Poole .............................................................. Vice-President (Representing Diesel-Engine Engineering)
John A. C. Warner ..................................................... Secretary and General Manager
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Wm. B. Stout, Vice-Pres.
Chas. L. Lawrence, Vice-Pres.
A. J. Poole, Vice-Pres.
B. B. Bachman, Vice-Pres.
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A. J. Neerken, Vice-Pres.
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Aircraft
Chas. L. Lawrence, Chairman

Standards Committee
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J. F. Hardecker, Chairman

Airplane-Engine Division
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Field Organizer

William C. Haines
In Charge of Hoover Airport Station

Forecast Division

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District Forecasting

Charles L. Mitchell
District Forecaster

R. Hanson Weightman
District Forecaster

Instrument Division

Benjamin C. Kadel
Chief

Field Organization—District Forecasting

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District Forecaster

Denver
District Forecaster

New Orleans
District Forecaster

San Francisco
District Forecaster

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(Formerly Major Control Airport Stations)

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Eugene M. Barto

Cheyenne
Henry P. Adams

Chicago
Fred H. Weck

Cleveland
Clarence G. Andrus

Dallas
John A. Riley

Kansas City
Leslie A. Warren

Los Angeles
George M. French

New York (Newark Airport)
Homer W. Ball

Omaha
Vincent E. Jakl

Portland, Ore.
Julius C. Smith

Salt Lake City
Harry M. Hightman

San Francisco (Oakland Airport)
Dehert M. Little
TRADE INDEX

· DIVISION I ·

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V. E. Clark, Vice-Pres. and Gen. Mgr.
Harold Kondolf, Secretary
A. O. Cushny, Treasurer

AMPHIBIONS, Inc., Garden City, N.Y.

Privateer III 3-place Cabin amphibion,
165 H.P. Radial.
N-2-B 4-place Wright J-6
Cabin amphibion
N-2-C 5-place Wasp 425 H.P.
Cabin amphibion

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Manager. T. P. Leaman, Chief Engineer

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Land Title Building, Philadelphia.

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Executive Vice-Pres. and Treas.; E. T.
Asplundh, Vice-Pres.; J. G. Ray, Vice-
Pres.; K. C. Acton, Sec.; A. E. Larsen,
Chief Engineer.

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New Castle, Delaware

Bellanca Cabin Monoplanes
Pacemaker, Skyrocket, Airbus
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Adams, Vice-Pres.; Andrew Bellanca,
Sec.; A. D. Chandler, Treas.; W. B.
Hurlburt, Vice-Pres. & Director of Sales.

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Baltimore, Md. Manufacturers and
designers of aircraft. Thomas A.
Morgan, Pres.; Thomas B. Doe, Vice-
Pres.; Temple N. Joyce, Vice-Pres. &
Gen. Mgr.; John Sanderson, Sec. &
Treas.; W. H. Bowne, Ass't Sec.; G. B.
Arnold, Ass't Sec. & Fcty. Mgr.; F. S.
Hubbard, Ch. Engr.; W. H. Miller,
Ass't Chief Engineer.

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Seattle, Wash.

Subsidiary of United Aircraft &
Transport Corp.

Designers and manufacturers of
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C. L. Egqvist, Vice-President
D. R. Drew, Secretary
H. E. Bowman, Treasurer

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CO., Inc., 29 West 57th St., N.Y. City

A division of Curtiss-Wright Corporation.
Factory: Buffalo, N.Y. Military
aircraft, multi-motor transports.
J. A. B. Smith, Pres.; T. P. Wright,
Vice-Pres.; Burdette S. Wright, Vice-
Pres.; B. G. Leighton, Vice-Pres.;
Wm. E. Valk, Vice-Pres. Cable Address
"Aeroexco."

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A division of Curtiss-Wright Corporation.
Factories: St. Louis, Mo., and
Wichita, Kansas

Builders of Commercial planes, parts
and accessories. Walter Beech, Pres.
Cable Address "Aeroexco."

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Surveys, Inc., and Fairchild Aerial
Camera Corp., 270 West 38th St.,
N. Y.; Kreider-Reisner Aircraft Co.
Inc., Hagerstown, Md.; Fairchild
Aircraft, Ltd., Longueuil, P. Q.,
Canada.
FORD ALL METAL PLANES

GENERAL AVIATION MANUFACTURING CORPORATION
Dundalk, Maryland
Subsidiary of General Aviation Corporation
Affiliated with General Motors Corporation

GREAT LAKES AIRCRAFT CORPORATION, Cleveland, Ohio
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Builders of the Great Lakes Sport-Trainer
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Edward Rembert, Sales Manager

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2050 Elmwood Ave., Buffalo, N. Y.
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Drawn Sections for Aircraft
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Archibald M. Hall, Vice-Pres.
Charles F. Pape, Secy. and Treas.

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A division of Curtiss-Wright Corporation
Factory: Bristol, Pa.
Military Planes, Flying Boats, Amphibions, Multi-motor Transports
Edgar N. Gott, Pres.; W. S. Leacraft, Vice-Pres.; Ralph S. Damon, Vice-Pres.; Bruce G. Leighton, Vice-Pres.
Cable Address "Aeroexco"

GROVER LOENING AIRCRAFT COMPANY, Inc.
Roosevelt Field, Garden City, N. Y.
Experimental Aircraft Manufacturers

THE GLENN L. MARTIN COMPANY
Baltimore, Maryland
Designers and manufacturers of aircraft. Contractors to the U. S. Army and Navy since 1912.
Glenn L. Martin, Pres.; Charles A. Van Dusen, 1st Vice-Pres. and Gen. Mgr.; Lessiter C. Milburn, 2nd Vice-Pres. and Chief Engineer.

ST. LOUIS AIRCRAFT CORPORATION
Subsidiary
St. Louis Car Company
St. Louis, Mo.
BUILDERS OF THE CARDINAL TWO-PLACE CABIN MONOPLANE


CHANCE VOUGHT CORP.
East Hartford, Conn.
(Division of United Aircraft)
Designers and Manufacturers of Observation, Attack and Sport Convertible Landplanes, Seaplanes and Amphibions
E. E. Wilson, President

THE WACO AIRCRAFT COMPANY
Troy, Ohio
Manufacturers of WACO Airplanes
Clayton J. Bruckner, President
Lee N. Brutus, Vice-Pres. and Treas.
L. E. St. John, Secretary
Hugh R. Perry, Sales Manager
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THE GOODYEAR-ZEPPELIN CORPORATION, Akron, O. Mfrs. all types lighter-than-air craft; rigid, semi-rigid and non-rigid airships, spherical and kite balloons. P. W. Litchfield, Pres.; F. M. Harpham, V.-Pres.; Dr. K. Arinstein, V.-Pres. in Ch. of Engr.; J. C. Hunsaker, V.-Pres.; W. C. Young, Sales Mgr.

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ALLISON ENGINEERING COMPANY
Subsidiary of
General Motors Corporation
Indianapolis, Ind.
Aircraft Power Plant Engineering and Construction
Allison Steel Back Bearings

E. W. BLISS CO., Brooklyn, N. Y.
Aero Division
Radial Aero Engines
Air Cooled
"Bliss-Titan"—5 Cyl.
"Bliss-Neptune"—7 Cyl.
"Bliss-Jupiter"—9 Cyl.
Direct Drive and Geared

KINNER AIRPLANE & MOTOR CORP., Ltd.
Glendale, Calif.
Kinner Aircraft Engines
Type K-5—100 h.p., A. T. C. No. 3
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