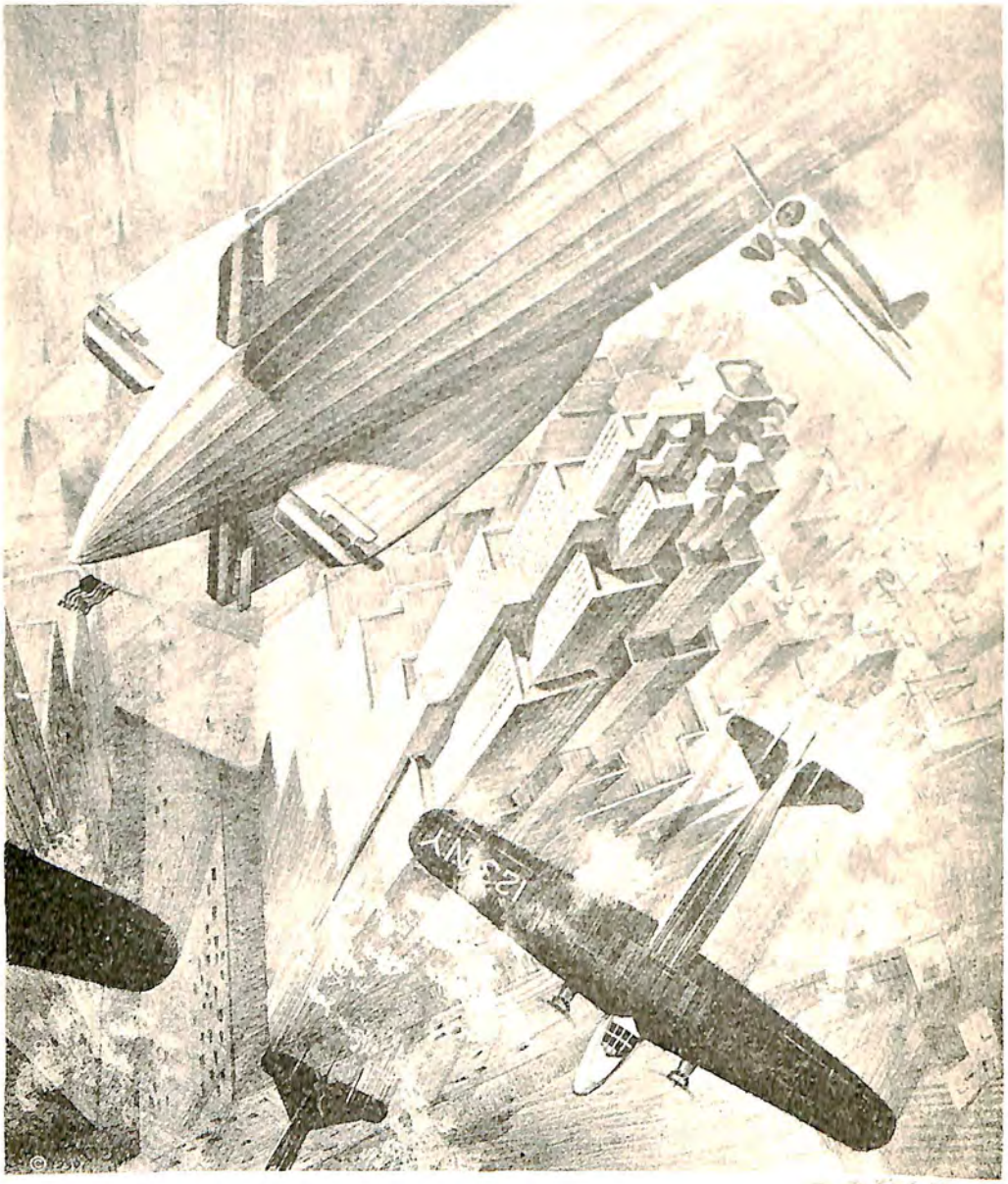
The AIRCRAFT YEAR BOOK

For 1931

HARRISON BRAND, JR.



The AIRCRAFT YEAR BOOK

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For 1931

VOLUME THIRTEEN

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By
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TABLE OF CONTENTS

CHAPTER I

WHAT'S AHEAD FOR 1931?

Readjustments of 1930 Under Trial—Great Year in Air Transport Foreseen —Major Airship Projects Under Way—Military Aviation Important Factor—Expect Some Improvement in Commercial Market

WITH the opening of 1931, man entered his twenty-eighth year of flight and the aviation industry left behind it an unusual record of achievement and readjustment. In common with the experiences of much older and, therefore, more firmly founded industries, 1930 was a critical year in aviation.

This, the thirteenth successive edition of THE AIRCRAFT YEAR BOOK, is a record of aeronautic development throughout the world during 1930. It is designed to reflect the trends in the industry during a period of world-wide depression, to review the progress made, to appraise the known effects of certain readjustments, and thus to provide a possible index to the immediate future.

Judged from the viewpoint of air transport development, impressive flights and operation records, 1930 was without doubt a period of marked achievement overshadowing any previous year. Examined through the eyes of those who undertook elaborate promotional projects and those speculators who predicated their activities upon the continuance of business conditions on the 1928–29 level, 1930 was certainly disappointing. Viewed from the position of the industry as a whole, 1930 was a critical period destined to have a corrective and constructive influence upon the developments of 1931, because the industry had settled upon a firmer and deeper foundation.

Despite generally depressed conditions in all industries, air transport experienced the greatest year in its history, doubling and tripling the peak traffic figures of 1929 for the volume of miles flown, passengers carried, and mail and express transported. The year witnessed a remaking of the air transport map of the United States as a result of the efforts of the Post Office Department and the passage by Congress of the McNary-Watres Air Mail Act. New alignments of the interests controlling the major lines resulted; mail contractors added passenger services on their routes; old lines were abandoned or extended, and new ones added.

The full effect of these factors could hardly be visible before the summer of 1931 when operators were to swing into their new schedules, equipped to handle more traffic. The air transport operators, aware of their respon-

sibilities under the air mail legislation, were making substantial investments in new equipment and improved ground facilities to assure the public of a superior and vastly swifter service at rates but slightly above those of first class rail travel. In the air transport field, 1931 promised to be the greatest year in aviation history if the untested factors growing out of the readjustments of 1930 proved sound. The contractors, however, needed the continued assurance of support from the government under the new act to sustain and encourage them in the individual efforts they were making toward unsupported commercial operation at a time when capital was reluctant to reenter even the older industries and more stable forms of investment.

Exceeding in international significance even the new alignments of interest effected within the United States, Latin American air transport experienced the opening of a new phase which in its importance was little less than a new era in transportation. The American air transport effort South of the States stood united as a result of consolidating in 1930 the two major American companies operating there. That consolidation, in turn, nourished a growing spirit of international cooperation between foreign air transport interests. French, Dutch, German and British interests were definitely coordinated with American so that the efforts of all could be devoted to constructive ends rather than diverted to destructive competition. It remained for 1931 and succeeding years to reveal the world-wide importance of these agreements.

Eventual air transport across the seas moved a step closer to realization as 1931 opened with plans for world airship services definitely taking form. The world's largest dirigible, the ZRS–4, was being completed in Akron for the United States Navy. It was scheduled to be launched in 1931. Upon the experience obtained in building this and a second dirigible for the Navy, American airship interests planned other ships for commercial trans-oceanic service. The plans of two companies formed to establish world-wide commercial transportation with rigid airships were authoritatively announced during 1930. The new year was destined to see further progress on these projects which linked foreign airship interests with those of America. In this stupendous undertaking to create an American airship merchant marine, the Navy's airship construction program was acknowledged to be an essential factor.

In making an analysis of the past or in projecting a picture of the future, the unique position of aircraft in transportation must always have an important bearing. Speed—one of the most important factors in successful modern transportation of any kind—is the lifeblood of air transportation. It is a point of excellence which no other existing form of transportation threatens to overshadow. Airplanes of the past year were, at least, three times as fast as the next speediest mode of transportation.

The public has always paid a premium for added speed in transportation, and it appeared safe to believe that speed would continue to command a predominant position.

Military aviation, always an important factor in American aeronautics, stood out as particularly significant during 1930 when certain phases of commercial aviation failed to approximate popular imagination. The Army Air Corps flew 32,500,000 miles during the year, while the Navy and Marine Corps logs totaled nearly 26,500,000 miles. Both constituted new operating records. It appeared that the Army Air Corps, with continued appropriations called for under the Five Year Program, would have the 1,800 serviceable airplanes called for at the end of the designated period. The Navy also was nearing completion of its Five Year Program with the 1930–31 authorizations designed to raise the number of airplanes to 1,000 by 1932 in accordance with provisions of the plan approved by Congress in 1926.

The importance of military procurement as the tangible nucleus of engineering and production in the American aircraft industry was more apparent than ever at the beginning of 1931. The industry by that time had been largely deflated. Ambitions and hopes which had attracted inexperienced personnel and volatile capital into aviation had lapsed, and with their passing, a more accurate perspective was possible. Just as it was impossible in 1928 and 1929 to expand the industry a thousand diameters (although such was the actual appearance), so it likewise was impossible in 1930 to destroy the industry that existed. What aviation "lost" it never actually possessed.

It was certain that those elements in the industry which were able to continue successfully through 1931 would require and deserve the maintenance of a military procurement program. This program in the field of construction, like the air mail act in the operating field, would supply aviation with a minimum of assured activity to reasonably and conservatively develop its resources. It deserved such a program because it was ploughing its receipts back into the business. The life of the aircraft industry always will be engineering; its nutriment, production. In commercial aviation, the latter could not come until the former had received attention. It was certainly apparent that before the public buys airplanes in quantity, it would demand improvement and scientific advance possible only in the laboratory and at great expense. In military aviation, engineering underlies procurement, because the strength of national defense can be evaluated in terms of the progress made in development of new equipment to replace that which becomes obsolete.

In its determined effort to place air transport and private and industrial flying upon a truly commercial basis by improving equipment and operations, and in its endeavor to supply the national defense with the most

advanced types of military aircraft, it was not unnatural that the industry early in 1931 was disturbed at the approaching completion of the Five Year Military Programs and the consequent possible resumption of conditions which prevailed prior to 1926. At that time, disastrous competition held free play and the fruits of engineering were lost when proprietary rights of design were ignored. However, the industry entered 1931 with the reassurance of a more general understanding of the facts, and confident that, as it demonstrated its determination to promote commercial aviation, public opinion and national policy would evolve an answer to the military construction problem at the right time.

As will be seen in succeeding chapters, aircraft production in 1930 was less than half that of the peak year 1929. The military and air transport markets constituted the chief outlets for aircraft produced. These two fields were certain to prove of major importance again in 1931. With proper regard for economy, many manufacturers concentrated their efforts upon improving old products or preparing to introduce new ones, because they realized that the real bid for supremacy in the commercial market during 1931 and 1932 was almost certain to be based upon the achievements of the engineering laboratory. In the light airplane field, 1931 was to see the appearance of several small planes to sell from $1,000 to $1,500. Their success depended upon general public acceptance. Manufacturers also devoted considerable attention to the development of suitable planes with larger pay loads for industrial use as well as more attractive ships in the private-owner field. No nation in the world had as much industrial and private flying as the United States, and this market promised to be an important one for manufacturers who could meet the specialized needs of the industrial or private owner.

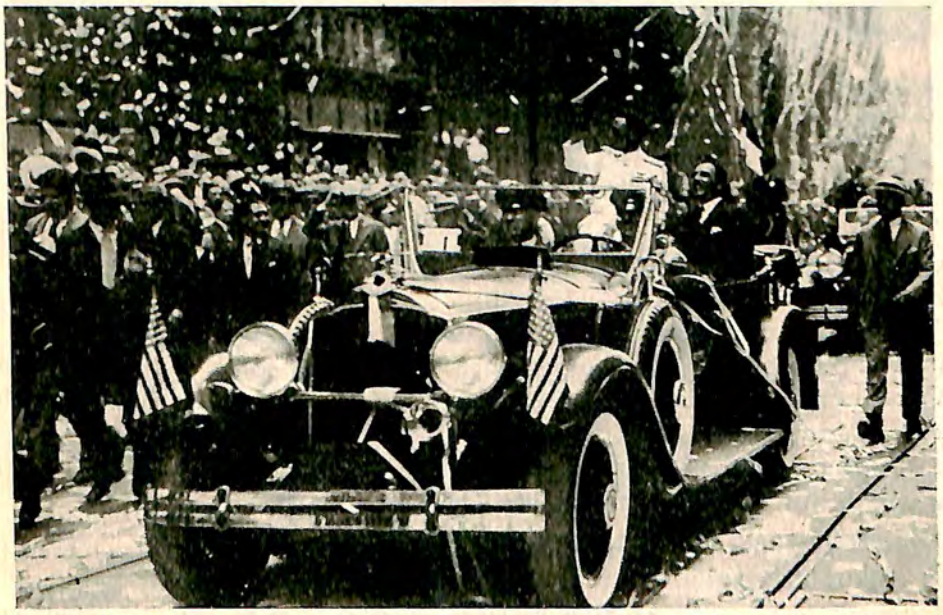
The fact that commercial aircraft sales exceeded production throughout 1930 indicated that the major part of the stocks built up as a result of overproduction in 1929 were exhausted by the opening of 1931. It indicated that production in 1931 would most likely be increased over 1930 to meet the demands for necessary replacements in every field, as well as the market for new planes resulting from normal growth. The fact that the United States managed to hold its volume of aeronautic exports within five per cent of the peak reached in 1929 also was significant. It indicated that any improvement in world-wide business conditions was almost certain to see a complementary improvement in the export market during 1931. The events of 1929 and 1930 taught all elements in the industry to be conservative in their estimates of growth, but it could be said with a fair degree of safety that there would be an improvement in the commercial aircraft market during 1931, although production was not expected to approach the peak of 1929.

The manufacturing field lost two great pioneers during 1930 in the

Byrd Expedition.

SOUTH POLE THEIR GOAL

Ford monoplane "Floyd Bennett" (3 Wright engines) climbs higher and higher as it passes over Liv Glacier on the flight to the Pole, carrying Rear Admiral Richard E. Byrd and his companions.



International News.

BROADWAY HONORS AN AIR HERO

Rear Admiral Richard E. Byrd acknowledging the cheers of New Yorkers who crowd Broadway upon his return from the South Pole conquest.

death of Glenn H. Curtiss and Chance M. Vought. Only a month before his death, Curtiss retraced the course of his historic flight from Albany to New York in a celebration sponsored by the Aeronautical Chamber of Commerce to commemorate the twentieth anniversary of the history-making exploit. Vought was the head of the manufacturing division of United Aircraft and Transport Corporation bearing his name. Both had been active in the work of the Aeronautical Chamber of Commerce since its founding. Aviation also lost a generous friend in the death of Daniel Guggenheim, who appropriated large sums of money from his

CHAMBER STRIKES BYRD MEDAL

Gold medal designed by Julio Kilenyi, sculptor, and struck by the Aeronautical Chamber of Commerce "commemorating the conquest of the poles by Rear Admiral Richard E. Byrd and his associates." Silver medals of the same design were presented to each member of the Byrd Expedition.

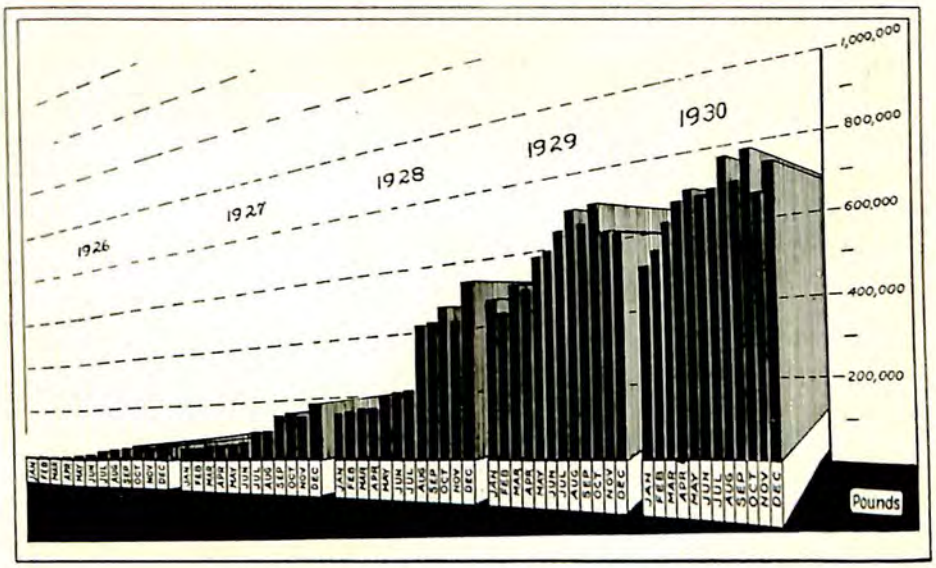
personal fortune to carry on the work of the Guggenheim Fund for the Promotion of Aeronautics.

History-making exploits of 1930 rivaled those which fired the world with enthusiasm for aviation in 1927. Coste, Bellonte, Kingsford-Smith, Von Gronau, Eckener, Hawks, Lindbergh, Mermoz, Johnson, Boyd, Williams, Yancey and Soucek were among the names figuring prominently in the year's most spectacular flights. Their achievements will be reviewed at length in a later chapter. It possibly was true that repeated success on trans-oceanic and long distance flights had made these exploits less romantic and more commonplace in the eyes of the general public, but they continued to be an interesting measure of advancement for the aviation industry.

The progress in world air transport development, spectacular flights

to all part of the globe, and methodical advances in the improvement and employment of aircraft equipment all served to point to aviation as a factor certain to have a profound effect upon international relationships. It was becoming increasingly apparent that aviation was to have as great an effect upon the lives of nations as the automobile has had upon family life and community relationships.

Fifteen years ago, aviation was little more than a fantasy, with a very few experimenters devoting their attention to it. Ten years ago, it seemed a vain hope, with the engineering thought summoned to it during the



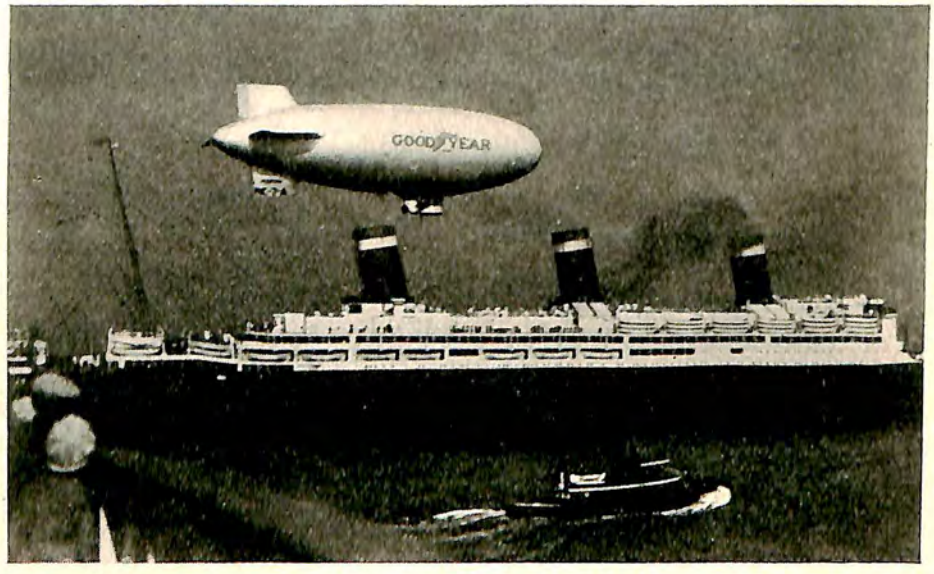
GROWTH OF UNITED STATES AIR MAIL

World War reverted to older industries. In 1931, the genius of men devoted to the basic sciences from which other great industries have sprung was available to aviation.

Through radio telephony, the human voice is projected from America to Australia. Through aircraft, physical cargoes, living and inert, were destined to be transported at high speeds and in comparative safety to the ends of the earth. Each year has seen the aviation industry through its many branches move a step closer to the realization of this vision of commercial aeronautics' place in the scheme of world relationships. The new year, 1931, is almost certain to see important developments toward this end.

TRANSPORTS OF TWO CENTURIES

An old Wells-Fargo stage coach draws up beside the first tri-motored Ford (3 Pratt and Whitney Wasps) placed in new service by National Air Transport.



SHIPS OF AIR AND SEA

"Puritan," non-rigid airship, speeds past the giant S. S. Leviathan as it steams out of New York harbor headed for ports across the sea.

CHAPTER II

INDICES TO PROGRESS IN 1930

American Planes Fly 225,000,000 Miles in 1930—Air Transport Lines Double Passenger Traffic—All Government Flying Increased—Aircraft and Engine Production Half of 1929—Other Statistics

STATISTICS, accurately compiled and properly interpreted, furnish an important index to the progress of an industry and its most likely future trends. They are particularly important to a young industry, such as aviation, because they serve as an active barometer to readjustments effected during formative years of development. The Aeronautical Chamber of Commerce, as the national trade association of the aircraft industry to which all branches of the business turned for information, was in a unique position to keep its finger on the pulse of the industry from day to day throughout the year. Recognizing the importance of current statistics to every phase of the industry, the Chamber redoubled its efforts in this field during 1930 and expanded its facilities for the collection, compilation and distribution of statistical information. The result makes possible far more detailed statistical tables and analytical graphs in THE AIRCRAFT YEAR BOOK for 1931 than in previous editions of this book.

Aircraft under the American flag, including planes in civilian, commercial and government operation, flew more than 225,000,000 miles during 1930, an increase of more than 27,000,000 miles over the previous peak year, 1929.* This was considered particularly significant during a year in which many older industries showed a falling off of activity in their operation statistics. Civil and commercial planes flew 164,793,612 miles during 1930 as compared with 149,579,451 miles in 1929. Government planes, including those of the Army, Navy, Marine Corps, Coast Guard and Department of Commerce, flew 60,473,355 miles during 1930 as compared with 47,967,139 miles in 1929.

Air Transport

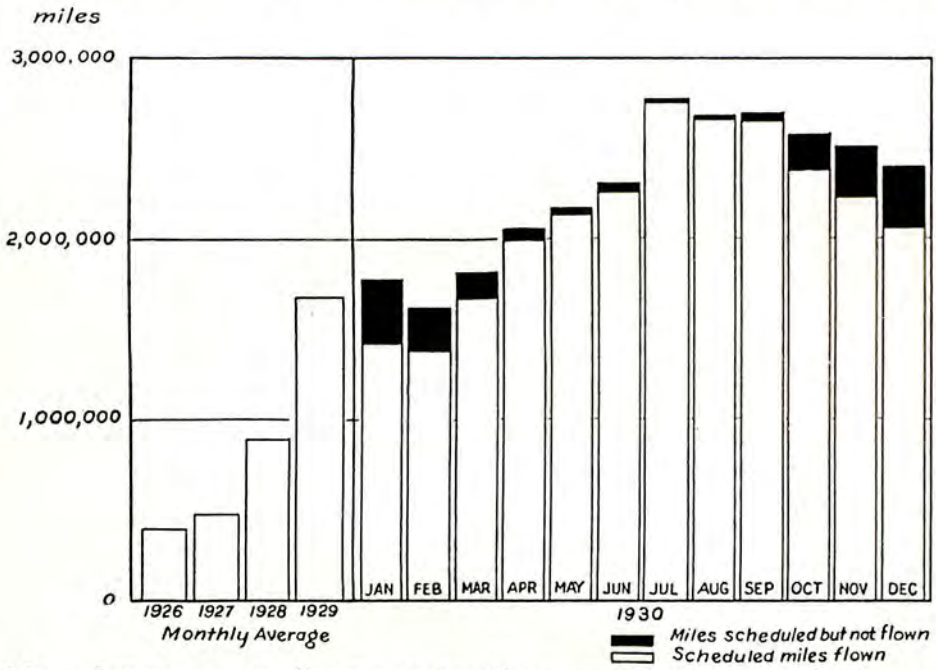
Thirty-four major air transport operators reporting to the Aeronautical Chamber of Commerce during 1930 carried 385,910 passengers, 286,798 pounds of express† and 8,005,201 pounds of mail. They flew 28,833,967 miles out of 30,703,119 miles scheduled during 1930. As will

* Detailed analytical table "Flying in the United States" in Appendix.

† Not including approximately 2,000,000 pounds of freight carried by Ford Air Lines.

be seen quickly from accompanying graphs, this represented an increase of more than 133 per cent. over 1929 in passengers carried, and an increase of about 42 per cent. in miles flown. The graphs, as well as the statistical tables in the Appendix,* provide a vivid picture of the growth of scheduled air transport operations during the last five years. They show monthly averages for years in which operations statistics were compiled only once each year and provide a month-by-month report for 1930.

The completeness of this report on air transport operations during 1930 can be seen from the following list of scheduled operators contributing



MILES SCHEDULED AND FLOWN BY AIR TRANSPORT LINES IN UNITED STATES

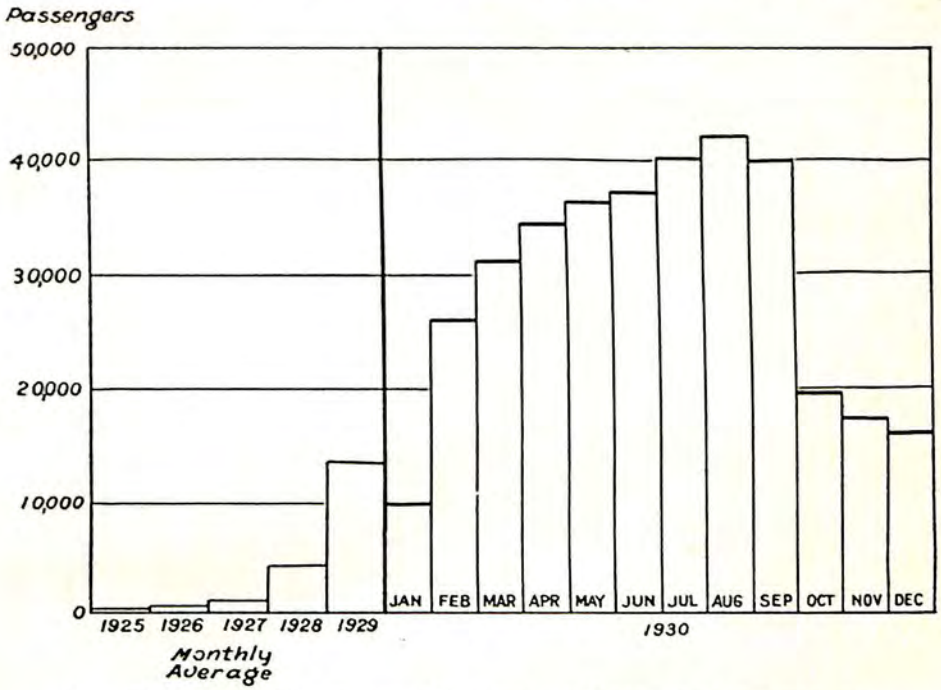
to it: Air Ferries, Ltd.; Alaska-Washington Airways, Inc.; American Airways, Inc.; (including: Colonial Airways Corporation, Southern Air Transport, Inc., Embry Riddle Company, Universal Aviation Corporation, Interstate Airlines, Inc., Alaskan Airways, Inc.); Boeing Air Transport, Inc.; Continental Air Express; Eastern Air Transport, Inc.; Gorst Air Transport, Inc.; Kohler Aviation Corporation; Mamer Air Transport; Mason-Dixon Air Lines; Michigan Air Express; National Air Transport, Inc.; National Parks Airways, Inc.; New York, Philadelphia and Washington Airway Corporation; Pan American Airways, Inc. (including: Cia Mexicana de Aviacion, New York Airways, Inc., Pan American-Grace Airways, Inc.);

* See Air Transport Summary under "Flying in the United States" and "Air Mail Operations" in Appendix.

Pittsburgh Airways, Inc.; Rapid Air Transport, Inc.; Robertson Air Lines; Transcontinental and Western Air, Inc.; United States Airways, Inc.; Varney Air Lines, Inc.; Wedell-Williams Air Service, Inc.; Western Air Express (including: Mid-Continent Air Express, Inc., and West Coast Air Transport Corporation).

Aerial Service Operations

The detailed statistical study made by the Aeronautical Chamber of Commerce in the aerial service field for 1930 showed a reduction in the



Air Transport Passengers Carried on Regular Schedule in United States

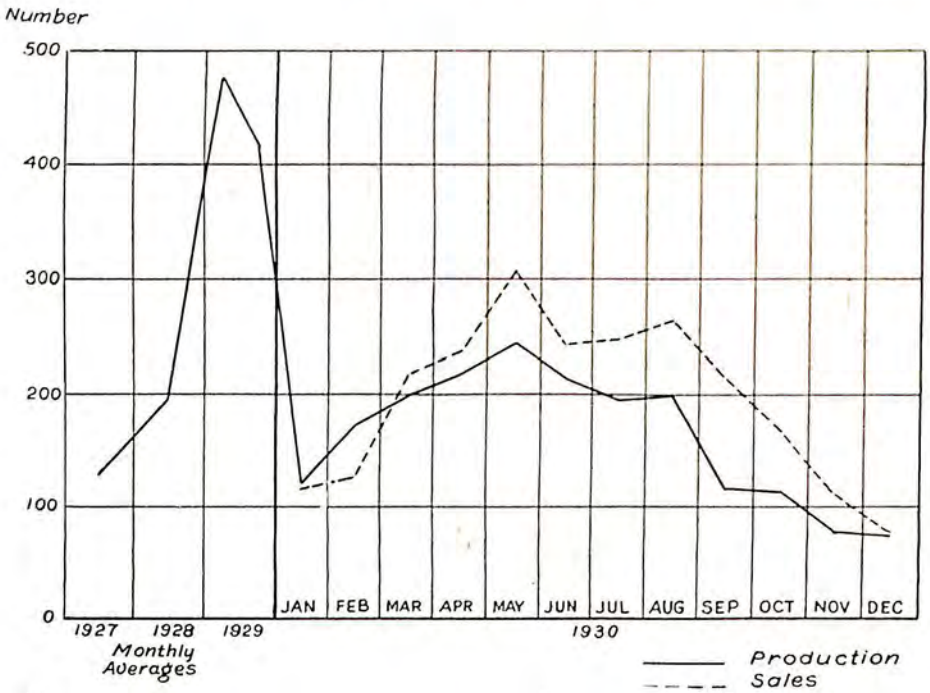
number of operating companies. Statistical estimates based on typical reports and computed to include 600 aerial service operators in the United States showed that 5,324 planes in service flew 95,959,645 miles during 1930 on missions that ran the gamut of diversification, from short hops to crop dusting and aerial photography. These operators carried 2,621,769 passengers during 1930 on charter flights or short hops. These figures were slightly under those for 1929 when 104,336,560 miles were flown and 2,995,530 passengers were carried, but compared very favorably with any year prior to 1929.* Since the aerial service field includes all commercial

* See Aerial Service Summary under "Flying in the United States" in Appendix.

flying not considered scheduled air transport and is a promising one for future development, these statistical analyses are discussed further in a later chapter, "Airplanes Jacks of All Trades."

Private and Industrial Flying

As was observed in the opening chapter, no nation in the world has a volume of private flying, both corporate and personal, approximating the proportions of that which exists in the United States. Because of the very character of this activity, it was practically impossible to obtain exact statistics on the miles flown by private individuals or corporations. How-



PRODUCTION AND SALES OF COMMERCIAL AIRPLANES IN UNITED STATES

ever, there was a marked increase in the extent to which such planes were employed during 1930 and the Aeronautical Chamber of Commerce estimated that 40,000,000 miles were flown during the year by the private or industrial flier, an increase of about 15,000,000 miles over 1929.

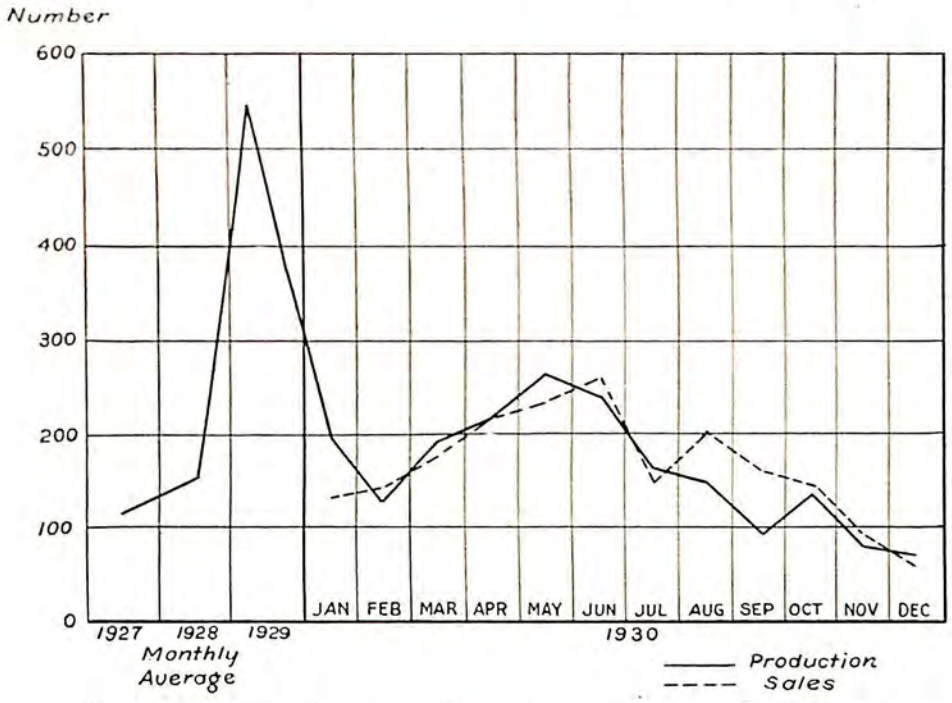
Government Operations

The United States Army Air Corps flew 32,500,000 miles during 1930, a marked increase over 1929 when 27,405,790 miles were flown. The United States Navy showed even a greater proportional increase during

1930, flying 26,478,700 miles as compared with 19,513,095 in 1929. The United States Coast Guard increased its total miles flown from 48,254 in 1929 to 67,655 in 1930. While no exact statistics on the mileage flown by the Department of Commerce was available, it was estimated that the Aeronautics Branch increased its activities from 1,000,000 miles flown in 1929 to 1,427,000 miles during 1930.*

Aircraft Production and Sales

While aircraft production during 1930 was less than half that of 1929, sales more than kept pace with manufacturing schedules to enable the



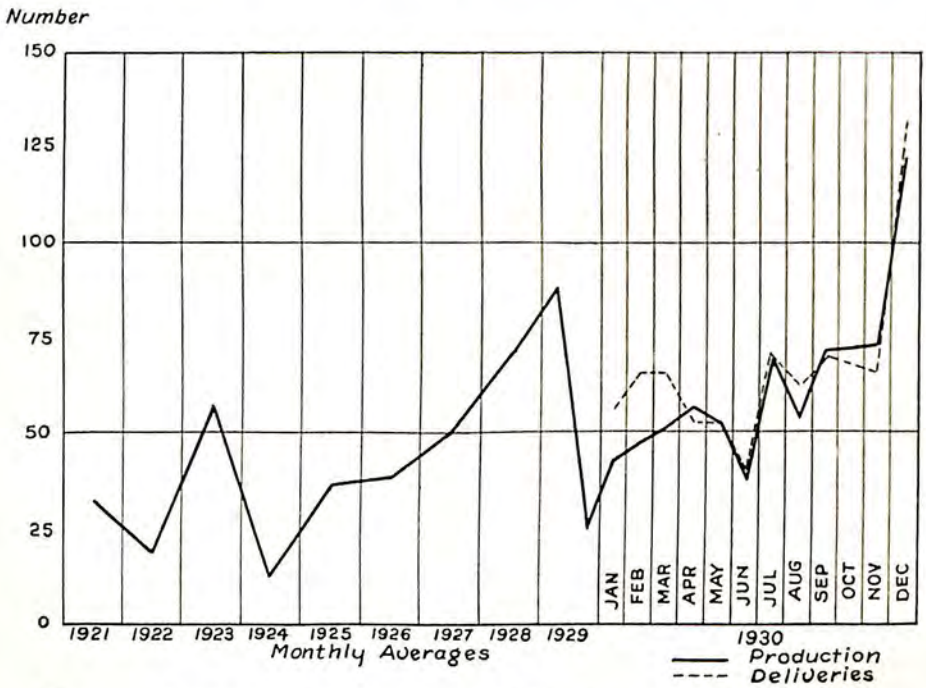
PRODUCTION AND SALES OF COMMERCIAL AIRCRAFT ENGINES IN UNITED STATES

movement of stocks on hand as a result of the period of over-production in 1929. It appeared that these assembled inventories had been substantially depleted by the opening of 1931.

American aircraft manufacturers produced 2,684 commercial and military airplanes during 1930 as compared with 6,034 units manufactured in 1929. Planes sold during 1930 totaled 3,125. No sales statistics were com-

* Detailed comparison of Government Operations by years under "Flying in the United States" in the Appendix.

piled in 1929 to afford a comparison. In the commercial field, 1,937 airplanes were built and 2,324 were sold during 1930. In the military field, 747 planes were manufactured and 801 were sold. The number of military planes produced represented an increase of 70 over the 677 manufactured in 1929. The commercial field showed a decided curtailment of production if the 1,937 planes manufactured in 1930 were compared with 5,357 made in 1929. The graphs provide an interesting picture of the month-to-month production and sales statistics for 1930 compared to the monthly averages for previous years.



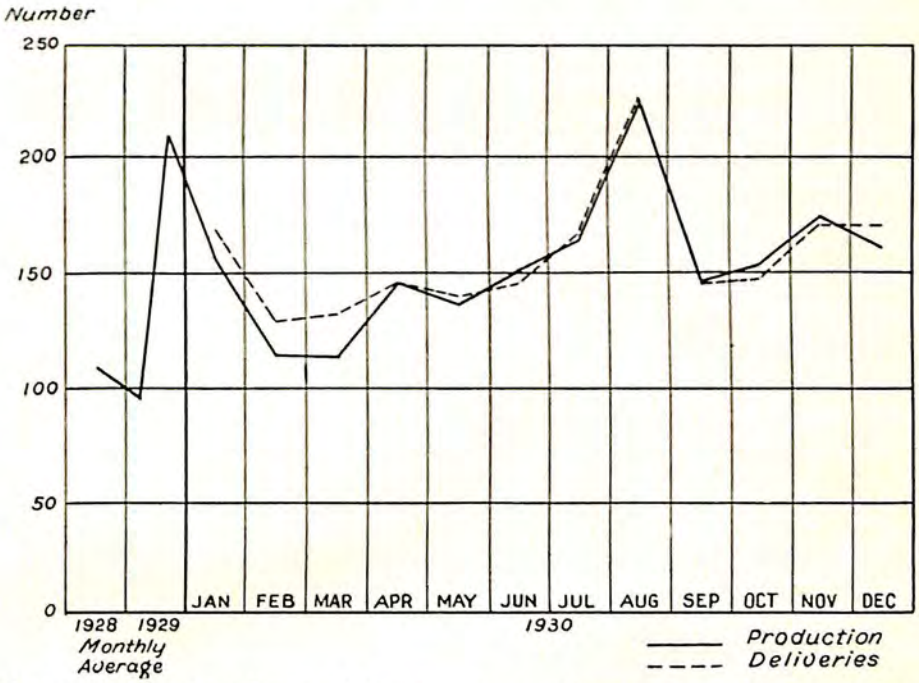
MILITARY AIRPLANE PRODUCTION AND DELIVERIES IN UNITED STATES

The total value of aircraft produced by American manufacturers during 1930 was $21,469,763 as compared with $44,457,300 in 1929. Sales in 1930 totaled $22,938,552. Commercial airplanes produced during 1930 were valued at $10,746,043, while military aircraft manufactured was valued at $10,723,720. Commercial sales during the year were reported at $11,666,209, while military sales totaled $11,272,343. Detailed analysis of these statistics on production and sales for 1930, with comparisons for 1929 and 1928, are provided in the Appendix.*

It is interesting to note that an analysis of airplanes produced and sold

* See "Production and Sales of Salable Aircraft in the United States" in Appendix.

during 1930 indicates a continued predominance of the open cockpit biplane, and particularly the three place open cockpit biplane. Only second to the three place job was the two place open cockpit biplane. Biplanes, generally, continue to outnumber monoplanes with 1,110 commercial biplanes produced as compared with 793 monoplanes. In the multi-engined field, however, monoplanes had a decided edge on biplanes in the number of units manufactured. The seaplane and amphibian market still remained to be developed on a scale commensurate with its potential importance. Only 17 seaplanes and 17 amphibians were produced and 23 seaplanes and



MILITARY AIRCRAFT ENGINE PRODUCTION AND DELIVERIES IN UNITED STATES

36 amphibians sold during 1930. However, their total value was approximately one-third that of the 1,110 land biplanes manufactured. The detailed analysis of this production and sales information in the Appendix is worthy of further study. It has been designed to permit comparisons at a glance.

The thoroughness of this statistical information on aircraft produced and sold by American manufacturers during 1930 can be seen from the following list of 75 manufacturers reporting their figures to the Aeronautical Chamber of Commerce during the year: Aeromarine Klemm Corporation; Aeronautical Corporation of America; Alexander Aircraft Company; American Aeronautical Corporation; American Eagle Aircraft Corporation;

Amphibions, Inc.; Arrow Aircraft and Motors Corporation; Atlanta Aircraft Corporation; Bach Aircraft Company, Inc.; Bellanca Aircraft Corporation B/J Aircraft Corporation; Bird Aircraft Corporation; Boeing Airplane Company; Buhl Aircraft Company; Butler Aircraft Corporation; Cairns Aircraft; Cessna Aircraft Company; Chance Vought Corporation; Command-Aire, Inc.; Consolidated Aircraft Corporation; Crawford All-Metal Airplane Company; Curtiss Aeroplane and Motor Company, Inc.; Curtiss-Wright Airplane Company; Davis Aircraft Corporation; Detroit Aircraft Corporation; Douglas Aircraft Company, Inc.; Driggs Aircraft Corporation; G. Elias and Brother, Inc.; Eyerly Aircraft Corporation; Fairchild Airplane Manufacturing Corporation; Fokker Aircraft Corporation of America; General Airplanes Corporation; Great Lakes Aircraft Corporation; Granville Brothers Aircraft, Inc.; Hall-Aluminum Aircraft Corporation; Hamilton Metalplane Company; Heath Aircraft Corporation; Huntington Aircraft Corporation; Inland Aviation Company; Jayhawk Aircraft Corporation; Kari-Keen Aircraft, Inc.; Kellett Aircraft Corporation; Keystone Aircraft Corporation; Lincoln Aircraft Company, Inc.; Glenn L. Martin Company; Mercury Aircraft, Inc.; Metal Aircraft Corporation; Mohawk Aircraft Corporation; Mono Aircraft Corporation; Mooney Aircraft Corporation; New Standard Aircraft Corporation; Nicholas-Beazley Airplane Company, Inc.; Northeast Airways, Inc.; Paramount Aircraft Corporation; Pheasant Aircraft Company; Pitcairn Aircraft, Inc.; Pittsburgh Metal Airplane Company; Rearwin Airplanes, Inc.; Sikorsky Aviation Corporation; Simplex Aircraft Corporation; Solar Aircraft Company; Spartan Aircraft Company; Stearman Aircraft Company; Stinson Aircraft Corporation; Swallow Airplane Company; Szekely Aircraft and Engine Company; Taylor Brothers Aircraft Corporation; Texas Aero Corporation; Timm Aircraft Corporation; Towle Aircraft Company, Inc.; U. S. Aircraft Company of New Jersey; Verville Aircraft Company; Waco Aircraft Company; Watkins Aircraft Company.

Engine Production and Sales

The number of aircraft engines produced during 1930 was approximately half that of 1929. Aircraft engine sales during 1930 more than kept pace with production to deplete stocks on hand in most factories by the close of the year. Commercial and military engines manufactured during 1930 totaled 3,766 valued at $17,078,916 as compared with 7,373 valued at $26,495,830.15 in 1929. Aircraft engine sales for 1930 in both the commercial and military fields totaled 3,846 units valued at $17,288,219. The graphs indicate the month-to-month production and sales trends in the engine field during 1930 as compared to the monthly average for the previous period.

Commercial and military production was fairly evenly divided during 1930 with 1,925 units produced and 1,961 sold to the commercial market while 1,841 engines were manufactured and 1,885 were sold to the military services. The analysis of production and sales statistics by horsepower * indicates that the largest number was produced and sold in the 76 to 125 horsepower class. However, engines produced and sold for the commercial market over 300 horsepower had more than twice the total value of those manufactured in the 76-125 horsepower class.

The completeness of this statistical report on aircraft engine production and sales, like that in the aircraft field, can be seen from the following list of 27 engine manufacturers reporting their figures to the Aeronautical Chamber of Commerce during the year: Alliance Aircraft Corporation; Allison Engineering Corporation; American Cirrus Engines, Inc.; Axelson Aircraft Engine Company; Century Rotary Motor Corporation; Chevolair Motors, Inc.; Chevrolet Aircraft Corporation; Comet Engine Corporation; Continental Aircraft Engine Company; Curtiss Aeroplane and Motor Company, Inc.; Dayton Airplane Engine Company; Fairchild Engine Corporation; General Air Motors Company; Heath Aircraft Corporation; Kimball Aircraft Corporation; Kinner Airplane and Motor Corporation; Lambert Aircraft Engine Company; LeBlond Aircraft Engine Corporation; Lycoming Manufacturing Company; MacClatchie Manufacturing Company; Menasco Motors, Inc.; Michigan Aero-Engine Corporation; Pratt & Whitney Aircraft Company; Prest Airplanes and Motors; Szekely Aircraft and Engine Company; Warner Aircraft Corporation; Wright Aeronautical Corporation.

American Aeronautic Exports

America's growing aeronautic export market promised to offer a new outlet for the products of American manufacturers in future years. American equipment was being flown in scores of foreign countries with satisfactory results reported. It was significant that American exports of aeronautical equipment, including aircraft, engines and parts, during 1930 were within five per cent. of the total for 1929, the peak year. During the first 11 months of 1930 for which reports were complete, American manufacturers exported 298 planes valued at $4,557,791, 370 engines valued at $1,623,737, and aircraft parts valued at $2,172,501.

Canada continued to be the principal export market for American equipment, while China, Soviet Russia, Peru, Mexico, Brazil, Japan, Chile, and Argentina were important outlets. The detailed table on aircraft, engines, and parts shipped to foreign countries during 1930, compared with exports in previous years, offers an interesting study.†

* See "Exports of Aircraft, Engines and Parts from United States" in Appendix.
† See "Exports of Aircraft, Engines and Parts from United States" in Appendix.

Statistics on aircraft accidents compiled by the Department of Commerce indicate a decided improvement in the safety of air transport operations during 1930 as compared with previous years, while all other flying grouped in a single classification showed a slightly better record.

While the Department of Commerce had not completed the compilation of its accident statistics for the second six months, it was authority for the statement that there were but three fatal accidents in scheduled air transport operations during the last half of the year, only one of which involved a passenger. The statistics show that the scheduled air transport operators flew 2,817,121 miles per fatal accident during the first six months of 1930 as compared with 1,022,371 miles per fatal accident during the corresponding period in 1929. The record for the second six months, with better flying weather and only half the accidents recorded during the first half, was certain to be much better than any previous period in the history of air transport operations.

The percentage of accidents in air transport operations as compared with all other flying continued to be reduced during 1930, with only 4.73 per cent. of the accidents in scheduled operations. Pilots' errors and weather conditions continued to be the principal causes of accidents as can be seen from the analysis made by the Department of Commerce.* Structural failures had come to be an almost unheard of cause of accident.

Aircraft, Pilots and Mechanics Licenses

Licenses issued by the Department of Commerce for aircraft, pilots and mechanics continued to be an important source of statistical information used by manufacturer and distributor-dealer alike. The Aeronautical Chamber of Commerce kept analyses of the license lists up-to-date to illustrate the number and geographical distribution of airplanes, pilots and mechanics. Several interesting analyses of this type are included in the Appendix. Further consideration to the relative number of licenses issued as compared with former years will be given in a later chapter, "Preening Wings of Commerce."

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

* Comparative tables on accident statistics in Appendix.

CHAPTER III

OVER THE NATION'S AIR LINES

Traffic Doubled during 1930—Effect of McNary-Watres Act—Changes in Air Transport Map—Effect of Fare Reductions—Mergers, Purchases, Consolidations—Major Group Control

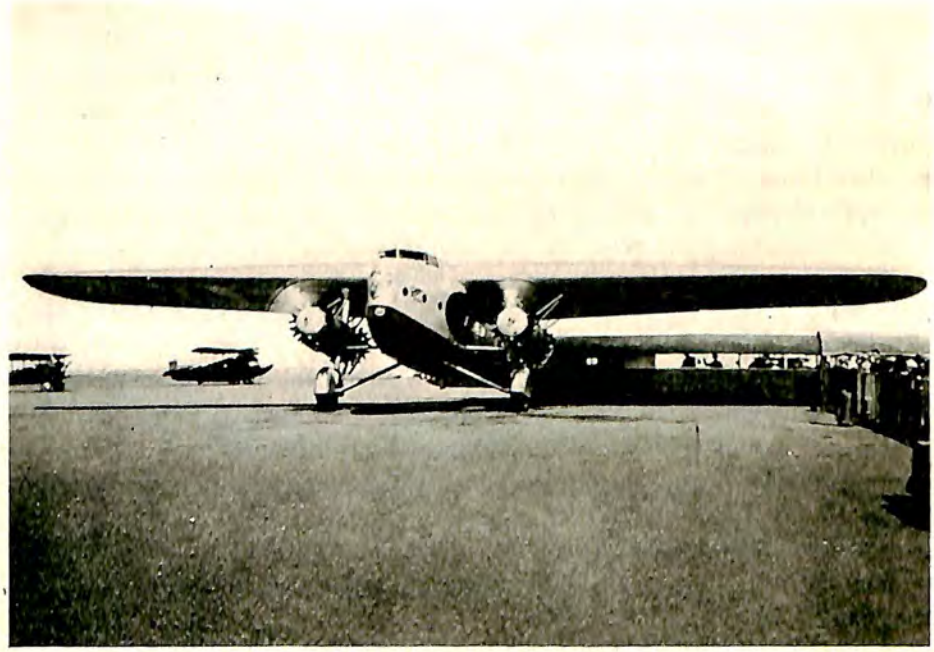
AIR transport experienced the greatest year in its history during 1930 and the United States led the world in the volume of passengers, mail and express carried on its regular air lines. The phenomenal expansion of air transport activity during the year served as an inspiration to other branches of the industry which failed to withstand the general economic depression, and, with military construction, was an important force in sustaining the resources of manufacturing interests.

The year witnessed a drastic remodelling of the nation's air transport map, with a new alignment of operating companies and a vast revision of schedules. The McNary-Watres Act, passed by Congress to stimulate the development of air transport and particularly the carrying of passengers by air, was a powerful force in revamping the transport situation. Conferences of officials of the leading transport companies with Postmaster General Walter F. Brown on problems growing out of the administration of the act extended throughout most of the year. The new air mail bill also had a definite effect upon the trend in design in aircraft manufacturing, as will be seen in later chapters concerned with technical and engineering phases of the industry.

To the air traveller, the year's expansion meant the opening of passenger services on all routes between principal cities throughout the country and the speeding up of schedules to provide a fast and comfortable service. New, improved equipment was added to care for the increased traffic and air lines concentrated their attention upon the construction of better air terminals and ground facilities to insure safety and regularity of operations and add to the passengers' comfort. Two-way radio communication between planes in flight and their ground bases was installed on the major air lines, and an extensive weather reporting service was employed to keep pilots well-informed on conditions along their courses at all times. This progress in the improvement of physical equipment will be discussed more fully in a later chapter, "Air Terminals on Land and Sea."

Although 1929 was a peak year for the transportation of mail, passengers and express by air, 1930 figures doubled and nearly tripled those

of the previous year. Passengers, mail and express were being flown more than 102,000 miles every 24 hours, with more than one-third the distance being flown between dusk and dawn on the lighted airways which served as the "boulevards of the sky." One hundred million people, a major share of the nation's population, were placed within useful distance of the air transport network. This service did not take into consideration another 20,000,000 people on the American-owned lines in Canada and Latin America which flew an additional 14,421 miles daily. The South American



HEADED FOR SAN FRANCISCO

Fokker F-32 (4 Pratt and Whitney Hornets) ready to leave the Alhambra terminal of Transcontinental and Western Air, Inc., for 'Frisco.

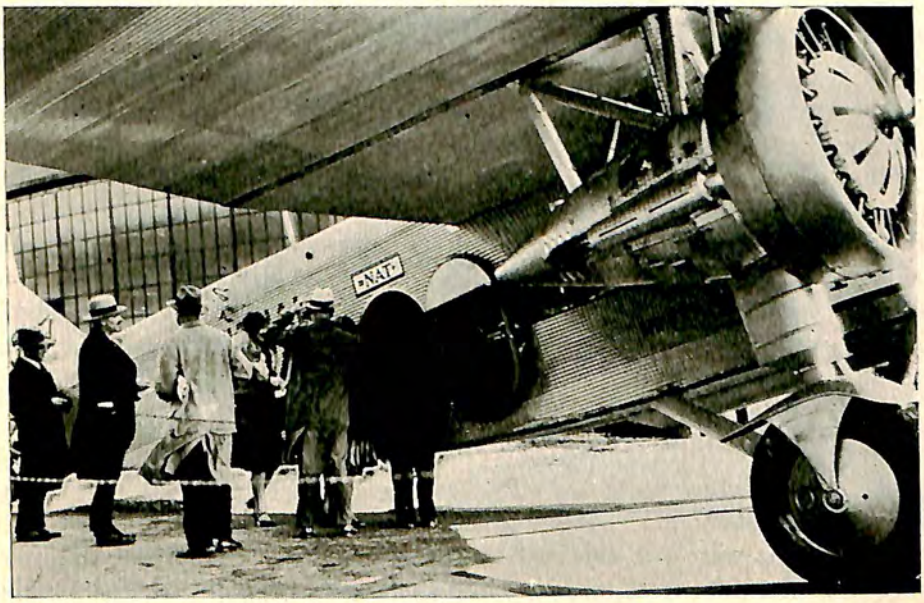
development was so phenomenal and so crowded with international significance that it has been considered worthwhile to consider these events in a separate chapter, "Latin America By Air."

Fare vs. Fear

Reductions in fare early in 1930 had an important bearing upon the rapid increase in the volume of passenger business on the scheduled transport lines. Many of the lines, expecting a lull in their winter business, cut rates to rail-plus-Pullman levels in an experiment to determine whether high fares were a greater hindrance to the rapid development of passenger

HEADED FOR NEW YORK

National Air Transport inaugurated six and one-half hour service from Chicago to New York with Ford monoplanes (3 Pratt and Whitney Wasps).



BOARDING NEW YORK PLANE

Passengers boarding new Ford tri-motor plane (3 Pratt and Whitney Wasps) of National Air Transport at Chicago Municipal Airport.

traffic than public fear, which received such a major share of attention by those who theorized upon the obstacles to general use of air lines by the travelling public. The answer was an overwhelming one, pointing directly to fare as a greater consideration than fear. Traffic increases of from 100 to 500 per cent were reported by the principal operating companies, and many were unable to handle the volume of business with their regular equipment.

The experiment also demonstrated just as positively that the operators could not continue to maintain these rates with present-day equipment and operating schedules with hopes of making expenses, to say nothing of a fair profit. It showed that the lines needed some other source of revenue, such as a mail contract, to permit general stimulation of passenger business at even a moderately low rate. Late in June or early in July, practically all of the lines which had been operating at the low rate increased their tariffs slightly so that a fare of seven cents per mile was generally adopted. When it was considered that the distance between principal cities was often much closer by air than by rail, the seven cent level was not far above that of rail-plus-Pullman. It was certainly far below the average passenger rate in force during 1929, shown to be 10.6 cents per mile in the survey made by the Aeronautical Chamber of Commerce. The trend in rates was shown graphically in the charges made for passenger transportation from New York to Los Angeles. In January, the fare was dropped to $152.92 for the trip by air and rail. The result was a 400 per cent increase in traffic. Later, the seven cent fare was put into force and the cost raised to $181.43. The all-air service, established later in the year and found to be more popular than the air-rail arrangement, set the fare for the transcontinental trip at $200. The trip was made in 36 hours, cutting 12 hours from the air-rail schedule and more than three days from the best train time. Perhaps the most significant thing about the increase in traffic volume was that the operators did not experience a reduction in the number of passengers when the rates were raised. In fact, the number of passengers carried continued to grow until the normal seasonal decline was felt in the fall. This is demonstrated graphically in accompanying charts.

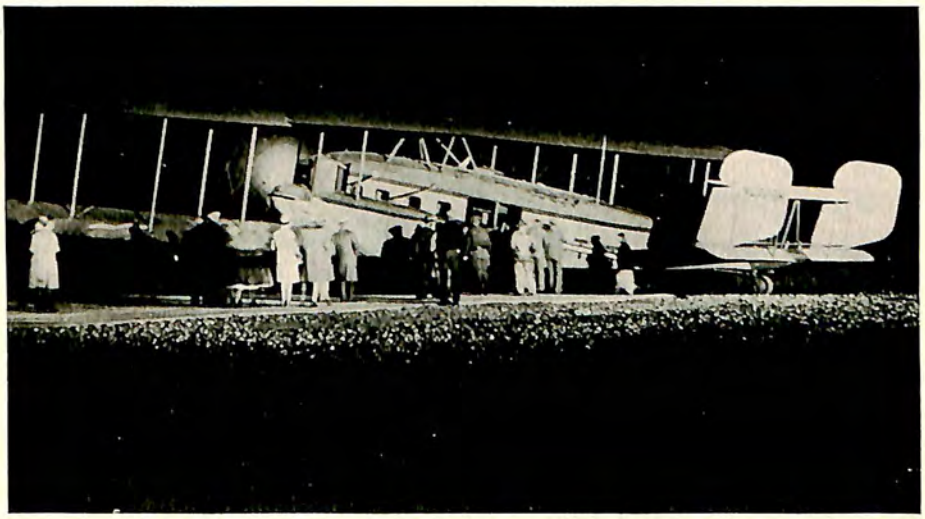
Effect of McNary-Watres Act

Without doubt, the McNary-Watres Act was responsible for the most important fundamental changes in the air transport picture during 1930. Its full effects were not expected to be felt until the spring and summer of 1931 when lines were to swing into their new schedules with smoothly operated services and good weather to stimulate their passenger business. Signed by the President April 29, the Act * provided a more equitable

* McNary-Watres Act printed in full in Appendix.

SHIPS IN THE NIGHT

With wing lights aglare and a warm glow from the passenger cabin, a Chicago-bound Ford (3 Pratt and Whitney Wasps) of N.A.T. nears its goal.

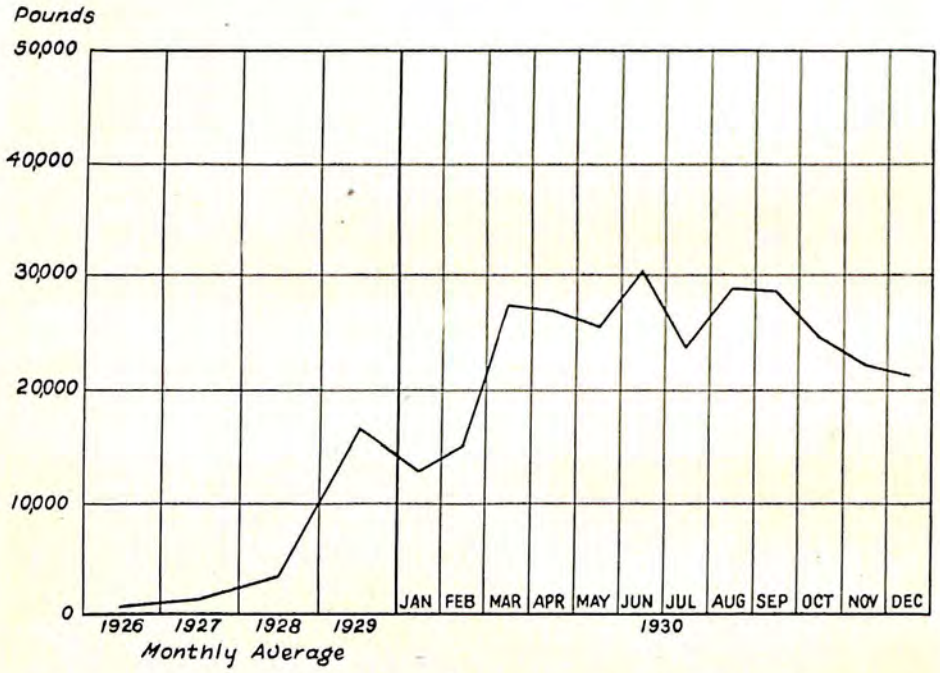


NIGHT PLANE LANDING

Curtiss Condor (2 Curtiss Conquerors) lands at night in the service of Transcontinental Air Transport. This type is being used by Eastern Air Transport along the Atlantic Coast.

basis for the payment of air mail contractors upon a space-weight per mile rate rather than on a poundage basis, previously in force. It was designed especially to stimulate the development of air passenger business, and placed a premium upon the ability of those pioneering lines which had demonstrated successful operations with passengers, in the awarding of new contracts.

Indirectly the new air mail act was responsible for the realigning of old companies into new groups, important purchases and consolidations,

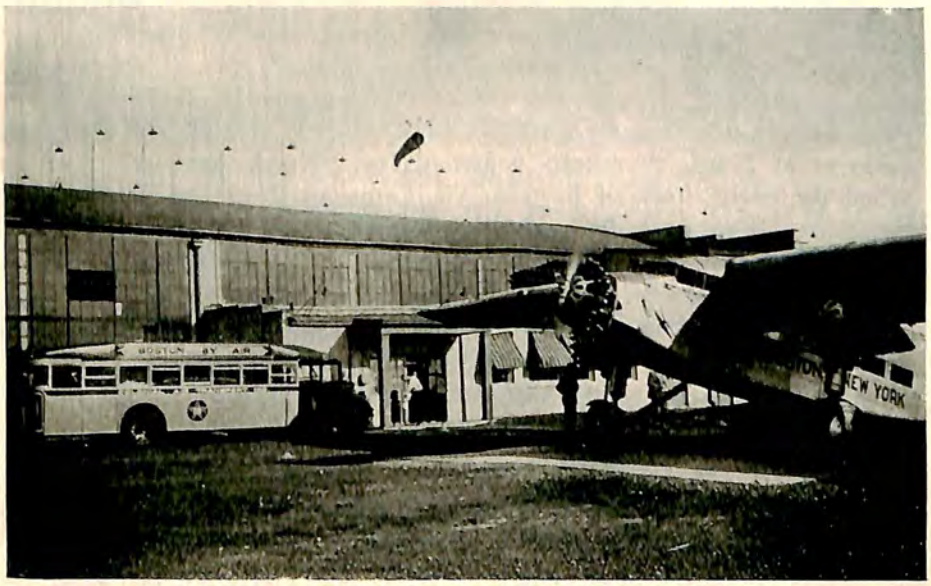


POUNDS OF FREIGHT CARRIED ON SCHEDULED AIR TRANSPORT LINES IN UNITED STATES

and a general remaking of the air mail map of the United States. To several companies, it meant a loss of revenue under a new lower rate, while others received increased compensation; and several important passenger carriers received contracts which they did not have to aid them previously. At the close of the year, there was not a single air mail contractor who was not also carrying passengers. Notable exceptions in 1929 were National Air Transport, Eastern Air Transport and Varney Air Lines. There were several important lines, however, carrying passengers exclusively, but their operators had an eye fixed on the possibility of a mail contract as new routes were established.

ENROUTE TO BOSTON

New York-Boston passenger plane of Colonial Air Transport flying along the Hudson River near the new bridge (right) under construction.



DE LUXE BUS TO NEW YORK

Ford tri-motored monoplane (3 Pratt and Whitney Wasps) of Colonial Air Transport arrives at Newark with passengers from Boston for quick transfer to New York.

Four major financial groups continued to maintain control of most of the principal air lines, but 1930 saw some important changes in the alignments. The Aviation Corporation of Delaware, one of the holding companies, operated a vast system of air transport lines through its subsidiary, American Airways, Inc., which had five divisions: Universal Division, Colonial Division, Interstate Division, Southern Division and Embry-Riddle Division. Through one of its subsidiaries, the Aviation Corporation filed a joint bid with Southwest Air Fast Express for the new southern transcontinental air mail contract offered by the Post Office Department under the McNary-Watres Act, and was successful. The contract was turned over to a jointly owned subsidiary, Southern Air Fast Express, Inc., which began operation October 15. In preparation for this service, Aviation Corporation through its Southern Division had previously purchased the assets of Standard Air Lines, a subsidiary of Western Air Express operating between El Paso and Los Angeles, and Delta Air Service, operating between Dallas and Birmingham, as well as the equipment of Southwest Air Fast Express, which had operated extensive schedules between St. Louis, Tulsa, Dallas and Kansas City.

A second grouping of interests centered around Transcontinental and Western Air, Inc., of which C. M. Keys was chairman of the board, H. M. Hanshue, president, and D. M. Sheaffer, chairman of the executive committee. Control of Transcontinental and Western Air, Inc., was shared by TAT-Maddux Air Lines and Western Air Express, Inc., each having a 47½ per cent interest. A minority interest was held by Pittsburgh Aviation Industries. Mr. Hanshue also was president of Western Air Express, Inc. Mr. Sheaffer represented the Pennsylvania Railroad, one of the largest stockholders in TAT-Maddux Air Lines, and Mr. Keys was president of North American Aviation, Inc. North American Aviation owned the entire stock of Eastern Air Transport, Inc., and controlled its operations. It was not the controlling interest in any other transport line. As an investor, it owned substantial interest in TAT-Maddux Air Lines.

United Aircraft and Transport Corporation was the third great financial group owning operating units in the air transport field. National Air Transport, Inc., previously associated with the Curtiss-Wright group, was purchased during the year through an exchange of stock, one share of United for three of N. A. T. Stout Air Lines also were acquired by purchase and later merged with National Air Transport. In the Northwest, Varney Air Lines, Inc., operators of an air mail contract from Salt Lake City to Seattle and Spokane, were acquired and closely coordinated with the Boeing System, which included Boeing Air Transport, operating the western division of the northern transcontinental route, and Pacific Air Transport, serving the Pacific Coast from Seattle to San Diego. When National Air Transport established passenger service on its route from

Chicago to Cleveland, the Universal Division of Aviation Corporation by agreement discontinued its service between those points.

The fourth air line system centered in the individuals and banking interests linked with Western Air Express and Fokker Aircraft Corporation. It owned an equal interest with Transcontinental Air Transport-Maddux Air Lines in the new operating company known as Transcontinental and Western Air, Inc., and completely controlled Western Air Express, West Coast Air Transport and Mid-Continent Air Express. This group sold Standard Air Lines to the Aviation Corporation during the

FLYING SOUTHERN TRANSCONTINENTAL

Fokker tri-motored monoplane (3 Pratt and Whitney Wasps) over Texas on the new transcontinental route of Southern Air Fast Express.

year to make possible the latter's operation of the southern transcontinental mail route.

The stronger financial backing resulting from these mergers of interest was in a large measure responsible for the sound growth of the air transport lines during 1930. The "independent" lines, if operators outside these four major groups may be so identified, also were alive to the necessity for improving their services and made great strides in coordination of their schedules with other lines and in the employment of better equipment.

Work of Air Transport Section

Since the operators were occupied with the problems of readjustment arising out of the McNary-Watres Act during most of the year, the Air

Transport Section of the Aeronautical Chamber of Commerce concentrated its attention upon the collection of statistics, elimination of the tax on aviation gasoline, and compilation of information on the advisability of regulation of air lines by the Interstate Commerce Commission. Statistical reports were increased from a quarterly to a monthly basis toward the end of the year to give the operators a direct key to traffic volume trends.

Personnel and Equipment

The transport lines were employing an unusually high type of personnel, both in their operating and traffic departments. First-pilots or

SNOW NO HINDRANCE

Passengers boarding a Fokker tri-motor (3 Wright Whirlwinds) on the Universal Division of American Airways, Inc., at St. Louis in winter.

captains were men with thousands of hours of experience; co-pilots or assistant-pilots were well trained men; and stewards or couriers, employed on the longer passenger routes, were college men or women. One line insisted that its stewardesses have experience as trained nurses. Thirty-two major lines reporting to the Aeronautical Chamber of Commerce employed 2,850 persons, of whom 324 were pilots and 1747 were mechanics or other ground personnel. The remainder were traffic solicitors or administrative executives.

The 32 lines used 642 planes during 1930, 579 of which were land

planes, 23 seaplanes and 40 amphibians. Single-engined planes outnumbered all other classes with 403, principally because of the large number of efficient mail and express planes or mail-passenger transports so equipped. Twelve had twin engines and 164 were tri-motors. Of the seaplanes, 13 were single-engined and 10 were twin-engined. Thirty-three of the amphibians were twin-engined and 17 were single-engined.

Air cooled engines predominated among the types used on lines with 902 of this type as compared with 142 water-cooled for a total of 1,044. One air cooled Diesel engine was reported in use.

GOLDEN GATE TO CHICAGO

Boeing tri-motored transport (3 Pratt and Whitney Hornets) used in daily service by Boeing Air Transport between San Francisco and Chicago.

New Lines Opened, Others Extended or Improved

The stories of the development of each air transport line compose a picture unprecedented in the history of transportation. While necessarily brief, it appears worthwhile to review the activities of each company. They are arranged in alphabetical order for easy future reference.

Air Ferries, Ltd., operating between San Francisco, Alameda, Oakland, and Vallejo, transported nearly 60,000 commuters since it began operations in February, and became known as the "busiest air transport line in the world." Starting with two Keystone-Loening amphibians, popularity of the service soon necessitated the use of two more ships of the same type. San Francisco Bay was crossed 50 to 60 times a day on regular schedule,

and travel time between outlying cities and San Francisco was reduced from more than an hour to a minimum of six minutes. A three way landing ramp at San Francisco was so arranged that planes frequently discharged their loads and were in the air with a return load in two minutes. A working agreement with a cab company provided service to downtown sections of San Francisco and Oakland for a nominal sum.

Alaska-Washington Airways, flying on schedule between Olympia, Tacoma and Seattle in Washington; Victoria, Vancouver and Manaimo in British Columbia; and connecting with Ketchikan, Juneau, Skagway and

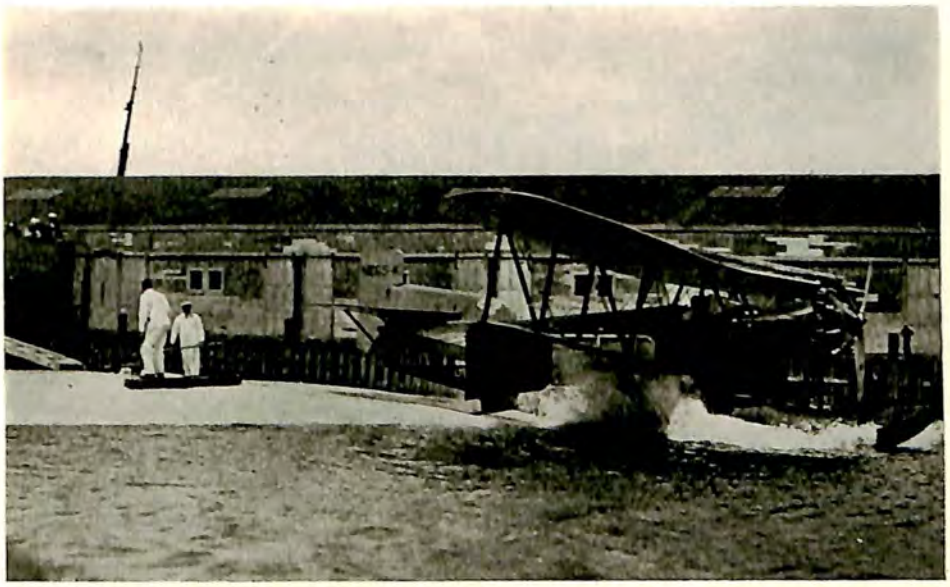
PASSENGER RESERVATION DESK

Checking space reservations at the United Airport, Burbank, Cal., a few minutes before the transcontinental plane leaves for the East.

other points in Alaska, carried 11,621 passengers during the first nine months of 1930. Equipment consisted of 10 Fairchild and Lockheed Vega cabin monoplanes equipped with pontoons. On February 1, passenger service to Yakima, Wash., from Seattle was inaugurated on a daily schedule. On July 1, the line was sold to a new company, taking the name of Seattle-Wenatchee-Yakima Airways, Inc. Passenger service between Vancouver and Victoria, British Columbia, was increased to two trips a day March 15. A few months later this service was increased to three scheduled trips daily. On June 1, twice weekly passenger service was extended from Seattle to Juneau, Alaska, a distance of 1,060 miles.

Lack of adequate weather reports was a serious handicap to the development of the Alaskan service. The company was installing two-way radio communication between planes and ground stations to help overcome this difficulty. It was planned to increase the Alaskan service to a daily schedule during the summer of 1931.

American Airways, Inc., operating subsidiary of the Aviation Corporation, spanned the country from New England to California. More than 50 large cities were linked with daily scheduled mail, passenger and express service over C. A. M.* 1, 2, 16, 20, 21, 22, 23, 24, 28, 29, 30, 33



AIR FERRY AT SAN FRANCISCO

Keystone-Loening amphibian (Wright Cyclone) of Air Ferries, Ltd., leaving the "button airport" at 'Frisco for its six minute hop across the bay.

and F. A. M. 1.† The Colonial Division of American Airways, Inc., operated over 1,000 miles of mail, passenger and express routes between New York, Boston, Albany, Buffalo and Cleveland in the United States, as well as Toronto and Montreal in Canada, over C. A. M. 1 and 20 and F. A. M. 1. Passenger service between Boston and New York using tri-motored Fords was increased from one round trip daily in 1929, to three round trips throughout most of 1930. During heavy summer traffic, four round trips were scheduled for several months. The Universal and Interstate Divisions, serving such key cities as Chicago, St. Louis, Omaha and Kansas City, were in a position to make direct connections with every air mail

* Contract air mail route.
† Foreign air mail route.

operation in the country, as well as the West Indies and South America, with two minor exceptions. Passenger operations were conducted by the Universal Division from Chicago to St. Louis, and during part of the year from Cleveland to Kansas City, as well as St. Louis to Tulsa. The Interstate Division operated air mail service between Chicago, Atlanta, Evansville and St. Louis. On April 1, night service was inaugurated on this route, and an additional day service from Atlanta to Nashville was begun. The Southern Division, operating C. A. M. routes 21, 22, 23, 29 and the new southern transcontinental C. A. M. 33, made daily contacts with 26

NEW YORK TO CHICAGO

Boeing transport plane of National Air Transport carrying mail and express from New York to Chicago in six and one-half hours.

cities in eight states. Starting at Atlanta, the network extended westward to Los Angeles, and as far south as Brownsville, Tex., on the Mexican border. Such cities as New Orleans, Houston, Dallas, and Galveston were among those receiving this daily air mail and passenger service. The contract for C. A. M. 33 was awarded to Southwest Air Fast Express and Robertson Aircraft Corporation and later transferred to a jointly owned subsidiary, Southern Air Fast Express, Inc., which began operations October 15. Southern Air Fast Express was the last link in the transcontinental chain controlled by Aviation Corporation. The new contract included a mail line between Big Springs, Tex., and San Antonio. The Embry-Riddle Division operated mail and passenger service over C. A. M. 24 from Chicago to Cincinnati, and transported mail over C. A. M. 16 from Cleve-

land to Louisville. Passenger service was increased for several months from one round trip daily, to two. Additional passenger service also was furnished between Chicago and Indianapolis for several months. These divisions of American Airways, operating scores of planes of all types, flew more than 7,000,000 miles and carried more than 60,000 passengers and 1,000,000 pounds of mail during 1930. Alaskan Airways, Inc., also a division of American Airways, conducted operations from Fairbanks, Nome and Anchorage in Alaska, carrying mail, passengers and freight. The operation was gradually developing into a regular scheduled service between important points.

EVERY HOUR ON THE HOUR

Passengers boarding a tri-motored Stinson monoplane (3 Lycomings) at Central Airport, Camden, N. J., taking advantage of the Ludington Line's hourly service between New York and Washington.

The Boeing System, a division of United Aircraft and Transport Corporation, composed of Boeing Air Transport, Inc., and Pacific Air Transport, Inc., and operated day and night on a well lighted route of more than 3,200 miles, observed the completion of its first 10,000,000 miles of flying during 1930. More than half of this mileage was flown at night. Together, these two lines reaching from Chicago to San Francisco and from San Diego to Seattle carried 1,912,000 pounds of mail during 1930, or 23 per cent of the nation's total. This was double the amount carried in 1928 by the Boeing System. Boeing Air Transport carried more than 1,700,000 pounds of mail, gravitating to C. A. M. 18 from the great Chicago

area and feeder lines at Salt Lake City, Cheyenne, Kansas City, St. Louis and the East. More than 3,000 passengers were flown over this route during the first ten months of 1930, as well as 12,000 pounds of express. A fleet of new tri-motored Boeing biplanes, powered with Pratt and Whitney Hornet engines, were placed in service during 1930. The feasibility of night passenger service had been proved, and the new planes were used to provide for an increased public demand for the 30 hour service between Chicago and Los Angeles. Stewardesses were employed to travel aboard the tri-motored planes instead of male couriers, formerly used. The

FAST LIGHT MAIL PLANE

Stearman Junior Speedmail Model 4D, powered with a Pratt and Whitney Wasp Jr. engine, is cowled for increased speed in flight.

two-way radio system recently completed was one of the most complete in the world. Hangar depots were built at five important points along the route to accommodate passengers and facilitate travel by night along the route. A Repair depot was established at Cheyenne, Wyoming, to handle the servicing and repair of the 40 single-engined and tri-motored planes used regularly by the company.

Continental Airways, Inc., operated seven passenger Travel Air cabin monoplanes on the 300 mile trip between Chicago and Columbus. Comfortable passenger accommodations at Port Columbus awaited the traveler who transferred to the Transcontinental and Western Air line for points east and west.

Eastern Air Transport, Inc., operated C. A. M. routes 19 and 25 be-

tween New York, Atlanta and Miami, Fla. Intermediate stops were made at Philadelphia, Baltimore and Washington in the North, and Daytona Beach, Orlando and St. Petersburg in Florida. During the first nine months of 1930, Eastern Air Transport flew 1,221,000 miles, carrying nearly half a million pounds of mail. In April, double service was started on the New York to Atlanta route, and two additional stops were made at Charlotte, North Carolina, and Greenville, South Carolina. The first air mail to leave Greenville set a new record for first-flight poundage, 1,067 pounds being loaded aboard the plane. Poundage records on this route

WAITING ROOM AT ALHAMBRA

Rivaling the finest railroad passenger terminal, the waiting room of the new Transcontinental and Western Airport at Alhambra, Cal., is typical of new terminal designs.

were broken five times during the year, with 60,000 pounds of mail in October as the peak. Passenger service was begun for the first time, August 18, between New York and Richmond. The service was later extended to Atlanta, and was scheduled to extend to Miami early in 1931, making air travel possible from New York to South America and from New York to California by the southern route. Plans were made to equip the line with automatic gyroscopic pilots. These "robot" pilots were to supplement the work of human pilots and serve to increase the operating efficiency of the line. Equipment included four Pitcairn Mailwing and

18 Super-Mailwing planes, three Ford and two Fokker tri-motors. Of the 1,436 miles operated by the company, all but a short spur line from Daytona Beach to St. Petersburg, were lighted for night flying.

Ford Air Lines, privately owned and operated by the Stout Metal Airplane Company, a division of the Ford Motor Company, was in its sixth year of service. Since its inception in April, 1925, the line had flown Ford tri-motored planes more than a million and a half miles and carried more than 10,120,000 pounds of freight, mostly spare parts, supplies and even unassembled Ford motor cars for Ford dealers. Flying a daily schedule between Detroit and Chicago, Cleveland and Buffalo, the line completed the equivalent of 60 trips around the earth at the equator with only one serious accident. Ford Air Lines, while operated for private purposes, was so unique that it commanded a place with other transport lines.

Gorst Air Transport, Inc., flying 15 miles between Seattle and Bremerton, Wash., made 11 round trips daily with seven passenger Keystone-Loening amphibians, carrying more than 15,000 passengers and flying 75,000 miles during 1930, this short line has shown steady growth since its inauguration in 1929. A new type floating terminal was built in the center of Seattle's busy waterfront during the year, accommodating five planes, a completely equipped shop for servicing and repair, a store room, a large passenger waiting room, rest rooms, and offices. Three landing ramps permitted speedy handling of traffic during peak loads, and brought passengers close to the center of Seattle's business district. A "flag stop" service was inaugurated in early summer to serve points near the route between Seattle and Bremerton. Stops were made, on call, at any beach along the route to pick up or discharge passengers. The cost of the extra service was very nominal and increased patronage of the line considerably. Regular fares were reduced early in the year and the change met with such public approval that lower fares remained in force.

Kohler Aviation Corporation, a passenger line connecting Grand Rapids and Muskegon with Milwaukee across Lake Michigan, operated jointly with Michigan Air Express in maintaining passenger service through to Detroit. Using six place Keystone-Loening amphibians, the company maintained a schedule of three round trips daily over the 119 mile route.

Mamer Air Transport, using Ford tri-motored planes, flew a daily schedule between Seattle and Spokane, 228 miles. Passenger and express service was maintained three times weekly between Spokane and St. Paul, with stops at Missoula, Butte, Billings and Aberdeen, but was discontinued in the fall. Nearly 150,000 miles were flown and 4,000 passengers, largely between Spokane and Seattle, were carried during 1930.

The Martz Air Lines, using two Bellanca Airbuses and a Ford tri-motored plane, maintained daily service between Wilkes Barre, Pa., and

Newark, N. J., started during the summer. The service was to be extended to Buffalo in 1931. Quick connections were to be made at Wilkes Barre for Buffalo. The whole trip covering 302 miles was to be made in three hours and 15 minutes.

Mason and Dixon Air Lines, Inc., maintained twice daily service between Detroit and Cincinnati, 237 miles. Stops were made at Toledo, Springfield, Dayton and Middletown. Flamingo all-metal cabin planes were used. The service was arranged so that excellent air and rail connections were made at Detroit or Cincinnati for Chicago, New York or the West.

EASY RADIO COMMUNICATION

Radio earphones and mouthpiece are ingeniously built into the pilot's helmet for use on the Western Air Express mail routes.

National Air Transport, Inc., a division of United Aircraft and Transport Corporation, carried air mail and express (C. A. M. 3 and 17) daily between New York, Cleveland, Chicago, Kansas City, Wichita, Tulsa and Dallas, a distance of nearly 3,000 miles. More than two million miles were flown during 1930, and planes carried 1,900,000 pounds of mail and 40,600 pounds of express. The Stout Air Lines, carrying passengers between Detroit, Chicago and Cleveland, were acquired October 1. Coincident with acquiring Stout Air Lines, passenger service on the National Air Transport mail route between Chicago and Cleveland was started. Air passenger service was extended from Cleveland to New York December 1, but the air-rail hook-up already in use on another schedule was not affected. The new line connected with westbound air lines at Chicago and provided 48 hour transcontinental air service, including an overnight stop at Chicago. Tri-motored planes capable of carrying 11 passengers and 1,000 pounds of

mail at a maximum speed of 150 miles per hour were used to fly this route. The New York-Chicago route was flown in eight hours by westbound planes, and six hours and 34 minutes by eastbound planes with the aid of the prevailing winds. Complete two-way radio installations were being placed in all planes to increase safety and insure the completion of scheduled flights, even in bad weather. Passenger service was to be extended January 2 from Chicago to Kansas City, and later to Tulsa, Dallas and Fort Worth.

National Parks Airways, Inc., operating C. A. M. 26 with daily mail, passenger and express service between Salt Lake City, Pocatello, Butte and Great Falls, Mont., improved its facilities during the year. The feeder line from Butte to Great Falls was operated only during the summer months. Sixteen intermediate landing fields on the route were completed during the year. The route for 150 miles between Salt Lake City and Pocatello was lighted by beacons every 25 or 30 miles with plans for lighting the entire line, crossing mountain ranges 10,000 feet high, in 1931. Using one Boeing, four Fokkers and three Stearman cabin planes, a total of 500,000 miles were flown during the year with 64,000 pounds of mail and 2,500 passengers. The latter represented an increase of 40 per cent over 1929. At Salt Lake City, air transportation to San Francisco, Los Angeles, Portland, Seattle and all points east was available. One-way radio communication was installed on all planes, with plans for a two-way system in 1931. In spite of severe mountain storms and the necessity of taking off and landing at altitudes of not less than 3,900 feet, the line completed 99 per cent of the mileage scheduled during the year.

New York, Philadelphia and Washington Airways opened service September 1, between New York, Philadelphia and Washington. With a fleet of eight ten-passenger Stinson tri-motored cabin monoplanes flying 11 round trips per day, a total of 4,400 miles, the line set a new pace for transport operators. This single line averaged more passengers per day than all the cross-channel lines operating out of Croydon, England, combined. Stops at Baltimore and Trenton were added November 24. From September 1 to the end of the year, the line safely flew 400,000 miles, carrying more than 15,000 passengers in maintenance of schedules "every hour on the hour." Round trip service was provided at rail-plus-Pullman fares between New York and Washington.

Northwest Airways, Inc., operated daily passenger and mail service (C. A. M. 9) during 1930, using Ford, Hamilton and Stinson planes, seating from three to fourteen passengers. Its routes radiated from the Twin Cities in all directions: to Winnipeg, Canada, in the North; Chicago, Milwaukee and Green Bay to the East; and as far South as Sioux City and Omaha. Schedules were frequent and so arranged that air-line connections for all parts of the United States and the Canadian Northwest

SCHEDULED AIRWAY OPERATORS

Route No.	Operator	Routes Operated	Route Mileage	Class of Service
1	Air Ferries Ltd.	San Francisco to Oakland	7	P
2	Alaska Washington Airline	Seattle to Victoria	74	P
		Seattle to Vancouver	123	P
		Victoria to Vancouver	62	P
3	Barnes & Gorst	Seattle to Victoria	74	MP
4	Boeing Air Transport	San Francisco to Chicago (via Lincoln)	1930	MPE
		San Francisco to Chicago	1932	MPE
5	Browers Air Service Corp.	Wichita to Omaha	346	P
6	Colonial Airways, Inc.	Cleveland to Albany	446	ME
		New York to Boston	192	MPE
		Buffalo to Toronto	58	P
		New York to Montreal	332	MP
7	Cromwell Airlines, Inc.	San Angelo to Dallas	232	P
		San Antonio to Big Springs	266	P
8	Continental Airways, Inc.	Columbus to Chicago	295	P
9	Continental Air Express, Inc.	Los Angeles to San Francisco	372	P
10	Dixie Flying Service	Greensboro to Washington	266	P
11	Eagle Air Lines	Kansas City to Des Moines	182	P
12	Eastern Air Transport Corp	Atlanta to New York	793	MP
		St. Petersburg to Daytona Beach	147	M
		Miami to Atlanta	616	M
		Richmond to New York	312	P
13	Embry-Riddle Co.	Cincinnati to Chicago	261	MPE
14	Ford Airways	Detroit to Buffalo (via Cleveland)	270	E
		Detroit to Chicago	261	E
15	Gorst Air Transport, Inc	Seattle to Bremerton	15	P
16	Interstate Airlines, Inc.	St. Louis to Evansville	145	M
		Atlanta to Chicago	623	M
17	Kalispell Airways	Kalispell to Butte	185	P
18	Kohler Aviation Corp.	Milwaukee to Grand Rapids	119	P
19	Mamer Air Transport	Spokane to Seattle	228	PE
		Twin Cities to Spokane	210	P
20	Mason & Dixon Airlines, Inc.	Cincinnati to Detroit	237	P
21	Michigan Air Express	Grand Rapids to Harbor Springs	188	P
		Grand Rapids to Detroit	140	P
22	National Air Trans. Co., Inc.	Chicago to New York	717	MPE
		Tulsa to Ponca City	72	ME
		Kansas City to Chicago (direct)	411	ME
		Dallas to Kansas City (via Tulsa)	457	ME
		Dallas to Chicago (via Wichita and St. Joseph)	1009	ME
		Detroit to Chicago	261	P
		Detroit to Cleveland (direct)	93	P
		Detroit to Cleveland (via Toledo)	152	P
		Cleveland to Chicago	314	P

Route No.	Operator	Routes Operated	Route Mileage	Class of Service
23	National Parks Airways, Inc.	Salt Lake to Great Falls	483	MPE
24	New England and Western Air Transport	New York to Springfield	121	P
25	New Orleans Air Line	Pilottown to New Orleans	74	M
26	New York Airways, Inc.	Atlantic City to Newark	97	P
27	New York, Phila. and Wash. Airways Corp.	Washington to New York	206	P
28	Northwest Airways, Inc.	Milwaukee to Green Bay	120	MPE
		Chicago to St. Paul (via Milwaukee)	398	MPE
		Chicago to St. Paul (via Rochester)	372	MPE
		St. Paul to Winnipeg	439	P
		Chicago to Madison	140	MPE
		Omaha to Twin Cities	320	P
29	Pacific Air Transport, Inc.	San Diego to Seattle	1164	MPE
30	Pan American Airway, Inc.	Santiago, Chile, to Montevideo Uraguay	867	M
		San Juan to Paramaribo, Dutch Guiana	1342	MP
		Paramaribo to Sao Paulo	3495	MP
		Cristobal, C.Z., to Curacao, Dutch West Indies	890	MP
		Santiago, Chile, to Cristobal, C.Z.	3731	MP
		Tampico to Guatemala City	885	MP
		Brownsville to Mexico City (via Tampico)	472	MP
		Miami to Cristobal	2074	MP
		Miami to San Juan	1445	MP
		Miami to Nassau	185	MP
		Miami to Habana	228	MP
31	Pennsylvania Air Lines	Washington to Pittsburgh	192	PE
		Pittsburgh to Cleveland	118	MPE
32	Pittsburgh Airways, Inc.	Pittsburgh to New York	336	P
33	Rapid Air Transport	Kansas City to Omaha	168	P
34	Robertson Air Service	New Orleans to St. Louis	599	P
35	Southern Air Fast Express	Los Angeles to Atlanta	2119	MPE
36	Southern Air Transport	San Antonio to Houston	191	PE
		New Orleans to Atlanta	480	M
		Houston to New Orleans	319	M
		Galveston to Dallas	318	MPE
		Brownsville to Dallas	546	MPE
		Oklahoma City to Tulsa	98	P
		Fort Worth to Tulsa (via Dallas)	272	P

Route No.	Operator	Routes Operated	Route Mileage	Class of Service
37	Transcontinental and Western Air	Los Angeles to Columbus via Tulsa	2043	MPE
		Los Angeles to New York via Kansas City	2564	MPE
		Los Angeles to San Francisco	348	PE
		Agua Caliente to Los Angeles via San Diego	130	PE
38	Thompson Aeronautical Corp.	Chicago to Kalamazoo	133	MPE
		Kalamazoo to Muskegon	80	MPE
		Kalamazoo to Bay City	151	MPE
		Kalamazoo to Pontiac	172	MPE
		Cleveland to Bay City	251	MPE
		Detroit to Buffalo	217	P
39	U. S. Airways	Kansas City to Denver (via Salina)	577	P
		Tulsa to Wichita (via Ponca City)	141	P
40	Universal Air Lines	St. Louis to Chicago	273	MPE
		St. Louis to Omaha	406	M
		Kansas City to Chicago	411	P
		Louisville to Cleveland	346	M
		Tulsa to Kansas City	215	P
41	Varney Airlines	Pasco to Seattle (via Portland)	322	ME
		Pasco to Spokane	127	ME
		Salt Lake to Pasco	525	ME
42	Wedell Williams Air Service	New Orleans to Fort Worth	487	P
		New Orleans to Houston	319	P
43	Western Air Express	Los Angeles to Avalon	49	PE
		Pueblo to Cheyenne	199	MPE
		Agua Caliente to Los Angeles	130	P
		San Diego to Salt Lake City	702	MPE
		Dallas to Amarillo	345	P
		Amarillo to Pueblo	261	P
		San Francisco to Seattle	685	PE
		El Paso to Denver	630	P

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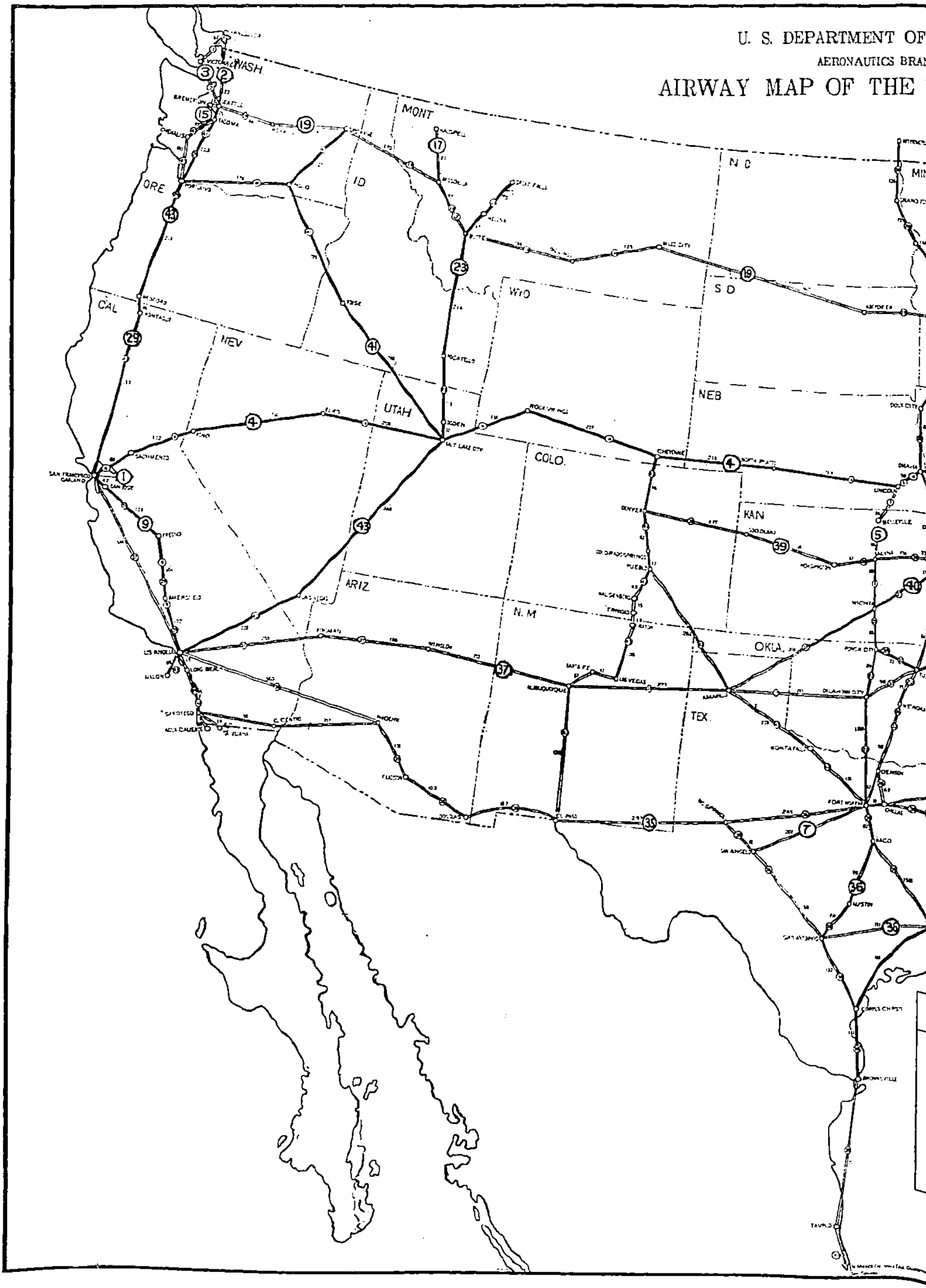
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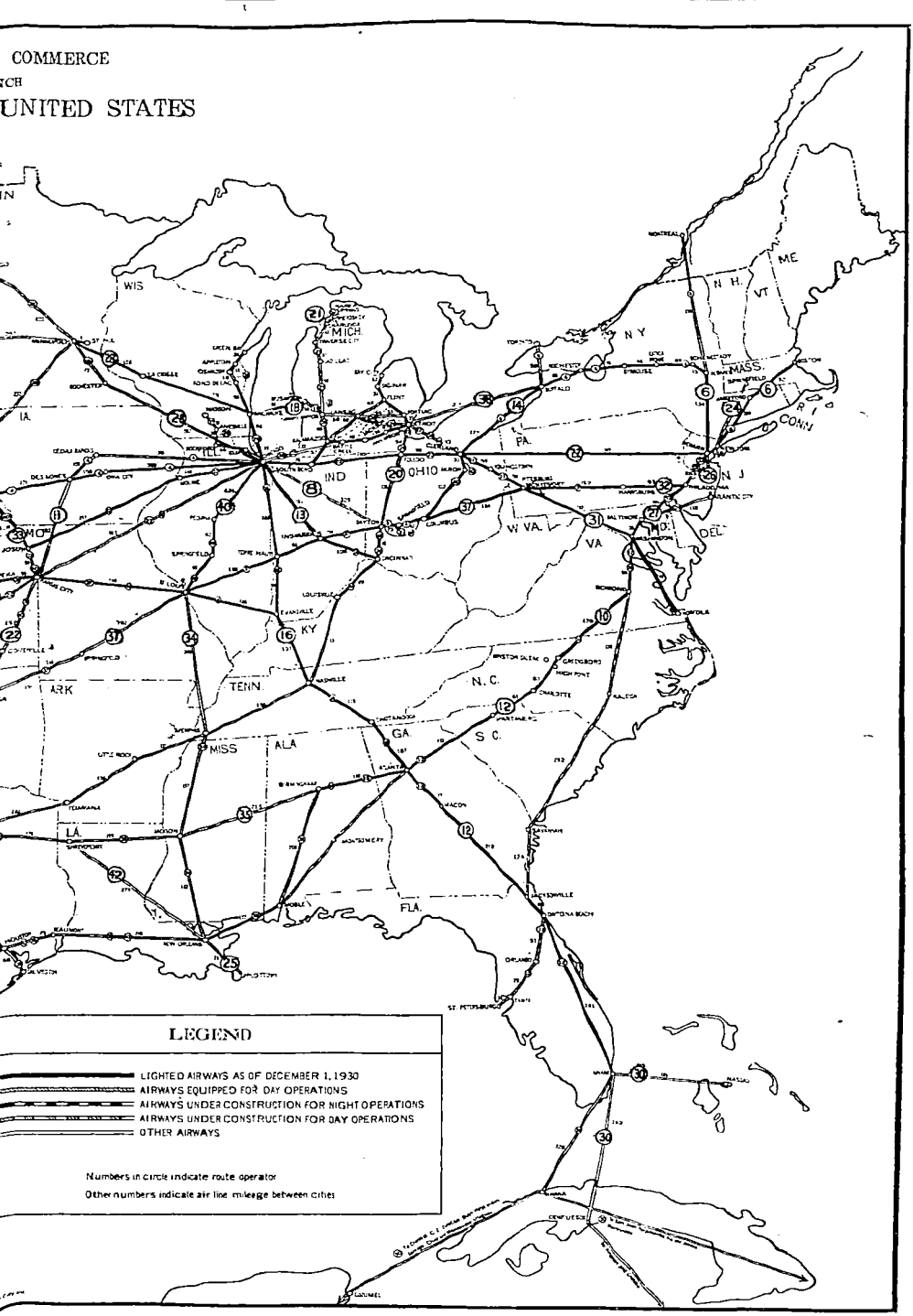


were always available to passengers. The Ford and Hamilton planes were equipped with radio, permitting communication with the ground for receipt of weather reports.

Pacific Air Transport, Inc., a unit of the Boeing System in United Aircraft and Transport Corporation, operated mail, passenger and express service between San Diego, Los Angeles, San Francisco, and Seattle. Northbound flying time was reduced early in the year, and later the route was extended southward to San Diego, from the previous terminal, Los Angeles. A new night schedule was inaugurated on the southbound mail and passenger service from Seattle to the California cities, providing transportation without loss of business hours. Night schedules were possible by completion of the system of air beacons along the route. Radio-telephone equipment was installed in all planes, and seven ground stations were established to permit voice communication between pilots and ground stations along the route. A new permanent southern terminal was erected at San Diego during the year, as well as general improvements at all ports of call. Two Boeing 40-B-4 mail passenger planes were added to the fleet of seven planes of similar type in use. Air mail poundage showed a ten per cent. increase over 1929 and doubled that of 1928, with a total of 280,000 pounds in 1930. A new peak in passenger traffic also was reached during the year.

Pan American Airways System, operating from two bases in the United States, one at Miami, Fla., and the other at Brownsville, Tex., on the Mexican border, connected the United States with Mexico, Central America, the West Indies and South America. Its extensive activities and phenomenal expansion will be discussed in another chapter, "Latin America By Air."

Pennsylvania Air Lines, Inc., formerly known as Clifford Ball, Inc., carried mail (C. A. M. 11), passengers and express daily over the 300 mile route between Washington, Pittsburgh and Cleveland. Fairchild monoplanes accommodating six passengers were used.

Pittsburgh Airways, Inc., had flown more than 100,000 miles since March and built up its traffic from 25 passengers in March to nearly seven times that number late in the year. The route extending from Pittsburgh to New York, with a stop at Philadelphia, was 336 miles long. Two hundred and fifty-five miles of the airway, from Pittsburgh to Philadelphia, were being lighted with beacons.

Rapid Air Transport, Inc., maintained daily passenger service on the 170 mile route between Kansas City and Omaha, Nebr. Flying six place Ryan and Bellanca monoplanes, the line carried nearly 1,000 passengers during the last three quarters of 1930. On August 1, the frequency of the service was doubled and a Sunday service of one round trip added to accommodate the increasing number of passengers between these two cities.

Robertson Air Service started a daily passenger line between St. Louis and New Orleans April 27. Stops were made at Jackson, Miss., and Memphis to discharge and take on passengers. By the end of 1930, more than 1,509 passengers were transported over the 600 mile route, and the total air mileage covered by the planes was well in excess of 260,000 miles. Connections were made at St. Louis with planes traveling east, west and north. The southern points on the line provided convenient connections with planes for Los Angeles, Miami, Mexico and South America. It was planned to install radio receiving sets on all planes upon the completion of a chain of ground stations.

Thompson Aeronautical Corporation, operating largely in Michigan, and connecting Chicago, Cleveland, Detroit, Saginaw, Lansing and Grand Rapids with daily air mail (C. A. M. 27), passenger and express line, flew 756,000 miles in 1930. More than 6,800 passengers and 180,000 pounds of mail were carried, using tri-motored Ford planes. In February, a new repair station was completed at Pontiac, Mich., to keep equipment in first-class condition. Mishawaka, Ind., was designated March 5, as a regular stop for air mail planes on C. A. M. 27. The line between Detroit and Cleveland over Lake Erie resumed operations April 28, equipped with Keystone-Loening Air Yachts carrying six passengers and 500 pounds of baggage, mail and express. Four round trips a day were made between Detroit and Cleveland, requiring only 55 minutes each way. The first Diesel-powered mail plane was put into regular service June 26 between Pontiac and Chicago. Additional engines of this type were to be used if they proved reliable, safe and economical. The installation of radio apparatus on all mail, passenger and express planes was begun in October. Beginning November 11, an extension of air passenger service was made from Detroit to Buffalo. One round trip a day was scheduled over the 225 mile route, except on Sundays and holidays.

Transcontinental and Western Air, Inc., was one of the youngest operating companies in American aviation but was formed by an association of two of the oldest companies in the industry. Transcontinental and Western Air, Inc., was an operating subsidiary of Transcontinental Air Transport-Maddux Air Lines and Western Air Express, Inc., formed to carry out the air mail contract (C. A. M. 34) awarded the two parent companies under authority of the McNary-Watres Act. Operations of the new company were begun October 25, as the first operator to provide an all-air mail and passenger service between New York, Los Angeles and intermediate points. Its 36 hour coast to coast service reduced by 12 hours the fastest previous schedules, which were maintained by the air and rail connections of both T. A. T.-Maddux and Western Air Express. The route of Transcontinental and Western Air, 2,559 miles long without the 300 mile division between Los Angeles and San Francisco, followed almost

exactly the former routes of Transcontinental Air Transport and Western Air Express, at the same time retaining the elastic rail connections of both companies. With the 36 hour all-air service and the optional 48 hour air-rail service, two transcontinental routes were flown daily. In each case the schedules provided for overnight stops in hotels. The stop was in Kansas City on the 36 hour schedules and in Amarillo on the 48 hour schedules. Transcontinental mail was carried only on the all-air service. Local mail, however, was carried between St. Louis and Amarillo on the 48 hour combination schedules. Until January 1, when completion of the lighted airway from coast to coast was planned, planes were flown in daylight hours only. Upon completion of the lighting projects, both mail and passengers were to be flown day and night to provide 24 hour transcontinental service. Passengers not desiring to fly at night were to be offered optional schedules arranged to provide for overnight stops in hotels at terminal cities. The cities on the route of Transcontinental and Western Air were those formerly served by Transcontinental Air Transport and Western Air Express, namely, Columbus, Indianapolis, St. Louis, Kansas City, Amarillo, Springfield, Tulsa, Oklahoma City, Albuquerque, Winslow, Kingman, Los Angeles, and San Francisco, with the addition of those cities between Columbus and New York included in the new all-air service. These cities were Pittsburgh, Harrisburg, Philadelphia and New York. A number of other cities were served by combination air schedules with other lines. Chicago, to cite an example, was but eight hours from New York by the combined air schedules of Transcontinental and Western Air and Continental Airways, the transfer being made at Columbus. Extensive express service was contemplated for 1931.

United States Airways, Inc., served nearly 1,000 miles of territory between St. Louis, Kansas City and Denver during 1930, and a branch line was extended as far south as Tulsa. All lines carried passengers on daily schedules and connected with other air transport lines to all parts of the country.

Varney Air Lines, Inc., a division of United Aircraft and Transport Corporation, operated daily schedules from Seattle and Portland to Spokane, via Pasco, and from Pasco to Salt Lake City, via Boise, Ida. The routes from Pasco to Salt Lake City (C. A. M. 5) and from Pasco to Spokane, and Pasco to Seattle via Portland (C. A. M. 32), carried only mail on a daily schedule in 1929. Passengers, mail and express were carried over these routes on a daily schedule at the close of 1930 except on the Portland-Salt Lake line where double daily schedules were being operated. The two mail contracts were consolidated into one (C. A. M. 5), and mail totaling 400,000 pounds was carried over the route during the year. A little less than half the 3,500 miles flown by this company daily were over a regu-

larly lighted route maintained by the Department of Commerce. All planes were equipped with two-way radio, which insured maximum safety.

Wedell-Williams Air Service, Inc., operated two passenger lines out of New Orleans. The northern line going to Fort Worth, Tex., served Baton Rouge, Alexandria, Shreveport and Dallas en route. Two schedules a day were in operation between New Orleans and Shreveport. The southern line going directly from New Orleans to Houston, via Patterson, La., was inaugurated during the summer, daily service being maintained at the close of the year.

West Coast Air Transport Corporation, closely affiliated with Western Air Express, operated daily passenger service between Seattle and San Francisco over one of the most spectacular scenic routes in the country. Regular stops were made at Portland and Montague, at the foot of Mt. Shasta in Northern California. The tourist travel to Montague was heavy enough to justify this stop as a permanent feature. Equipment consisted of three twelve-passenger, tri-motored Fokker monoplanes.

Western Air Express, Inc., continued to operate 2,000 miles of airway routes under its own name in addition to participating in the activities of the newly formed Transcontinental and Western Air, Inc. The 45 mile trip from Los Angeles to Catalina was made in Keystone-Loening amphibians in 30 minutes, as compared with an all day trip by boat and train. Landings were made at Long Beach and Avalon. A one hour trip from the airport at Los Angeles on another line brought the passengers to Tia Juana or Agua Caliente, popular Mexican resorts. Equipment consisted of a fleet of twelve-passenger Fokker monoplanes and several Fokker F-32's capable of carrying 32 passengers. Starting at Los Angeles, passengers and mail were flown daily over the deserts of Nevada and the salt flats of Utah to Salt Lake City. The trip was made in six hours and included a short stop at Las Vegas, Nev. Western Air Express, in conjunction with an affiliated line, Mid-Continent Air Express, operated another line linking Cheyenne with El Paso and Dallas in Texas. Stops were made at Denver, Colorado Springs, and Pueblo on the way south. The planes diverged at Pueblo, one line going to Dallas via Amarillo, Wichita Falls and Fort Worth, and the other to El Paso, via Albuquerque.

Western Air Service Corporation operated between Omaha and Oklahoma City, beginning in the summer of 1930. Previously, the line was known as the Brower Air Service Corporation, and operated between Wichita and Omaha, a distance of nearly 300 miles. Passengers were carried on a daily schedule between these two points until June 21, when an extension of the service was announced. Approximately 400 passengers were carried since the line was acquired by new interests. Equipment consisted of a fleet of six place Stinson-Detroiter cabin planes, powered with Wright Whirlwind 300 engines.

CHAPTER IV

LATIN AMERICA BY AIR

Pan American and New York Rio Consolidated—American Effort United —Foreign Agreements—Opening New Markets—Routes and Services of All Lines—Aircraft Factory for Chile—Military Aviation

WITH the opening of 1931, aviation in Latin America faced the most promising decade in its history after a year in which South American air transport developments exceeded in international significance the major mergers and extensions effected within the United States. Having practically no rapid transportation facilities, this great continent with its towering mountain ranges and wide expanses of impassable jungle found in the airplane a medium through which its tremendous natural resources might be exploited and its industrial life sped up to the modern cadence.

The first major American operation in Latin countries started in 1927 when Pan American Airways inaugurated a line 261 miles in length between Key West, Florida and Havana, Cuba. From this small beginning operations expanded in three years to the most extensive air transport system in the world. The purchase on September 15, 1930, by the Aviation Corporation of the Americas, of the New York, Rio and Buenos Aires Lines, Inc., gave Pan American 19,190 miles of airways, encircling South America, and traversing the West Indies, Central America and Mexico. As a result of this amalgamation, the American effort stood united.

But that consolidation, important as it was, paled beside the greater significance of the new era in South American air transport which 1930 ushered in. French, Dutch, German and British interests were definitely aligned with American. The Pan American Airways System, the name under which the Aviation Corporation of the Americas operates its totally owned Pan American Airways, Inc., Cia. Mexicana de Aviacion, S. A., and its half-owned Pan American-Grace Airways, Inc., to which the NYRBA assets were added, signed its first international operating agreement on the night of March 2. Dr. Peter von Bauer of the Condor Syndicate, Ltd., German-backed air line in Brazil, signed his name beneath that of Juan T. Trippe, Pan American's president, in New York to seal an operating agreement between the German and American interests.

The move was continued in May when Trippe went to England to bring the Imperial Airways forces into the general plan. From that meeting and subsequent correspondence came the startling announcement of a

trans-Atlantic air mail project involving Imperial Airways, the French Aéropostale, and Pan American Airways. The Condor Syndicate operating along Brazil's coast cooperated with Pan American in the development of radio communications. The Lloyd Aero Boliviano was reported to be planning a new route joining the Pacific Coast with interior Bolivia and Argentina in case the existing route from Santiago over the Andes to Mendosa should prove too difficult for faster schedules. In May, the French made a public statement that they would grant flying privileges over their colonies.

LINDBERGH OPENS NEW LINE

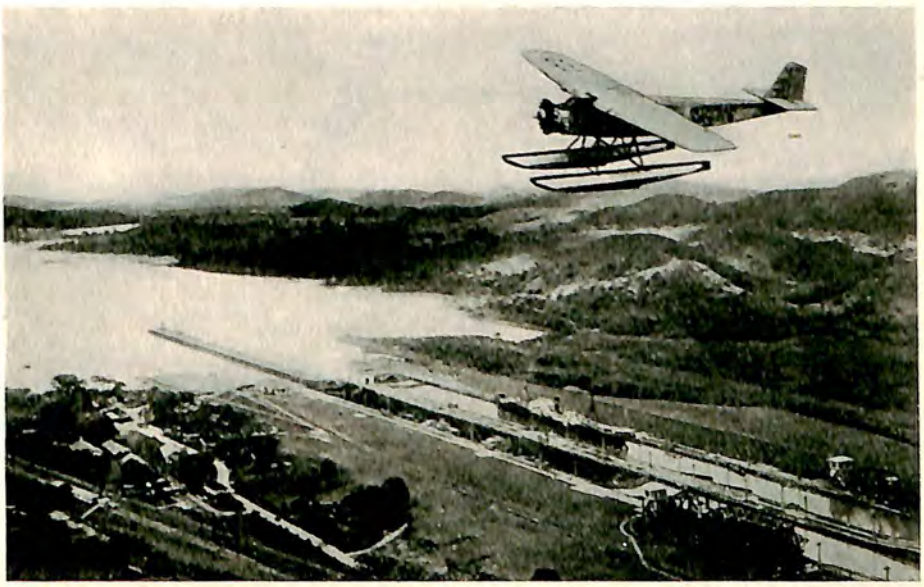
Sikorsky Amphibion (2 Pratt and Whitney Wasps) used by Col. Charles A. Lindbergh in inaugurating new Pan American route to Panama.

South Atlantic Air Mail

Across the South Atlantic, European nations tapped the rich markets of South America. From Dakar, Africa, French cruisers sped the mails to Natal, Brazil, where French pilots flew them on to Buenos Aires. It took eleven days for the trip from Europe's cities. The Graf Zeppelin was preparing for its South Atlantic flight. The German Luft Hansa had tied in with the German Zeppelin interests, and Spain had interested itself with the Germans. A French-Portuguese alignment obtained exclusive aviation rights in the Azores. Jean Mermoz and his comrades were grooming their plane for the first South Atlantic air mail flight. Newspapers wrote of a race between the German-Spanish interests and the French-

Portuguese group. But there was no race. Mermoz landed at Natal, May 13, and Paris mail was in Buenos Aires the next day, four days after posting. The Graf Zeppelin left for South America on the 18th. On the 21st it was over the Cape Verde Islands, and by radio received permission to fly over the French and British possessions in Latin America. On the 22nd, it was at Pernambuco, Brazil, since named by Dr. Eckener as the destined terminus for South Atlantic dirigible service.

To connect the United States with South American cities via the Atlantic Coast, NYRBA started a weekly passenger and cargo service south



OCEAN-TO-OCEAN SERVICE

Hamilton metal plane (Pratt and Whitney Hornet) used by Isthmian Airways, Inc., in connecting Atlantic with Pacific, across Panama, in less than an hour.

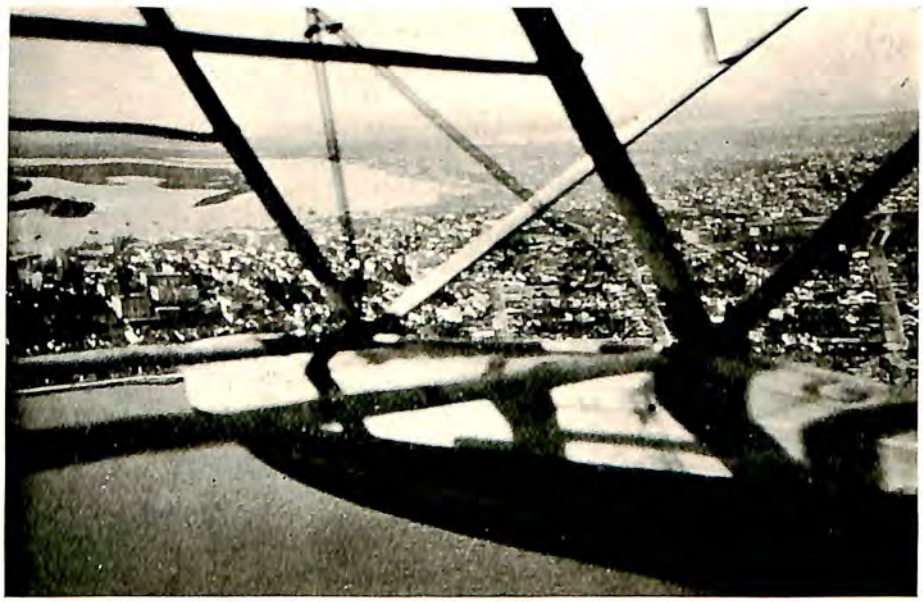
from Miami to Buenos Aires using the newly designed Commodore flying boats. To speed up mail deliveries the United States Post Office Department advertised for bids on an east coast route. This United States air mail contract could be let at a maximum of two dollars per mile. Competitive bidding might force the award down to costs or less than costs, and the American effort in South America would be weakened, a powerful argument for the Pan American-NYRBA consolidation which later took place.

In the meantime Pan American Airways opened a northbound mail service from Santos and Rio connecting with existing air mail routes at Paramaribo. The Post Office Department then doubled its service on the west coast. It was obvious that twice weekly air mail service from the

principal cities of the United States to and from Buenos Aires and Montevideo in seven days was better than an uncertain four day trans-oceanic flight from Europe. In order not to split the Post Office support by dividing air mail contracts between competing American companies, unification of American lines was proposed.

Negotiate for Consolidation

A long series of negotiations between the two American companies followed, with Juan Trippe representing Pan American and William P. Mac-

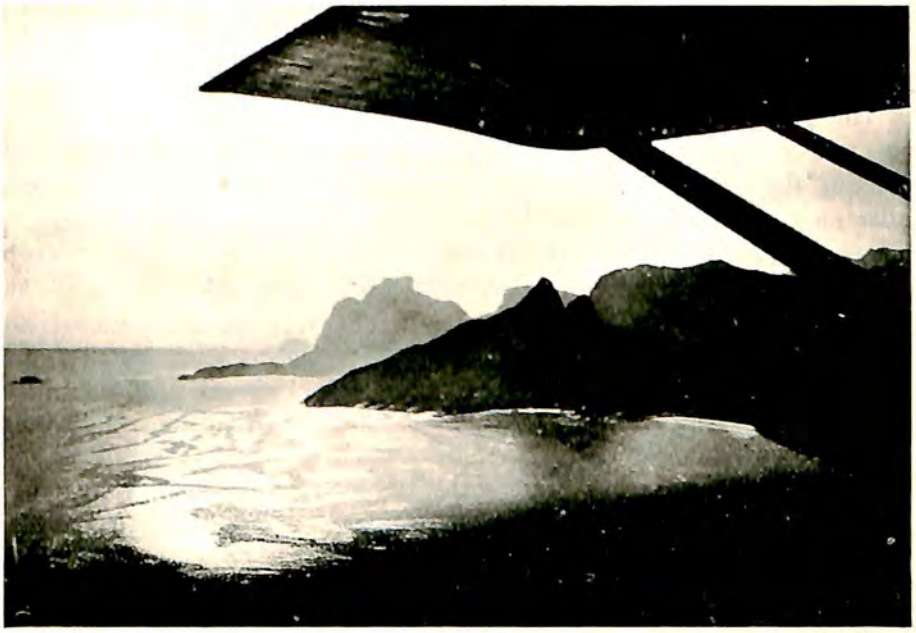


MONTEVIDEO FROM AMERICAN PLANE

A glimpse of Montevideo, Uruguay, is caught by the passengers in a giant Consolidated Commodore flying boat of the Pan American Airways System.

Cracken, Jr., representing the NYRBA line. Newspapers reported false stories of the consummation of a deal again and again. Until the end of August, the two groups of officials discussed price and terms. When completed and finally announced, the trade was not a merger, as originally reported, but a purchase of NYRBA assets.

Meanwhile work had gone ahead looking to the operation of an air line into Jamaica. Pan American representatives spent July at Kingston. During the fall, repeated announcements of air connections to Cuba were printed in the British and American press. Finally, on the heels of the announcement of an agreement for trans-Atlantic air mail service, came



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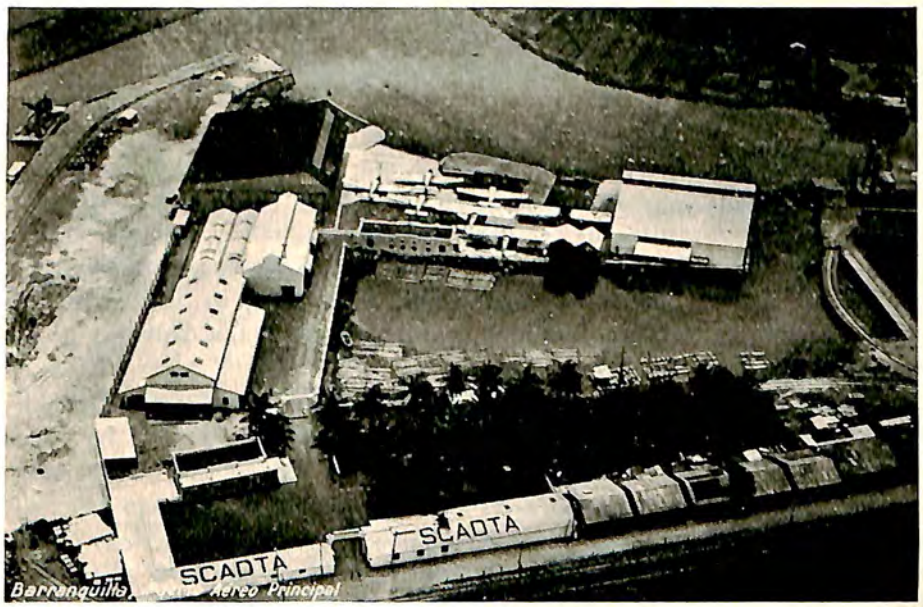
FLYING DOWN FROM RIO

Headed for Santos from Rio de Janeiro along the Brazilian coast, the American passenger witnesses a brilliant sunset on the sea.



BARRANQUILLA'S SEAPLANE BASE

Main operating base of "Scadta" in Colombia for its Magdalena River and Inter-Ocean lines, showing the types of seaplanes in use.

confirmation of the new route by way of Jamaica to the Canal Zone to be opened December 2 on a twice weekly schedule both ways, carrying United States air mail.

The year 1931 must see many things develop which were started in 1930. Most important of all was the psychological change in the way of handling the problem. While previously air lines had secured their subsidies on the basis of an international battle for markets, the American interests as represented by Pan American Airways have chosen the much more daring, but economically sounder, basis of cooperation with all reputable air transport groups for the development of international air transport. By joining all air lines, a system is created linking all countries. It remains only for the shrewd American business man to utilize this superior mode of transportation more effectively than his competitors in other countries.

Whether there will come, from the common ground of air transport in Latin America, a coordination of all world air transport remains to be seen. Clearly this dream of a few men has taken on many aspects of reality. On this romantic and adventurous background, let us project the facts and figures of air transport in Latin America as it exists today.

Pan American Airways System

The Pan American Airways System is the holder of the United States Post Office Department Foreign Air Mail contracts numbers 4, 5, 6, 7, 8, 9, 10 and extensions, which cover the transportation of mail from the United States to Latin American countries. Routes 5 and 8 merge into one at San Salvador, as will be seen from the accompanying map, and continue southward to the Canal Zone. The extension from Cienfuegos (Cuba) to Kingston (Jamaica) was opened December 2 and another extension from Venezuela to Trinidad was contemplated, completing two great circles of rapid transport with points of coincidence at Cristobal, C. Z., and Port of Spain, Trinidad. The system was so flexible that in case of a rupture of operations at almost any point, traffic between North and South America could be rerouted.

During 1929 and 1930, the Pan American lines were increased rapidly to 19,190 miles, a phenomenal growth. Pioneer companies' lines had been acquired and reconstructed and new routes had been placed in operation until the company's records showed on September 1, 1930, that 5,344,447 miles had been flown since January 1, 1929. In this period, 30,727 passengers, 1,022,730 pounds of baggage and more than 580 tons of air mail had been transported on the international routes with northernmost terminals in Brownsville, Tex., and Miami, Fla., and southernmost extremities in Montevideo, Uruguay, and Buenos Aires, Argentina.

It should be interesting to review the growth and history of some of the other air transport interests in Latin America, representing the ambitions of France, Germany, Great Britain and the nationals of South America to establish new routes in this sphere.

American Influences

The Faucett Aviation Company of Peru, organized in 1920, bears the name of an American who carried on air transport and photographic

TAKING OFF NEAR SUGAR LOAF

American Marchetti S-56 (Kinner) taking off from the water near the famous landmark at Rio de Janeiro in Brazil.

business almost single-handed until April, 1929, when a North American aviation interest joined forces with him and enlarged the organization. Passengers, mail and express are carried by this pioneer company over 1,200 miles of routes in Peru, connecting Arequipa, Mollendo, Ica, Lima, Chimbote, Trujillo, Pacasmayo, Chiclayo and Paita.

The Corporación Aeronautica de Transportes, S. A., (Aeronautic Transport Company) was organized with aid from American interests to use speedy Lockheed monoplanes on an air mail, passenger and express service southward from Nogales, Juárez and Matamoras on the U. S.-Mexican border to Mexico City and a transcontinental air route between Matamoras

and Mazatlan. The latter route was inaugurated March 9, 1929, on a bi-weekly basis, and the Juárez and Nogales routes to Mexico were initiated August 17, 1929. Both have since been increased to a daily service between terminals within 12 hours. The 2,087 miles of routes flown include: Matamoras to Mazatlan, 638 miles; Juárez to Mexico City, 1,104 miles; and Nogales to Chihuahua, 345 miles.

The Compañia Aereo Hondureno (Honduran Air Company) was organized in 1928 in the Republic of Honduras as the air transport subsidiary of the United Fruit Company, and transports passengers, mail and express over the Tela, San Pedro, Tegucigalpa route, a distance of 166 miles.

GERMAN AIR LINER OVER RIO

Dornier Wal flying boat of the Condor Syndicate flying over Rio de Janeiro after a flight from Rio Grande do Sul along the coast.

Isthmian Airways, Inc., using Hamilton metal planes, inaugurated a tri-daily service, May 5, 1929, for passengers and express in the Canal Zone over the Panama Canal route from Cristobal to Balboa, a distance of 47 miles.

French Back Line

The Compagnie Générale Aéropostale was an outgrowth of the Latécoère Airlines, which started operations December 15, 1918, as the result of the first scheme presented to the French government for linking Europe, Africa and South America by air. The plan was presented two months before the World War armistice was signed by P. Latécoère. The Aéropostale was organized April 21, 1921, under the laws of France and took

over the Latécoère lines. The Buenos Aires-Natal route was placed in operation November 15, 1927, and on March 1, 1928, the air mail was carried from Natal by fast steamers to Dakar, Senegal, Africa, thence by plane to Paris in a total of 17 days. This service has been improved until the trip was made from Toulouse to Buenos Aires in nine days and Mermoz flew one shipment of mail across the Atlantic from Paris to Argentina in four days. The Compagnie Générale Aéropostale conducts a weekly service between Natal, Buenos Aires, and intermediate points, 2,895 miles, and between Maracaibo and Maturin, Venezuela, 689 miles, under its own name. A subsidiary, the S. A. Aeroposta Argentina operated

MILITARY AIRPORT IN BRAZIL

Military landing field at Sao Paulo, Brazil, typical of government maintained ports in the principal countries of South America.

in Argentina between Buenos Aires and Mar del Plata, 240 miles; Buenos Aires and Rio Gallegos (bi-weekly), 1,650 miles; Buenos Aires and Asuncion, Paraguay (bi-weekly), 690 miles; and Buenos Aires and Santiago, Chile (weekly), 750 miles.

The Sociedad Colombo Alemana de Transportes Aereos in 1924 carried on a great amount of aerial mapping over unexplored territory in the Republic of Colombia. Because the original and main route of the company extended along the Magdalena River, and later extensions were projected chiefly along the coast of Colombia, seaplanes were selected as

the flying equipment and they still form the bulk of the company's operating equipment. The passenger and mail routes of the Scadta company, totaling 2,440 miles, included: Barranquilla to Bogota (daily), 650 miles; Barranquilla to Guayaquil, Ecuador (weekly), 1,200 miles; Santa Marta to Cristobal, C. Z., 500 miles; and Bogota to Ibague across the Andes (bi-weekly), 90 miles. The Cosado (Compania Santandereana de Aviacion), a subsidiary, was liquidated in 1930. Fourteen seaplanes and six land planes were operated by the Scadta.

Peru, Chile and Bolivia

An American Naval Air Mission sent to Peru played a large part in the establishment of the Peruvian Naval Air Service in 1926, connecting

NEW FACTORY IN CHILE

First airplane factory established in Chile, the new Curtiss-Wright plant at Santiago is opened with President Ibañez officiating.

the isolated portion of Peru east of the Andes with the Pacific slope. Passengers, mail and express were transported over routes totalling 1,100 miles, including: Puerto Bermudez to Iquitos, 800 miles; and Moyabamba to Iquitos, 300 miles.

The Chilean National Air Lines is a passenger, mail and express service maintained by the Chilean government and operated by the Chilean War Department between Arica, Puerto Montt and Magallanes, 2,900 miles.

The Compania Lloyd Aerea Boliviano was established in August, 1925, and in 1930 operated a system of seven air lines wholly within Bolivia.

Passengers, mail and express were carried over the routes totalling 2,264 miles, including: Cochabamba to Santa Cruz, 274 miles; Santa Cruz to Puerto Suarez, 469 miles; Sucre to Cochabamba, 150 miles; Santa Cruz to Yacuiba, 375 miles; Cochabamba to Todos Santos, 135 miles; Riberalta to Todos Santos, 625 miles; and Cochabamba to La Paz, 236 miles.

The Condor Syndicate, Ltd., was organized in May, 1924, by Capt. Fritz Hammer, Dr. Peter von Bauer and financial interests of Hamburg, Germany. The original plan was to establish an air mail and passenger service from Colombia and the Canal Zone through Central America to the United States. Two large Dornier Wal seaplanes were constructed especially for this service and in August, 1925, they were

MARINE "SKY-RIDERS"

Curtiss fighting planes (Pratt and Whitney Wasps) of the U. S. Marines in formation near San Diego, Cal., during maneuvers.

flown from Barranquilla, Colombia, to the Canal Zone and through Central America to Havana, Cuba. As a pioneering flight the project was highly successful, but an attempt to obtain financial backing for the intercontinental project in New York was in advance of the public's acceptance of international air transport. The company then turned its attention toward South American-European service. A mail, passenger and express line was opened in 1927 between Rio de Janeiro and Porto Alegre. The Varig (Rio Grande Airways Company) is a subsidiary of the Condor Syndicate operating between Porto Alegre and Rio Grande do Sul. The lines were extended northward February 15, 1930, to Natal, Brazil. On

March 21, the line was extended from Natal over water to the Island of Fernando de Noronha. The mail was transferred here to fast steamers bound for the Canary Islands, where it was turned over to airplanes and flown to various European points over the Luft Hansa lines. A further improvement contemplated replacing the steamers by airplanes. The Condor Syndicate operated 2,992 miles of routes including: Rio Grande do Sul to Rio de Janeiro (weekly), 935 miles; Rio de Janeiro to Fernando do Noronha (weekly), 1,511 miles; and Rio de Janeiro to Corumba, Brazil (weekly), 546 miles.

FLYING LEATHERNECKS

Rough fields mean nothing to these U. S. Marine Corps fliers who pilot Vought Corsairs (Pratt and Whitney Wasps) in Nicaragua.

From this summary of the activities of the principal companies operating regular air line service in Latin America it can be seen that 41,294 miles of air routes are flown regularly. Pan American Airways System, flying 19,190 miles of this total, was by far the largest single operator in the world.

Radio Welds System Together

Radio communication was playing an important part in welding together these far flung air transport systems in South America. Most air lines in the Caribbean, Central America and the east coast of Brazil had excellent radio telegraph facilities. The Pan American Airways System

operated its own radio communication system from 48 ground stations. Over this network, weather reports were flashed to planes in the air along the routes.

Aside from a small number of airports which have been established by the war departments of the several countries, the task of providing commercial airports has fallen squarely upon the air transport companies. Operations along the east coast of South America and in Colombia are chiefly confined to water landings, but in Mexico, Central America, the West Indies, the west coast of South America, Argentina and Venezuela,

MIGHTY ACONCAGUA LIFTS HER HEAD

Passengers flying across the Andes to Buenos Aires catch a glimpse of Aconcagua, the highest peak in the western hemisphere.

landing fields have been established or were under construction. Of the 200 airports in Latin America, 72 of them were leased or owned by the Pan American Airways System.

Chile has been one of the most enterprising countries in Latin America so far as the development of aviation is concerned. Just as in 1929, Chileans found a network of national air lines to serve them in the central and northern sections of the country, with airport facilities in all leading cities and Santiago the southern terminus of the longest air line in the world, so in 1930 Chileans again had their national pride bolstered when an airplane factory was established near Santiago. Chileans have long been recognized

as the foremost mariners of South America, and are determined to become the foremost mariners of the air as well as the sea.

The factory, the property of the Curtiss-Wright Export Corporation, was constructed upon the invitation and under a concession of the Chilean government at a cost of $750,000. Work on the first airplane to be manufactured in the plant was formally commenced October 16, 1930. President Ibañez, the genial strong man of the republic, assisted at the opening ceremonies.

TYPICAL "SCADTA" BASE

Seaplane bases at Buenaventura, showing ramp, used by the Sociedad Colombo Alemena de Transportes Aereos in Colombia.

Chile Orders Military Production

The Chilean government awarded the factory an initial order for 20 military planes of the Falcon type, which was to be followed by a similar order for an equal number of Hawks and Fledglings. The production of commercial planes was to be undertaken before the end of 1931. The factory is located at the commercial airport of Los Cerrillos, near Santiago, and has a capacity of 50 to 60 planes a year. Engines were to be imported from the United States.

Under the terms of its concession, the Curtiss-Wright Export Corporation is obliged to employ Chilean workmen and Chilean materials so far

as possible, and 25 Chilean mechanics were given an intensive training course in the United States to prepare them for this work.

During the first nine months of 1930, the Chilean National Air Lines flew approximately 225,000 miles; Pan American-Grace flew about 100,000 miles in Chile; members of the Club Aero de Chile, 250,000 miles; and the Compagnie Générale Aéropostale, 10,500 miles in Chile. Thirty planes, 20 pilots and 35 mechanics were in the Chilean service of these lines, giving some indication of the extent of air transport operations in this far South American republic.

No doubt, other aircraft factories will be established under government concession at important centers in Latin America, but with the exception of the planes produced by the Chilean factory and in small military aircraft plants in Argentine and Mexico, all aircraft used in South America has been imported, principally from the United States, Germany, France and Great Britain. The export divisions of United Aircraft and Transport Corporation, the Curtiss-Wright Corporation, Aviation Corporation, Detroit Aircraft Corporation and Great Lakes Aircraft Corporation particularly interested themselves in the possibilities of this field during 1930, several of the companies sending representatives into the territory or entertaining missions from the Latin American governments. Sales of American aircraft in South America, one of our principal export markets, can be seen at a glance from the tables of aircraft, engines and accessories exported during 1930 printed in the Appendix.

Problems of Exporter

The American exporter making sales in Latin America must expect to do far more than is necessary in making a domestic sale. He must provide a means of training the purchaser's pilots to use the planes and then plan a method of servicing the planes. The market for airplanes among trained pilots in Latin America is too small to be considered. The exporter must sell the government or operator and then proceed to train their personnel.

There are few flying schools in Latin America where students may receive training. Most of the pilots have been trained by American, German or French missions sent into the country under an agreement to train the necessary personnel to pilot new planes purchased. In some sections, schools were being organized. Plans for the completion of the Chilean airport at Los Cerrillos called for the establishment of a commercial flying school there in 1931. In Havana, the Cia. Cubana de Aviacion Curtiss offered flight training along with its charter and sightseeing service, and the Cuban Army Flying School trained eight pilots during the year. The aviation school at Santo Domingo in the Dominican Republic

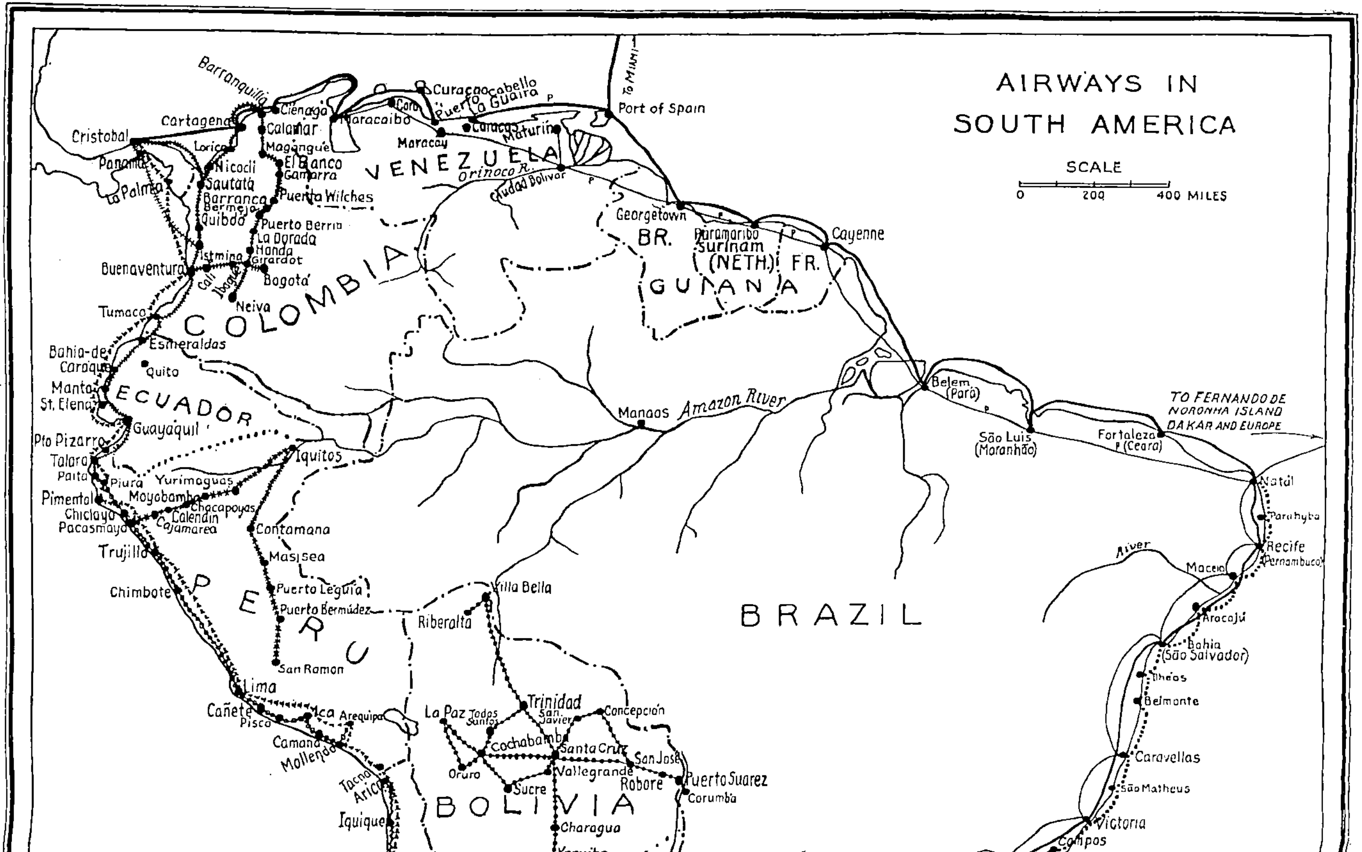
was destroyed by hurricanes which swept the country in 1930. In Guatemala, two students were under instruction of the Compagnia Nacional de Aviacion, and one soloed. Generally, however, flying instruction was confined to the army and navy establishments of the several governments.

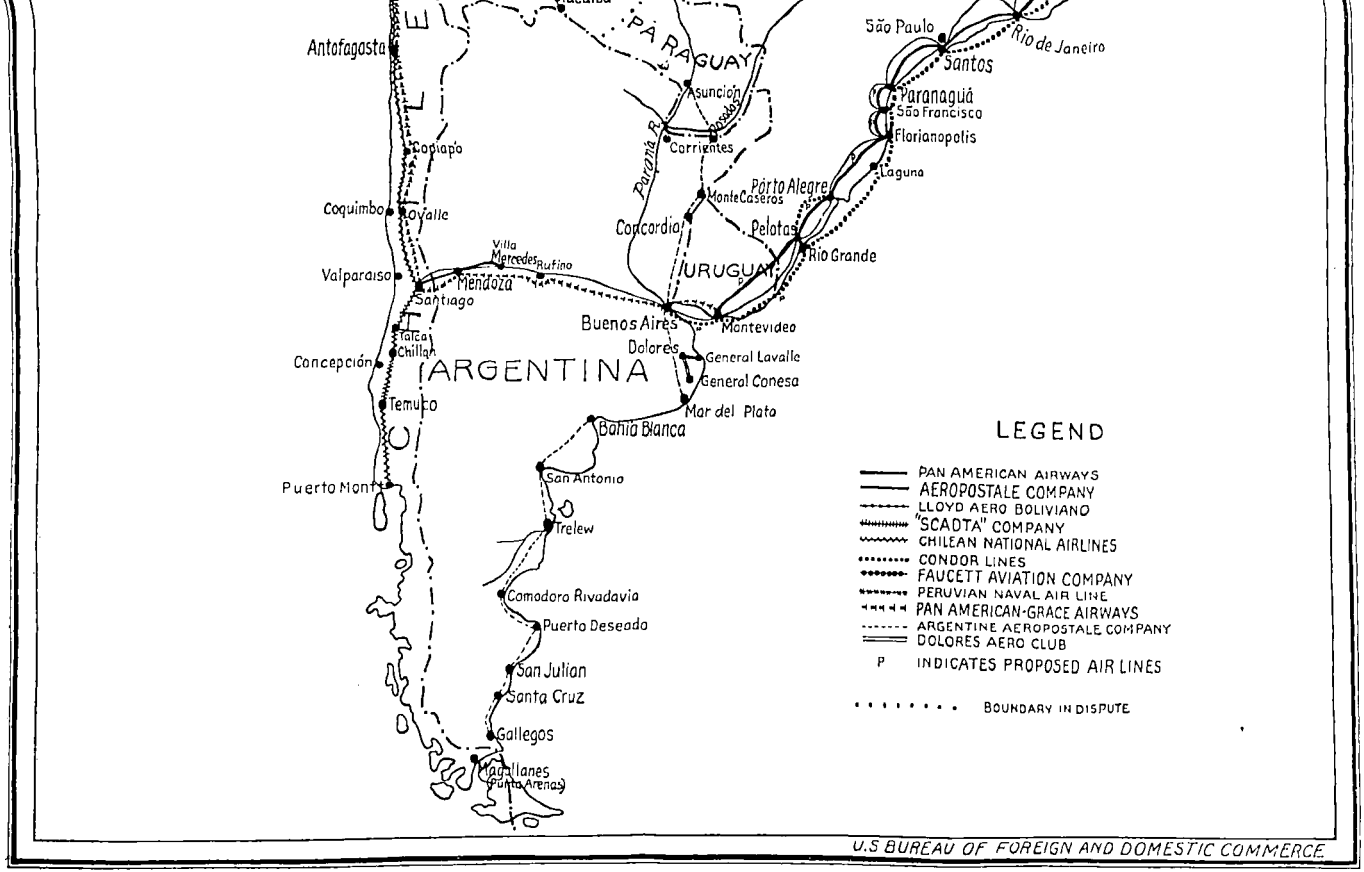
Aviation was playing an increasingly important part in the military services of Latin America, and several major skirmishes during the South American revolts of 1930 were aided by use of aircraft which routed ground forces of the opposing army. Many of the airports in South America were military airdromes or were controlled by the war department. Two military flights by Latin American officers during 1930 spurred a nationalistic interest in aviation. Commander José Estremadoyro of the Peruvian Air Service flew from Iquitos to Manaos, Brazil, and return over densely forested country, and Capt. Benjamin Mendez, American-trained Colombian pilot, flew from Bogota, Colombia, to Quito, Ecuador.

Military Aviation Develops

Chile had one of the largest aviation units in South America with more than three score planes in service. Mexico also had more than 60 planes in its air force. Peru had 33 planes in its military establishment, 20 at the Jorge Chavez military base and 13 in naval aviation. The government of Paraguay owned 33 planes, all of which were used for military purposes, eight of them for training. Uruguay's naval aviation service, which previously existed only on paper, came into reality during 1930 when three planes were purchased and the training of several naval pilots started. Equador's aviation corps had two American observation planes in its service. The United States Marine Corps, occupying Haiti under terms of the treaty of 1915, operated six planes for military purposes and maintained landing fields at Port au Prince and Cape Haiten. The Marines and the Pan American Airways contributed largely to the relief of Santo Domingo following the hurricane in September, carrying medical supplies, doctors and nurses to the stricken area. Nine airplanes were in the service of the Guatemalan air corps, while El Salvador had six planes in its military service. Argentina and Brazil both maintained aviation units in their armies. The Cuban Army Air Corps had 19 American military planes in service. Just as in the United States military aviation and organized commercial air transport are the backbone of aviation, so in Latin America they are responsible for the awakening of the public to possibilities of flying.

The air transport lines are breaking down nationalistic boundaries and are bringing the peoples of the various countries into closer social and business relations with each other. Journeys which previously required weeks or a month are now made in a day. The result is stimulated busi-


AIRWAYS IN SOUTH AMERICA
SCALE
0 200 400 MILES
TO MIAMI
Port of Spain
Curacao
Puerto Cabello
La Guaira
Caracas
Maracay
Coro
Maracaibo
Barranquilla
Cienaga
Cartagena
Calamar
Cristobal
Panama
La Palma
Lorica
Magangue
El Banco
Gamarra
Nicocli
Sautata
Puerto Wilches
Barranca Bermeja
Quibdo
Puerto Berrio
La Dorada
Honda
Girardot
Istmina
Buenaventura
Cali
Ibague
Bogota
Neiva
Tumaco
VENEZUELA
Maturin
Orinoco R.
Ciudad Bolivar
Georgetown
BR.
Paramaribo
Surinam (NETH.)
FR.
GUIANA
Cayenne
COLOMBIA
Esmeraldas
Bahia-de-Caraquez
Quito
Manta
St. Elena
ECUADOR
Guayaquil
Pto Pizarro
Talara
Paita
Piura
Yurimaguas
Iquitos
Pimentel
Moyobamba
Chacapoyas
Chiclayo
Calendin
Cajamarca
Pacasmayo
Contamana
Trujillo
Masisea
Chimbote
Puerto Leguia
Puerto Bermudez
PERU
San Ramon
Lima
Cañete
Pisco
Ica
Arequipa
Camana
Mollendo
Tacna
Arica
Iquique
Manaos
Amazon River
Belem (Para)
São Luis (Maranhão)
Fortaleza (Ceara)
TO FERNANDO DE NORONHA ISLAND DAKAR AND EUROPE
Natal
Parahyba
Recife (Pernambuco)
River
Maceio
Aracajú
Bahia (São Salvador)
Ilheos
Belmonte
Caravellas
São Matheus
Victoria
Campos
BRAZIL
Villa Bella
Riberalta
Trinidad
La Paz
Todos Santos
San Javier
Concepcion
Cochabamba
Santa Cruz
San José
Oruro
Vallegrande
Robore
Puerto Suarez
Corumba
Sucre
BOLIVIA
Charagua



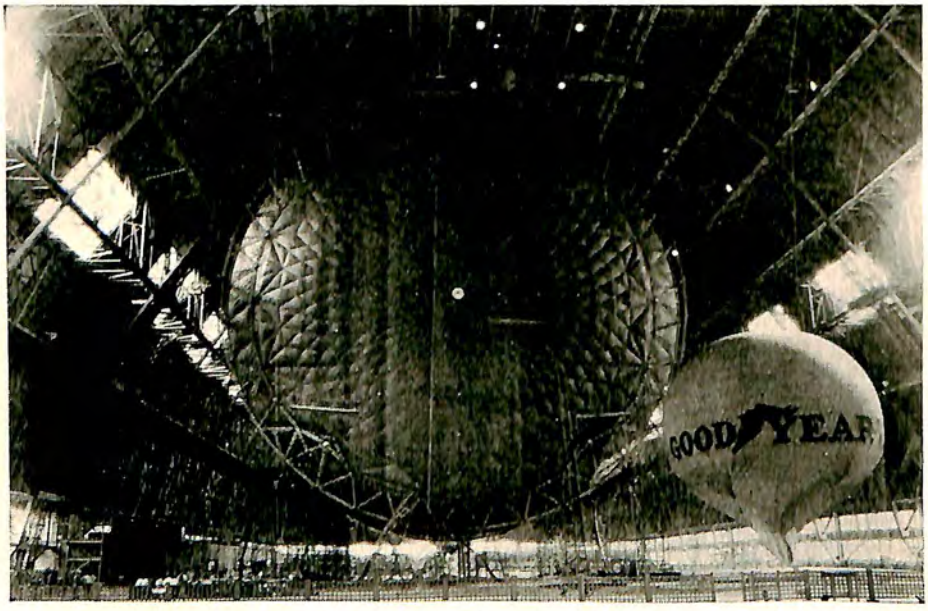
U.S BUREAU OF FOREIGN AND DOMESTIC COMMERCE

ness activity in Latin America, toward which American business and enterprise are turning an attentive eye. The markets of South America are brought as close to the New England manufacturer as our own Pacific Coast, and new trade territories are being developed.

Aviation and especially air transport has a strong foothold in Latin America. The year 1931 should see a rapidly expanding volume of business for these lines as "Latin America by Air" becomes commonplace for the American business man and South American traveller alike.

NAVY'S SKY QUEEN

With towering skyscrapers reaching up into the sky beneath it, the U. S. S. Los Angeles flies serenely over lower Manhattan headed west.



BUILDING NEW DIRIGIBLE

First gas cell for the U. S. S. Akron, world's largest dirigible under construction for the Navy, has capacity of 950,000 cubic feet.

CHAPTER V

PROJECTED WORLD AIRSHIP SERVICES

Groundwork Laid for Trans-oceanic Routes—Two New Companies Organized—ZRS-4 Nears Completion for Navy—Largest Non-Rigid Ship Ordered—Los Angeles Used in Tests—Huge Metalclad Airship Proposed

LIGHTER-THAN-AIR activities promised to share a large part of the attention given to aviation during 1931, as plans for projected world airship services advanced nearer the stage of realization. The world's largest dirigible, the U. S. S. Akron, was nearing completion in the Goodyear-Zeppelin dock at Akron under contract for the United States Navy. The Graf Zeppelin added to its international fame in 1930 through a highly successful four-continent flight. The R-100, Britain's sky queen, completed a round trip across the Atlantic to Canada and was ready for further flights to frontiers of the Empire. The U. S. S. Los Angeles piled up additional hours to its impressive record, which represents a longer period of service than any other rigid airship ever built. The R-101 disaster failed to shake America's confidence in the future of lighter-than-air craft and served to emphasize the importance of helium for inflation of future ships and the value of America's World War heritage in the acquisition of German engineers experienced in the design of great airships. Success of the first metalclad airship ever built prompted the proposal of a new 100 ton metal airship for the United States Army.

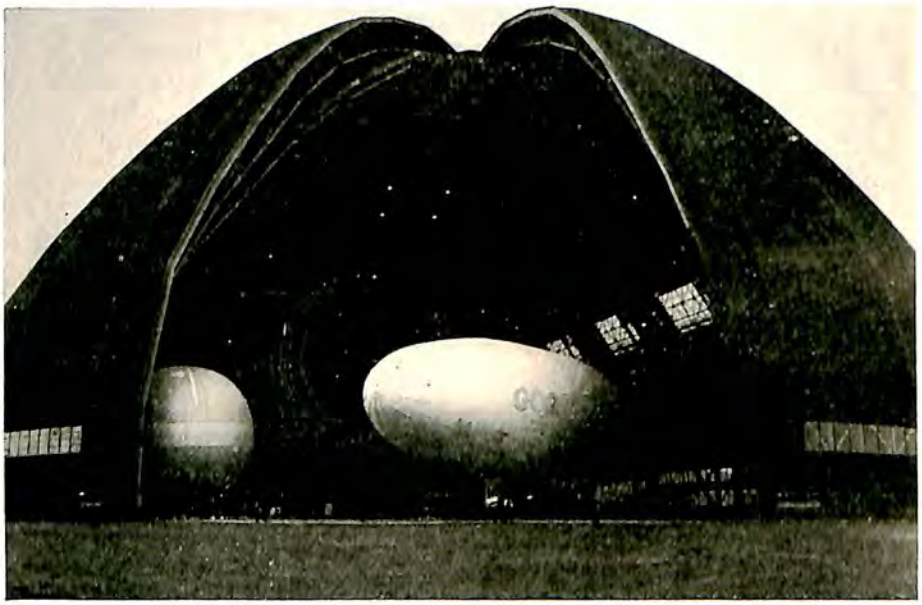
Late in 1929, two companies whose aim is the development of world-wide commercial transportation with rigid airships were organized under the laws of Delaware. The International Zeppelin Transport Company, in which are both American and German interests, is looking toward the establishment of a trans-Atlantic line, while the Pacific Zeppelin Transport Company, an entirely American organization, expects to establish a line extending from the west coast to the Hawaiian Islands and the Philippines, and eventually to the Orient.

The McNary-Parker bill before Congress would provide legal status for commercial airships in international commerce, and authorize letting of mail contracts. Upon its adoption depends to a great degree the early beginning of world airship service, lighter-than-air experts said.

During 1930, engineers of the International Zeppelin Transport Company and the Pacific Zeppelin Transport Company were gathering data regarding possible terminal sites on both the east and west coasts of North

America, and on operating costs. It was expected that ships of 6,500,000 cubic foot capacity, the same size as the ship now being built for the Navy by the Goodyear-Zeppelin Corporation, would be used in the trans-Atlantic and trans-Pacific services.

Banking, steamship and aircraft interests, as well as the Goodyear-Zeppelin Corporation, are represented in the International Zeppelin Transport Company. Among them are: the National City Company, Aluminum Company of America, United Aircraft and Transport Corporation, Union Carbon and Carbide Company, Grayson M-P Murphy Company, Lehman



GIANT "ORANGE PEEL" DOORS OPEN

Great doors of the Goodyear-Zeppelin airship dock at Akron roll back to reveal the Vigilant, a free balloon and the framework of the ZRS-4.

Bros., Goodyear Tire and Rubber Company, Luftschiffbau-Zeppelin and a group of German banks.

Directors of the Pacific Zeppelin Transport Company included: P. W. Litchfield, Goodyear president; J. P. Ripley, Natinal City Bank; E. O. McDonnell, Grayson M-P Murphy Company; Allan S. Lehman, Lehman Brothers; R. Stanley Dollar, Dollar Steamship Company; Col. E. A. Deeds, National City Company; F. B. Rentschler, United Aircraft and Transport Corporation; Henry O'Melvany, Los Angeles; Kenneth R. Kingsbury, Standard Oil Company of California; W. P. Roth, Matson Navigation Company, Herbert Fleischacker, Anglo-London-Paris Bank of San Francisco; Clarence H. Cooke, Bank of Hawaii; John R. Galt, Hawaiian Trust

Company; Walter Dillingham, Honolulu; Harry Chandler, Los Angeles Steamship Company; C. M. Keys, Transcontinental and Western Air, Inc.; J. A. Talbot, Western Air Express and Fokker; Juan T. Trippe, Pan American Airways; Graham B. Grosvenor, Aviation Corporation; and Edward P. Farley, American-Hawaii Steamship Company.

Great Britain is known to be contemplating the establishment of inter-dominion lighter-than-air services, with routes to Canada and India certain to have first consideration. Russia was identified with rumors of negotiations with German Zeppelin interests to build a ship for operation between Berlin, Moscow, Yakutsk and Vladivostok, on the Pacific coast of

GREAT DIRIGIBLE TAKES FORM

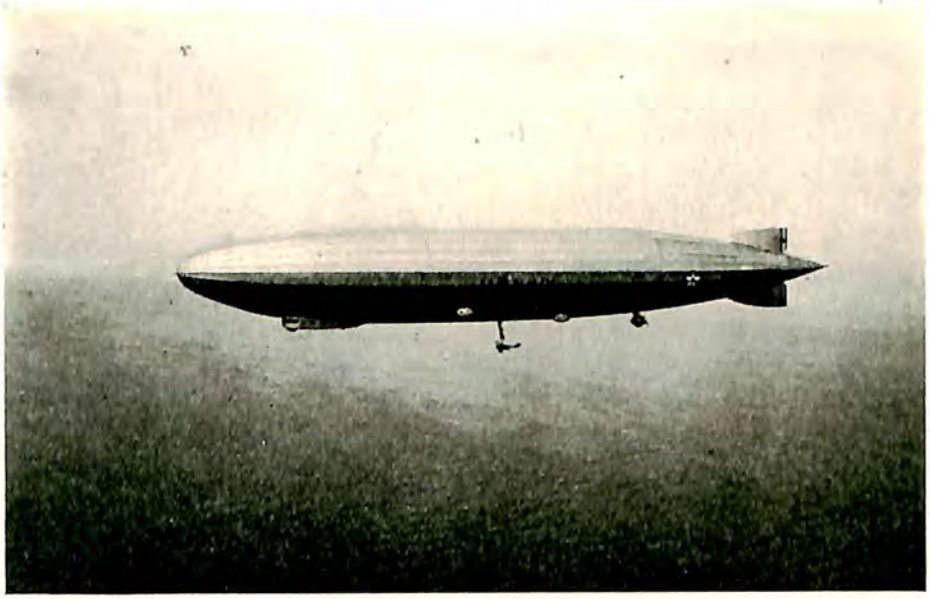
U.S.S. Akron, the world's largest dirigible, is seen under construction at Akron on Navy Day when Rear Admiral Moffett accepted a flag for the new ship.

Siberia. The Germans would build the first dirigibles, and Russia would enter construction of its own ships later. Japan was linked with plans for world airship services when Toyoji Keneko, acting consul general of Japan, announced that a $15,000,000 Japanese company had been formed to operate a 68 hour dirigible service between Tokio and San Francisco. He said Japan was negotiating for the purchase of three German airships to cost $1,500,000 each. Acquisition of a large tract of land near Tokio for a base was authorized.

Analyzing the costs and potential revenues of an airship service between Great Britain and the Western Hemisphere across the North Atlantic, Sir C. Dennis Burney, designer of the R-100, holds that profitable operation of such a line is possible. He made a detailed report to the

British government, conservatively estimating possible revenues and costs of operation based on present day experience. He suggested that four dirigibles be used in a twice-weekly service to provide sufficient regularity to make it attractive to trans-Atlantic passengers.

Compared with the steamship Leviathan, a 300 ton airship, twice the sibe of the R-100, would transport 21 per cent of its gross displacement in pay load in addition to 50 per cent fuel reserve and a crew at from 70 to 80 knots, while the Leviathan fully loaded carries only four per cent of its gross displacement in pay load at 24 knots.



FIND THE AIRPLANE

The giant dirigible Los Angeles dwarfs the Vought Corsair hooked onto a trapeze beneath it in flight near Lakehurst.

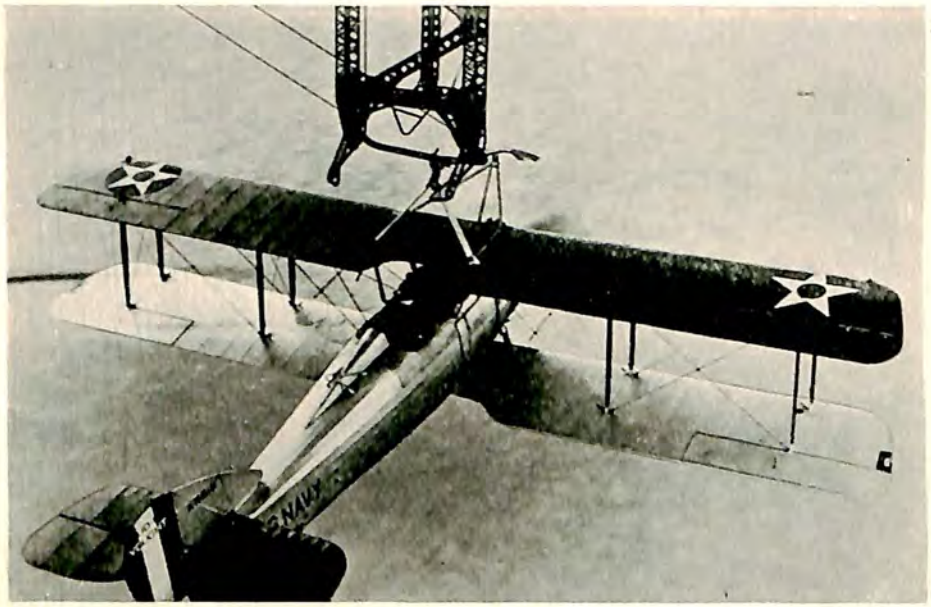
"Akron" Nears Completion

The year 1930 saw rapid strides in the construction of the ZRS-4, the 6,500,000 cubic foot rigid airship being built at Akron for the U. S. Navy by the Goodyear-Zeppelin Corporation. With actual assembly of the frame just begun as the year 1930 opened, the ship has taken shape and more than 700 feet of the framework had been erected at the close of the year. The nose was in place January 1, leaving but 85 feet of the after-portion of the craft to be constructed.

The Navy Department formally named the ZRS-4 the "U. S. S. Akron", in recognition of the place held by that city in fostering lighter-than-air throughout the years. Public interest in the construction work has grown

steadily since the framework began to reveal the immensity and beauty of line of the "Akron." Thousands of visitors have filed through the dock, which is the largest structure in the world without internal support, and was completed in January, 1930.*

Work on the control cabin was well under way by the end of the year, while construction of gas cells and outer covering for the ship had begun. The control cabin will be the only portion of the ship extending outside the hull, as the motors are housed inside, with power being delivered to propellers mounted on outriggers through a specially designed bevel gear



HOOKED ON LOS ANGELES

Preparing for the day, not far distant, when dirigibles will have airplane hangars in their hulls, a Vought Corsair hooks onto the U.S.S. Los Angeles in flight.

device. Installation of the motors inside the hull itself eliminates the necessity of suspended gondolas as in past practice. This is made possible through use of helium, the non-inflammable non-explosive lifting gas found only in America, and through the added strength given by the triple keel system built into the structure.

Motors Are Tested

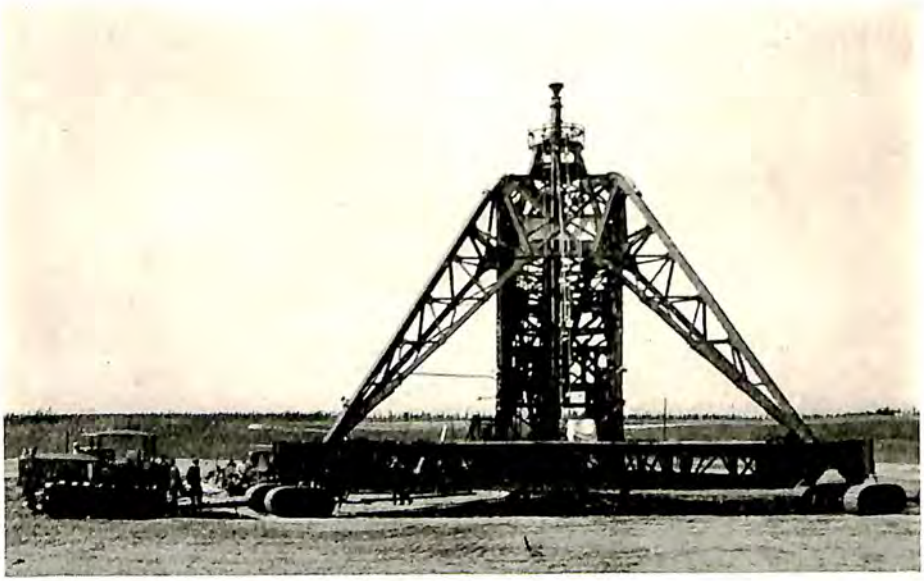
There will be eight motors totaling 4,480 horsepower on the "Akron," and these have been received and have been tested in a replica of the ship's motor rooms. The power transmission device, which allows the

* For description of dock, see "The Aircraft Year Book for 1930."

propellers to be tilted on their axes through a 90 degree arc, making it possible for them to be used in a vertical as well as horizontal direction, has also been thoroughly tested by both Navy and Goodyear engineers during the year.

On Navy Day, October 27, school children of the city of Akron presented to Rear Admiral William A. Moffett, chief of the Navy's Bureau of Aeronautics, a silk flag, to be the "Akron's" official colors. At that time, crowds estimated at 50,000 were present.

The "Akron" was designed by Dr. Karl Arnstein, vice-president of the



FACILITATES DIRIGIBLE HANDLING

New mobile dirigible mooring mast is capable of receiving giant airship, drawing it to earth and then "walking it" into the hangar without large ground crew.

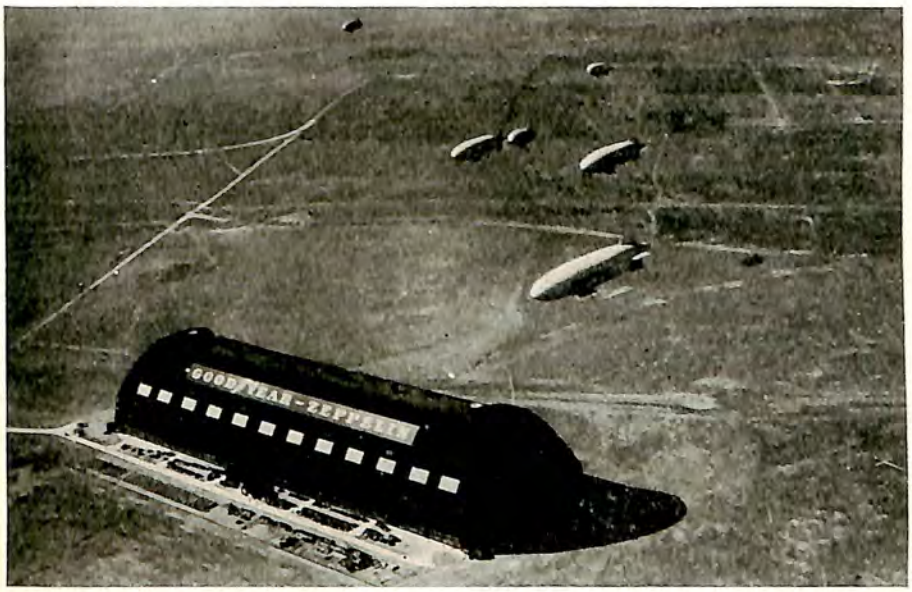
Goodyear-Zeppelin Corporation, who designed and constructed more than 70 of Germany's war time Zeppelins. The general superintendent of construction is W. H. Collins, who formerly held a similar post with the Bethlehem Shipbuilding Corporation, while Z. W. Wicks is erection superintendent. Wicks was formerly a commander in the Navy, and was at one time in charge of the government's helium plant at Amarillo, Texas, and later executive officer at the Naval Air Station at Lakehurst, N. J.

Non-Rigid Ordered by Navy

A new non-rigid airship, the largest of this type ever built in the United States, was under construction for the United States Navy for use in re-

search to develop a fuel gas which may replace gasoline. The envelope for the new ship, which will have a gas capacity of 320,000 cubic feet, was being built at Akron by the Goodyear-Zeppelin Corporation, while the car was being constructed at the Naval Aircraft Factory in Philadelphia. The new ship will be one and one-half times as large as the biggest blimps now operated by the Navy, the J-3 and J-4, and will be twice the size of the largest commercial non-rigid. The new airship will be 200 feet long and 54 feet in diameter.

Use of a fuel gas of the same density as air has long been desired by

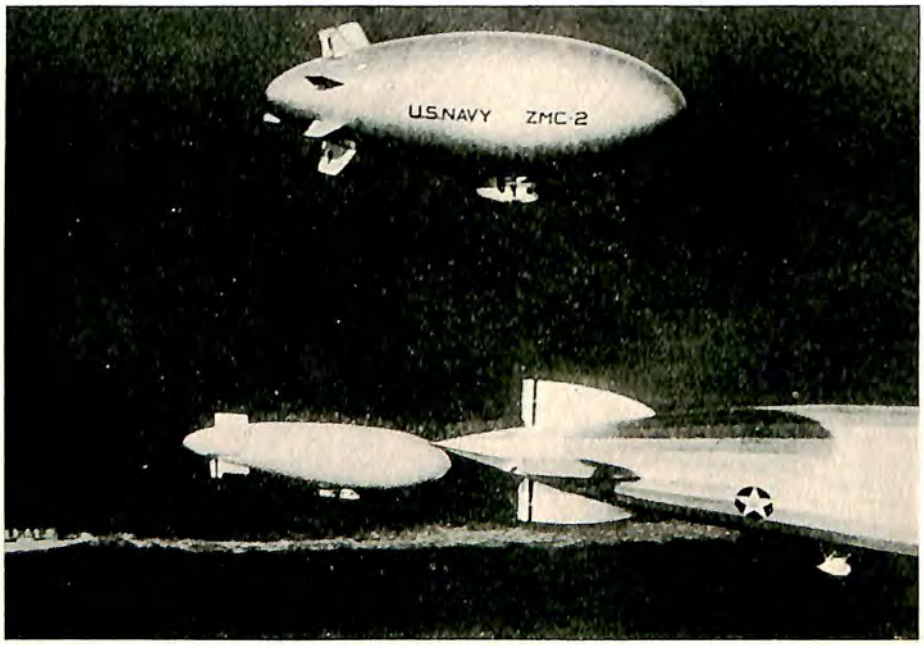


BLIMP FLEET OVER DOCK

Six small airships of the Goodyear-Zeppelin corporation flying over the giant dock in which the world's largest dirigible is being built.

lighter-than-air engineers since it would obviate the necessity of water recovery which is now required to maintain equilibrium and to conserve the valuable helium lifting gas. Development of a fuel gas to replace gasoline has previously been strictly a German development resulting in the use of "Blau gas", named for its inventor, Dr. Blau, in the Graf Zeppelin. The Navy also experimented with a mixture of hydrogen and helium, and it was found possible to use up to 14 per cent of hydrogen in the mixture and still maintain the non-explosive characteristic of the gas. While no conclusive result was announced, it was found that the hydrogen mixture provided better lifting power and was considerably cheaper than pure helium.

The dirigible "Los Angeles" was used during 1930 in extensive tests of new devices to be incorporated in the dirigible "Akron," and in the development of knowledge in the mechanical handling and mooring of rigid airships. A Navy board assigned to the task of examining the "Los Angeles" in November, 1930, reported that the dirigible should last from two to four years longer. Having flown 110,000 air miles and having spent 1,200 hours at mooring masts, the "Los Angeles" passed through a useful life greater than that of any other rigid airship known to date. It was flown across the Atlantic by Dr. Hugo Eckener after being completed in 1924 at Friedrichshafen under terms of the Versailles Peace Treaty.



METALCLAD KEEPS PACE

First metalclad airship of the U. S. Navy, the ZMC-2, flying in formation above the stern of the Los Angeles and one of the Navy blimps.

The possibilities of launching gliders from airships in flight were demonstrated in January by Lieut. Ralph S. Barnaby of the Navy when he left the dirigible "Los Angeles" near the Naval Air Station at Lakehurst and after 12 minutes of gliding landed at the station. Lieut. C. M. Bolster had previously left the "Los Angeles" in an airplane which had been hooked onto the dirigible in flight by Lieut. A. W. Gorton. The tests were made to study problems concerned with the new Navy dirigibles which will house five planes in their hulls, launching them from a trapeze through

a door in the bottom of the airship and hauling them back in after their mission has been completed.

The Graf Zeppelin, Germany's latest rigid airship, added to its laurels during the year with a flight from Europe to Africa, South America, North America and return to Friedrichshafen described in the chapter on "History-Making Flights of 1930." Finishing its 1930 flying season late in November, the Graf was deflated and given a thorough overhauling during the winter months. Since it was placed in service, the Graf Zeppelin has made 155 flights, covered 144,375 miles, has carried 6,278 passengers, 12,000 pounds of freight and 18,000 pounds of mail and has earned enough to pay for fuel, wages for her crew, insurance and depreciation.

LZ-128 Construction Halted

Dr. Eckener halted construction on the Graf's sistership the LZ-128 early in November, 1930, and announced that it would be redesigned in view of the R-101 disaster so that the new ship will use helium imported from the United States. The LZ-128 was to be completed in 1931, but two years work must be undone to complete the redesigned ship. The ship was to be ready by 1932 under the new plan.

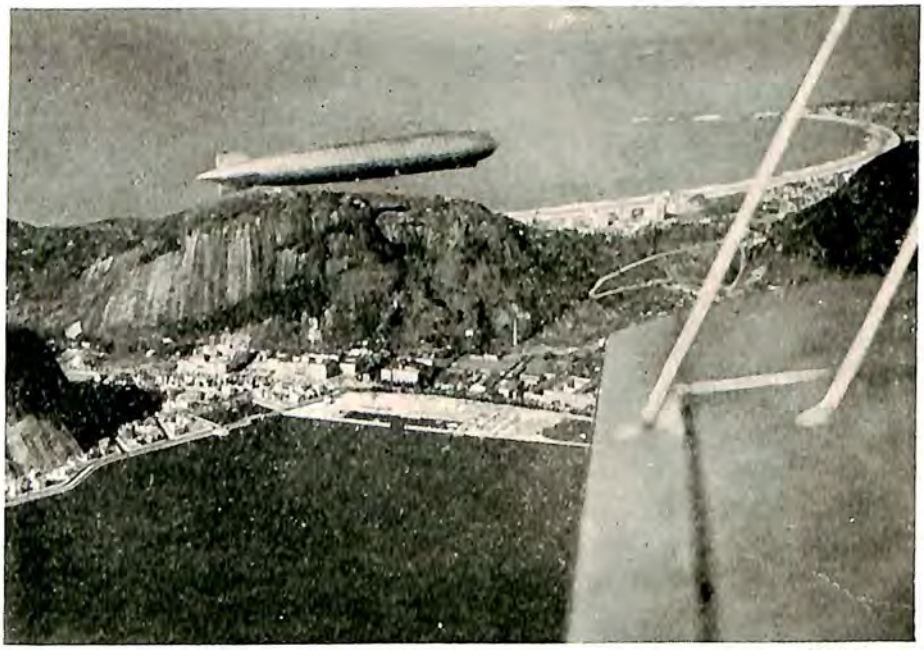
The LZ-128 was to be somewhat larger than the Graf Zeppelin measuring 815 feet in length and 130 feet in diameter as compared to the Graf's 775 foot length and 90 foot diameter. The displacement of the new dirigible was to be 5,250,000 cubic feet as compared to 3,877,000 cubic feet for the Graf. Crude-oil motors will drive it through the air instead of engines using Blau gas. Use of helium was expected to increase its new size substantially.

The British R-100, the largest rigid airship in the world at the close of 1930, had successfully completed her first mission, a round-trip flight to Canada from England. Details of this journey are described in the chapter on "History-Making Flights of 1930." Her sistership, the R-101, patched up by the addition of a section amidships to give her greater lifting power, was not so fortunate, crashing near Beauvais, France, on a flight to India with the loss of her crew and a distinguished group of passengers. The British Court of Inquiry had not yet presented its report at the close of the year. David S. Ingalls, Assistant Secretary of the Navy for Aeronautics, commenting upon the disaster, said that it would not in any way affect the Navy's policy toward lighter-than-air. He added that he hoped the knowledge which may come through the disaster may be a means of great saving of life and property in the future.

The Metalclad Airship ZMC-2, built for the United States Navy by the Aircraft Development Corporation, a division of the Detroit Aircraft Corporation, was in service throughout 1930, using the Naval Air Station at

Lakehurst, N. J., as its base. During the sixteen months of its operation, it was flown more than 300 hours and, according to naval officers, functioned satisfactorily as an experimental and training ship. It was reported that the ship had come up to expectations, that it has high structural strength and maneuverability, and has demonstrated its ability to retain helium with less leakage than fabric covered airships of similar size.

The ZMC-2 has a capacity for 200,000 cubic feet of helium and is powered with two air-cooled engines totaling 450 horsepower, giving it a top speed of approximately 70 miles an hour. The only change in the



Ludwin.

RIO HAILS TRANS-ATLANTIC LINER

"Graf Zeppelin," finishing one lap of its four-continent flight to the United States, sails majestically over Rio de Janeiro.

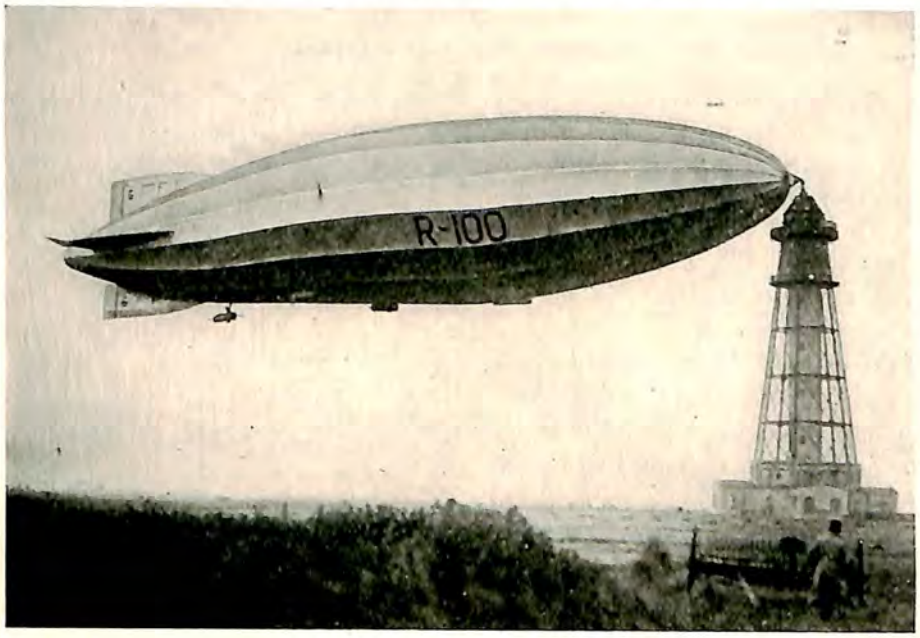
ship since its delivery to the Navy was the substitution of a landing wheel underneath the pilot's cabin for a skid originally used.

The hull covering the ship consists of thin aluminum alloy sheets .0095 inch thick. Hence the name Metalclad. The seams of these sheets are gas tight, the metal hull thus serving as a direct container for the buoyant helium gas as well as carrying all shear stresses and to a large extent the tensile stresses also. The entire outer surface of the metal hull was thoroughly examined and no corrosion or deterioration of any consequence was

discovered. The metal covering was slightly tinted by oxidation, giving it the appearance of a metal airplane under a similar length of service.

100-Ton Metalclad Proposed

Utilizing the engineering development and experience gained from the construction of the ZMC-2 as a basis for research and investigation, the engineering department of the Aircraft Development Corporation was engaged during 1930 in the design of a 100-ton, 100-mile-an-hour Metalclad airship suitable for either military or commercial use. The Vandenburg-



R-100 FLIES TO CANADA

British sky queen is moored to the new $750,000 mast at St. Huberts' Airport near Montreal, Can., after flight from England.

Kahn bill before Congress would, if passed, authorize the Army Air Corps to contract for the construction of a ship of this size at an estimated cost of $4,500,000.

This ship would be about 550 feet long; would have a maximum diameter of 120 feet; would be powered with engines totaling 4,800 horsepower and would have an air displacement of about 4,000,000 cubic feet. Its military uses would include: training of personnel, transport of military supplies and personnel, submarine research, destruction of mines by direct gun fire, and long distance reconnaissance. It would be able to transport

40,000 pounds of military load from Washington to Panama in 30 hours at a cruising speed of 80 miles an hour.

It was pointed out by the designers that this ship would be valuable not only from a military standpoint, but it would also furnish a technical demonstration of large metalclad airships, thus laying the foundation for the commercial utilization of similar size ships operating from the United States to the important sea coast cities of Central and South America.

The metalclad airship is distinctly an American development. The success of the first unit, the ZMC-2, has stimulated world wide interest in engineering circles as to its possibilities.

Blimps Pile Up Record

An impressive record for hours flown, miles covered and passengers carried was set up during 1930 by the six non-rigid airships of the Goodyear-Zeppelin Corporation, the only lighter-than-air ships operating commercially in the United States.

The fleet consisted of the Defender, Puritan, Volunteer, Mayflower, Vigilant and Pilgrim. The Pilgrim, smallest and first of the six to be built, made its first flight in 1925 and has been in operation ever since. In 1930, more than 35,000 people were carried by the fleet in various sections of the country, while a total of more than 6,000 flying hours was piled up. It was estimated that the ships flew 300,000 miles during the year. Not a single flight accident resulting in injury or death of passengers or personnel was incurred in making this record.

New Lighter-than-Air School

Of great interest to aviation during the year was the announcement 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 University of Akron, at Akron, Ohio, was granted $175,000 for carrying out this work. Of this sum, it was specified that $120,000 be used to cover the costs of operation for five years, while the remaining $55,000, together with an additional sum of $100,000 secured by bonds voted by citizens of Akron, was to be used for construction and equipment of a building in which the research work will be conducted.

A site has been selected and plans for the building are being drawn up with construction work due to begin in the spring of 1931. Actual operations are to begin in September, 1931, with Dr. von Karmen of California Tech. as director. The California Institute of Technology was granted $75,000 for furthering lighter-than-air research by the Guggenheim Fund and the University of Akron is to work in conjunction with California Tech.

CHAPTER VI

A'WING WITH THE ARMY AIR CORPS

Thirty-two Million Miles Flown in 1930—Squadron Flies in Formation Six Miles High—War Games Illustrate Efficiency—"Robot" Flies Bomber—New Aircraft Ordered—Five-Year Program

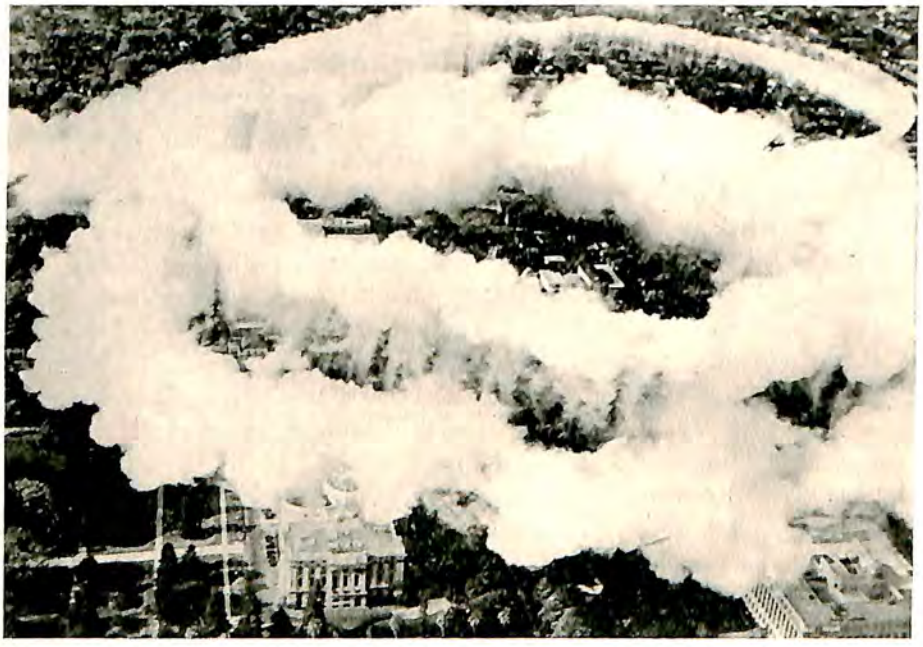
THE United States Army Air Corps, flying more miles during 1930 than any other single organization in the world, continued to develop the efficiency of its operations as an important link in the national defense. The Army Air Corps covered a wide range of activities in the execution of which 32,500,000 miles were flown.

The annual "war games" of the Army Air Corps and special military missions carried out during each year provide a striking picture of the progress that has been made in the development of military aviation. The spectacular performance of 19 Boeing pursuit planes, powered with supercharged Pratt and Whitney Wasp engines, climbing in combat formation to 30,000 feet above Sacramento, California, April 12, was the highlight of the 1930 maneuvers on the west coast. Only a few years before, six miles above the earth was a mark for special altitude fliers to shoot at, yet in 1930 Army pursuit pilots pushed the fighting front of the air to that height and maintained communication with the ground by radio throughout the formation flight. Pilots who outclimb their opponents always have the upper hand in pursuit combat and the Army Air Corps indicated that it intended to maintain its lead in this field. The 95th Pursuit Squadron, which accomplished the mission despite temperatures of 40 degrees below zero and thin air in which the pilots were forced to use oxygen, again demonstrated its skill in a simulated attack upon Los Angeles in June.

Enemy forces had taken Los Angeles, according to the theoretical problem, and had destroyed a large portion of the business district to establish headquarters, anti-aircraft nests and an ammunition base in the heart of the city. The high command was operating from the City Hall. Preparatory to reoccupation by friendly troops, the Army Air Corps was ordered to destroy the enemy's stronghold, disorganize their forces and throw them off their guard for an attack by friendly Infantry. Six giant Curtiss Condor bombers, powered with Curtiss Conqueror engines, were dispatched by the 11th Bombardment Squadron from San Diego, flying at an altitude of 15,000 feet, loaded with bombs, and protected by the 95th Pursuit Squadron flying from five to six miles above the earth. The little single-seater fighters could not be heard or seen from the ground. It was the

first time in history that an air squadron was to launch an attack from such a height.

A few seconds before the bombers arrived over the city on their deadly mission of destruction, carrying 24,000 pounds of bombs, the 95th Pursuit Squadron dove earthward, belching out volleys of machine gun fire and releasing light bombs on the enemy's anti-aircraft nests, theoretically disabling them to such an extent that they could not damage the oncoming bombers. Then the light pursuit planes zoomed back up into the sky,



CALIFORNIA'S CAPITOL HIDDEN

Spreading a smoke screen over the capitol grounds at Sacramento, Cal., during the Army Air Corps West Coast maneuvers.

ready to come down to the aid of the big bombers if necessary. Continuous radio communication was maintained in the air between the two squadrons and with their ground bases. The world was permitted to listen-in on the proceedings over a nationwide radio hookup. The giant bombers soon "laid their eggs" and wiped out the enemy base, making it possible for ground troops to enter again and reoccupy Los Angeles.

During the west coast maneuvers, a bombardment plane equipped with a "robot" pilot demonstrated what might be expected in the elimination of the human element as far as possible in future aerial tactics. The automatic pilot flew a huge twin-motored bomber from Sacramento to San

Francisco and returned without a human hand touching the controls. Less spectacular than these demonstrations during the "war games", but just as important from a military standpoint, was the transfer of 150,000 pounds of supplies, including pursuit-plane wings and heavy engines, from San Diego to Sacramento and return, a distance of 1,000 miles. It demonstrated that aircraft units can transport their own supplies over great distances without serious attention to bulk or weight.

The flight of an Air Corps transport plane from Miami to Panama, 1,200 miles, in 11 hours and 25 minutes in February, the night raids con-

BOMBERS DURING MANEUVERS

Eighteen Keystone Army bombers (2 Pratt and Whitney Wasps) in formation flight during Air Corps "war games" on West Coast.

ducted by the Third Attack Group, the protection of New York from a mythical enemy by a smoke screen in September, and the actual bombing of obsolete airplanes near San Antonio, Texas, in November, all served to illustrate graphically the increasing effectiveness of aircraft in military operations.

The use of aerial photography in military tactics made a material advance during 1930 with the successful photographing of Mount Ranier from a distance of 270 miles by Capt. A. W. Stevens of the Army Air Corps. This achievement paralleled another record made when photographs were taken by the Air Corps from an altitude of 39,000 feet. Air Corps photographic sections performed mapping missions for the War De-

partment and other federal agencies covering more than 14,000 square miles during the year. Upon the request of the Costa Rican government, the Air Corps completed the photographing of the proposed Pan American highway in October.

An interesting technical development in military aircraft design during 1930 was linked with photographic missions deep in enemy territory. The Fokker Aircraft Corporation built a twin-motored monoplane, the XO-27, especially for photographic missions under war time conditions. The

FLYING SECRETARY OF WAR

Assistant Secretary of War F. Trubee Davison, in charge of Army aviation, and Capt. Ira C. Eaker ready for trip in the Army's new Consolidated Fleetster (Pratt and Whitney Hornet).

plane, representing many departures from conventional design, had two 600 horsepower Curtiss Conqueror engines recessed into the wings and was equipped with retractable landing gear. The bow cockpit was equipped as a darkroom for the photographer-observer, while a pilot and gunner-radio operator made up the other members of the crew.

A new experimental observation plane was developed by the Curtiss Aeroplane and Motor Company and delivered to the Army Air Corps late in the year. Known as the XO-1G, the plane was powered with a water-

cooled Curtiss D-12 engine and showed a speed of 147 miles an hour in preliminary tests, considerably faster than standard types in use. The landing gear was streamlined to reduce wind resistance. The wheels were located further back than on other designs and the landing gear was shorter, tending to eliminate ground loops. Brakes and a 12-inch pneumatic tail wheel, which could be steered by the pilot, were additional features.

Keystone Panther bombers, powered with Wright Cyclones or Pratt and Whitney Hornets, and Curtiss Condors, powered with Curtiss Con-

Associated Press.

HIDING NEW YORK FROM THE ENEMY

Army planes lay a smoke screen along the Battery to hide the great metropolis from an imaginary enemy during maneuvers.

queror engines, dominated the equipment of the bombardment division of the Army Air Corps. In the pursuit squadrons, Boeing P-12's, powered with Pratt and Whitney Wasp engines, or Curtiss Hawks, powered with Curtiss D-12 engines, were generally used. Both types carried two machine guns firing through the propeller arc. Curtiss Falcons, powered with Curtiss D-12 engines, were used by attack squadrons, while Douglas O-2 or Douglas O-25 observation planes were in general service among observation units.

At the close of 1930, the Army Air Corps had passed the halfway mark toward the goal for aircraft procurement set by the five-year military

program created by the act of July 2, 1926. In general, the act proposed to create a bombardment wing on each coast of the United States, an attack wing in the center of the country, and an additional pursuit group on the northern border. Provision also was to be made for defense of the insular possessions, an observation squadron and a photo section in each of the nine corps areas, and the necessary schools and other utilities. It proposed to provide the Army Air Corps with a total of 1,800 "serviceable airplanes" at the end of the five-year period.

During 1930, the Judge Advocate General of the Army rendered an

READY TO "LAY ITS EGGS"

Giant Curtiss Condor bomber (2 Curtiss Conquerors) carrying a huge bomb beneath its fuselage for release in maneuvers.

opinion that the "1,800 serviceable airplanes" authorized by the Army Air Corps act did not include airplanes undergoing major overhaul or repair at Air Corps depots as they were manifestly unserviceable during the time they were at the depots. The opinion was approved by the Secretary of War. It appeared that the tactical units could never be brought up to the strength called for unless such a ruling could be held as the intent of Congress in enacting the legislation.

According to provisions of the five-year program, the Army Air Corps should have had 1,520 serviceable airplanes on hand at the close of the fiscal year 1930. It actually had 1,319 airplanes on hand and 211 on order.

The 1,319 airplanes, however, included those which were undergoing major overhaul and repair and 133 airplanes which were more than five years old. The equipment problem was primarily one of quantity, since the quality of Army aircraft showed continued improvement.

The "West Point of the Air", the Army Air Corps' great training center at Randolph Field near San Antonio, Texas, was brought a step closer to completion during 1931. When ready for occupancy in January, 1932, it will be the largest and most comprehensive aviation school in the world, covering 2,300 acres of buildings centered on 450 acres. It was planned at a cost of $11,000,000.

READY FOR "DOG FIGHT"

Boeing P-12 Army pursuit plane, powered with a Pratt and Whitney Wasp engine, such as was seen in combat maneuvers in the West.

Pending the opening of the new school, the older training centers at Kelly, Brooks and March fields carried on, graduating 306 advanced students during 1930. While an increasingly large number of West Point graduates sought admission to the Air Corps, the vast bulk of flying cadets came from civil life. More than 4,000 youths sought to enter the Air Corps schools during 1930; 932 qualified for admission; 591 were sent to training schools; 227 completed the course and 141 qualified for commissions in the Regular Army.

The Air Corps personnel problem continued to be one principally of

rank. Although Tables of Organization called for a major to command each squadron, only five out of 53 squadrons were commanded by majors; captains, first lieutenants, and in some cases even second lieutenants were in command of squadrons, charged with the lives and training of 18 fellow officers, 129 enlisted men, and planes, armament, and other equipment valued at more than a half million dollars. The Assistant Secretary of War for Aeronautics requested the speeding up of Air Corps promotion scheduled for officers, and the creation of adequate grades and ratings for enlisted men.

The five-year program called for 1,374 regular officers at the end of the fiscal year 1930. Officers actually commissioned at that time numbered

COMBAT PLANES IN ACTION

Boeing pursuit planes (Pratt and Whitney Wasps) flying over Olympic Mountains on their way from Seattle to San Diego to participate in maneuvers.

1,271, an increase of 79 over 1928–29. The program called for 12,086 enlisted men at the end of this period, and the Air Corps was only 54 short of this total. The program also authorized 330 reserve officers on extended active duty, but only 258 were assigned because of the limited number of planes available. The Assistant Secretary of War for Aeronautics urged the provision of additional service-type equipment for the use of reserve officers. Reserve training totaled 22,500 hours during 1930, which was considered far from adequate by Air Corps officials.

Military aviation will always contain a greater element of danger than any other form of flight, because of the extra demands made upon planes and pilots by acrobatic and other tactical requirements, but the efforts of

the heads of the Air Corps to promote efficiency of operations were closely synchronized with a steadfast purpose to insure the safety of fliers through sturdy equipment and careful training plus as many hours of flying practice as funds permitted.

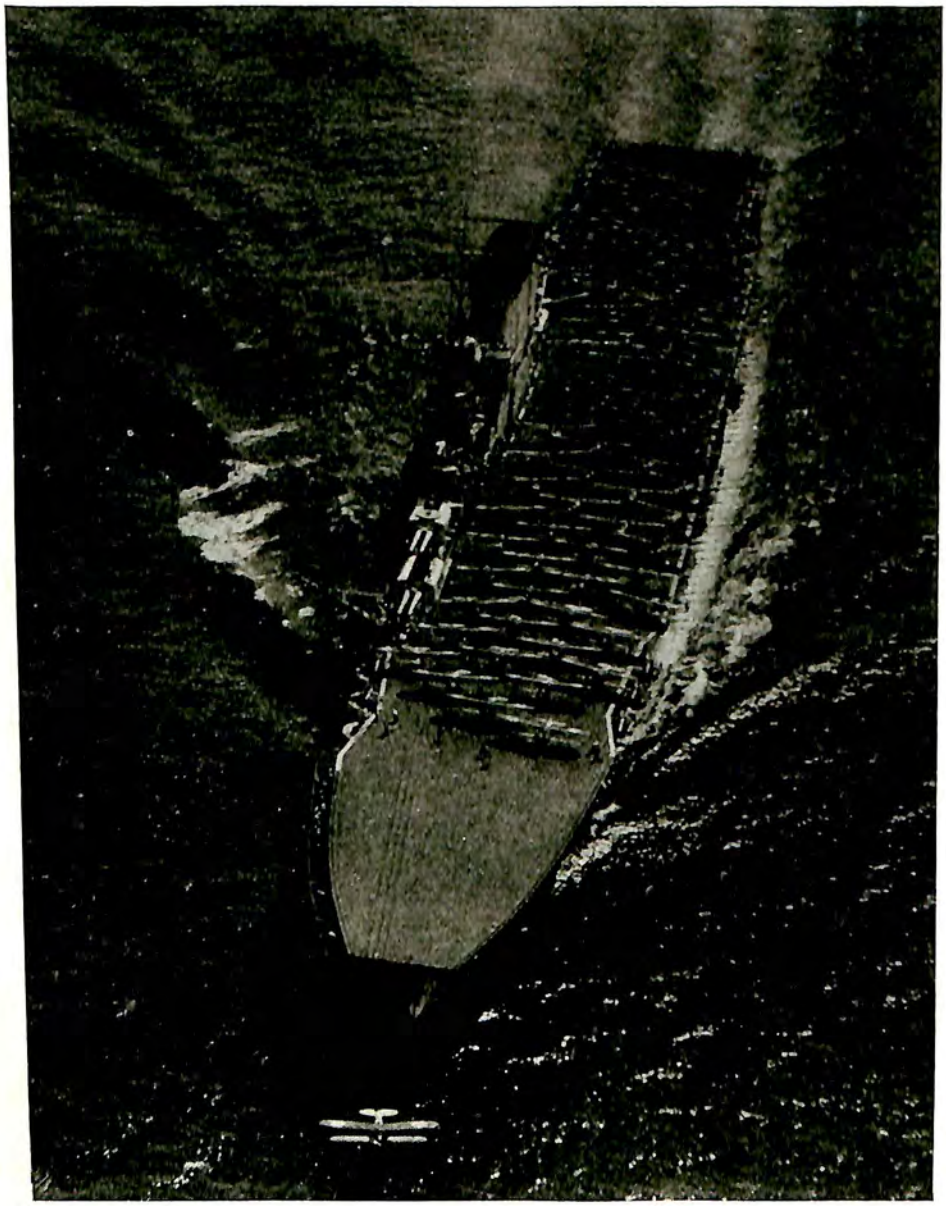
During 1930, planes of the Army Air Corps flew 32,500,000 miles as compared with 27,405,790 miles in 1929. There was only one fatal accident in 1930 for every 855,900 miles flown, as contrasted with one for every 627,000 miles flown during the preceding year. The record among flying school instructors was particularly good. During the last seven years, instructors on duty flew a distance equal to one-quarter the distance from

ON LINE FOR INSPECTION

Brig. Gen. William E. Gillmore inspecting Boeing pursuit planes (Pratt and Whitney Wasps) of the First Pursuit Group during West Coast maneuvers.

the earth to the sun. There were but five fatalities or an average of one fatality for each five million miles in the air.

The diligence of the Air Corps flying chiefs, F. Trubee Davison, Assistant Secretary of War for Aeronautics, and Maj. Gen. James E. Fechet, Chief of the Air Corps, was in no small way responsible for the increased efficiency of the air force. Flying in a speedy Consolidated Fleetster, powered with a Pratt and Whitney Hornet engine, Secretary Davison made a 10,000 mile inspection tour to all parts of the country during July. General Fechet also flew thousands of miles inspecting posts and investigating new developments which might serve to increase the efficiency of the Air Corps.



WINGS FOR THE FLEET

Steaming into the wind with her deck crowded with fighting planes, the U. S. S. Saratoga, Navy aircraft carrier, sends a plane from her deck.

CHAPTER VII

WITH THE NAVY'S FLYING FLEET

Aircraft Squadrons in Mimic Warfare—Five-Year Program Nears Completion—Navy's Aviation Problems at Sea—Planes Improve in Efficiency—Catapults Installed on Men-of-War

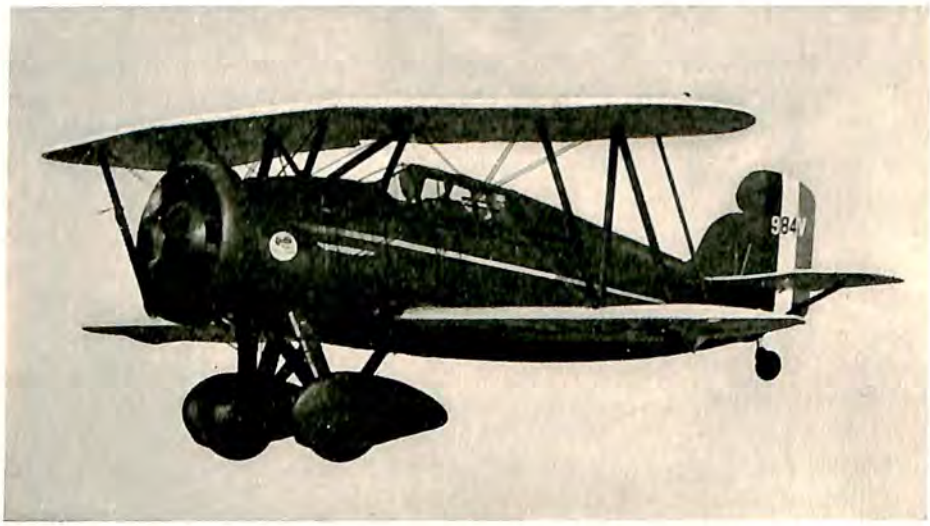
NAVAL aviation, long recognized as the "eyes of the fleet", continued to gain recognition among Navy strategists as the "mailed fist" of the forces at sea as 1931 operations got under way. With the addition to the "flying fleet" of diving bombers, two-seater fighters and three-purpose planes, an evolution in the Navy's aerial tactics has taken place. The planes with the fleet had definitely demonstrated their usefulness in reaching an objective on land and in striking a devastating blow to an opposing sea force.

Winter maneuvers with the fleet during the last three years at Honolulu, Panama and Colon and joint exercises with the Army Air Corps in 1930 on the west coast were an important factor in proving the efficacy of an air force at sea on the backs of the fleet. With fighting, scouting, torpedo and bombing planes on the landing decks of the Navy's three aircraft carriers, observation planes on the catapults of 16 battleships, and scouting planes ready for action on 12 light cruisers, the Battle Fleet and Scouting Fleet of the United States Navy have been able to coordinate the operation of aircraft at sea in important naval maneuvers.

The blows which "won the war" during these important peacetime maneuvers were struck by airplanes operating with the fleet. At Honolulu, planes from the decks of the carriers went over the naval defenders and smothered the shore troops in spite of counter attacks by aircraft. At Panama, the power of the "flying fleet" was even more dramatically demonstrated. On an arc the radius of which centered at Panama, a great defensive fleet of battleships, destroyers and submarines was spread out from shore to shore, 150 miles from the objective to be attacked. Behind the line of defense was the Lexington with its fleet of nearly 100 planes ready and eager to take to the air to meet the fliers from the attacking carriers. The Saratoga, her flight deck crowded with planes, was at sea, 900 miles from the objective at which she proposed to hurl bombs within 24 hours. The defenders were powerless to locate her and were forced to wait on the lines for the attack they knew was coming.

Screened by her auxiliary defenders throughout the day, the Saratoga cruised toward Panama. When night fell she went to full speed, faster

than any other ship afloat, 35 knots. One cruiser picked her up, but according to theory, would have been put out of action by the four cruisers which formed the principal escort for the Saratoga. The aircraft carrier approached the cordon 150 miles from Panama before daylight, and then 85 planes left her decks. They took off in darkness and made a rendezvous in darkness, all directed by radio and under the cover of night. They flew across the heavily defended area and swooped down on Panama. The Lexington had no chance against the torpedo and bombing planes, and the planes from her decks could not get into the air quick enough to meet the elusive attacking planes. The attack came from all directions. The

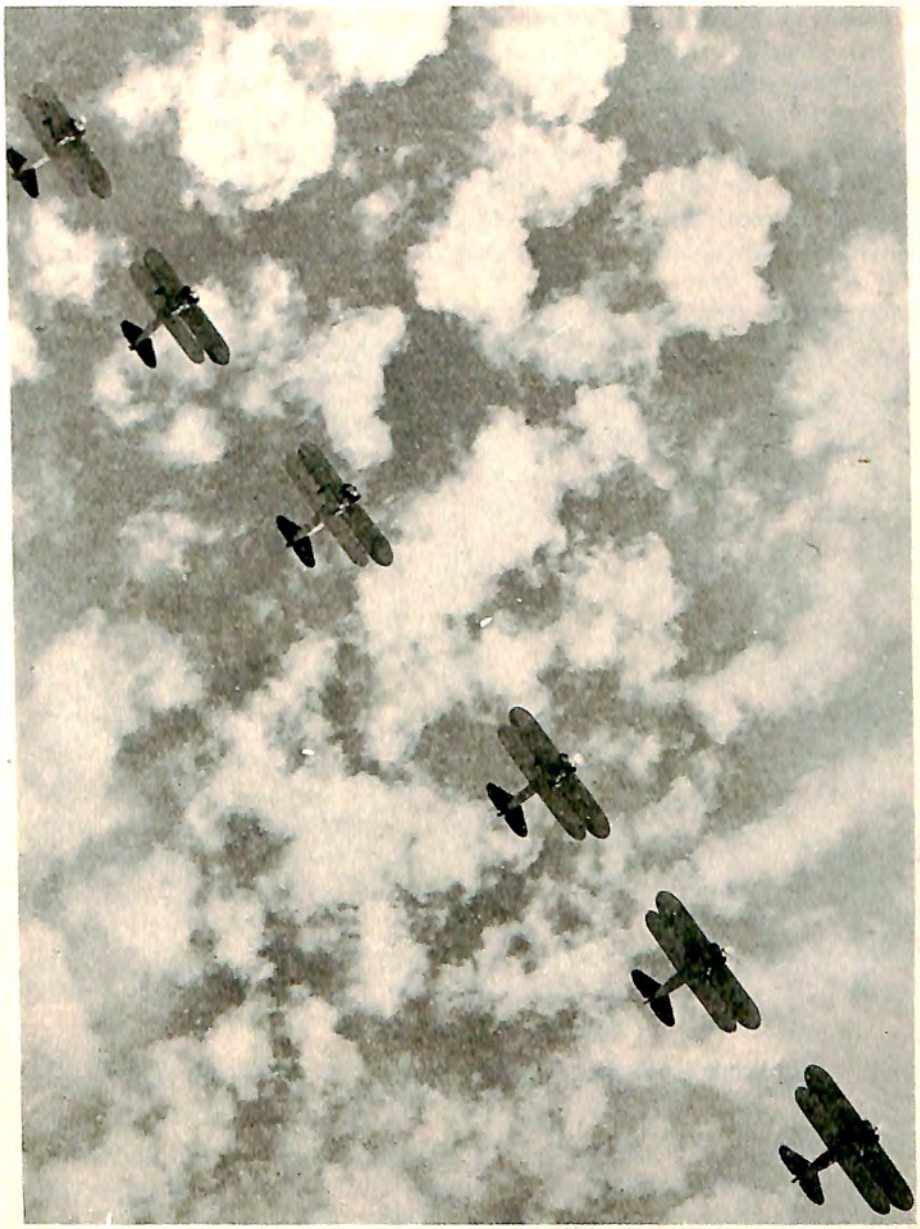


NAVY SECRETARY ON THE WING

Assistant Secretary of Navy David S. Ingalls, in charge of Naval aviation, flying his new Curtiss Command Helldiver (Wright Cyclone) on inspection tour.

first contingent destroyed the Miraflores and Pedro Miguel locks. Another division bombed ground fortifications. A third swung in from the north, and while the defenders were busy against the other air squadrons, bombed the great Gatun locks. The Saratoga's defense, caught in an unexpected current, became separated from her and laid her open to the big guns from the defending battleships. However, in real war, the Saratoga would have escaped by her superior speed and then called her planes in by radio. This was proved possible in previous and subsequent maneuvers.

During the 1930 winter maneuvers, an attack of a similar nature was staged but the attacking force failed, and the Saratoga was bombed out of the water, not by big guns, but by airplanes from the Lexington. This time the Lexington's squadrons got the jump. The Saratoga had been



"EYES" AND "FISTS" OF THE BATTLE FLEET

"Red Rippers" of the Battle Fleet squadrons, flying their Boeing fighters (Pratt and Whitney Wasps) in perfect formation during maneuvers on the West Coast.

ordered to come in behind an escort of slower cruisers and battleships. The big guns were her defense instead of her speed and, according to the rules of the war game, the big guns failed to carry out their assignment.

The joint Army and Navy maneuvers along the California coast during 1930 emphasized the value of naval aircraft in attacking land bases from the decks of the ships at sea. These war games, in which aircraft carriers and planes from the battleships and light cruisers played an important part, convinced many Navy strategists that the airplane has become the "fist"

SIXTY: COUNT THEM

Planes of the Aircraft Squadrons Battle Fleet flying in close formation over San Diego make possible a remarkable photograph.

as well as the "eyes" of the fleet. The flying fleet demonstrated that it can directly attack strategic shore centers over which battleships must pound away at each other, miles from the objective of their fight.

The success of naval aviation as a coordinated branch of fleet operations justified the carrying out of the five-year naval aircraft program and the authorization of five small aircraft carriers by Congress. Appropriations for one of these 13,800 ton carriers were approved and the contract for its construction awarded during 1930. It appeared that aircraft procured under the 1930–31 authorizations would raise the total number of air-

planes on hand to 1,000 by 1932 in accordance with the five-year aircraft building program approved by Congress, June 24, 1926.

When the first-year program was inaugurated, the Navy had 351 useful airplanes. In July 1, 1927, there were 468; on July 1, 1928, 624; on July 1, 1929, 829; and on July 1, 1930, 928. The last appropriating year contemplated by the act ends June 30, 1931. The Navy's Bureau of Aeronautics indicated that it will need thirty additional airplanes to outfit light cruisers Nos. 32 to 36 to be delivered from 1932 to 1934, and 114 planes to equip the new aircraft carrier, which will be completed in 1934. Requests for

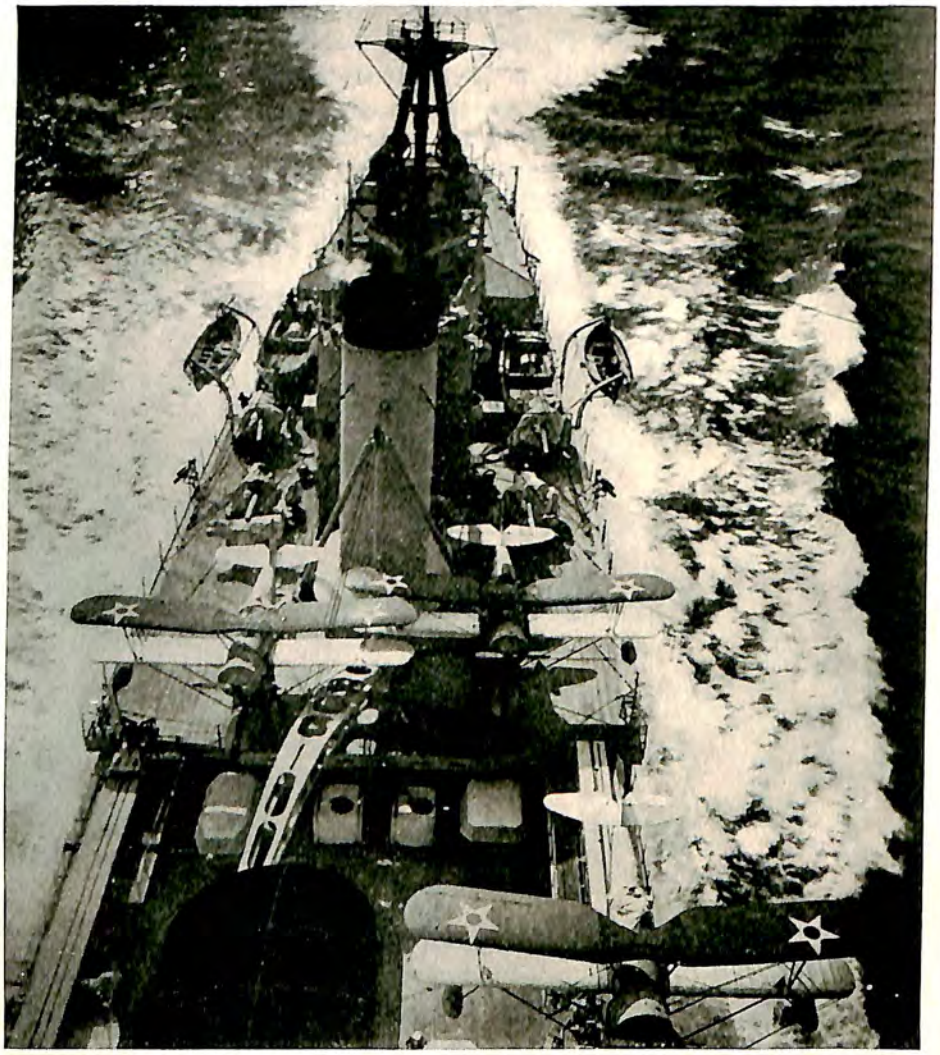
HELLDIVERS FOR CARRIERS

Curtiss F8C-4 Helldiver (Wright Cyclone), a new two place fighter and diving bomber, designed for use on the aircraft carriers.

this equipment were to be included in legislation to be presented to Congress, aside from that calling for completion of the five-year program.

Examination of expenditures under the five-year program indicates that a saving of $20,307,150 over the original estimates was accomplished because annual wastage was reduced through the building of higher quality planes and more reliable engines by American manufacturers under contract, and through increased skill of pilots and maintenance personnel. The record showed that the Navy was getting more airplanes for its money and more service from its airplanes than ever before. During the 1930 fiscal year, 234 service type and seven experimental airplanes were delivered to the Navy.

Practically all the changes made in naval aircraft as the result of experiences gained in the "war games" and through daily operations, except such as were due to the normal development of the art, were in introducing

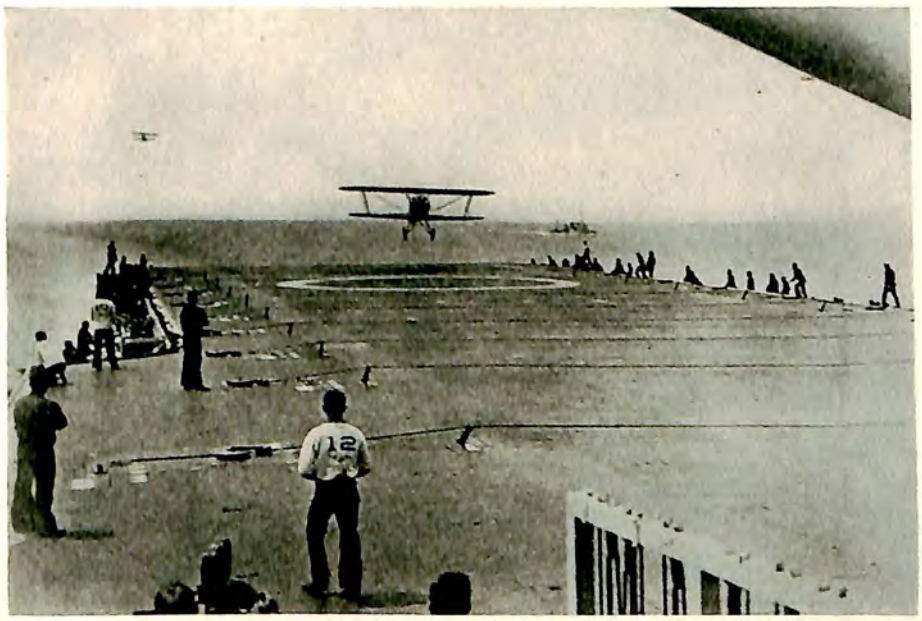


CORSAIRS OF THE FLEET

U.S.S. Salt Lake City under full power carrying three Vought Corsairs (Pratt and Whitney Wasps) on her deck.

features which would permit them to operate from ships. Ship-based land planes were equipped with emergency flotation gear to keep them on the surface in a forced landing at sea. They also have carrier arresting

gear and low stalling speeds to permit safe and satisfactory operation from the flight decks of the carriers. Most planes were equipped with radio to enable them to keep in touch with their moving bases and to make possible direction of a flight from the time it leaves the carrier until it reaches its objective and is directed to return. Observation planes were equipped with sturdy float type landing gear to permit landing in rough water. The use of carriers also resulted in the development of a satisfactory but light amphibian landing gear. The size of fleet airplanes was kept



FLOATING AIRPORTS OF THE FLEET

Boeing fighter (Pratt and Whitney Wasp) landing on the deck of the Aircraft Carrier Lexington off the Virginia Capes. Arresting gear is shown.

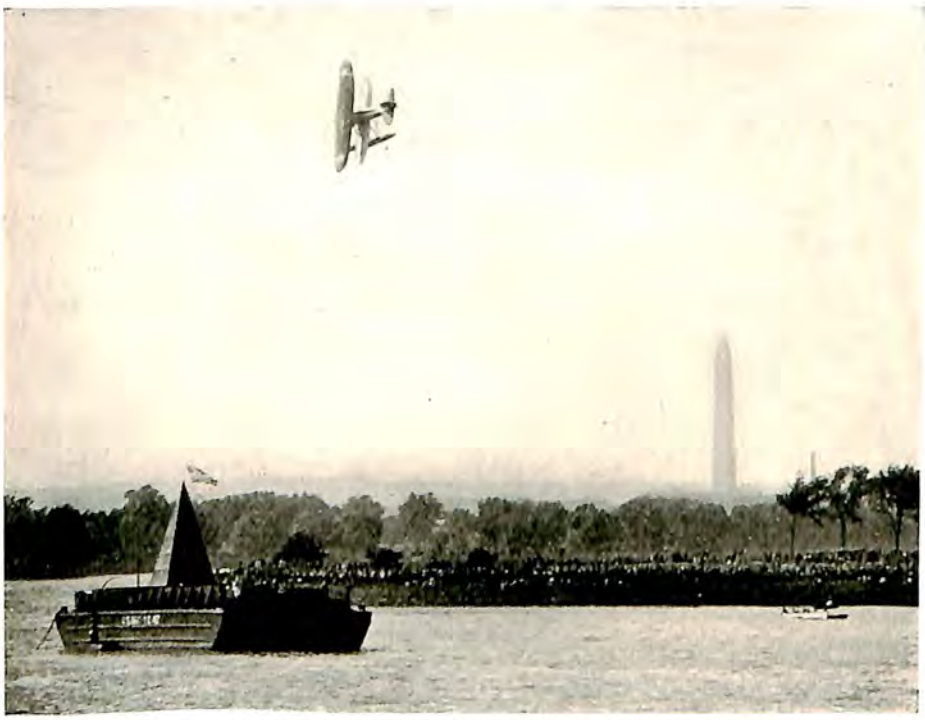
at a minimum to utilize the limited space aboard ship to the best advantage.

The elimination of wood from naval aircraft structures was a development continued during 1930. The last of the wooden fuselage airplanes of the Navy passed with 1930. Wooden wing ribs and wooden tail structures were being entirely replaced by metal in new designs, while almost all new experimental types and new production aircraft had metal wing beams as well. Experiments with metal monocoque fuselage construction were continued.

Corrosion-resisting steels were investigated in an effort to find materials better adapted for marine operations. Streamline tie rods made of various

steel compositions were service tested; seaplane floats of stainless steel were under observation. Wing ribs constructed of spot-welded strip stainless steel were incorporated in some wings for service tests. A discovery that incorrect heat treatment of aluminum alloys used in floats and hulls was responsible for rivet corrosion was expected to eliminate this trouble.

While experimental work was under way on liquid-cooled, radial Diesel, air cooled, in line and several other types of engines, the advantage in weight, reliability, cost, durability, ease of maintenance, and performance



WINNING CURTISS MARINE TROPHY

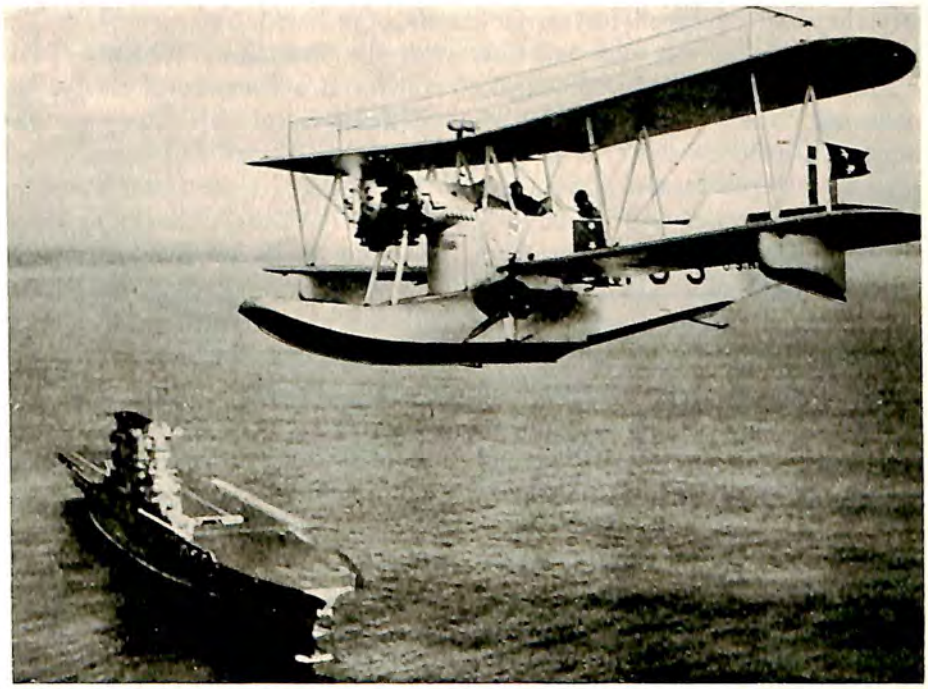
Capt. Arthur H. Page of the Marine Corps banking around the home pylon in a Curtiss Hawk seaplane (Curtiss D-12) to win the famous race cup.

at altitudes of the American radial air cooled engines continued to rule in favor of that type for most naval operations. Definite progress was made in increasing the power of these engines through better cylinder and crank shaft design, and by the use of higher compression ratios and intake pressures.

The catapult, used to hurl airplanes into the air at flying speed from the decks of battleships and cruisers, is distinctly an American achievement, under development since 1912. Two catapults have been made for

each of the 12 latest battleships and all light cruisers, and one for each of the older battleships, but eight powder type catapults still await installation in battleships. The older and smaller air catapults on the ten cruisers of the Omaha type, due to their age and the increase of weight of scouting planes, were to be replaced with larger equipment. Success of the catapult is indicated in the record that no serious accidents or injuries resulting during 1930 from malfunctioning of these devices.

The advent of the two-seater fighter as a possible successor to the single-



COMMANDING FLEET BY RADIO

Rear Admiral H. V. Butler in his Keystone-Loening amphibian (Pratt and Whitney Hornet) over the Aircraft Carrier Lexington, directing the fleet by radio during maneuvers.

place job so closely identified with aerial dog fighting was seen during 1930. The development of the Curtiss Helldiver, a two-place carrier fighter and diving bomber, was illustrative of this evolution. Powered with a 575 horsepower Wright Cyclone engine, the new plane attained 180 miles an hour speed and carried a light bomb which it released after a steep dive, making it almost invulnerable from attack. An improved type of the Boeing shipboard fighter, powered with a Pratt and Whitney Wasp engine, continued in general use on the carriers. It was a single-place job with an exceptionally high speed and ceiling.

The first of a contract for 36 O3U-1 observation and scouting planes was delivered to the Navy in June. Manufactured by the Chance Vought Corporation and powered with a Pratt and Whitney Wasp engine, it represented the last word in observation type planes for use on the battleships and cruisers with the fleet. The O3U-1 was an improved type Vought Corsair, the latest of the Vought series: UO-1, O2U-1, O2U-2, O2U-3, and O2U-4.

The Berliner-Joyce Aircraft Company developed an interesting experimental fighter for the Navy during 1930, the XFJ-1, of monocoque construction and equipped for carrier landings and with emergency flotation gear and brakes. It was powered with the Pratt and Whitney Wasp engine. The new PM-1, the first of which, on a contract of thirty, was delivered to the Navy in July by the Glenn L. Martin Company was illustrative of the latest type patrol plane. Other service and experimental planes developed for the Navy are described in the chapter "Manufacturing American Aircraft" and in the technical chapter "Out of the Engineering Laboratory." Drawings of some of these new types are included in the Aircraft and Engine Design Section.

The rapid improvements in the design and construction of aircraft and in the skill of pilots and maintenance personnel can be credited with the Navy and Marine Corps' brilliant operations record for 1930. Although tens of thousands of landings and take-offs were made at sea from the limited decks of the aircraft carriers and millions of miles were flown in wing-to-wing formations, diving, looping, and executing maneuvers necessary only in naval aviation, the Navy and Marine Corps attained the greatest record in their history during 1930.

Out of a total of 252,095 flights made during 1930, only 14 resulted in fatal injuries to occupants of the aircraft. Flights were 99.9954 per cent. safe from fatalities. During 1930, the Navy and Marine Corps flew 26,478,700 miles, an increase of 6,965,605 miles over 1929. It was a brilliant record of performance, worthy of tribute to the high type of personnel trained by the naval services and to the excellence of their equipment.

The Marine Corps aviation operations were conducted at Quantico, San Diego, Haiti, Nicaragua and Guam. As in previous years, the active service flights during 1930 in Nicaragua reconnaissance, courier, passenger and freight carrying, and attack missions were reported to have greatly facilitated the suppression of banditry by the small military forces in the field.

A Marine, Capt. Arthur Page, won the eleventh annual Curtiss Marine Trophy Race in competition with the best race pilots of the Navy and Marine Corps. He was the only representative of the Marines, winning the race in a Curtiss Fighter at an average speed of 164.1 miles an hour, establishing a new speed record for the event by two miles an hour. The

trophy was presented by Glenn H. Curtiss, in one of the last public appearances before his death.

Capt. Page later flew a Navy observation plane, equipped with standard instruments and a radio beacon receiver, from Omaha, Nebraska, to Washington without seeing the ground from his enclosed "blind" cockpit. Another officer landed the plane at refueling stops after Capt. Page had brought it directly over the field. Capt. Page entered the speed race in the National Air Races at Chicago as the Marines' representative and was leading when he crashed and was killed.

The Navy's brilliant part in the development of lighter-than-air activities is reviewed in another chapter, but suffice it to say that the financial and technical contributions of the Navy department to this field are responsible for the dirigible's present high state of development in America.

No review of the year's activities in naval aviation would be complete without some mention of the excellent direction it was afforded through David S. Ingalls, Assistant Secretary of the Navy for Aeronautics, and Rear Admiral William A. Moffett, Chief of the Bureau of Aeronautics. Both made extended trips by air during the year to inspect naval air bases and were responsible for the efficient development and operation of the "flying fleet."

International Newsreel

HOME FROM THE CONQUEST

All hands stretching out to grasp the hand of Rear Admiral Richard E. Byrd as he forces his way through the crowd to New York's City Hall.

International Newsreel

"COLUMBIA" DOES IT AGAIN

Veteran Bellanca (Wright Whirlwind) monoplane lands at Croydon aerodrome, London, after Boyd (right) and Connor span Atlantic in it.

CHAPTER VIII

HISTORY-MAKING FLIGHTS OF 1930

Five Successful Atlantic Crossings—Transcontinental Records Broken—Graf On Four-Continent Junket—R-100 Flies to Canada—First Bermuda Flights—Altitude, Duration Marks Raised

AVIATION'S achievements in the field of spectacular flights during 1930 overshadowed all previous years, with more than a score of brilliant performances which could be classed as "history-making."

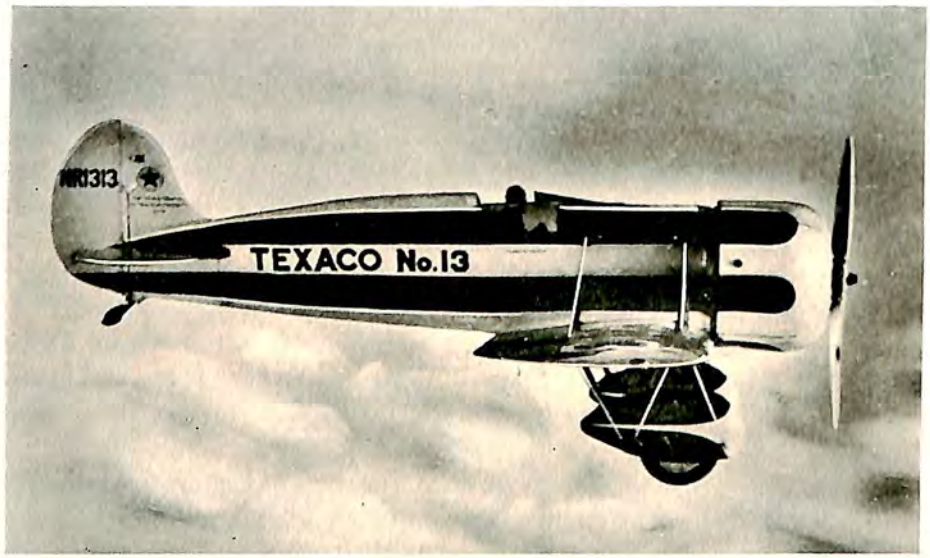
The Atlantic was crossed five times, one a direct non-stop hop from Paris to New York; all transcontinental speed records were broken; world altitude and refueling duration marks were raised; the Graf Zeppelin braved equatorial storms on a four-continent flight; the R-100 made a round trip from England to Canada; the first air mail plane crossed the South Atlantic; Bermuda was linked with New York; Kingsford-Smith completed his globe-girdling trip and broke Hinkler's London-Australia record; New York was linked with Mexico City and Panama on non-stop flights, brought within 52 hours of Buenos Aires; a girl flew from London to Australia; and Byrd returned from the South Pole to receive a hero's welcome.

The spectacular flights, many of them measures of engineering progress, served an important purpose in sustaining public interest in aviation during a year when general business was depressed. It was true, nevertheless, that the world was apt to view as commonplace, accomplishments which would have been considered all but impossible a few years before.

Transcontinental Records Fall

While 1930 witnessed the shrinking of distances between major cities throughout the country, the transcontinental record flights continued to hold the center of interest, principally because they spectacularly measured the progress of flying. Fowler, Maynard, Kelly, Macready, Maughan, Goebel, Collyer and Hawks are names which went into history between 1912 and 1929 associated with record transcontinental flights. While the name of the latter was again destined to stand out above all others in this field during 1930, it was Colonel and Mrs. Charles A. Lindbergh who opened the season's record onslaught with a spectacular flight from Los Angeles to New York on Easter Sunday, April 20.

In the dim half light of the early morning hours, the Lindberghs roared down the runway at Grand Central Airport near Los Angeles in their swift Lockheed Sirius monoplane powered with a Pratt and Whitney Wasp engine. Only a few spectators had watched them climb into electrically heated flying suits and prepare for their high altitude flight across the continent. Flying above 10,000 feet, they were not sighted until they spiraled down to the airport at Wichita in midafternoon for a 20 minute refueling stop on their 2,700 mile trip. It was shortly after 11 o'clock that night that the beacon at Roosevelt Field, L. I., picked the Lockheed plane out of the sky as Lindbergh circled for a landing on the great white run-



HAWKS SETS NEW RECORDS

Capt. Frank Hawks, who broke all transcontinental speed records, is seen above the clouds over Los Angeles in his Travel Air Mystery Ship (Wright Whirlwind).

way from which he had taken off for Paris and world fame three years before.

The Lindberghs averaged more than 180 miles an hour to complete the trip in 14 hours, 45 minutes and 32 seconds, elapsed time, faster by 2 hours, 52 minutes and 44 seconds than the record non-stop time made by Capt. Frank M. Hawks in 1929. They depreciated efforts to credit them with breaking Capt. Hawks' record, which was a non-stop flight with a heavy load. The Lindberghs held to levels between 10,000 and 15,500 feet to "test the theory that airplane speed and efficiency are to be sought above storm areas, in rare atmosphere." Capt. Hawks was one of the first to congratulate the Lindberghs, insisting that they had broken his speed

record. Hawks seemed pleased that someone had bettered his time and opened the way for new record attempts across the continent.

Roscoe Turner, with a lion cub as companion, flew his Hornet-powered Lockheed Air Express from Los Angeles to Curtiss Airport a month later in an attempt to better the Lindberghs' time. Turner made the trip in 15 hours and 37 minutes, almost an hour slower. Undaunted, he eyed Capt. Hawks' east-west record and headed west May 27 to better it with the aid of stops for refueling. He landed at Grand Central Airport in 18 hours, 43 minutes and 34 seconds, elapsed time, after a refueling stop in Wichita,

CROSSES CONTINENT IN GLIDER

Capt. Frank Hawks, transcontinental speed flier, "loafed" across the continent in his Franklin glider "Eaglet" towed by an airplane.

bettering the non-stop time of 19 hours 10 minutes and 32 seconds made by Hawks. Again Hawks grinned congratulations; insisted his record had been broken.

Edward F. Schlee and William S. Brock, who won world fame in 1927 when they flew from Detroit to Tokio in a few days, emerged from their aircraft salesroom in Detroit to set a new round trip ocean-to-ocean record. Stepping into their Lockheed Air Express (Pratt and Whitney Wasp) at Jacksonville Beach, Fla., June 17, Brock and Schlee reached San Diego, Calif., without incident in 13 hours, 55 minutes and 30 seconds to better the time made in 1920 by Maj. Theodore McAuley,—19 hours, 10 min-

utes. Returning through electrical storms over the Rockies, they were forced to refuel at Tallulah, La., but pushed on to Jacksonville Beach in 16 hours and 50 minutes to better the 1922 record of Lieut. James H. Doolittle—22 hours, 20 minutes. Despite adversity, they had completed the ocean-to-ocean round trip in 31 hours and 58 minutes, elapsed time for a new record. The route was 800 miles shorter than that flown by Capt. Hawks in 36 hours, 48 minutes elapsed time from New York to Los Angeles and return.

The speedy flights of the Lindberghs, Turner, Brock and Schlee whetted

SET COAST-TO-COAST RECORD

Flying at 15,000 feet on their one-stop flight, Col. and Mrs. Charles A. Lindbergh set a new transcontinental record in their Lockheed Sirius (Pratt and Whitney Wasp), later broken by Hawks.

the appetite of Capt. Frank Monroe Hawks for new transcontinental laurels. He had turned to gliding after setting up his 1929 cross-continent records, and during the first week in April had "loafed" across the continent from San Diego to New York in a Franklin glider, the Texaco Eaglet, towed by a Waco biplane. At the end of a 500 foot cable, he made the 2,960 mile trip in 36 hours and 47 minutes flying time, making 19 stops and devoting nearly ten hours to gliding and soaring exhibitions enroute. But now speed flying again attracted his attention, and he arranged for a Travel Air Mystery ship powered with a 300 horsepower high

compression Wright Whirlwind engine. It was christened "Texaco 13", given license number 1313, and soon groomed for its first transcontinental test.

Capt. Hawks went to Curtiss Airport, Valley Stream, L. I., early on the morning of August 6, talked with mechanics about an engagement to play golf with his father in Los Angeles at 4 o'clock that afternoon. He left the runway at 6 A.M. (Eastern Daylight Saving Time) headed for Columbus, St. Louis, Wichita, Albuquerque and Kingman, his refueling stops on the westward flight. He grinned as his father stepped forward

LION CUB AS COMPANION

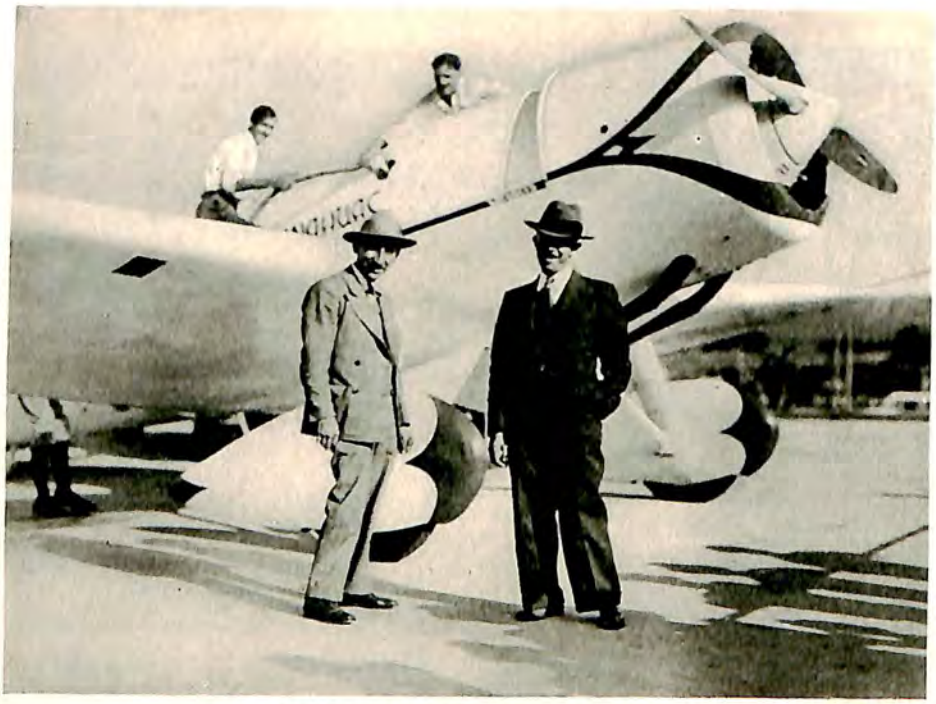
Lieut. Col. Roscoe Turner with his lion cub, Gilmore, out to break the transcontinental speed record in his Lockheed Air Express.

to congratulate him at the Los Angeles Municipal Airport at 4:50 P.M. (Pacific Standard Time). His elapsed time was 14 hours, 50 minutes, 43 seconds. It was the first such flight made in full daylight and faster than Turner's record by three hours and 52 minutes. Despite head winds, he had averaged 179 miles an hour, often making 240. Hawks' name was again written after the official east-west speed record.

It was moonlight when the red and white Mystery ship sped down the runway at Grand Central Airport on the morning of August 13 and hurdled the San Bernardino mountains on its way east. Albuquerque in three hours and 26 minutes; then Wichita, Indianapolis, and finally Curtiss Airport at Valley Stream, L. I., for a new transcontinental record of 12

hours, 25 minutes and 3 seconds. Hawks smiled as he stepped from his cockpit, his white shirt and linen knickers unsoiled. Friends' efforts to compare his new record with the Lindberghs' slower time brought a sharp retort from Hawks, who disclaimed interest in records, spoke of the venture as a "demonstration of the possibilities of an aerial pony express, with relay pilots and fast planes at intermediate stops."

While the transcontinental record flights held the center of the aviation stage, shorter speed flights linking major cities forcefully illustrated the



NEW YORK TO MEXICO CITY NON-STOP

Col. Roberto Fierro (left) and his Lockheed Sirius (Pratt and Whitney Wasp) shortly before taking off on his speedy non-stop flight.

possibilities for rapid transit with faster transport planes. Early in the year, Lee Shoenhair flew from New York to Tampa in a Lockheed Vega cabin monoplane in seven hours and 15 minutes. In March, Capt. R. A. Ellis of the Standard Oil Company's aviation division brought his Lockheed Vega (Pratt and Whitney Wasp) from Miami to Newark in eight hours to average 160 miles an hour. In June, Dale "Red" Jackson, the endurance flier, flew a Travel Air Mystery ship from Montreal to New York in 115 minutes to average 190 miles an hour. In July, Jackson sped from Detroit to Cleveland in 26½ minutes.

Hawks, after his brilliant transcontinental flights in August, turned to clipping hours from usual transportation times between important cities. He shot his low-winged Mystery ship from Detroit to New York, September 27, in two hours and 41 minutes, averaging a little more than four miles a minute. He brought Boston and New York within 54 minutes of each other on October 7. Then two days later shot from Philadelphia to New York in 20 minutes, keeping a 270 mile an hour pace.

Turning again to longer distances, Capt. Hawks left Valley Stream, L. I., at 8: 50 o'clock on November 6 and headed his low-winged monoplane southward for Havana. Stopping 23 minutes at Jacksonville for

READY FOR BERMUDA FLIGHT

Capt. Lewis A. Yancey and companions warm up the Wright Whirlwind engine before taking off for Bermuda in their Stinson Detroiter.

fuel, spending 20 minutes clearing customs at Miami, he arrived in the Cuban capital in semi-darkness. He had bettered the 14 hour time of Wilmer Stultz, who carried Charles A. Levine and Mabel Boll on a non-stop trip in 1928, by setting a new record of nine hours and 21 minutes. Flashlights boomed, Hawks grinned and addressed the Cuban reporters in Spanish.

The return trip was made in even faster time when Hawks set his veteran speed ship down on Roosevelt Field, three days later, after a flight from Havana in eight hours and 44 minutes. He cut 38 minutes from his own record between the two metropolises, although he fought head-

winds over nearly 800 miles of the distance, and stopped in Miami and Charlotte, N. C., enroute. Always insistent that no chances should be taken by pilots, Hawks disclosed upon arriving in New York that he had worn a rubber life-preserver jacket beneath his parachute, the gift of Ambassador Harry F. Guggenheim.

Latin American Flights

Three other long distance flights had Latin American cities as their goals. Lieut. Will White and Lieut. Clement McMullen fixed their eyes on distant Buenos Aires. Fierro and Cortes, Mexican army aviators, pre-

Associated Press.

END OF ATLANTIC FLIGHT

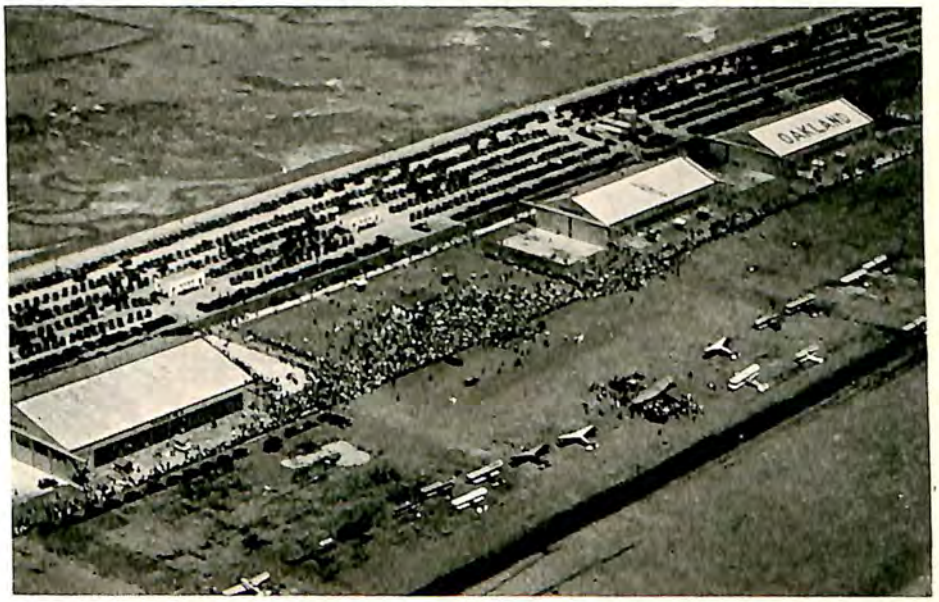
Headed for Roosevelt Field, the "Southern Cross" (3 Wright Whirlwinds) is five miles from New York goal on its one-stop flight from Ireland.

pared for a speedy trip betweeen New York and Mexico City. Capt. Roy W. Ammel, Chicago broker, impatiently waiting for favorable weather over the Atlantic, headed his plane for Panama in a non-stop flight.

Taking off from Newark Airport February 14 in a Lockheed Vega (Pratt and Whitney Wasp) monoplane, Lieuts. White and McMullen began a flight to the Argentine capital which broke existing records for each lap as well as for the entire trip. Their flying time from Newark to Miami was eight hours and 30 minutes; they crossed the Caribbean non-stop to Panama in 11 hours and 20 minutes; Panama to Talara was

achieved in nine hours and five minutes; Lima was but four hours and 40 minutes further away; the lap to Arica was made in five hours; Santiago was then reached in seven hours and 40 minutes. They had crossed the equator, flown through all kinds of weather, and finally soared over the Andes at 20,000 feet to set a new record of six hours between Santiago and Buenos Aires.

The 6,780 mile flight was made in five days and five hours, elapsed time, of which only 52 hours and 15 minutes were spent in the air. They averaged 131 miles an hour. The flight, sponsored by the Foreign Advertising and Service Bureau and dedicated to the Latin American press, was



BUSY DAY FOR OAKLAND AIRPORT

Wing Commander Charles Kingsford-Smith is greeted by thousands as he completes globe-girdling trip in California.

hailed with enthusiasm throughout South America. White and McMullen were dubbed "the eagles of the north," ambassadors of good-will.

Mexican aviation, suffering from the tragic death of Emilio Carranza on his New York-Mexico City flight and from the death of "Sidar the Madman" on his flight to Buenos Aires, found a bright streak on the horizon June 21 when Colonel Roberto Fierro and his mechanic, Arnulfo Cortes, landed in Mexico City. They had flown non-stop from New York in 16 hours and 33 minutes, a record, in their Lockheed Sirius (Pratt and Whitney Wasp) monoplane. The flight paralleled Lindbergh's non-stop flight to the Mexican capital from Washington in 1927. Using the slower "Spirit of St. Louis", it took Lindbergh 27 hours and 10 minutes.

Capt. Roy W. Ammel, a Chicago broker, flew from Los Angeles to New York in September in his Lockheed Sirius "Explorer" (Pratt and Whitney Wasp) and announced after a few test trials that he was ready for a flight to Europe. November came and he had not yet received a favorable map from the weather bureau. Impatient, he decided to fly non-stop to Panama. With 703 gallons of gasoline, he roared down the runway at Floyd Bennett field November 9 for the 3,000 mile flight, charting 1,200 miles of his course over water. He landed at France Field, Panama, in 24 hours and 35 minutes, a record. Asked the object of his flight, he

Associated Press.

GERMANY TO NEW YORK

Capt. von Gronau and his companions land their Dornier Wal at the Battery after a flight from Germany through Iceland and Greenland.

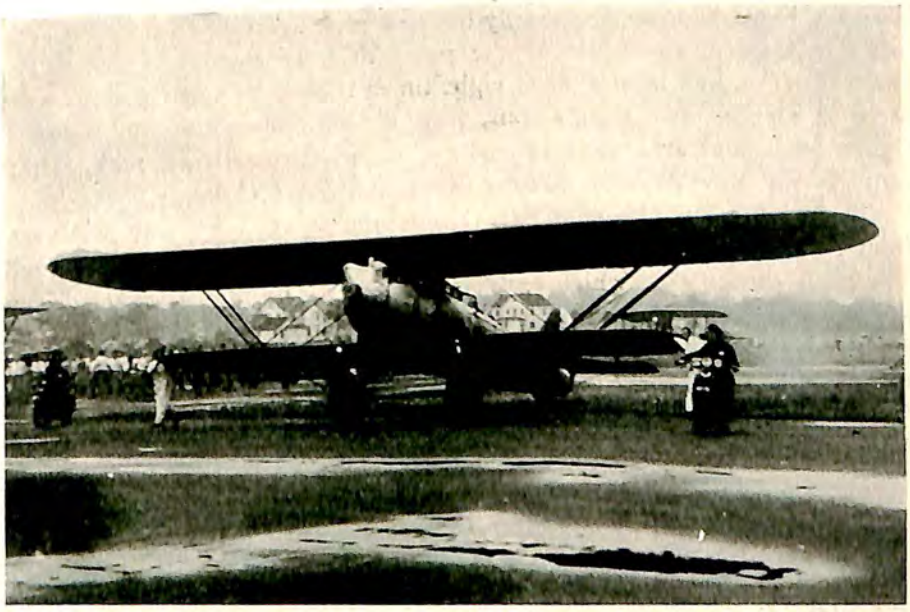
replied: "It has no object. I just wanted to come to Panama. I used to live here, you know." He was planning another long-distance flight in the "Explorer" for 1931.

First Flights to Bermuda

Bermuda, the world's most northerly coral islands and a Mecca for American tourists, was linked with New York by air for the first time during 1930. Two flights chose this strand of semi-tropical islands—mere dots to find in mid-Atlantic—as their objective.

Capt. Lewis A. Yancey, able navigator and, with Roger Q. Williams, hero of a trans-Atlantic flight to Rome, said he would fly to Bermuda

any time he was provided with a good ship, a good pilot and 48 hours notice. On April 1, the Stinson (Wright Whirlwind) monoplane "Pilot," with William H. Alexander as pilot and Zeh Bouck as radio operator, was ready for the flight. Capt. Yancey was certain he could navigate the plane direct to the 20 square mile dot, 580 miles off shore. Once in the air, the "Pilot" maintained radio communication with the New York Times. Night found them 60 miles short of Bermuda over a glassy sea. They descended, floated the swells until dawn, rose again and reached Hamilton Harbor with a wrenched pontoon strut. The flight proved the importance



Associated Press.

COSTE LANDS IN NEW YORK

Making the first non-stop flight from Paris to New York, Capt. Dieudonné Coste and Maurice Bellonte reversed Lindbergh's feat.

of seaplanes for safety in transoceanic flying and pointed out the possibilities for rapid service between New York and Bermuda by air.

Roger Q. Williams, formerly coadventurer with Yancey, was at the controls of the veteran trans-Atlantic monoplane "Columbia", used by Chamberlin and Levine in 1927, when it headed for Bermuda June 29 on a non-stop round trip. A land monoplane, certain of disaster if forced to alight at any time during the round trip flight, the "Columbia" carried Harry P. Connor, navigator, and Capt. Errol Boyd, pilot. They reached Bermuda, circled the islands and returned to New York in 17 hours and eight minutes, the first time such a flight had been tried and achieved.

The trip served as preparation for Boyd and Connor's trans-Atlantic flight later in the year.

First Atlantic Air Mail

The "open season" for trans-Atlantic flying was inaugurated unusually early in 1930 and lasted almost until the close of the year. Paris and Buenos Aires were linked with four day air mail service as the result of the first Atlantic flight of the year from St. Louis, Senegal, Africa, to Natal, Brazil, and then to Buenos Aires.

Anxious to complete the missing link in their air service between Paris and Buenos Aires, officials of Aéropostale, French air line interests in South America, chose Jean Mermoz to fly the first mail across the South Atlantic in an experiment to determine the possibilities of regular service. The South Atlantic had been crossed eight times before, all from east to west. Mermoz and his two companions, Jean d'Abry, navigator, and Leopold Gamie, radio operator, were to make a round trip with air mail, which formerly lost nine days by steamer across the South Atlantic.

Their Latécoère (Hispano-Suiza) seaplane winged its way westward from Senegal May 12 across the 1,700 mile water-stretch to Natal, Brazil. The plane carried mail which had left Paris by air 36 hours before. Keeping up a running story of the progress of their flight by radio to the mainland, the French fliers landed in a heavy sea at Natal in 20 hours and 16 minutes. The mail was rushed to Buenos Aires and other South American points by air. The fliers were fêted lavishly, hailed as the first Atlantic air-postmen.

The French cruisers, which guarded the course of the experimental route, were lined up in readiness for the return trip July 8. Mermoz was anxious to be the first to complete the west-to-east crossing, in many ways comparable to the North Atlantic's hazardous east-west flight. The French fliers took off late in the afternoon, headed directly out to sea and started their radioed story of a pioneering flight. All was well until the sixteenth hour, when they reported a defective oil feed that was certain to force them down. They located the Phocee by wireless and a few minutes later landed beside the relief patrol boat, 350 miles off Dakar on the African coast and only a few hours from their goal. The three fliers were taken aboard, 600 pounds of mail saved, and the plane sank. Mermoz was disappointed. He said the flight would be commonplace in a few years.

Kingsford-Smith Completes World Flight

When the "Southern Cross" landed at Croydon, near London, in July, 1929, it had a record rivalled by few planes ever built. It had crossed the Pacific from California to Australia; * made extensive transcontinental

* See "The Aircraft Year Book for 1929."

journeys in Australia; and then spanned Asia and Europe on a 12,000 mile flight in 12 days.† The Atlantic, conquered but once on an east-west flight, was the last barrier to be hurdled in the completion of a world flight.

Hazardous as the east-west crossing might be, the world placed implicit confidence in the ability of Major Charles Kingsford-Smith to span the Atlantic and the American continent to reach his starting point in Oakland, Cal. The "Southern Cross", a Fokker monoplane with three Wright Whirlwind engines, was ready in June, 1930.

With Evert Van Dyck, Dutch co-pilot, Capt. J. Patrick Saul, Irish navi-

Associated Press.

COSTE OFF FOR DALLAS

With a $25,000 prize awaiting him in Texas, Capt. Dieudonné Coste takes off from Valley Stream, L. I., after his non-stop flight from Paris.

gator, and John Stannage, South African radio operator, as companions, Kingsford-Smith lifted the heavily loaded "Southern Cross" off the beach at Port Marnock, Ireland, shortly after daybreak, June 24. By radio they gave the world a brilliant story of their flight as they sped for hours under overcast skies, through rain and bumpy air, against strong headwinds. Radio bearings, which Stannage obtained from ships at sea, kept them on their course. Throughout the trip, they were in two-way communication with ships at sea or land stations. Bearings obtained as they neared the Newfoundland coast showed that they were pursuing an erratic

† See "The Aircraft Year Book for 1930."

course, flying "blind," and had advanced only 120 miles in four hours. Their compasses pointed crazily east and west. They were flying through the Grand Banks fog that swallowed Nungesser and Coli, the Princess Lowenstein-Wertheim, and kept the Bremen pilots short of their goal. Kingsford-Smith realized that he could not make New York nonstop. A rift in the fog. The airport at Harbor Grace appeared. The Australian flier headed the big ship into the field, landed. He asked for a cigarette, said it was a "tough 31 hour flight", and prepared for the 1,200 mile flight to New York.

The next day, June 26, the veteran "Southern Cross" made a triumphant entry into the United States, thrilled New England seaboard towns, and circled Manhattan before landing at Roosevelt Field for an enthusiastic reception. Later in the week the old ship spanned the continent, stopping in Chicago and Salt Lake City on its way to Oakland to end the world trip. Kingsford-Smith was raised to the rank of Wing Commander, showered with gifts and titles. The "Southern Cross" was presented to Capt. G. Allan Hancock, wealthy Santa Maria, Cal., banker and oil operator, who loaned the ship to Kingsford-Smith for the Australia flight, then gave it to him when the flight was successful.

Von Gronau's North Atlantic Flight

New York harbor received its first trans-Atlantic air liner August 26 when Capt. Wolfgang von Gronau and his crew of three students flew out of the northeast over Manhattan's crowded Battery, circled the Statue of Liberty, and followed a police escort plane to a landing in the midst of the harbor traffic. Their spectacular finish was in direct contrast to their unostentatious departure from List on the Isle of Sylt in Northern Germany, August 18.

The Captain and his three students, Eduard Zimmer, co-pilot; Franz Hack, mechanic; and Fritz Albrecht, radio operator, left Northern Germany in a five year old Dornier Wal (B. M. W.) flying boat on a training flight to the Faroe Islands and Iceland. It was the same ship that the late Roald Amundsen had used in the Arctic and Capt. Frank Courtney had been forced to bring down in mid-Atlantic, where it demonstrated its seaworthiness.

Capt. von Gronau held as his life-long ambition a flight to New York with a landing in the harbor. He planned the flight by the northerly route, but failed to tell his student companions or notify his government. In Iceland, he told the students of his plans, wired the government for permission, took off for Greenland an hour later. The long hop to Greenland completed, they flew on to Labrador, then Nova Scotia, and made a speedy trip down the coast into New York harbor. They had flown 4,670 miles in 47 flying hours, nine days elapsed time.

The Germans flew their flying boat overland to Buffalo, then to Chicago for the National Air Races. Everywhere they were met by enthusiastic throngs who hailed them as true adventurers. Germany received them later as "builders of German prestige".

New York-Paris: Two-way Airway

Capt. Dieudonné Coste, premier airman of France, and Maurice Bellonte provided the world with a brilliant counterpart to Col. Charles A. Lindbergh's spectacular flight to Paris when they made the first non-stop

MAKING REPAIRS IN MID-AIR

One of the Hunter Brothers makes some minor adjustments on their Wright Whirlwind engine as the Stinson Detroiter flies toward a refueling record.

Paris to New York flight the first two days in September. But while the two flights were virtually over the same route, they furnished a study in sharp contrasts.

Lindbergh, an obscure air mail pilot, flew alone without radio in a Ryan monoplane, powered with a 200 horsepower Wright engine, which had flown only across the continent. He had two compasses on a conventional instrument board and maps to guide him on the 3,610 mile eastward flight, which he made in 33 hours and 29 minutes to average 107 miles an hour.

Coste, France's idol of the air, a veteran war flier with six world air records and a score of brilliant flights to his credit, left Le Bourget with a companion in the radio-equipped Breguet "Question Mark," powered

with a 650 horsepower Hispano Suiza engine, which was the veteran of many record flights. Its instrument board had more than 30 dials with practically every instrument known to science. Yet with all this preparation, and the advantage of tail winds for half of the 4,100 mile journey, the French fliers found that their average speed was cut down from 160 to 109 miles an hour. Their flying time was 37 hours and 18 minutes. The westward journey proved far more difficult than that which Lindbergh had experienced.

After reaching Nova Scotia, they attempted to fly beneath low hanging rain clouds to keep the ground in sight. They flew on, skirting a precipice. Suddenly there loomed up out of the mist another precipice on the port side. They were caught beneath the banks of a river. It was a tight place. Bellonte was at the controls. The ship was light after the long flight across the sea. He gave her the gas and shot upward, cleared the barrier. Several hours later they landed at the Curtiss-Wright Airport on Long Island. A crowd of 10,000 swept the field. Among the first to congratulate them was Col. Charles A. Lindbergh. The Aeronautical Chamber of Commerce entertained them at an informal dinner.

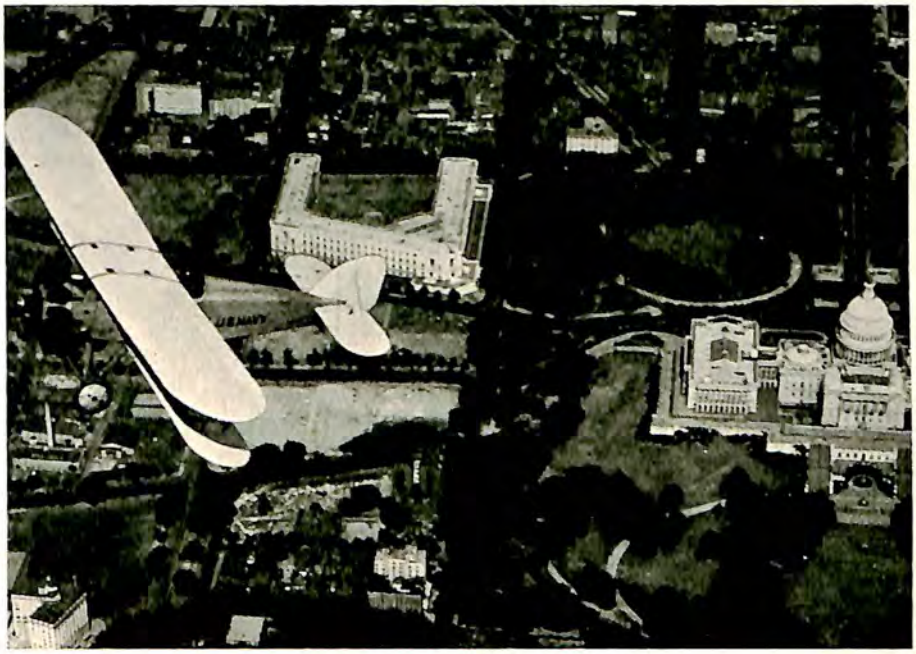
To keep a promise and win a $25,000 prize offered by Col. William E. Easterwood, Jr., Coste and Bellonte flew from New York to Dallas non-stop. They said the 1,700 mile flight was "easy". A mob of 20,000, characterized by Coste as "even more enthusiastic than New York", swept police lines aside in their reception of the fliers. The two Frenchmen flew back to New York the next day, made a side trip to the capital, and started a tour of the country, in the interest of aviation and Franco-American friendship, almost as extensive as that made by Lindbergh. They returned to France in October, set up their plane on the coast, flew to Le Bourget to receive a great ovation from the French people. All admitted, however, that it lacked the spectacle and buoyant enthusiasm of the Lindbergh reception. France had learned to expect great things from her idol—Coste—and in this, his greatest effort, he had not disappointed them.

"Columbia" Spans Atlantic Again

Capt. J. Errol Boyd and Lieut. Harry P. Connor, companions with Roger Q. Williams on the non-stop round trip from New York to Bermuda earlier in the year, prepared the veteran Bellanca (Wright Whirlwind) monoplane "Columbia" for its second crossing of the Atlantic. The "Columbia" had been flown non-stop from New York to Germany by Col. Clarence Chamberlin, with Charles A. Levine as passenger, in 1927.

In mid-September, the "Columbia" left Montreal for Harbor Grace, Newfoundland, but was forced to land at Charlottetown, P. E. I., due to bad weather. The flight to Harbor Grace was continued ten days later

and the ship prepared for the Atlantic hop. Boyd, a Canadian, and Connor, former U. S. Navy flier, took the entire runway at Harbor Grace to get off with their heavy gas load on the morning of October 9. Headed east through squally weather, they were sighted by the steamers Quaker City, Lancastria, and Virginia. It was nearly dusk on October 10, with Croydon only a short distance away, when the gasoline feed line clogged. Capt. Boyd landed the plane on the narrow beach of the tiny Scilly islet of Tresco, continued the next day to Croydon, their distination. Their total time in the air was 27 hours and three minutes.



STARTING SIX MILE CLIMB

Lieut. Apollo Soucek, premier altitude flier of the U. S. Navy, over capitol as he starts climb for new world altitude record.

A short stock man, remembered at Croydon for his sensational solo flight—the first in his life—from Paris to London in the "Columbia", was among the first to greet the new pilots of the veteran ship. He was Charles A. Levine. Boyd confided to him that the flight was "tough as hell." It was the fifth heavier-than-air Atlantic crossing of the year, the twenty-sixth in history.

Graf's Four-Continent Flight

The Graf Zeppelin, veteran of a globe-circling flight in 1929 and five Atlantic crossings, continued its brilliant record of achievements to rival in many ways the progress made in the heavier-than-air field. The Graf's

outstanding flight during 1930 was one to test its ability in all climates, to cross the ocean at the equator, and to demonstrate the airship's potentialities to Latin Americans. The test proved severe, and the Graf demonstrated its mettle.

The great silver-nosed airship with Dr. Hugo Eckener at her helm left Friedrichshafen Sunday afternoon, May 18. Hailstones "as big as walnuts" tore a dozen holes in her outer covering near Lyons on the first lap of her flight to Seville. With 20 passengers and a crew of 42, the Graf headed for South America. Torrential downpours near the equator bore down like tons of added ballast, but the Graf plowed steadily along her route to Pernambuco, where she landed 62 hours after leaving Seville. Rio de Janeiro was the next stop. Then Pernambuco and the long flight up the American coast to Lakehurst. Dr. Eckener decided to cut out Havana and the Caribbean despite passengers' protests, to save time and avoid risks. Lakehurst was reached, after battling rain squalls most of the way, Saturday, May 31st.

Dr. Eckener with his flair for showmanship gave Broadway a midnight demonstration such as it had never seen when he flew over Manhattan two days later, headed for Seville on his seventh crossing of the Atlantic with the Graf Zeppelin. With her silver hull against the bright gold of the setting sun, the Graf droned over a hilltop into Friedrichshafen on June 6, ending the 19 day four-continent flight, which had taken her 21,250 miles in 280 flying hours. Her average speed was 75 miles an hour; her highest, 125; her lowest, 30. She spanned the South Atlantic in 60 hours, crossed the North Atlantic in 55 hours. The crowd roared "Hoch!" and sang "Deutschland über Alles" as the grand old man of the air, Dr. Eckener, stepped from the control cabin at the end of the flight.

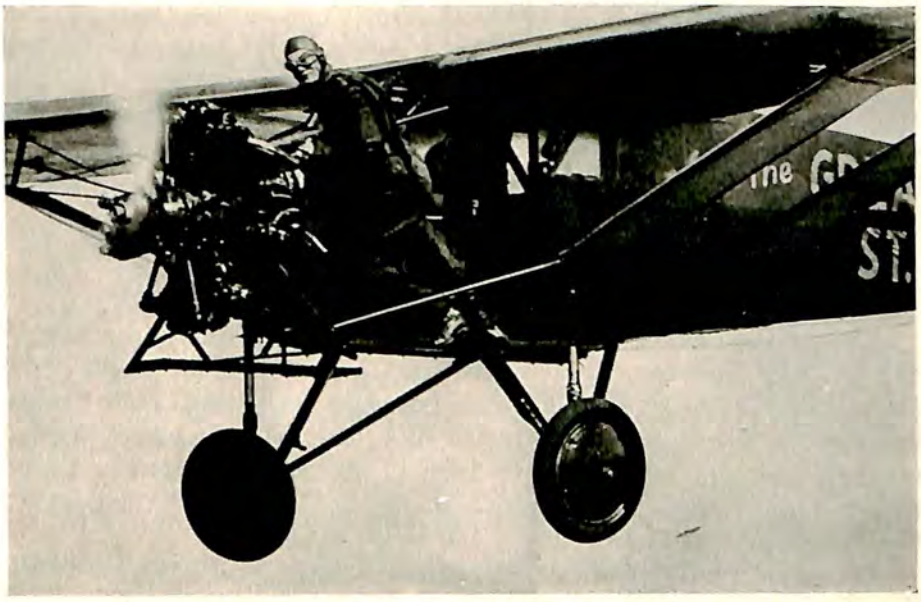
R-100: London to Montreal and Return

The British dirigible R-100, completed in 1929, received her first extensive test in 1930 on a round trip flight from London to Montreal, with a 1,000 miles side trip to Ottawa, Toronto, Hamilton and Niagara Falls. Larger than the Graf Zeppelin, the R-100 was one of two giant dirigibles built under the British Air Ministry's program for linking the ends of His Majesty's far flung empire.

Buffeted by storm that ripped her tail, the R-100 became the fourth airship to span the Atlantic, completing the crossing in 78 hours and 49 minutes. She carried 37 officers and crew and seven passengers, including her designer, Commander Charles Dennistoun Burney. Canada enthusiastically welcomed her first airship visitor as she was made fast to the special $750,000 mooring mast at St. Hubert Airport, Montreal. Thousands climbed through her spacious cabins, resembling those of an ocean liner, during her two weeks stay.

Officers of the R-100 hoped to beat the best time of the Graf Zeppelin for the Atlantic crossing on the journey home, but wind and rain forced the ship to remain in the air 57 hours and five minutes on the trip to Cardington, a distance of 3,200 miles. The Graf flew from Lakehurst to Friedrichshafen, 4,200 miles, in August, 1929, in 55 hours and 24 minutes. A small, but enthusiastic, crowd greeted the returning sky queen. Cricket crowded news of the R-100's return into insignificant corners of British newspapers.

The R-101, lengthened by adding a midsection to give her greater



SETTING NEW WORLD'S RECORD

Closeup of Dale "Red" Jackson greasing the rocker arms of the Curtiss Challenger engine, while Forrest O'Brine pilots the Curtiss Robin toward a new endurance record.

buoyancy, was ready for a speedy trip to India and return in October. Carrying Lord Thomson, British Air Minister, and other notables, the world's largest airship, headed east October 5. She crashed and exploded at Beauvais, France, killing her 48 passengers.

Twenty-Seven Days Aloft

The craze for refueling endurance flights which swept the country in 1929 simmered down to two notable successes during 1930; the breaking of the Jackson-O'Brine record by the Hunter brothers, and the regaining of the record by the former holders.

Four brothers from Sparta, Ill., figured in the breaking of the world record for refueling endurance flight set at 420 hours and 21 minutes by Dale "Red" Jackson and Forrest O'Brine in the St. Louis (Curtiss Challenger) Robin. Flying a second-hand Stinson Detroiter (Wright Whirlwind) monoplane, christened the "City of Chicago", John and Kenneth Hunter remained aloft over Sky Harbor, Chicago, for 553 hours and 41 minutes, June 11 to July 4. Two other brothers, Walter and Albert, manned the refueling ship, and Irene, a sister, prepared their meals. They flew approximately 40,000 miles on their grueling test.

"Red and Obie", the former record holders, prepared to get the record back. They took off July 21 in the "Greater St. Louis", a Curtiss (Challenger) Robin similar to the one used in 1929. They continued their long grind over Lambert Field at St. Louis until August 17, when they landed before a crowd of 800 with a new world's record for endurance flying with the aid of refueling: 647 hours, 28 minutes and 30 seconds. The fliers said a "cracked crank case" forced them down. Their manager said it was lack of income from their flight.

Soucek: Eight Miles High

Lieut. Apollo Soucek, America's premier altitude flier, set the world's altitude record for seaplanes at 38,560 feet, then boosted the world's land plane record to 39,140 feet in 1929. Seventeen days later, Willi Neuenhofen of Germany reached 41,795 feet in a land plane. Soucek set out to take the altitude record from Germany again, but knew that he would have to brave the rarefied air which snuffed out the life of Capt. H. C. Gray at 42,470 feet in an Army Air Corps balloon.

Taking off from the Naval Air Station at Anacostia, D. C., across the river from the capital, June 4, the Navy flier climbed his Wright Apache (Pratt and Whitney Wasp) land plane to 43,166 feet, a new world record, surpassing that of Neuenhofen and the balloon altitude record of Capt. Gray. Soucek now holds both land and seaplane altitude records.

"Amy" Flies to Australia

Amy Johnson, a British girl who hated the humdrum of life in a London office and took up flying, was scarcely noticed by British newspapermen when she took off alone in her tiny De Havilland (Gipsy) Moth biplane from Croydon "for Australia". Few took the matter of her destination seriously, and little appeared in the press about her flight until, with amazing swiftness, she had overcome the barriers which had tripped veterans and was well on her way across Asia toward her destination.

She landed at Port Darwin, Australia, May 24, the "Empire's heroine", completing an 11,500 mile flight in a little second-hand patched up air-

plane within three days of Harold J. L. "Bert" Hinkler's record, which had stood for years. She crossed perilous terrain and the shark-infested waters of the Timor Sea. The British press printed open apologies to Miss Johnson for overlooking her, and she received the highest honors which a grateful empire might bestow upon its heroine.

Flies Home to Marry

The world had learned to expect great feats from the Australian flier, Wing Commander Charles S. Kingsford-Smith, and it seemed the appropriate thing when he announced in London that he would fly home to Australia, after girdling the globe, to be with his fiancée and to have a "last fling" at distance flying. The flight was filled with human interest. He was racing with three other fliers in the attempt to break Hinkler's three year old record.

"Southern Cross, Jr.," an Avro Avian, was the tiny plane used by the Australian on his swift flight from Heston, England, over the Alps, across the Mediterranean, over Southern Asia, across the Timor Sea to Port Darwin, on the northwestern tip of Australia. He crossed jungle, plain and mountains on the 12,000 mile trip in nine days and 23 hours, elapsed time. He bettered by five and one-half days Hinkler's record of fifteen and one-half days, then shot across the Australian continent to Sydney to see his fiancée, Mary Powell; promised her it was his last spectacular flight.

Byrd Returns from South Pole

Rear Admiral Richard E. Byrd, dressed in the uniform of his new rank, arrived in New York harbor, June 14, aboard his good ship "City of New York", veteran of the long, hard voyage "down under" to little America. More than a month late, he received the reception of a conquering hero, and graciously stepped aside to permit his comrades to share the spotlight. The city and nation honored him, and the Aeronautical Chamber of Commerce fêted him at a banquet June 25, in Hotel Astor, attended by all the celebrities in the aeronautical field. Frederick B. Rentschler, president of the Chamber, presented Admiral Byrd with a gold medal, struck in his honor and designed by Julio Kilenyi. Members of the expedition received silver medals. Admiral Byrd related the critical episode of the South Pole flight, which Kilenyi portrayed on one side of the medal.

"The mountain peaks and formations in our view were awe-inspiring in their majesty, terrible in the colossal shapes that had been carved into extraordinarily jagged and rounded forms. We felt insignificant and small among these lofty and eternal peaks which, since the childhood of mankind, have symbolized its aspiration. The critical time had come, the

moment we had discussed a thousand times. The air began to get rougher. We were getting close to the highest altitude the plane could reach. Our weight was a bit over 13,000 pounds. We saw the great polar plateau through the clouds. It was a critical moment.

"Bernt yelled in my ear above the roar of the engines: 'We must drop 200 pounds immediately or go back.' 'A bag of food overboard,' I yelled to Harold. Over went one of the brown bags. We had gradually gained altitude but not enough. A few hundred feet now might make the difference between success and dismal failure. Suddenly the wheel turned loose in Bernt's hands. 'Quick, dump more,' he shouted. Mac shoved it through the trapdoor. The minutes went slowly. We had a few hundred feet to spare. Bernt gave a shout of joy. The plateau stretched ahead, cloudless and glistening in the sun, giving an unobstructed route to the Pole."

CHAPTER IX

MANUFACTURING AMERICAN AIRCRAFT

New Designs Concentrated in Light Transport and Private Plane Fields —Drastic Production Economies Effected—Price Reductions General—Simplify Engineering Standards

THE remarkable operations record piled up by American aircraft in all parts of the world during 1930 stood as a tribute to the genius of American designers and engineers engaged in the development and construction of commercial and military airplanes. While production during the year was less than half of the peak reached in 1929, there was no slowing up of activity in the development of better designs more adaptable to the particular needs of modern business or the private flier. The Department of Commerce issued 95 Approved Type Certificates on new models introduced during the year and approved changes on units already in production to improve their performance.

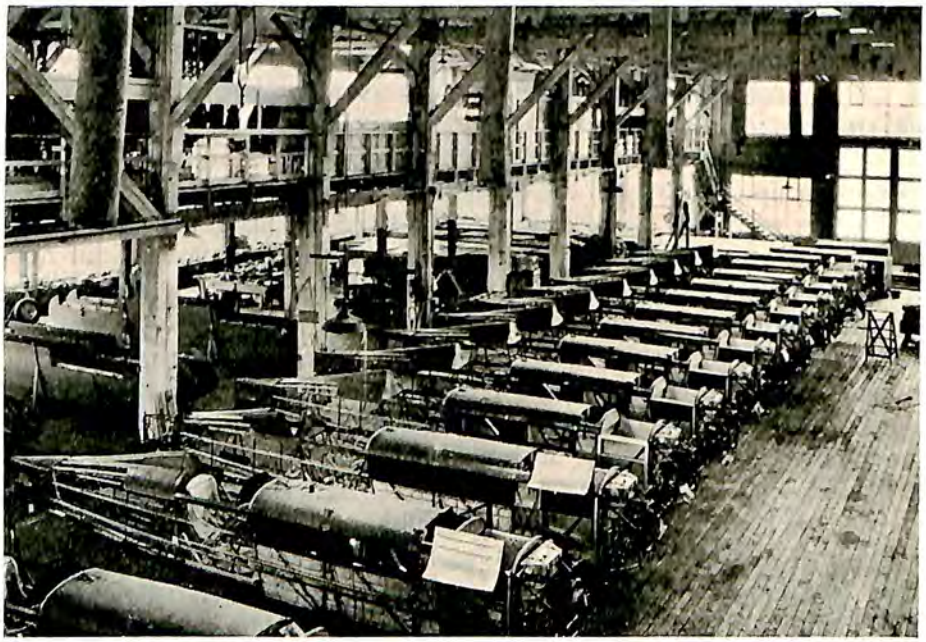
With the advent of the general business depression late in 1929, most manufacturers had curtailed their production to prevent an over-supply of aircraft on the market. These reduced schedules continued in force in many factories during most of 1930, making it possible to move stocks on hand and to keep pace with the normal market. As was pointed out in an earlier chapter, sales kept pace with production throughout 1930 and in many months surpassed the production volume to indicate a movement of old stocks. The result was a reduction of completed inventories to a point which demanded an increase in production early in 1931 to meet a normal market.

The Department of Commerce listed 215 companies manufacturing aircraft in the United States toward the middle of 1930. However, 79 of these companies held the total number of Approved Type Certificates—379 —issued by the Department of Commerce since it undertook the inspection of aircraft in 1927. The remainder of the companies were engaged in development of experimental models or in small scale production. It was obvious that some of them lacked the necessary engineering background and sound business management which would make them successful. The 1931 issue of the Department of Commerce directory was almost certain to see a great reduction in the total number of companies identified with the manufacture of aircraft. It might be interesting to point out that the more substantial companies represented in the membership of the Aeronautical Chamber of Commerce produced 96.2 per cent.

of the saleable aircraft manufactured during 1930. The Chamber's manufacturing section also added 11 new members during the year to strengthen its position.

Production Economies Effected

Many of the larger manufacturing companies moved into new plants completed early in 1930 or built additions to old factories to meet their needs. A high degree of organization and efficiency was attained in most



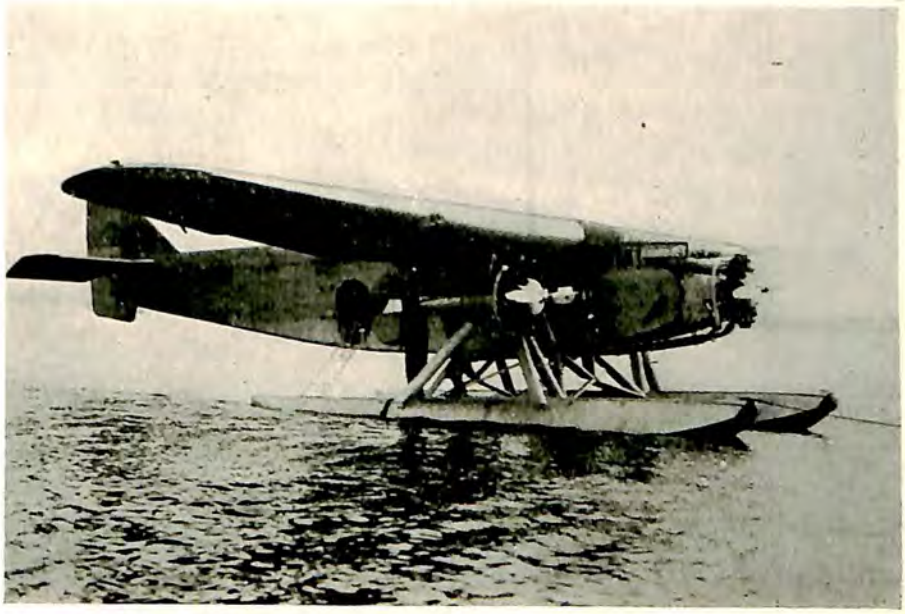
BOEING ASSEMBLY LINE

Mail-passenger planes under construction on the assembly line of the Boeing Airplane Company at its factory in Seattle, Wash.

plants which employed production methods similar to those which were commonly identified with the automobile industry. New machinery and equipment was added to cut down the number of skilled workmen required for each operation with a resultant saving in operation costs. There was a marked tendency among the several large financial groups, which grew out of the mergers of 1928 and 1929, to combine certain of their manufacturing units cutting overhead costs and concentrating their skilled designers and workmen at central plants.

The Curtiss-Wright Corporation changed the name of the Curtiss-Robertson Airplane Manufacturing Company at St. Louis and the Travel

Air Manufacturing Company, Inc., at Wichita to the Curtiss-Wright Airplane Company. The St. Louis unit continued production of the Robin series and added manufacture of the Moth, previously made by a separate subsidiary, the Moth Aircraft Corporation, at Lowell, Mass. The Wichita unit continued production of the Travel Air line. The New York plant of the Loening Aeronautical Engineering Corporation, previously operated as a division of Keystone Aircraft Corporation, also a unit in the Curtiss-Wright Corporation, was closed and the well-equipped Keystone plant at Bristol, Pa., took over the manufacture of the Loening line along with



FORD AS HUGE SEAPLANE

Equipped with metal floats, the Ford metal monoplane (3 Pratt and Whitney Wasps) showed good performance as a seaplane.

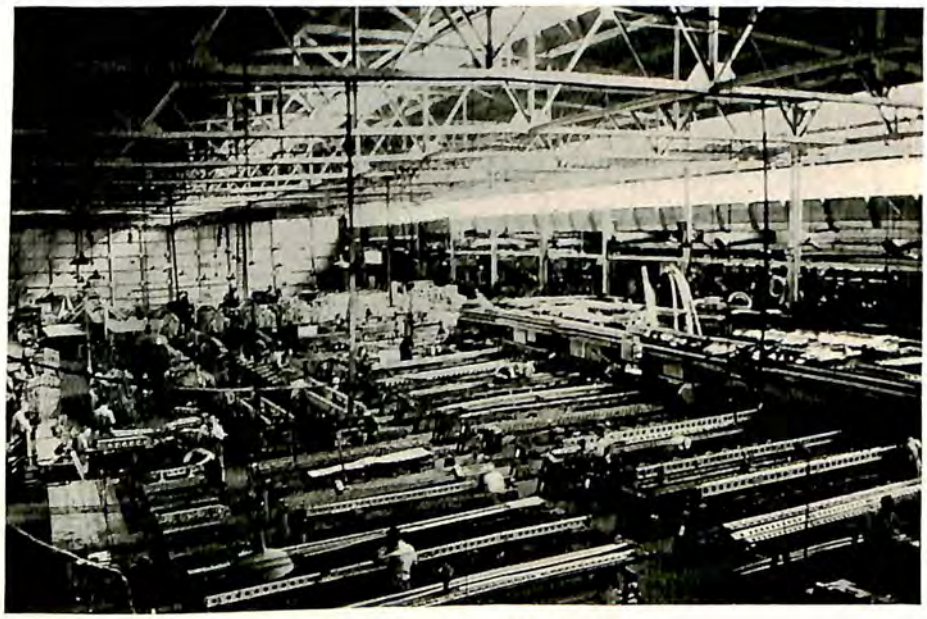
the regular Keystone models in production. The Curtiss Aeroplane and Motor Company, Inc., at Garden City, L. I., another unit of the Curtiss-Wright Corporation, concentrated its efforts on military production and the development of huge transport planes.

The Detroit Aircraft Corporation, another holding company with extensive manufacturing interests, made similar changes in its organization to effect economies in production. The activities of Ryan Aircraft Corporation, previously located at Anglum, Mo., and those of Parks Aircraft, Inc., formerly at East St. Louis, Ill., were moved to a central plant in Detroit. Although metal fuselages and other parts for the Lockheed planes

were manufactured in Detroit, the major part of this unit's activities remained in Burbank, Cal., the original home of the Lockheed Aircraft Corporation.

General Motors' control of Fokker Aircraft Corporation, obtained through an interest purchased in 1929, resulted in the setting up of the General Aviation Corporation in 1930 with Fokker and the American Dornier interests as units in the manufacturing field.

United Aircraft and Transport Corporation continued operation of its several aircraft manufacturing units in new modern plants, including the



METAL SHOP AT GREAT LAKES

Typical of many manufacturing plants, a section of the well-equipped factory of Great Lakes Aircraft Corporation is shown.

Stearman Aircraft Company at Wichita; the Boeing Airplane Company at Seattle; Sikorsky Aviation Corporation at Bridgeport; and Chance Vought Corporation at Hartford. The Northrop Aircraft Corporation was acquired during the year as a division of United, and operations were started in a new plant on United Airport at Burbank, Cal. The United group coordinated its engineering activities through frequent meetings of a technical committee composed of designers and engineers from each manufacturing division. They pooled their experience and laid out a common program for new projects.

The elimination of duplication of effort and greater efficiency achieved through employment of better manufacturing methods resulted in a saving

which increased the possibilities for a fair profit, and in many instances the savings were passed on to the public in the form of price reductions. An examination of a table cataloguing aircraft prices in 1929 and 1930 would show quickly that reductions of from five to twenty-three per cent. were made in each class of planes produced, and that some manufacturers offered price cuts as high as 35 and 40 per cent. from the 1929 levels. There were more than a score of models available to the private owner between $2,000 and $3,000, while companies catering to this low-price field hurried work on experimental models designed to give the public a

NEW ROGERS FLYING BOAT

Harry Rogers taking off in a new flying boat of his own design powered with a Wright Whirlwind engine, mounted as a pusher.

two place open cockpit ship with a high speed of about 70 miles an hour for $900 to $1,500. This was a development to be introduced to the general public in the spring of 1931.

There was a general trend toward simplification of the engineering standards required in the manufacture of aircraft without decreasing the margin of safety insured the buying public. The first joint meeting of the Airplane Manufacturers' Section of the Aeronautical Chamber of Commerce with the Department of Commerce, under a code of procedure drafted by the Chamber and the Department, centered around this point when the conference was called in Washington, September 26. Officials of the Department of Commerce drew up a list of proposed changes in

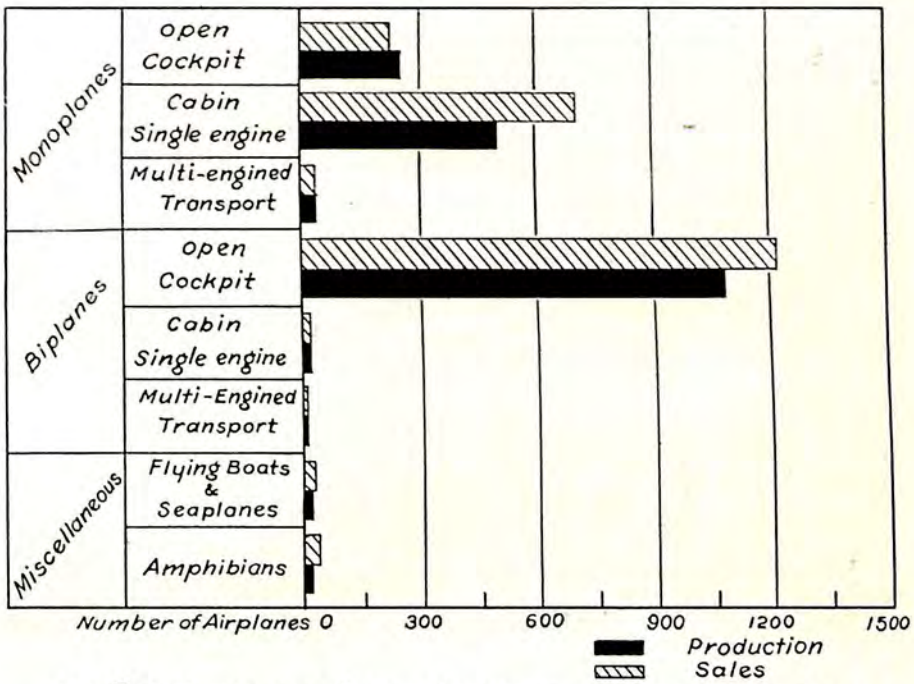
the Airworthiness Requirements, the government engineering code under which all American aircraft must be manufactured for sale. The manufacturers drafted a similar proposal for changes affecting 46 requirements of the Department. Many of the proposed changes of both the Department of Commerce and the manufacturers represented through the Chamber were concerned with a simplification of the requirements to prevent the limiting of the designers' field through detailed specifications. Drafted by leading engineers and designers from all parts of the country, the manufacturers' proposals on engineering matters were approved by the Department of Commerce officials in every instance, save one.

NEW AMPHIBIAN FOR PRIVATE FLIER

Privateer, a new two place open cockpit amphibian powered with a Warner Scarab engine, takes off in a yacht harbor on Long Island Sound.

The Department of Commerce was requested to waive the necessity of prospective aircraft purchasers obtaining a student pilot's permit before being allowed to handle the controls on a demonstration flight. The request was made by manufacturers during the St. Louis meeting of the Airplane Manufacturers' Section in February, and was granted by the Department. The waiving of this regulation eliminated a barrier to the sale of planes to private owners considered very important by the manufacturers. To further stimulate sales, the Chamber undertook the development of a sales manual in cooperation with sales managers of member companies to place before airplane salesmen the methods found most suc-

cessful in creating a desire for ownership. The Section also conducted an investigation of problems in the used plane market and considered the development of a manual for the guidance of dealers in valuing old planes. To supplement the Standard Manufacturers Sales Agreement prepared by the Chamber, a Standard Retail Sales Contract was being developed for use of distributors and dealers. The Chamber also inaugurated an effort to reduce aircraft freight rates through obtaining a reclassification of existing rates, in force since the World War, on airplanes, engines, accessories



1930 Production and Sales—Commercial Airplanes—By Types

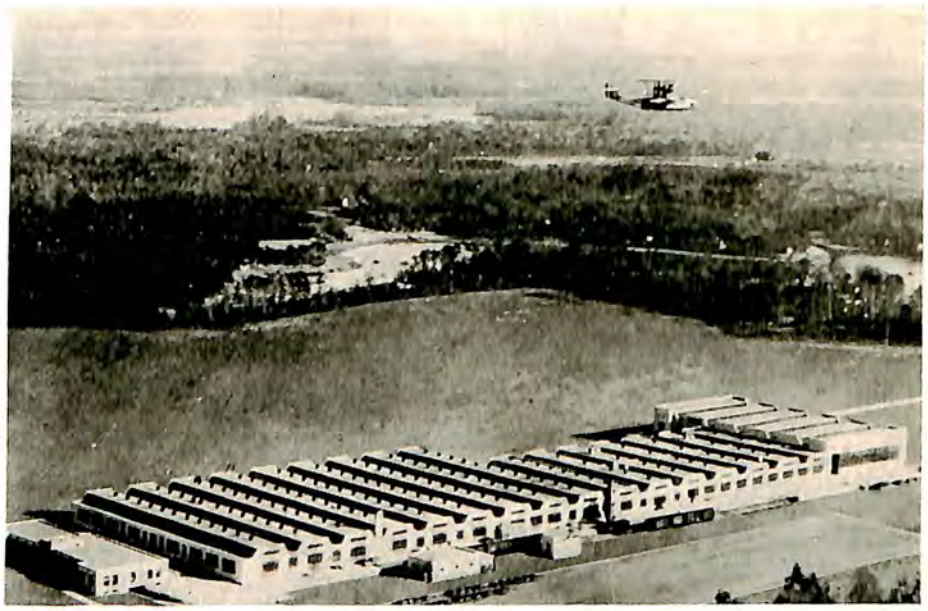
and component parts. A survey was made during 1930 to serve as a basis for furthering this project.

Condemn Acrobatic Demonstrations

Believing that "casualties during air races and individual stunts do incalculable harm to the industry," the Airplane Manufacturers' Section of the Chamber went on record at its Washington meeting "condemning any and all demonstrations which in order to attain spectacular publicity, emphasize the dangerous possibilities of flying." It was recommended that the manufacturers bind themselves under penalty of discipline to observe the Safety Code authorized by the Chamber's Board of Governors; that

specific suggestions for increasing discipline and penalties for dangerous practices should be made to the Department of Commerce; and that the National Aeronautic Association should be requested to cooperate on a common policy for future air races and competitions.

It was interesting to note that despite generally depressed world economic conditions during 1930, American exports of aeronautical equipment remained at approximately the 1929 level, the highest previous year.* The policy of many manufacturers who established export divisions late in 1929 to expand their markets was responsible for this favorable condition. The



NEW MARTIN FACTORY

Modern factory buildings and offices at the new Glenn L. Martin plant near Baltimore is an outstanding example of new construction for aircraft manufacturing.

Curtiss-Wright Export Corporation, General Motors Export Corporation and United Aircraft Exports, Inc., were separate units maintained by three of the great manufacturing groups to develop foreign markets. The Detroit Aircraft Corporation, Douglas Aircraft Corporation, Fairchild Airplane Manufacturing Company, and Nicholas-Beazley Airplane Company maintained active export divisions to further their development of world markets.

The Export Committee of the Aeronautical Chamber of Commerce directed the preparation of a new aviation cable code, known as "Avico," for use by aviation companies in sending or receiving foreign and domestic messages concerning their products. The code contained 30,000 words

* Complete table of American exports in Appendix.

and phrases, which included the listing of manufacturers' names, specifications of airplanes and motors, parts and parts assemblies, installations, export terms on shipping, boxing, price quotations, steamship lines, ports, banks and similar terms used in export communications. It was estimated conservatively that the new code would save members of the Chamber 30 per cent. of their domestic and foreign telegraph expenses. Through a clever and foolproof arrangement of code words, a maximum safety in transmission of messages was provided by the code. It was prepared and published in 1930 after months of study by experts within the industry and conferences with officials of the Department of Commerce.

NEW PLANT FOR STEARMAN

Factory and administration building of Stearman Aircraft Company completed adjacent to Wichita's Municipal Airport.

The growing export business in South America prompted the Chamber's Export Committee to request the Aeronautics Trade Division of the Bureau of Foreign and Domestic Commerce to place two Aviation Trade Commissioners in South America. The Washington office of the Chamber prepared and published with the cooperation of the Bureau a "Handbook for the Aeronautic Exporter," which contained current information on all world markets for the American manufacturer interested in export business.

Glimpses of Three Score Factories

It is difficult to obtain a true picture of manufacturing progress made during the year in American plants. The refinements of engineering designs to increase the speed and efficiency of planes will be discussed in a

later chapter, "Out of the Engineering Laboratory." While necessarily brief, the following résumés of the year's activities in 61 of the best known aircraft manufacturing establishments, widely scattered throughout the country, should 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.

Aeromarine Klemm Corporation of Keyport, N. J., continued production of its two place, open cockpit, low wing monoplane. Two new models, the Aeromarine 85 and the Aeromarine 70 powered with Le Blond 85 and 70 horsepower engines respectively, were added to the Aeromarine 40, a model powered with the Salmson 40 horsepower engine. A building to house the paint and doping departments was added to the factory.

Aeronautical Corporation of America in Cincinnati, Ohio, was one of the new companies to enter actively the field during 1930. Until late in the year production and sales efforts were confined to the Aeronca C-2, a single place, open cockpit monoplane powered with a 30 horsepower engine manufactured by the company. During the latter part of the year, the Aeronca C-3, a side-by-side dual control, open cockpit monoplane was designed for training and sport purposes. Production facilities were increased during 1930 by addition of a motor experimental room and a section to house the finishing department.

Alexander Aircraft Company of Colorado Springs, Colo., continued production of its Eaglerock models, available in two distinct types of three place, open cockpit biplanes, known as the sport commercial and training types. Each type included models powered with Curtiss OX-5, Curtiss Challenger, Hispano A and E, Wright Whirlwind 240, and Kinner K-5 engines. The Eaglerock Bullet, a four place, low wing, cabin monoplane powered with a Wright Whirlwind 165 was added to the production line during the year. A primary and secondary type glider also was developed.

The American Aeronautical Corporation moved into a new factory located at Port Washington, N. Y., continued production of the S-56, a three place, open amphibian powered with a Kinner K-5, and supplemented this model with the S-56B, an amphibian of same general specifications powered with a Kinner B-5. Another type produced was the S-55, a double hull, 17 place flying boat powered with either two Wright Cyclones or two Isotta Fraschinis. Engineering was concentrated on adapting these Savoia-Marchetti designs to American production methods.

American Eagle Aircraft Corporation of Kansas City, Kan., continued production of its three place, open cockpit biplanes powered with Curtiss OX5, Kinner and Wright Whirlwind engines. A model known as the Tourplane, a four place, cabin monoplane also was placed in production. The American Eaglet, an open cockpit light monoplane, designed to carry either one or two persons, depending upon the power plant used, was

developed during 1930. It was equipped with a Cleone or Szekely engine and was especially designed for the private owner or student.

Amphibions, Inc., of Garden City, N. Y. (formerly Ireland Aircraft, Inc.), supplemented its line with the Privateer, a two place, open cockpit, side-by-side amphibian monoplane powered with a Warner Scarab motor. Other types produced were the N2B and the N2C, five place, open or closed cockpit, amphibian biplanes powered with a Wright Whirlwind 300 and a Pratt and Whitney Wasp respectively. The Engineering Department concentrated its efforts on a landing gear retraction system, wing

SPEEDY GREAT LAKES RACER

With perfect streamlining and cowling, the special racing ship designed by Great Lakes Aircraft Corporation attained high speed with an American Cirrus engine.

tip float construction and general refinements of design. Early in 1930 the company moved into a new factory on Roosevelt Field.

Arrow Aircraft and Motor Corporation of Havelock, Nebr., continued production of its two place, side-by-side open cockpit biplane powered with Kinner or Le Blond engines.

Atlanta Aircraft Corporation of Atlanta, Ga., produced during 1930, an all metal eight place, low wing cabin monoplane powered with three Wright Whirlwind 240 engines. Especially designed for transport use the new plane was undergoing service tests at the close of 1930.

Bellanca Aircraft Corporation of New Castle, Del., placed the Bellanca Airbus, a combination mail and passenger cabin monoplane powered with

a Curtiss Challenger, Pratt and Whitney Hornet or Wright Cyclone engine on the market. Another new model known as the Skyrocket, a six place, cabin monoplane powered with a Pratt and Whitney Wasp, was introduced. The Pacemaker was made available with a Packard Diesel, Pratt and Whitney Wasp, Jr. or Wright Whirlwind 300 engine.

B-J Aircraft Corporation of Baltimore, Md. (formerly Berliner-Joyce), continued experimental work on models for military use. The corporation was reorganized during 1930 as a unit of North American Aviation Company, a holding company.

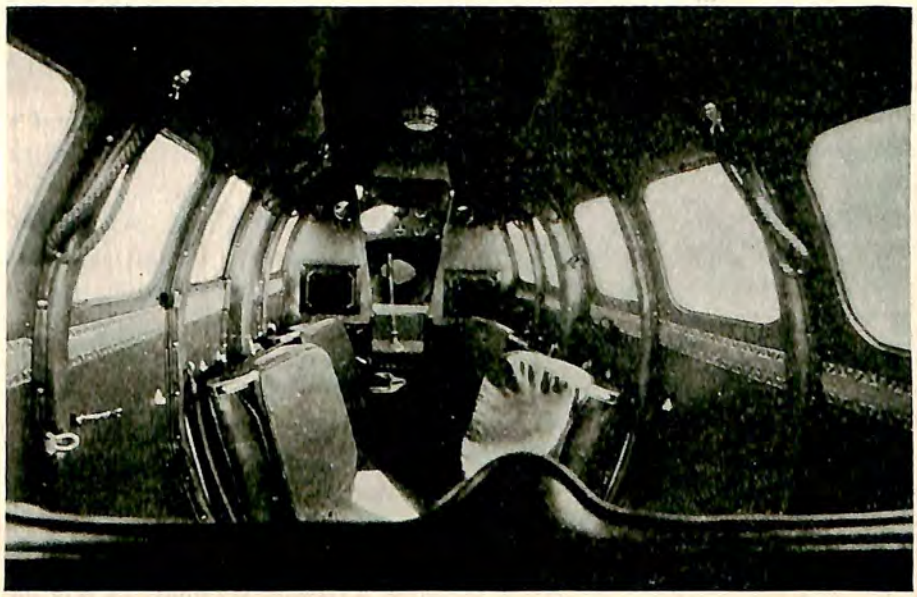
Bird Aircraft Corporation of Brooklyn, N. Y. (formerly Brunner-Winkle Aircraft Corporation), continued production of their Bird model, three place, open cockpit biplane, powered with a Curtiss OX5 or Kinner K5 engine. During the latter part of 1930, a new model was produced known as the Bird CK, a four place, open cockpit biplane, powered with a Kinner B5.

Boeing Airplane Company of Seattle, Wash., a division of United Aircraft and Transport Corporation, produced six military and five commercial models during 1930. The military models were the P-12-C, a single place, pursuit plane, powered with a Pratt and Whitney Wasp engine superseding the P-12-B and the F-4-B-2, similar in general design to the P-12-C but provided with necessary equipment to adapt it for Navy purposes. The Model 218 was developed as a biplane fighter with a metal monocoque fuselage powered with a Pratt and Whitney Wasp engine. Model 202 was produced as a single place, all metal parasol type monoplane pursuit plane and Model XP-9 was designed as a single place, all metal fighter powered with a Curtiss Super Conqueror Engine. To supplement this line of military planes, the design of a Bomber was completed just prior to the close of the year. The five commercial models produced during 1930 were the Boeing 80-A, a 20 place, tri-motored transport, powered with three Pratt and Whitney Hornet engines; the Boeing 80-B of similar specifications to the 80-A with the exception that the pilot's compartment was open; the Boeing 40-B-4, a biplane powered with a Pratt and Whitney Hornet engine designed to carry four passengers in a cabin with an open rear cockpit for the pilot; the Monomail 200, a single place, low wing, all metal monoplane powered with a Pratt and Whitney Hornet specially designed for mail; and the Monomail 221, a ship of similar design accommodating six or eight passengers in a fuselage cabin in addition to mail.

Buhl Aircraft Company of Marysville, Mich., continued production of the Sport Airsedan, Standard Airsedan and Senior Airsedan during 1930. The first was a three place cabin sesqui-plane powered with Wright Whirlwind 240 or Wright Whirlwind 300. The second was a six place, cabin sesqui-plane, powered with a Wright Whirlwind 300, and the third was

an eight place, cabin sesqui-plane, powered with a Wright Cyclone or Pratt and Whitney Wasp or Hornet engine. In addition to these models a two place, low wing, open cockpit monoplane powered with a Wright Whirlwind 300 or a Pratt and Whitney Wasp was produced early in 1930.

Cessna Aircraft Company of Wichita, Kan., continued production of its standard four place, cabin monoplanes powered with Curtiss Challenger, Wright Whirlwind 240 or Wright Whirlwind 300 engines. During the latter part of 1930 experiments were made on a single place, open cockpit monoplane powered with a 30 horsepower motor. An open cockpit, mid-



INTERIOR OF DETROIT LOCKHEED

Passenger cabin of the Lockheed Vega showing the cylindrical-shaped fuselage of monocoque construction. Pilot's cockpit can be seen forward.

wing monoplane powered with a Warner Scarab Engine especially designed for racing and a primary glider also were produced during 1930.

Command-Aire, Inc., of Little Rock, Ark., continued production of its Model 5-C-3, a three place, open cockpit biplane especially designed for sport and training with a Curtiss OX5, Wright Whirlwind 165, Wright Whirlwind 240, Lycoming, Axelson, Curtiss Challenger, or Warner Scarab engine. Especially designed for the sportsman pilot, the MR-1, known as the Little Rocket, was placed on the market. A low wing, single place, open cockpit monoplane powered with an American Cirrus engine, the Little Rocket won the All American Flying Derby.

Consolidated Aircraft Corporation of Buffalo, N. Y., continued produc-

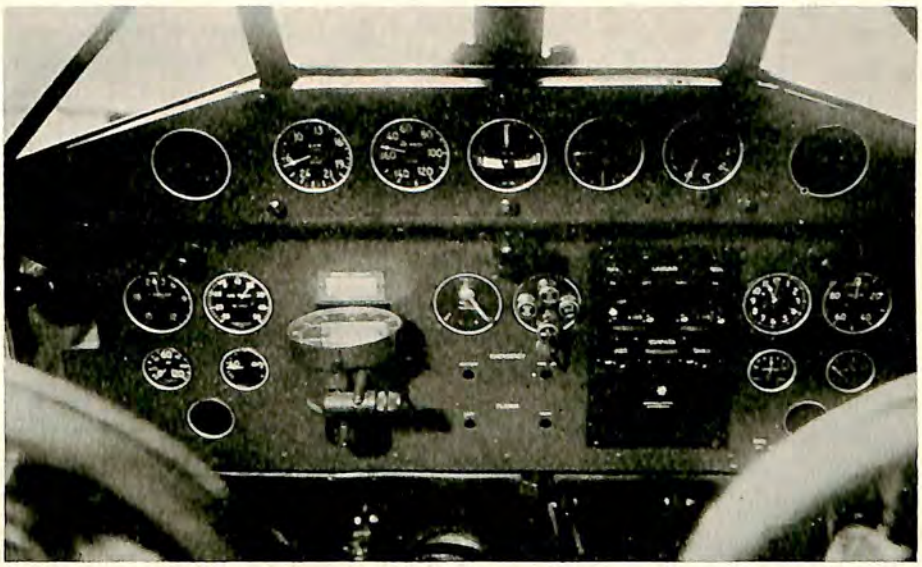
tion of its PT and NY series of training planes for the Army and Navy. Through the purchase late in 1929 of Thomas Morse Aircraft, the company also produced the O19B, an all metal observation ship for the Army, and received a contract for 90 O19C's, a ship of similar specifications powered with a Pratt and Whitney Wasp engine. The Standard Fleet, a two place, open cockpit biplane powered with a Kinner K5, B5 or Warner Scarab engine was produced and supplemented by the addition of a DeLuxe model, including additional equipment and refinements. Production of Model 17 Fleetster, an eight place, cabin monoplane powered with a Pratt and Whitney Hornet, was continued and the Model 20, a six place parasol wing monoplane seating five passengers in a fuselage cabin with the pilot in an open rear cockpit was added. The Commodore flying boat, a 25 place ship powered with two Pratt and Whitney Hornets was produced with a new model refined to accommodate 30 passengers and a crew of three. An airport comprising 126 acres was added to the plant during 1930 and a hangar 70 by 100 feet constructed.

Cunningham-Hall Aircraft Corporation of Rochester, N. Y., completed development of their model PT-6, a six place cabin sesqui-plane powered with a Wright Whirlwind 300. Engineering work was concentrated on the development of a high lift wing which was first fitted to the two place ship entered by the company in the Guggenheim competition.

The Curtiss Aeroplane and Motor Company, a division of Curtiss-Wright Corporation, with plants in Garden City, L. I., and Buffalo, N. Y., confined itself in a large degree to the production of military aircraft. Production was continued on the N2C-2, a two place, open cockpit biplane powered with a Wright Whirlwind 240 designed as a primary trainer for the Navy; the Hawk P-6; a pursuit biplane powered with a Curtiss Conqueror engine, equipped for either water or Prestone cooling; the Falcon O-1E, an observation biplane powered with a Curtiss D-12; and the Falcon A-3B, an attack biplane also powered with the Curtiss D-12. During the year a new model was added known as the F8C4 Helldiver, a two place biplane fighter and diving bomber powered with a Wright Cyclone 575 engine and especially designed for the Navy. An F8C5 Helldiver, a ship of same general specifications, was supplied to the Marine Corps. The Command Helldiver, with closed cockpits, also was designed for the Navy. Several experimental ships were developed: the YP-20, a pursuit biplane with a Wright Cyclone, the XF-C-6 racer, a single place monoplane with a Curtiss high compression Conqueror, the O-1G, an observation biplane powered with a Curtiss D-12, and the YO-13C, XO-16 and O-26 observation biplanes, each powered with Curtiss Conqueror engines. For the commercial field, the company continued production of the Curtiss Condor, a twenty-one place biplane powered with two Curtiss Conquerors, the Falcon Mailplane, powered with a Wright Cyclone engine, and a training plane similar to the

N2C-2, powered with a Curtiss Challenger 185 or Wright Whirlwind 240.

Curtiss-Wright Airplane Company (formerly Curtiss-Robertson) of St. Louis, Mo., a division of the Curtiss-Wright Corporation, continued production of the Robin series, three place cabin monoplanes powered with Curtiss Challenger or Wright Whirlwind 165 engines. The model was supplemented during 1930 by a four place Robin, powered with a Curtiss Challenger or Wright Whirlwind 240. The production of the Moth, formerly manufactured by the Moth Aircraft Corporation, Lowell, Mass., also was carried on in the St. Louis plant. The Moth was a two place, open cockpit biplane powered with a Wright Gipsy engine and equipped



NEW STRAIGHTWAY COMPASS

Pioneer instrument board installed on a Stinson monoplane, showing the new Straightway Compass (large instrument lower left) introduced in 1930.

with slots at the option of the purchaser. The Kingbird, an eight place cabin monoplane powered with two Wright Whirlwind 300 engines, was continued in production.

Curtiss-Wright Airplane Company (formerly Travel Air Manufacturing Company) of Wichita, Kan., a division of Curtiss-Wright Corporation, continued manufacture of their open and cabin airplanes especially designed for the commercial market. Current models produced during 1930 were the A-6000-A, a six place cabin monoplane powered with a Pratt and Whitney Wasp engine; the 6000-B, a ship of similar design powered with a Wright Whirlwind 300 engine and the four place cabin monoplane powered with a Wright Whirlwind 240. Open cockpit biplane models produced were 4-D, a three place ship powered with a Wright

Whirlwind 240; the Z4-D, a single place open cockpit biplane powered with a Wright Whirlwind 240, especially designed for crop-dusting; the E-4000, a three place ship with a Curtiss Challenger or Wright Whirlwind 165. Especially designed for the sportsman pilot, the Model S Mystery Ship was a single place, low wing monoplane powered with a Wright Whirlwind 300.

Davis Aircraft Corporation of Richmond, Ind., continued production of its two place open cockpit, parasol wing monoplane. In addition to the Model D-1, powered with a Le Blond 60, and the D-1K, powered with a Kinner K-5, additional models were produced known as the D-1-85 and the D-1L with the same general specifications but powered with a Le Blond 85 and Lambert 90 respectively. During the latter part of 1930 factory facilities were increased 50 per cent.

Detroit Aircraft Corporation of Detroit, Mich., concentrated the production activities of its member organizations during 1930. Production of the Ryan and Parks models was located in Detroit early in 1930. Manufacture of the Lockheed models was continued in Burbank, Cal. The Detroit plant produced the Ryan Brougham, a six place cabin monoplane powered with a Pratt and Whitney Wasp or a Wright Whirlwind 300; the Ryan Foursome, a new four place cabin monoplane powered with a Pratt and Whitney Wasp, Jr., or Wright Whirlwind 240; the Ryan Speedster, a new three place, open cockpit model; the Eastman flying boat, a four place open biplane powered with a Curtiss Challenger; the Eastman Amphibian, a new three place, open cockpit biplane powered with a Curtiss Challenger; the Parks T-1, a two place, open cockpit biplane powered with Curtiss OX5; and a primary glider, the Detroit Gull. The Lockheed plant produced the Lockheed Vega, a seven place, cabin monoplane powered with a Pratt and Whitney Wasp or Wright Whirlwind 300 constructed with either a wood or metal fuselage; the Lockheed Air Express, a five place parasol type wing monoplane seating four passengers in a fuselage cabin with an open cockpit for the pilot; the Lockheed Sirius, a two place, low wing, open cockpit monoplane powered with a Pratt and Whitney Wasp; and the Lockheed Mail Plane, a two place, low wing, open cockpit monoplane powered with a Pratt and Whitney Wasp.

Douglas Aircraft Company, Inc., of Santa Monica, Cal., continued the exclusive manufacture of military and mail planes. Production was maintained on adaptations of the O2 series, a two place observation plane, with O2-H and O2-K as the models for 1930. A contract for navy patrol boats and for planes to be used by the Chinese government was completed during the year.

Emsco Aircraft Corporation of Downey, Cal., continued production of the Emsco Cirrus, a two place center wing open cockpit monoplane, powered with an American Cirrus engine, and the Emsco Challenger, a tri-

motored eight place cabin monoplane powered with three Curtiss Challenger engines. A huge experimental plane of the standard Emsco center wing design was built for the Mexican government.

Fairchild Airplane Manufacturing Corporation of Farmingdale, N. Y., and Hagerstown, Md., a subsidiary of Fairchild Aviation Corporation which is a division of the Aviation Corporation, continued production of the Fairchild 71, a seven place, cabin monoplane, powered with a Pratt and Whitney Wasp; the Fairchild 42, a four place, cabin monoplane, powered with a Wright Whirlwind 300; the Fairchild KR34, a three place, open cockpit biplane, powered with a Wright Whirlwind 165; and the

FOR THE FLYING EXECUTIVE

New Stearman Business Speedster (Wright Whirlwind), a three place open cockpit biplane, designed to suit the needs of the busy executive.

Fairchild KR-21, a two place, tapered wing, open cockpit biplane, powered with a Kinner K5.

Fokker Aircraft Corporation of America, a division of General Aviation Corporation, with factories at Hasbrouck Heights, N. J., Passaic, N. J., and Wheeling, W. Va., was controlled by General Motors, producing a widely diversified line of planes for the military and commercial market. The XO-27, a three place observation-reconnaissance monoplane with two 600 horsepower Curtiss Conqueror engines faired into the wings, was developed during 1930 for the Army Air Corps. The F-32, a 32 place cabin transport monoplane with four Pratt and Whitney Hornet engines

mounted in double tandem; the F-14, a high wing monoplane designed to carry six passengers and a cargo of mail powered with a Pratt and Whitney Hornet or Wright Cyclone engine; the F-11A, an eight place monoplane amphibian with a Pratt and Whitney Hornet or Wright Cyclone mounted above the wing; the F-10A, a 12 place tri-motored cabin monoplane with three Pratt and Whitney Wasp engines; and the Fokker Super-Universal, a seven place cabin monoplane powered with a single Pratt and Whitney Wasp engine, were continued in production as standard models. The Standard Universal was offered with a Wright Whirlwind 300 engine.

The Great Lakes Aircraft Corporation of Cleveland, O., a division of Allied Motor Industries, continued production of the 2T1-A, a two place, open cockpit biplane, powered with an American Cirrus engine and the TG-1, a three purpose bombing, torpedo and observation plane for the Navy. The company also produced metal and wood floats on contract for the Navy.

The Hall-Aluminum Aircraft Corporation of Buffalo, N. Y., increased its factory space by 33,000 feet and added personnel. Production was started on an order of twin-engined flying boats for the Navy, each powered with two Wright Cyclone engines. A four engine patrol plane also was developed for the Navy.

Huntington Aircraft Corporation of Bridgeport, Conn., produced a two place, cabin monoplane, powered with a Warner Scarab engine. During the latter part of the year, the company experimented with a light plane especially designed for the private owner.

Inland Aircraft Corporation of Kansas City, Kan., moved into a new plant adjacent to Fairfax Airport and continued production of its two place side-by-side parasol type monoplane powered with Le Blond or Warner engines. During the latter part of 1930, an all metal ship similar in specifications to the Standard Inland Sport was designed.

Kellett Aircraft Corporation of Philadelphia, Pa., prepared for production of the Autogiro under license of the Pitcairn-Cierva Autogiro Company.

Keystone Aircraft Corporation of Bristol, Pa., a division of the Curtiss Wright Corporation, concentrated its production on military models. For the Army, it produced the B-3A, the YB4 and the YB5 bombing planes powered with two Pratt and Whitney Hornets or two Wright Cyclones. Production was continued on the OA-2 amphibian powered with a Wright Tornado engine. For the Navy, it produced the PK-1 flying boat powered with two Wright Cyclone engines and the OL-9 amphibian powered with a Pratt and Whitney Wasp. For the commercial field the Commuter, a four place amphibian biplane powered with a Wright Whirlwind 300 and the Air Yacht, an eight place, cabin amphibian, powered with a Wright Cyclone engine, were in production.

The E. M. Laird Airplane Company of Chicago, Ill., continued manufacture of its three place open cockpit biplanes powered with Wright Whirlwind engines. The LC-DW 300, a single place biplane, powered with a Pratt and Whitney Wasp, Jr., was designed and won the Thompson Trophy race in Chicago.

Lincoln Aircraft Company of Lincoln, Nebr., continued production of its P-3 series, a two place, open cockpit biplane, powered with Curtiss OX5 or Kinner K5, and added the Lincoln AP, a new three place cabin monoplane powered with a Kinner K5 or Kinner B5 engine.

The Glenn L. Martin Company of Baltimore, Md., produced two new

FOUR FOKKER TRANSPORTS

F-14, mail-passenger monoplane (Pratt and Whitney Hornet); F-11A eight place amphibian (Wright Cyclone); F-32, 32 passenger transport (4 Pratt and Whitney Hornets); and F-10A, 14-place transport (3 Pratt and Whitney Wasps), on the line.

types of patrol-bombing planes for the U. S. Navy during 1930. The XT5M-1, a biplane diving bomber, and the XT6M-1, a carrier torpedo biplane, were the new models introduced. Production was continued on the PM-1 and PM-2, twin-motored biplane patrol-bombing flying boats, and the P3M-1 and XP2M-1, tri-motored monoplane flying boats. Pratt and Whitney Wasps and Hornets or Wright Whirlwinds and Cyclones were used to power these models.

Mercury Aircraft, Inc., of Hammondsport, N. Y., produced their Model T-2, an all metal open cockpit training plane powered with a Le Blond engine.

Metal Aircraft Corporation of Cincinnati, O., continued production of the G-2-W, an eight place all metal cabin monoplane powered with a Pratt and Whitney Wasp, and the G-2-H, a similar ship powered with a Pratt and Whitney Hornet engine.

Mono Aircraft Corporation of Moline, Ill., continued production of the Monocoach, a four place, cabin monoplane, powered with a Wright Whirlwind 240; the Monoprep, a semi-cabin monoplane, powered with a Lambert M-5 engine; and the Monocoupe 60, a two place, cabin monoplane, powered with a Lambert M-5 engine. Four new models were added during 1930: the Monocoupe 90, a two place, cabin monoplane, powered with a Lambert 90; the Monocoupe 110, powered with a Warner Scarab; the Monocoupe 90-J, powered with a Warner Scarab, Jr.; and the Monocoupe 125, powered with a Kinner B-5.

Mooney Aircraft Corporation of Wichita, Kan., moved into a new factory adjoining the Wichita Municipal Airport, and produced its Model A-1, a four place cabin low wing monoplane, powered with a Kinner K-5 and its Model A-2, a ship of similar specifications powered with the Kinner B-5.

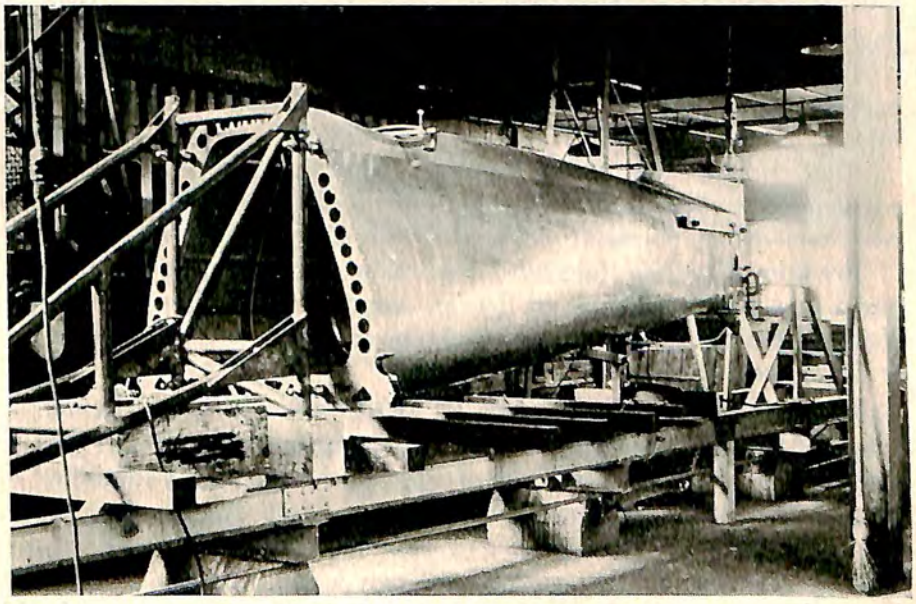
New Standard Aircraft Corporation of Paterson, N. J., continued production of its D-25 series of five place open cockpit biplanes powered with Wright Whirlwind 240 engines, and its D-26 series, three place open cockpit biplanes powered with Wright Whirlwind 240 engines. Model D-27, a single place biplane powered with a Wright Whirlwind 240 was especially designed for mail transport. Model D-25-B, a five place open cockpit biplane powered with a Wright Whirlwind 300; the Model D-25-C, a five place cabin biplane with the pilot in an open cockpit and powered with a Wright Whirlwind 240; and the D-29 series, a two place open cockpit biplane with a Kinner K-5 or Kinner B-5, were produced. A further development of the D-29 series was the D-31 and the D-32 models with the same general specifications but powered with Kinner B-5 and Wright Whirlwind 165 engines respectively. The NT-1, a two place open cockpit biplane, was supplied to the Navy on contract.

Nicholas Beazley Airplane Company, Inc., of Marshall, Mo., continued production of their Barling NB-3, a three place open cockpit low wing monoplane powered with Le Blond, Velie or Genet engines. During 1930, a new model was produced known as the NB-4, a ship of similar specifications to the NB-3 but powered with either a Lambert 90 or a Warner Scarab, Jr., engines.

Northrop Aircraft Corporation of Burbank, Cal., a division of United Aircraft and Transport Corporation, produced the Alpha, an all metal low wing seven place cabin monoplane with the pilot in an open cockpit. It was powered with a Pratt and Whitney Wasp engine. Considerable atten-

TWIN-ENGINED KINGBIRD

Curtiss Kingbird, an eight place cabin monoplane powered with two Wright Whirlwind engines, is designed especially for light transport.



MONOCOQUE FUSELAGE FOR BOMBER

Martin XT5M-1 Diving Bomber, showing the use of metal monocoque construction in the fuselage illustrative of the new trend.

tion was paid to experimental development of a "flying wing" type and a small experimental ship was successfully flown.

Pitcairn Aircraft, Inc., of Willow Grove, Pa., continued production of its PA-7, powered with a Wright Whirlwind 240 horsepower engine. It was available in two types: a three place open cockpit biplane or a single place biplane especially designed for mail and express. During 1930, a new model known as the PA-8 was produced with a Pratt and Whitney Wasp, Jr., or Wright Whirlwind 300. Late in the year, the company entered commercial production of the autogiro under license of the Pitcairn-Cierva Autogiro Company. The models which were available were three place ships powered with either a Pratt and Whitney Wasp, Jr., or a Wright Whirlwind 300.

Pitcairn-Cierva Autogiro Company of Philadelphia, Pa., held the American rights to the development of the Cierva Autogiro and carried on considerable experimental work to improve the flying characteristics of the machine before it was offered to the general market. Toward the close of the year, the company announced that it was prepared to enter into negotiations with responsible American companies to manufacture the Autogiro under a patent agreement. This company did not plan to manufacture the machines under its own name, but offered its engineering resources to aid other manufacturers who might begin production under rights granted them. Possibly the greatest advancement made during 1930 in the development of the Autogiro was the powering of the rotating wings from the engine to shorten the necessary time for taxiing before a take-off.

Pittsburgh Metal Airplane Company of Pittsburgh, Pa., continued development of the Thaden T-4, a five place cabin monoplane powered with a Wright Whirlwind 300. This ship is of all metal construction.

Prest Airplane and Motor Company of Arlington, Cal., late in 1930 commenced production of its Baby Pursuit model, a single place, parasol wing monoplane, powered with Szekely engine.

Rearwin Airplanes, Inc., of Kansas City, Kan., during 1930 moved into a new factory adjacent to Fairfax Airport and continued production of its three place open cockpit biplane powered with a Curtiss Challenger or Continental engine.

Sikorsky Aviation Corporation of Bridgeport, Conn., a division of United Aircraft and Transport Corporation, completed moving into its new factory during the early part of 1930. Production was continued on the S-38 which was increased from 10 to 12 place. A cabin amphibian, it was powered with two Pratt and Whitney Wasps or two Pratt and Whitney Hornets. During 1930 several new amphibian types were introduced. They were the S-39, a four to five place monoplane powered with a Pratt and Whitney Wasp, Jr.; the S-41, a 16 place cabin monoplane powered with two Pratt and Whitney Hornet engines; and the S-40, a 41

place monoplane amphibian powered with four Pratt and Whitney Hornets. When completed in 1931 the S-41 will be the largest plane in America and the world's largest amphibian.

Solar Aircraft Company of San Diego, Cal., produced the MS-1, an eight place, all metal, cabin monoplane powered with a Pratt and Whitney Wasp engine.

Spartan Aircraft Company of Tulsa, Okla., continued production of its C-3 series of three place, open cockpit biplanes. The series was available powered with the Wright Whirlwind 165 or Wright Whirlwind 240. New models produced were the C-4 series, a four place cabin monoplane

FORD AIRPORT AT DEARBORN

With an airport hotel under construction in the right background, Ford airport is keeping pace with its traffic needs. Ford airplane factory, engineering laboratory and museum also are seen in the foreground.

with a Wright Whirlwind 240 or Wright Whirlwind 300, and the C-5 series, a five place cabin monoplane powered with a Pratt and Whitney Wasp, Jr., or a Wright Whirlwind 300.

Stearman Aircraft Company of Wichita, Kan., a division of United Aircraft and Transport Corporation, late in 1930 moved into its new factory adjacent to the Municipal Airport in Wichita and continued production of its model C-3R, a three place open cockpit biplane, powered with a Wright Whirlwind 240, and the Junior Speed Mail series, three place open cockpit biplanes powered with a Wright Whirlwind 300, Pratt and

Whitney Wasp, Jr., or Pratt and Whitney Wasp. The series also was available as single place mail transports. During the latter part of 1930, the company received a contract from the Army for its Model 6A, two place open cockpit biplanes powered with Wright Whirlwind 165 engines. The commercial version of the ship known as the Cloud Boy series was powered with a Wright Whirlwind 165, Continental or Pratt and Whitney Wasp, Jr.

Stinson Aircraft Corporation of Wayne, Mich., continued production of its Stinson, Jr. series of four place cabin monoplanes available in models SM-7A, SM-7B, SM-8A, SM-8B and SM-8D. These models were powered with the Wright Whirlwind 300, Pratt and Whitney Wasp, Jr., Lycoming, Wright Whirlwind 240, and Packard Diesel engines, respectively. In addition to the Junior series, the Stinson Detroiter, a six place cabin monoplane powered with a Wright Whirlwind 300; the SM-6B, an eight place cabin monoplane powered with a Pratt and Whitney Wasp; and the SM-6000, a 12 place cabin monoplane powered with three Lycomings, were manufactured.

Stout Metal Airplane Company of Dearborn, Mich., a division of the Ford Motor Company, early in 1930 opened an addition to its former plant comprising 110,000 square feet of floor space. Production was continued on the Model 4-AT, a 14 place cabin monoplane powered with three Wright Whirlwind 300 or three Pratt and Whitney Wasp, Jr., engines. The 5-AT and 5-AT-C, 17 place cabin monoplanes powered with three Pratt and Whitney Wasp engines, and the 7-AT, a 15 place cabin monoplane powered with one Pratt and Whitney Wasp and two Wright Whirlwind 300 engines, were in production. A new model was introduced during the latter part of the year designated as model 8-A, a two place cabin monoplane powered with a geared Wright Cyclone engine, suitable for express transport. Engineering efforts of the company were concentrated on the development of greater top speed for the current models through aerodynamic cleanliness.

St. Louis Aircraft Corporation of St. Louis, Mo., continued production of its Cardinal series of two place cabin monoplanes. These ships were available with Kinner K-5, Le Blond 90 and Le Blond 65 engines.

Swallow Airplane Manufacturing Company of Wichita, Kan., continued production of its TP series, a two place open cockpit biplane. Several models were available powered with Curtiss OX5, Kinner K-5 or Warner Scarab engines. The F-28-AX, a three place open cockpit biplane powered with an Axelson engine, also was continued in production.

Timm Airplane Corporation of Los Angeles, Cal., continued production of its Collegiate K-90, a two place open cockpit parasol monoplane powered with a Kinner engine.

Verville Aircraft Company of Detroit, Mich., produced late in 1930

the Sport Trainer, a two place open cockpit biplane powered with a Continental engine. Production was continued during the year on the Air Coach, a four place cabin monoplane with a Wright Whirlwind 240 or Packard Diesel.

Viking Flying Boat Company of New Haven, Conn., manufactured the Viking, a four place open cockpit flying boat powered with a Wright Whirlwind 240. Production also was continued on the Kitty Hawk, a three place open cockpit biplane powered with a Kinner K-5 engine. During the latter part of the year experiments were being made on the design of a four place amphibian.

FORD EQUIPPED WITH FIRESTONE BALLOON TIRES

Chance Vought Corporation of Hartford, Conn., a division of United Aircraft and Transport Corporation, early in 1930 moved into its new factory adjacent to the United Airport at Hartford. The plant contained some 175,000 square feet of floor space. Production was concentrated on the Corsair, a two place observation-fighting ship powered with a Pratt and Whitney Wasp, for the Navy. Some of these ships delivered to the Navy were equipped with amphibian landing gear. During the latter part of the year experiments were made on a newly designed observation ship of all metal construction. The Corsair also was supplied to private owners.

Waco Aircraft Company of Troy, O., early in 1930 introduced a new model known as the "F." A three place open cockpit biplane, it was

available with a Kinner K5, Kinner B5 or Warner Scarab. Other models produced were the CSO, a three place open cockpit biplane powered with a Wright Whirlwind 240; the CTO, a three place open cockpit taper wing biplane powered with a Wright Whirlwind 240; and the QSO, a ship of the same general specifications as the CSO but powered with a Continental engine. The CSO and CTO also were available with Packard Diesel engines. The company produced a primary glider and experiments were under way on a light plane powered with the Continental engine.

Whittlesey Manufacturing Company of Bridgeport, Conn., continued production of the Avian, a two place open cockpit biplane powered with an American Cirrus engine and equipped with slotted wings at the option of the customer. The company also prepared to produce a small amphibian, and experimental work on its design was under way late in the year.

Accessories, Equipment and Materials

The development of new designs and refinement of existing types in the field of accessories, equipment and materials which make up component parts of a finished airplane were not retarded during 1930 as a result of the general business depression. Conversely, many of the well-established manufacturers contributing to this field pressed programs for new researches which might expand their market in the aircraft industry and make up for deficiencies in older fields which they have been serving for decades.

An examination of the method of fabricating an airplane will make clear the significance of this aggressive attitude on the part of accessory and material manufacturers. In reality, the word "accessory" is a misnomer as generally applied to parts going into the construction of aircraft. They are really component parts manufactured by specialists and supplied to aircraft manufacturers engaged in the design and final fabrication of the finished product. Some of the more important technical advances made in this field during 1930 will be reviewed in a later chapter, "Out of the Engineering Laboratory." It should be interesting here to get some conception of the wide range of allied industries contributing to the finished airplane. Corporations making contributions to the development of component parts for engines will be considered in the next chapter.

Wheels and brakes were perfected and produced by the Bendix Brake Company, a division of the Bendix Aviation Corporation, and the Kelsey Hayes Wheel Company. Pontoons were manufactured by Edo Aircraft Company, Aircraft Products Corporation of America, Brewster and Company, and Seymour J. Baum, Inc. Rubber tires for aircraft were especially perfected by Firestone Tire and Rubber Company, General Tire and Rubber Company, Goodyear Tire and Rubber Company, B. F. Goodrich

Rubber Company, and U. S. Rubber Company. Shock absorbers and struts were the specialty of Cleveland Pneumatic Tool Company, Gruss Air Spring Company, and Russell Manufacturing Company.

Aluminum Company of America, Bohn Aluminum and Brass Company, Carpenter Steel Company, International Nickel Company, Ohio Seamless Tube Company and Steel and Tubes, Inc., were among the principal contributors to the development of metal castings, forging and tubing. The Canton Drop Forging and Manufacturing Company, Endicott Forging and Manufacturing Company, Inc., U. S. Chain and Forging Company, and Wyman Gordon Company were specializing in drop forgings and castings for the industry. Welding equipment was supplied principally by Air Reduction Sales Company and Linde Air Products, Inc., while most of the shop equipment was developed by Black and Decker Manufacturing Company, Ex-Cell-O Aircraft and Tool Corporation, Gaul, Deer and Shearer Company, Indianapolis Tool and Manufacturing Company, and the Meisel Press Manufacturing Company.

The principal specialists in fabrics were F. Schumaker and Company, Thayer P. Gates, Thurston Cutting Corporation, and Wellington Sears and Company. Dopes and finishes were supplied by Berry Brothers, E. I. Dupont de Nemours and Company, Egyptian Lacquer Manufacturing Company, Inc., Titanine, Inc., Perry-Austin Manufacturing Company, and Valentine and Company. The chief purveyors of lumber and wood products suitable for aircraft construction were Aircraft Lumber Company, Balsa Wood Company, Haskelite Manufacturing Company, Port Orford Cedar Products Company, and the Posey Manufacturing Company. Machwyte Company and Stewart Hartshorn Company produced tie rods and wire for aircraft.

As pointed out in earlier chapters, the development of instruments and radio equipment to aid in the navigation of airplanes through all kinds of weather has been a major factor in the maintenance of air transport schedules and in raising the standard of aircraft reliability. The chief contributors to progress in the instrument field were American Askania Corporation, American Paulin System, Elgin National Watch Company, Moto-Meter Gauge and Equipment Corporation, Pioneer Instrument Company, a division of Bendix Aviation Corporation, and Sperry Gyroscope Company. In the radio field, the Aircraft Radio Corporation, Breeze Corporation, American Telephone and Telegraph Company, Radiomarine Corporation, and Western Electric Company, Inc., made outstanding contributions.

Five companies continued the development of parachutes and safety devices. They were Irving Air Chute Company, Inc., Follmer Clogg and Company, Russell Parachute Company, Switlik Parachute and Equipment Company, and Triangle Parachute Company. Flying togs, goggles or

wearing apparel for pilots were the specialties of A. G. Spaulding and Bros., Boehmke Optical Company, and E. B. Meyrowitz, Inc.

The Aero Supply Manufacturing Company, Air Transport Equipment, Inc., and Johnson Airplane and Supply Company acted as general wholesalers for supplies. Other companies specializing in products for aircraft included: Imperial Brass Company, sanitary equipment; John A. Roebling's Sons, cable; Russell Manufacturing Company, brake lining and shock cord; S. S. White Dental Manufacturing Company, small tubing; Packard Electric Company, electric cable; Eastman Kodak Company, photographic equipment; Detroit Steel Products; Tubular Rivet and Stud Company; and Parker Appliance Company, couplings.

CHAPTER X

PRODUCING AMERICAN ENGINES

Engine Refinements Increase Aircraft Efficiency—Superchargers and Higher Compression Ratios Used—Better Fuels Perfected—Diesel Engine Introduced—Activities of Principal Manufacturers

INCREASED reliability and efficiency of aircraft was the direct result of refinements made on aircraft engines in production and the development of new models during 1930. Engine failure, the cause of many forced landings in the early days of flying, had become so infrequent that it was no longer a source of concern to the operator who maintained a careful inspection of his equipment. The life of an engine had been materially increased and the costs of operation were consequently reduced.

Low weight and exceptional horsepower were the two characteristics fused into the aircraft engine to make it the most efficient known to the world since the combustion principle was first employed. Through employment of high compression pistons and superchargers, manufacturers made great strides during 1930 in increasing the horsepower of their standard models without materially increasing the weight. The result was the development of airplanes with greater pay loads in proportion to gross load.

In all these engines, the weight-horsepower ratio was reduced by continued "stepping-up" of power. The usual procedure was to effect the power increase by supercharging, operating at greater crankshaft speeds, and using higher compression ratios. Higher cylinder temperatures for higher thermal efficiency also were permitted with both liquid-cooled and air cooled engines. These 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.

Recognizing that the continued development of the aircraft engine depends, in a large measure, on the availability of better fuels and lubricants, leading oil companies carried on extensive research which resulted in definite improvement of aviation fuels, particularly with regard to knock rating. Record breaking flights of Capt. Frank Hawks, Lieut. James Doolittle and Charles "Speed" Holman were made possible through the use of better fuels. Power outputs of the engines used were increased from 300 horsepower to 425 horsepower due to the availability of anti-knock gasoline capable of use under conditions of high pressure and high temperature.

The Motor Manufacturers' Section and the Fuel and Lubricants Section of the Aeronautical Chamber of Commerce both played an important part during 1930 in investigating the principal problems associated with this work. The development of a uniform safety code for the handling of aviation gasoline, the establishment of a code of ethics and commercial practice for the marketing of aviation fuels and lubricants,* and the correlation of technical research activities of the several interested societies were definitely achieved during the year by the Fuels and Lubricants Section. The Motor Manufacturers' Section worked with the Department of Commerce on necessary changes in the requirements for manufacturing engines, and worked on a system of discounts to the aircraft manufacturer and distributor and dealer, which might prove equitable to all concerned.

The predominant position of American aircraft engines was evidenced from their wide use in all parts of the world. Foreign manufacturers often selected American engines for installation in aircraft required to perform an exceptionally difficult task. Twelve Curtiss Conqueror engines were installed in the giant Dornier DO-X when it was prepared for its projected trans-Atlantic trip. Pratt and Whitney Hornet engines powered giant Junkers charged with the Herculean task of transporting tons of gold mining machinery into the heart of British New Guinea. The Royal Dutch Air Lines selected Pratt and Whitney Wasps to power their Dutch-built Fokkers on the new route from Amsterdam to Java. Wright Whirlwinds were powering Fokkers of Swiss Belair Airlines over the treacherous Alps and Pyrenees between Munich, Germany, and Barcelona, Spain. In Canada, China, Japan, and most of the countries of Europe and Latin America, American engines of some make were in daily use. Some of them were constructed under licensing arrangements with foreign representatives, others were imported from the United States.

Diesel Engine Introduced

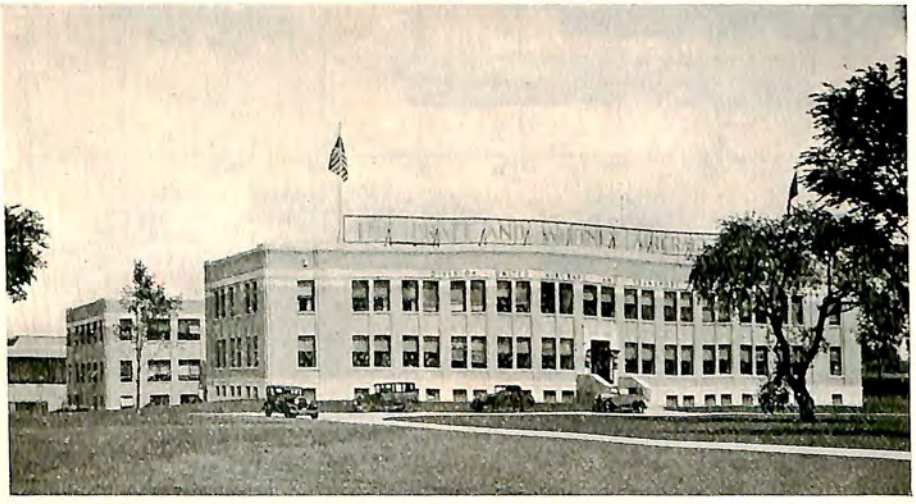
The introduction of a Diesel type aircraft engine and the successful testing of a new fuel injection engine using oil or gasoline were outstanding technical developments during 1930. These and other technical achievements in the engine field will be discussed in a later chapter, "Out of the Engineering Laboratory." It is sufficient to say here that the developments of the year were an inspiration to designers striving to develop planes carrying greater pay loads.

The Department of Commerce listed 68 manufacturers of aircraft engines in the United States toward the middle of 1930. However, only 30 of these were manufacturing under Approved Type Certificates issued by the Department of Commerce. Sixty-five Approved Type Certificates

* Code printed in Appendix.

MODERN PRODUCTION MACHINERY

General view of the connecting rod department of the Pratt and Whitney Aircraft Company in East Hartford, Conn., showing equipment used.



MODERN ENGINE PLANT

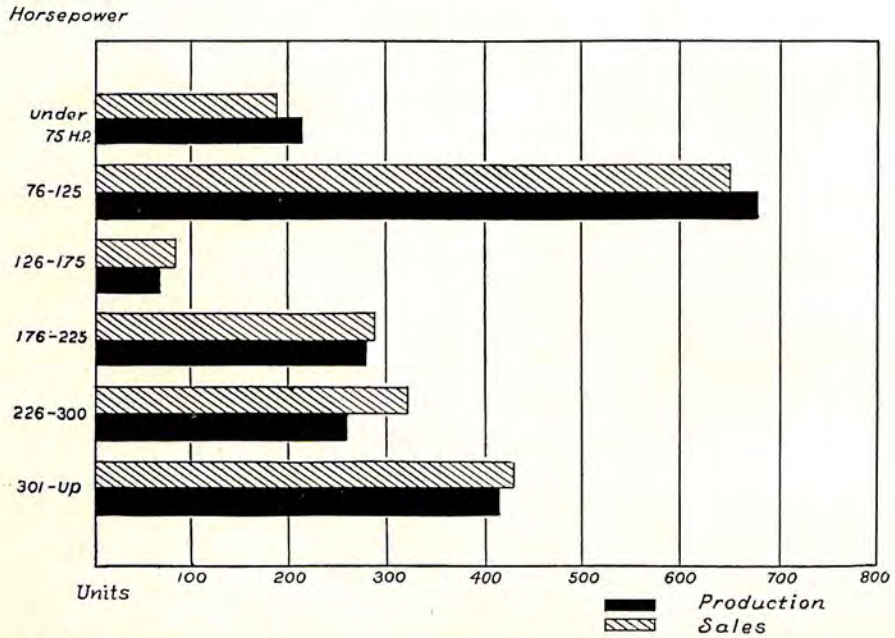
New factory of the Pratt and Whitney Aircraft Company at East Hartford, Conn., is illustrative of the strides made in providing better manufacturing facilities.

for engines had been issued by the Department of Commerce since it began its inspection work in 1927, and 29 of these were issued during 1930.

The design of light airplanes for the private flier to sell in the $1,000 class prompted several engine manufacturers to develop two to four cylinder engines during 1930 for this purpose. The two cylinder Aeronca engine, four cylinder Continental, and three cylinder Szekely were outstanding examples of this trend.

Manufacturing Résumé

A brief résumé of the year's activities in each of the major engine manufacturing plants should provide a fair picture of developments in this field

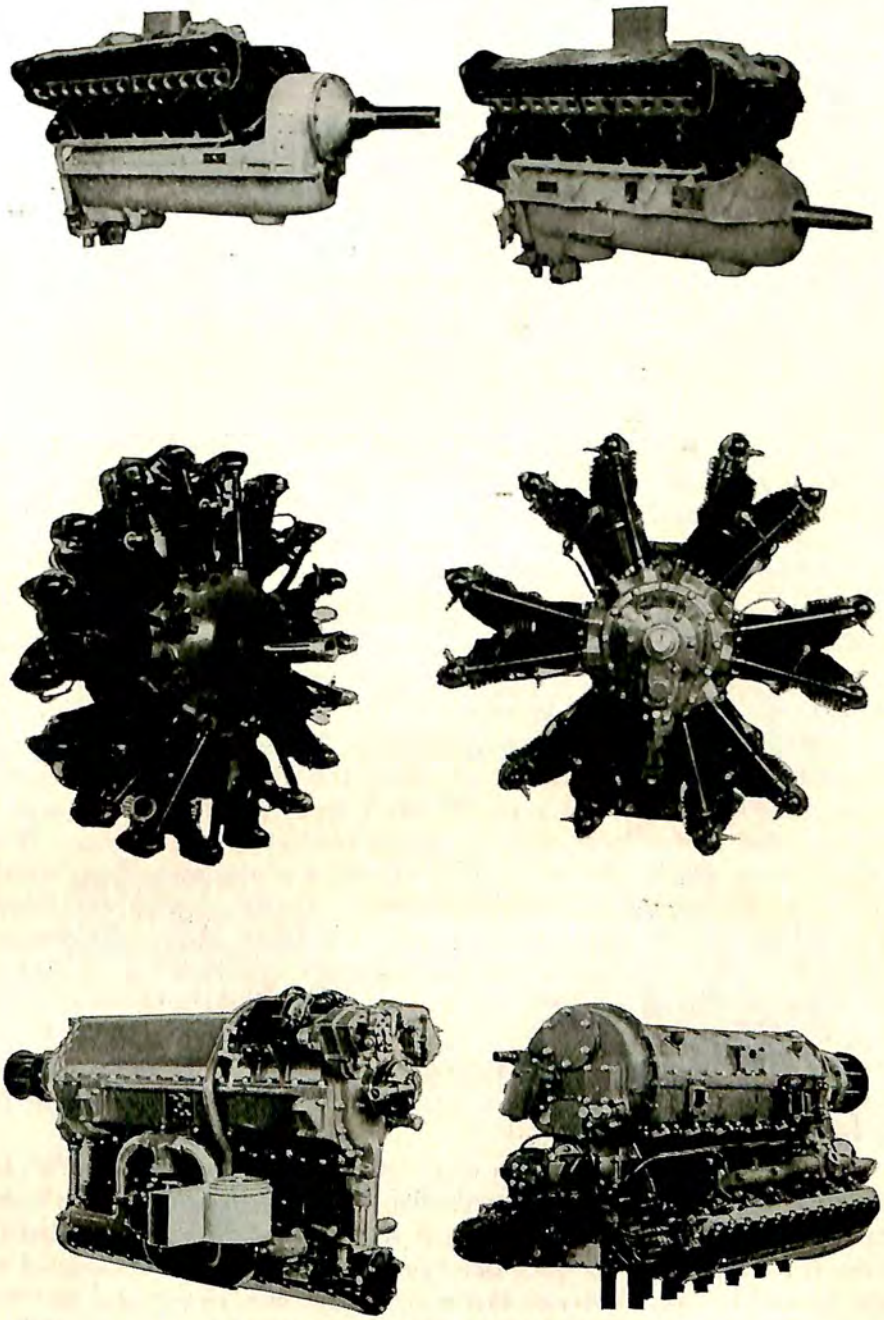


1930 Production and Sales—Commercial Aircraft Engines—By Types

and the types of products offered for both the commercial and military markets. They follow, arranged in alphabetical order for convenience in future reference.

Allison Engineering Company of Indianapolis, Ind., a division of General Motors, concentrated on experimental work for the Army and Navy and on the design on new engines for the commercial field, the character of which had not yet been announced at the close of 1930.

American Cirrus Engines, Inc., a subsidiary of the Allied Motor Industries, Inc., produced the American Cirrus, a four cylinder in-line air cooled



CURTISS, LYCOMING AND FAIRCHILD

Curtiss Geared Conqueror, 600 horsepower (upper left); Curtiss D-12, 435 horsepower (upper right); Lycoming R-680, 215 horsepower (center left); Curtiss Challenger, 185 horsepower (center right); Fairchild 6-390, 120 horsepower (lower left); and Fairchild V-770, 240 horsepower (lower right).

engine rated at 95 horsepower at 2,100 revolutions per minute, at its Marysville, Mich., plant.

E. W. Bliss Company of Brooklyn, N. Y., prepared to manufacture the Jupiter engine, a nine cylinder radial air cooled engine under its American rights to the patents of the Bristol Aeroplane Company of England.

Chevrolet Aircraft Corporation of Baltimore, Md., closely affiliated with the Glenn L. Martin Company, moved its factory from Indianapolis early in 1930 and continued experimental work on a four cylinder inverted in-line air cooled engine. Late in the year, the engine designated as model 333 successfully passed the Department of Commerce test for an Approved Type Certificate. Rated at 120 horsepower at 2,100 revolutions per minute, production of the new model was started during the closing months of the year.

Comet Engine Corporation of Madison, Wis., continued production of its model 7-E, a seven cylinder radial air cooled engine rated at 165 horsepower at 1,900 revolutions per minute.

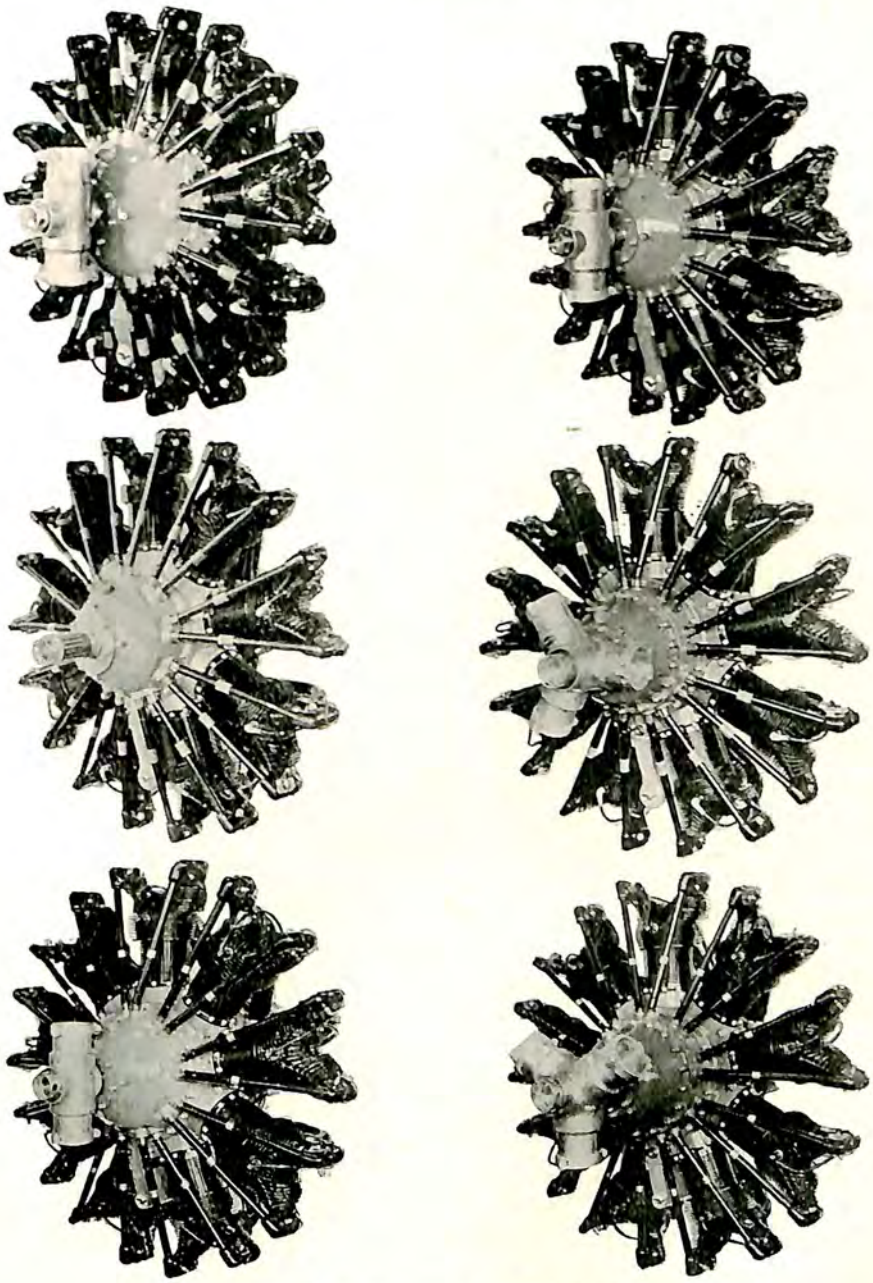
Continental Aircraft Engine Corporation of Detroit, Mich., a subsidiary of Continental Motors, began production of its model A-70, a seven cylinder radial air cooled engine rated at 165 horsepower at 2,000 revolutions per minute, early in 1930. A new four cylinder horizontally opposed air cooled L-head engine designed to develop 35 horsepower at 2,500 revolutions per minute was developed late in 1930.

Curtiss Aeroplane and Motor Company of Buffalo, N. Y., a division of the Curtiss-Wright Corporation, produced three distinct models during 1930. The Conqueror was a 12 cylinder V-type Prestone or water-cooled engine rated at 600 horsepower at 2,400 revolutions per minute. The engine was available with direct drive or with a 2:1 reduction gear which turned the propeller at half crankshaft speed. The D-12 was a 12 cylinder V-type water-cooled engine rated at 435 horsepower at 2,250 revolutions per minute. The Challenger was a six cylinder radial air cooled engine. Its rating was increased early in 1930 to give it 185 horsepower at 2,000 revolutions per minute.

Dayton Airplane Engine Company of Pawtucket, R. I., moved its factory from Dayton, O., during the year and continued development of its in-line air cooled engines.

Fairchild Engine Corporation of Farmingdale, N. Y., a division of the Aviation Corporation, started production late in 1930 on a six cylinder inverted in-line air cooled engine rated at 120 horsepower at 2,150 revolutions per minute. The model, developed during 1930, was designated as the Fairchild 6-390. Experimental development of a 12 cylinder inverted V-type engine designed to produce 240 horsepower at 2,150 revolutions per minute was under way late in the year.

Jacobs Aircraft Engine Company of Camden, N. J., completed experi-



PRATT AND WHITNEY ENGINES

Wasp, Jr., 300 horsepower (upper left); Wasp Direct Drive Series C, 450 horsepower military rating, 425 horsepower commercial rating (upper right); Hornet Series B, 575 horsepower (center left); Hornet Series B Geared, 550 horsepower (center right); Hornet Direct Drive Series A-1, 525 horsepower (lower left); and Hornet Series A-1 Geared, 500 horsepower (lower right).

mental work early in 1930 on a seven cylinder radial air cooled engine rated at 190 horsepower at 1,800 revolutions per minute. Production of this model was started and experiments were under way on a two-cylinder opposed air cooled engine designed to produce 25 horsepower at 3,000 revolutions per minute.

Kinner Airplane and Motor Corporation of Glendale, Calif., continued production of its model K-5, a five cylinder radial air cooled engine rated at 100 horsepower at 1,800 revolutions per minute. Several refinements were made on the model Kinner C-5, a five cylinder radial air cooled engine rated at 210 horsepower at 1,900 revolutions per minute. Service facilities for these engines throughout the country were expanded during the year.

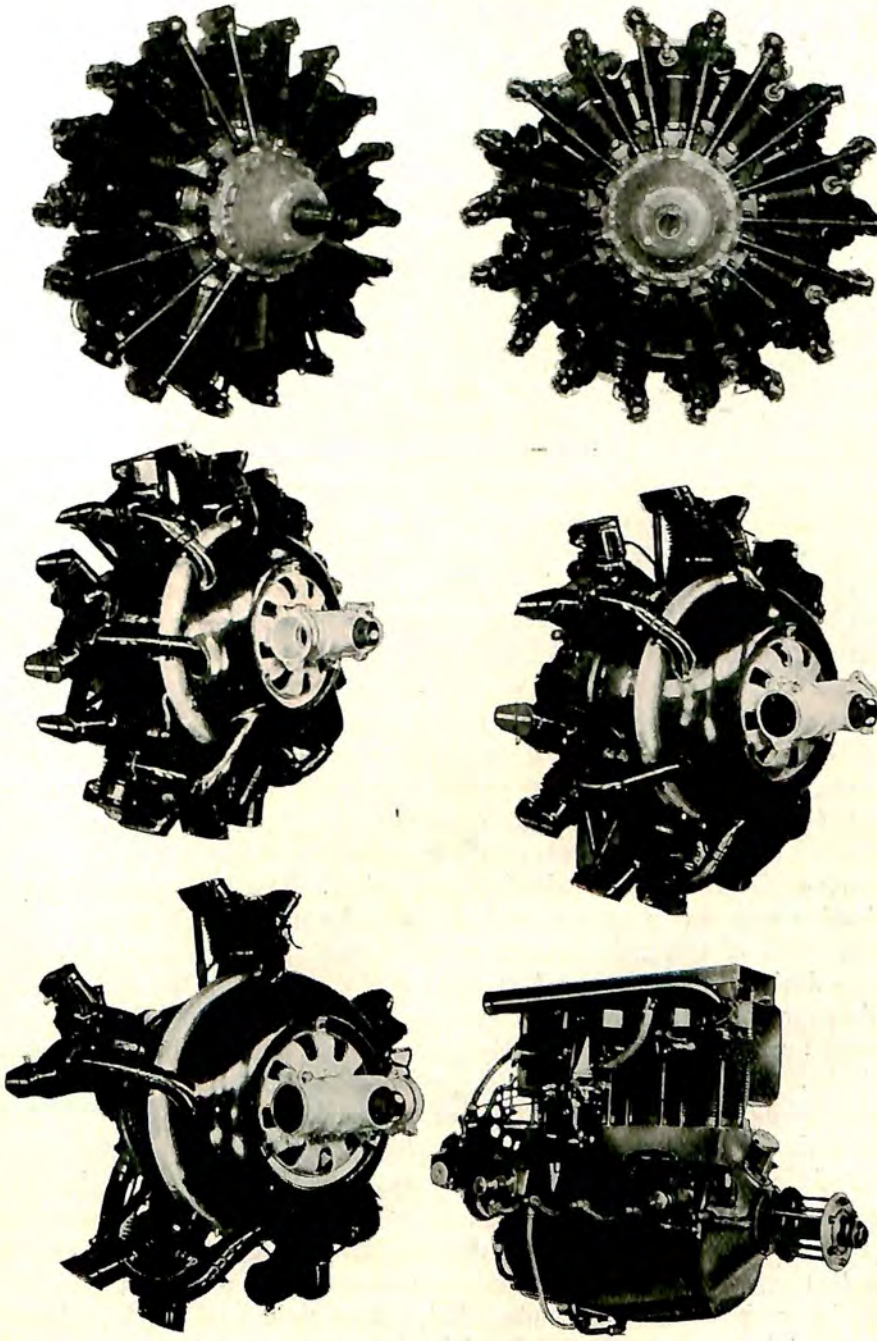
Lambert Aircraft Engine Corporation of St. Louis, Mo., continued production of the M-5, a five cylinder radial air cooled engine rated at 65 horsepower at 1,900 revolutions per minute. Early in the year, production also was started on the R-266, a five cylinder radial air cooled engine rated at 90 horsepower at 2,375 revolutions per minute.

Le Blond Aircraft Engine Corporation of Cincinnati, O., produced the Le Blond 70, 85 and 110 during 1930 and discontinued the Le Blond 60 and 90 in favor of the newer models. The 70, designated as model 5-DE, was a five cylinder radial air cooled engine rated at 70 horsepower at 1,950 revolutions per minute. The 85, known as model 5-DF, was a five cylinder radial air cooled engine rated at 85 horsepower at 2,125 revolutions per minute. The 110, named model 7-DF, was a seven cylinder radial air cooled engine rated at 110 horsepower at 2,150 revolutions per minute.

Light Manufacturing and Foundry Company of Pottstown, Pa., continued production of the Brownback Tiger model C-400, a six cylinder radial air cooled engine rated at 90 horsepower at 1,700 revolutions per minute. The model was formerly produced by the Brownback Motor Laboratories which were taken over early in the year by the Light Manufacturing and Foundry Company.

Lycoming Manufacturing Company of Williamsport, Pa., affiliated with the Cord Corporation, started production early in the year on their model R-680, a nine cylinder radial air cooled engine rated at 215 horsepower at 2,000 revolutions per minute. It superseded the former model known as the R-645.

Packard Motor Car Company of Detroit, Mich., introduced its Diesel Aircraft Engine early in 1930 after several years of development work. A new plant was completed for building the engine, a Department of Commerce Approved Type Certificate was obtained, and production of the new engine started. A radial internal combustion engine burning ordinary furnace oil and rated at 225 horsepower at 1,950 revolutions per minute, the new Diesel type engine had no carburetor, magneto or spark plugs.



WRIGHT ENGINES

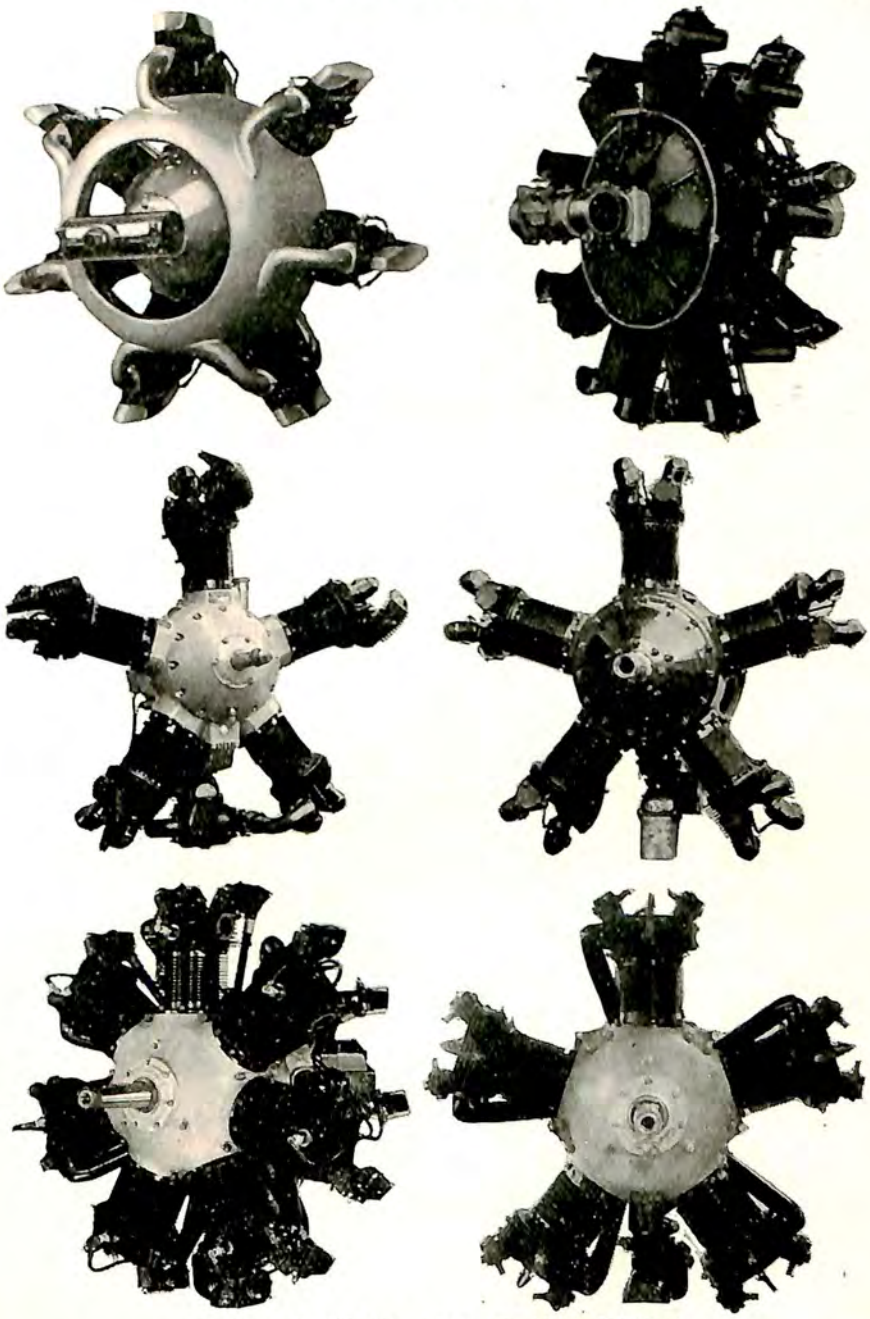
Cyclone, 575 horsepower (upper left); Cyclone, 525 horsepower (upper right); Whirlwind, 300 horsepower (center left); Whirlwind, 240 horsepower (center right); Whirlwind, 165 horsepower (lower left); and Gipsy, 90 horsepower (lower right).

Ignition was obtained by spraying fuel into air, compressed in the cylinders until it reached a temperature of about 1,000 degrees Fahrenheit. Because of the simplicity of construction and greatly reduced number of parts, it could be disassembled in 17 minutes. The company also continued production of its water-cooled engines of 600, 800 and 1,000 horsepower. These were known as the Packard 1500 and Packard 2500 models.

Pratt & Whitney Aircraft Company of East Hartford, Conn., a division of United Aircraft and Transport Corporation, began production January 1, 1930, in a new plant containing 500,000 square feet of manufacturing space devoted exclusively to the manufacture of aircraft engines. Production was continued on the Series C Wasp, a nine cylinder radial air cooled engine rated at 420 horsepower at 2,000 revolutions per minute; the Series A-1 Hornet, a nine cylinder radial air cooled engine rated at 525 horsepower at 1,900 revolutions per minute; and the Series B Hornet, a nine cylinder radial air cooled engine rated at 575 horsepower at 1,950 revolutions per minute. Early in the year, production also was started on the Wasp Junior, a nine cylinder radial air cooled engine rated at 300 horsepower at 2,000 revolutions per minute. The Wasp Junior also was available with a supercharger to develop 400 horsepower at 2,300 revolutions per minute at 4,000 feet. Late in 1930, the Series D Wasp, a supercharged high compression engine rated at 500 horsepower at 2,200 revolutions per minute, was placed in production. The Series A-2 Hornet, a development of the A-1, with 525 horsepower at 1,900 revolutions per minute, was put on the market in the summer of 1930. Geared engines available included: the Series C Wasp with 5:4 reduction drive and 2:1 reduction drive; the A-2 Hornet with 2:1 reduction drive; and the Series B Hornet with 3:2 and 2:1 reduction gear drives. The Pratt and Whitney reduction gear drives were manufactured under patents held by the company. One of the organization's most interesting experimental developments during the year centered around a device which eliminated the usual carburetor and intake system of the gasoline engine. The new injection system measured the fuel precisely and delivered it mechanically to each cylinder. The atomization was so perfected that a large range of fuels could be used, including both furnace oil and aviation gasoline. Continued development of the device was planned for 1931.

Szekely Aircraft and Engine Company of Holland, Mich., produced a three cylinder radial air cooled L-head engine rated at 30 horsepower at 1,750 revolutions per minute; a three cylinder radial air cooled engine rated at 45 horsepower at 1,750 revolutions per minute; and two five cylinder radial air cooled engines designed to develop 65 and 70 horsepower. These two engines differed in that one was an L-head type and the other employed overhead valves.

Western Enterprise Engine Company of Los Angeles, Cal., manufac-



COMET, PACKARD, KINNER AND WARNER

Comet, 150 horsepower (upper left); Packard Diesel, 225 horsepower (upper right); Kinner B-5 or K-5, 125 or 100 horsepower (center left); Kinner C-5, 210 horsepower (center right); Warner Scarab, 100 horsepower (lower left); and Warner Scarab Junior, 90 horsepower (lower right).

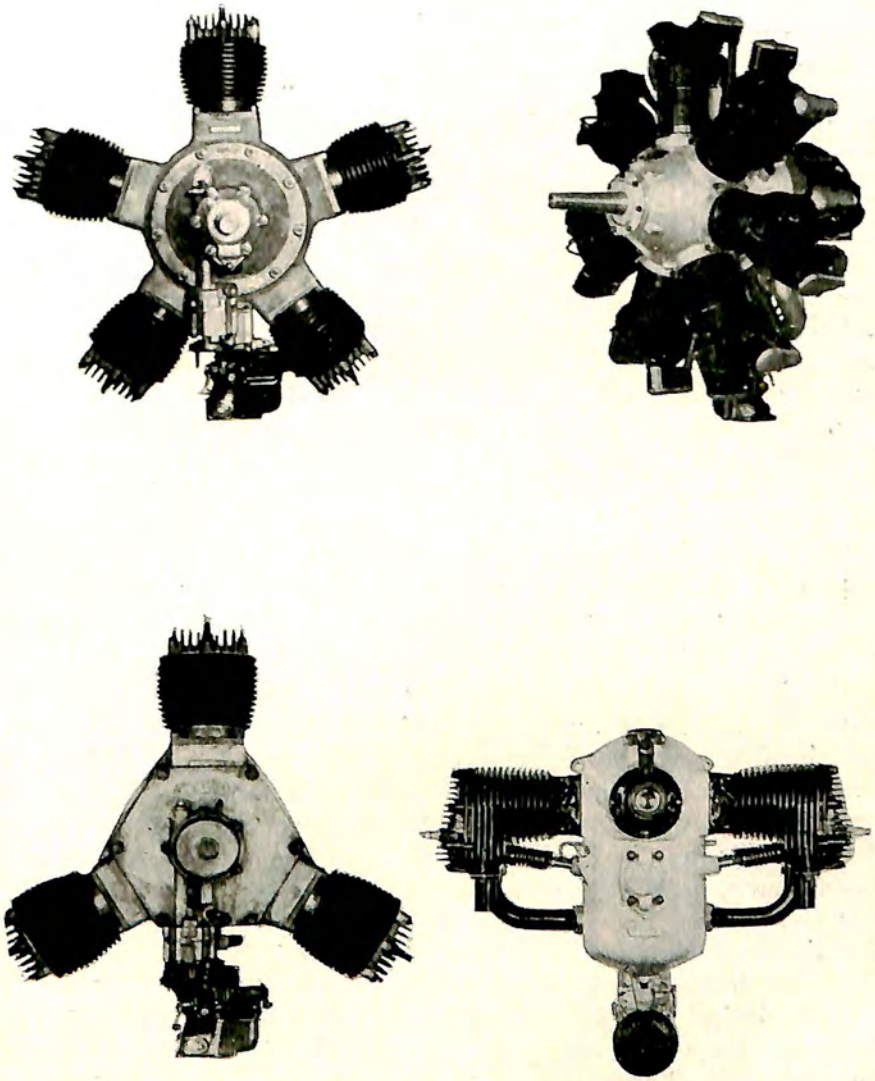
tured a seven cylinder radial air cooled L-head engine rated at 130 horsepower at 1,850 revolutions per minute.

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 revolutions per minute. During the year, the company also introduced the Warner Scarab Junior, a five cylinder radial air cooled engine rated at 90 horsepower at 2,025 revolutions per minute.

Wright Aeronautical Corporation of Paterson, N. J., and St. Louis, Mo., unit of the Curtiss-Wright Corporation, continued production of its Gipsy engine, its Whirlwind series and its Cyclone series. The Gipsy, a four cylinder in-line air cooled engine rated at 90 horsepower at 1,950 revolutions per minute, went into operating service for training and sport planes. The Whirlwind J-6 series included the Whirlwind 165, a five cylinder radial air cooled engine rated at 165 horsepower at 2,000 revolutions per minute; the Whirlwind 240, a seven cylinder radial air cooled engine which had its rating raised during 1930 from 225 to 240 horsepower at 2,000 revolutions per minute; and the Whirlwind 300, a nine cylinder radial air cooled engine rated at 300 horsepower at 2,000 revolutions per minute. To this Whirlwind series was added a supercharged high compression nine cylinder engine of 975 cubic inch displacement rated at 400 horsepower at 2,300 revolutions per minute. To the radial air cooled nine cylinder Cyclone Series, which previously included only the engine of 1,750 cubic inch displacement rated at 525 horsepower at 1,900 revolutions per minute, was added a new Cyclone of 1,820 cubic inch displacement rated at 575 horsepower at 1,900 revolutions per minute. Both Cyclones included many new engineering developments of which the new baffles for cooling were considered outstanding. The air cooled V-type Tornado series produced for military purposes was expanded during 1930 to include a new engine of 1,560 cubic inch displacement, an engineering development from the 1,460 cubic inch displacement engine of former years. The Wright spark plug cooler, centrifugal clutch, and offering of geared drive engines in the 165, 240, 300, 525 and 575 horsepower classes were among the year's developments in Whirlwinds and Cyclones. Geared engines were available in the Whirlwind and Cyclone series with a 2:1 reduction drive and 1.58:1 reduction drive.

Refinement of Component Parts

The increased efficiency of aircraft engines during 1930 was, in part, the result of refinements made on component parts manufactured by a score of companies contributing to the final product. Just as specialists contributed to the development of accessories and equipment necessary in airplane construction, so a host of well-established companies were improving the products necessary in the final assembly of an aircraft engine.



SZEKELY AND CONTINENTAL ENGINES

Szekely SR-5, 70 horsepower (upper left); Continental A-70, 165 horsepower (upper right); Szekely SR-3, 30 horsepower (lower left); and the Continental A-40, 35 horsepower (lower right).

Carburetors, magnetos, starters, generators, spark plugs, piston rings, bearings, cowlings and similar parts were developed by specialists and supplied to the manufacturers of engines.

Some of the outstanding technical developments in this field will be considered in a later chapter, "Out of the Engineering Laboratory." It should be interesting here, however, to obtain a picture of the number of well-established companies—many of them old names in the automotive field—which developed parts or accessories for aircraft during 1930.

The life and efficiency of the spark plug was improved through the researches of the A. C. Spark Plug Company, B. G. Corporation, Champion Spark Plug Company, and Hurley-Townsend Corporation. The Eclipse Aviation Corporation, a division of Bendix Aviation Corporation, Leece Neville and Sky Specialties Corporation improved their inertia starters and generator equipment.

The magneto was the center of specialized research and development in the plants of the Scintilla Magneto Company, a division of Bendix Aviation Corporation, and the Splitdorf Electrical Company. Carburetion was the subject of study by the Bendix-Stromberg Carburetor Company, a division of Bendix Aviation Corporation, which made several refinements on its carburetors supplied for aircraft engines.

The Electric Storage Battery Company and Delco Aviation Corporation, the latter a division of Bendix Aviation Corporation, developed a line of starting ignition units, starting vibrators and switches for aircraft engines. The Vellumoid Company specialized in manufacture of gaskets; Buhl Stamping Company developed new cowlings employed on many engines; and the Ex-Cell-O Aircraft and Tool corporation made various motor parts designed for the particular needs of some of the principal engine manufacturers.

Special bearings for airplane engines have been developed by several manufacturers, including Norma Hoffman Bearings Co.; S. K. F. Industries, Inc.; and Timken Roller Bearings Co. Other prominent manufacturers of engine parts are Thompson Products Co., valves; Wood & Spencer Co., parts; and McQuay-Norris Manufacturing Co., piston rings.

The principal purveyors of ignition cable included: A. C. Spark Plug Company, Acme Wire Company, Packard Electric Company, John A. Roebling Sons and Western Electric. Motor instruments greatly increased the efficiency of engine operation and contributed to increasing the engine's span of life. The A. C. Spark Plug Company, Moto-Meter Gauge and Equipment Company, and Pioneer Instrument Company, a division of Bendix Aviation Corporation, made the principal contributions in this field. Propellers, while not a part of an aircraft engine, were closely associated with it. The Hamilton Standard Propeller Company and Supreme Propeller Company continued to supply a major share of airplane propellers for American aircraft.

CHAPTER XI

PREENING WINGS OF COMMERCE

Volume of Federal Activity Promoting and Regulating Aviation Increased —Close Liaison with Industry Maintained—Weather Bureau Aids—Bureau of Standards—N. A. C. A.

THE several branches and divisions of the federal government charged with the stimulation of civil aeronautics as an aid to domestic and foreign trade experienced no let-down in their activities, despite the depressed condition of certain phases of the aviation industry during 1930. In fact, all reported an unprecedented volume of business to be handled, often without an increase in personnel or appropriations commensurate with the task.

Under the leadership of Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics, the Aeronautics Branch of the Department of Commerce continued to be a major factor in the proper stimulation and regulation of all phases of aeronautical activity associated with interstate commerce. Closely associated with this branch was the work of the Aeronautics Trade Division of the Bureau of Foreign and Domestic Commerce, especially charged with the development of trade information to aid American business in the expansion of its markets at home and particularly abroad.

The Aeronautics Branch reported an increase in its total volume of work during 1930 in excess of 100 per cent. although personnel was increased only 16 per cent. New tasks added during 1930 to the already long list of routine duties of the branch included: inspection of scheduled interstate passenger-carrying lines for certificates of authority to operate, the inspection and testing of parachutes for approved type certificates and the examination of parachute riggers for license. The work of the branch was directly concerned with protecting the flying public by insuring airworthy aircraft, competent pilots, adequate airways and standard air traffic rules.

The Aeronautics Branch was created under the provisions of the Air Commerce Act of 1926, which was passed by Congress as a result of a request of the aviation industry for regulation and helpful promotion. It was the first time in the history of modern business that an industry had requested regulation to aid in the sound stimulation of its undertakings, and the government pursued 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 built up between the Aeronautics Branch and the industry's trade association, the Aeronautical Chamber of Commerce.

Under a new plan, Assistant Secretary Young was assisted during 1930 in carrying out the program of the Aeronautics Branch by three executives, a Director of Air Regulation, a Chief Engineer of the Airways Division, and a Director of Aeronautic Development. Previously, all activities of the branch were coordinated directly under the Assistant Secretary of Commerce for Aeronautics. Under the decentralized plan,

FLYING COMMERCE SECRETARY

Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics, flying his new Northrop Alpha low wing metal monoplane.

Gilbert G. Budwig became Director of Air Regulation in direct charge of the inspection service, licensing division and engine testing section. Capt. F. C. Hingsburg was Chief Engineer of the Airways Division, responsible for the establishment and maintenance of aids to air navigation throughout the country, and Col. Harry H. Blee was Director of Aeronautic Development, supervising the development of aeronautic publications, the collection of statistics, promotion of airport activity and similar promotional projects on behalf of the industry.

The Airways Division was organized within the Bureau of Lighthouses of the Department of Commerce and, as far as practicable, its work

was carried on through the regular district organizations of this bureau. The 1930 construction program of the division included the lighting of 3,100 miles of airways, all extensively used for night flying. Thirteen airways radio communication stations and 26 radio range beacons were constructed. Automatic telegraph-typewriter circuits for the collection of weather and aircraft movement reports were placed in service on 5,650 miles of airways. At the close of the year, 29 airway engineers, 95 airway mechanicians, and 955 keepers, caretakers and attendants were employed in the maintenance of 13,504 miles of lighted airways throughout the country.

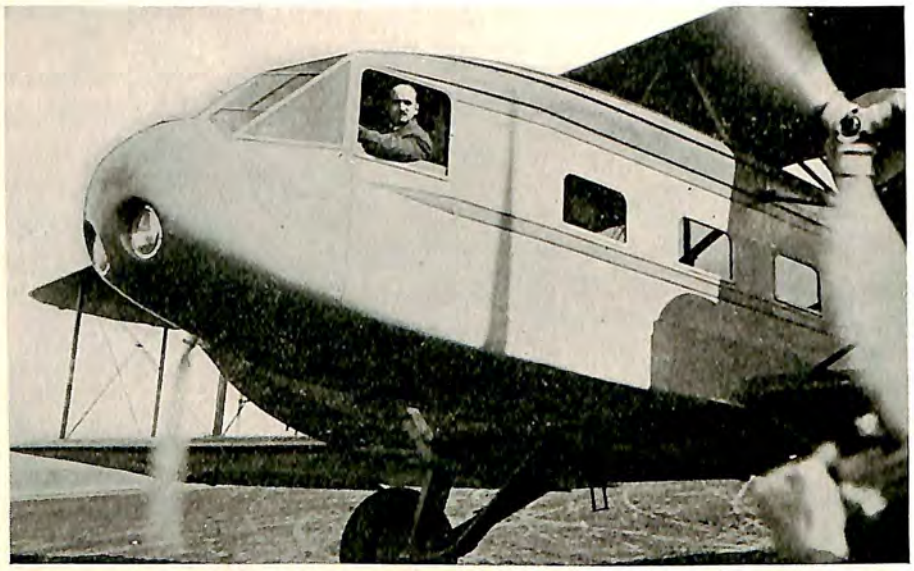
FLYING UPSIDE DOWN

Lieut. M. B. Gardner of the U. S. Navy demonstrating inverted flight maneuvers in a Curtiss fighter (Pratt and Whitney Wasp) near the capital.

The Air Regulation Service endeavored to protect the flying public and the aeronautical industry by eliminating, as far as possible, insufficiently trained pilots and unairworthy aircraft. In inspection service work alone, 90 men, 75 of whom were pilot-aeronautical engineers and 15 factory airplane inspectors, were employed. The rating of pilots for passenger-carrying privileges according to weights and types of aircraft was undertaken to raise the standard of flying ability among pilots and consequently increase the safety of the flying public who ride as passengers. Flying school regulations which became effective in 1929 resulted in the issuing of certificates to 44 approved schools. Development in aircraft design and

performance advanced substantially under critical testing of various models by engineering inspectors. The medical section of the licensing division certified 43,902 physical examinations in 1930 as compared to 28,478 in 1929, and the number of examiners was increased from 704 to 816. In fact, every section experienced a similar increase in the volume of its work.

The Aeronautic Development Service undertook a thorough study of hangar fire hazards and airport zoning problems during 1930 in addition to its numerous duties associated with the furnishing of information on all phases of aeronautical development to the general public. A report



International Newsreel.

CURTISS ON LAST FLIGHT

Glenn H. Curtiss at the controls of a Curtiss Condor on the twentieth anniversary of his first flight from Albany to New York, only a month before he died.

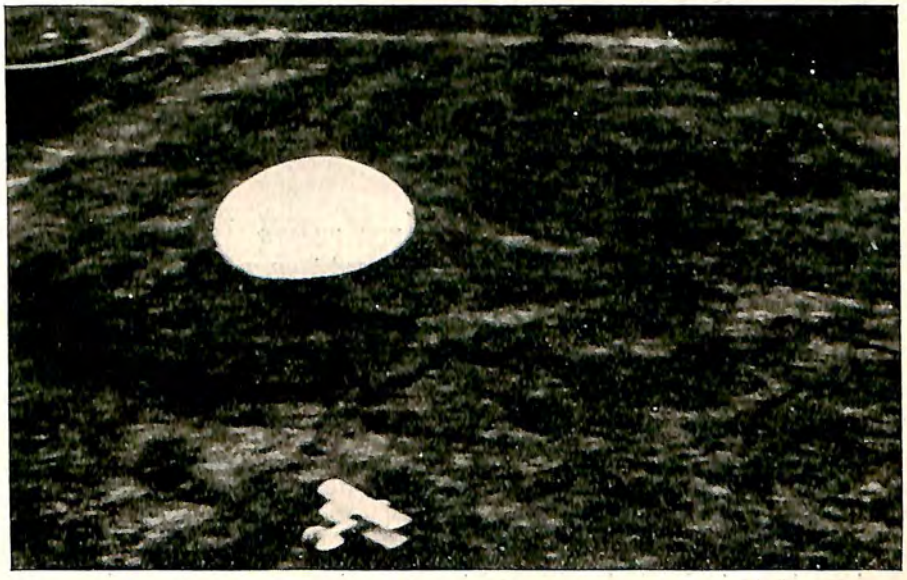
of the hangar fire hazard investigation was made public near the close of the year, and the special committee on airport zoning was to make its report early in 1931. The Aeronautical Chamber of Commerce was represented on both these committees.

United States Weather Bureau

Closely associated with the work of the Airways Division of the Department of Commerce was the indispensable aid to air navigation fur-

READY FOR PLANECHUTE TEST

With a giant parachute tucked into the rear of the fuselage beneath the rudder, the test pilot is seen ready to take off before his experimental drop to earth.



PARACHUTE DROPPING PLANE

Experimental ship is seen descending to the ground after 'chute has been released, demonstrating practicability of new device.

nished by the U. S. Weather Bureau through the collection of weather data at frequent intervals along the principal air routes. During 1930, the Bureau established pilot-balloon service at eight additional stations, making a total of 53 stations of this type. The majority of them were located at airports and furnished frequent information throughout the day and night to collecting centers along the airways. Reports also were received twice daily from 200 first-order weather stations. These, in combination with upper-air reports, were utilized in making aviation forecasts which were transmitted by automatic telegraph-typewriters and radio stations to all pilots flying along the airways.

WEATHER REPORTS FOR PILOTS

Section of the Weather Bureau of Transcontinental and Western Air, Inc., at the new Alhambra Airport, upon which pilots depend for frequent reports.

During 1930, the Weather Bureau established 120 special airways weather report stations in addition to the 110 already in operation. It was found that information as to weather conditions in areas adjacent to an airway was of considerable value in forecasting changes to be expected directly on the airway within two or three hours. For this reason, the Weather Bureau established 60 stations from 150 to 200 miles on either side of the transcontinental airway. Reports were received day and night at three hour intervals by four major collecting centers, and résumé of conditions was sent to all airways radio stations in each sector for simultaneous broadcast.

The Aeronautics Branch of the Department of Commerce also enjoyed the cooperation of the Bureau of Standards on all engineering projects concerned with aircraft instruction which demanded special investigation. Among the many special studies made during the year of interest to the aviation industry were those on methods of reducing noise in aircraft and ways of preventing vapor lock in engines. Recommendations were made for reducing noise in the propeller and engine exhaust and for insulating

International News.

N.A.C.A. WINS COLLIER AWARD

President Hoover presents the Collier Trophy to Dr. Joseph S. Ames, chairman of the National Advisory Committee for Aeronautics.

the cabin against outside noises. A wind tunnel in the Bureau's laboratories made possible aerodynamic studies to learn new methods of increasing the efficiency of airplanes. The results of all investigations were made public through special reports written by experts of the Bureau.

National Advisory Committee for Aeronautics

The National Advisory Committee for Aeronautics, with one of the world's most extensive research laboratories at Langley Field, Va., con-

tinued to work with the several departments of the federal government and the commercial industry upon fundamental problems of flight. For several years the major problems investigated by the Committee were concerned with safety in flight, improvement of aerodynamic efficiency and improvements in general design and operation. During 1930, the Committee's Fifth Annual Aircraft Engineering Research Conference was held at Langley Field in May to review the work of the past year and outline a new research program for 1931.

The problem of the spin was considered the most important under investigation, and the Committee reported that definite progress had been made in its solution. Completion of a new five foot vertical wind tunnel enabled the engineers to concentrate their efforts on a systematic testing program in conjunction with major projects under way. Many other problems of aerodynamic efficiency and design which could not be investigated adequately in the variable density wind tunnel or the propeller research tunnel were to be handled in the new 30 by 60 foot full-scale wind tunnel nearing completion. The testing of full-scale airplanes under the accurately controlled condition of the new tunnel was expected to increase available information on scale and interference effects, and thus lead to marked improvement in general design.

The increased importance of seaplanes and flying boats led the Committee to design and construct a seaplane towing channel 2,050 feet long with a carriage speed of 40 miles an hour. Other important problems studied during the year included those of structural safety, reduction of drag, stability and control, ice formation, propeller characteristics and boundary layer control. The results of each investigation were made available to the industry through numerous technical reports and notes.*

United States Coast Guard

The Coast Guard, flying thousands of miles with equipment purchased in 1927 to determine the usefulness of aircraft in its service, definitely proved the need for its aviation unit during 1930 and prompted officials to draw up specifications for new equipment to be purchased during 1931. During 1930, Coast Guard aircraft cruised a total of 67,655 miles and searched over an area of 801,067 square miles. Its airplanes were in the air 907.5 hours and more than 3,100 vessels were identified.

On eighteen occasions its planes were called upon to search for lost boats, persons or various kinds of property. Searching the sea for lost fishermen and disabled small boats was becoming an important part of the duty of the Coast Guard airplanes. In the winter months, lost boats in

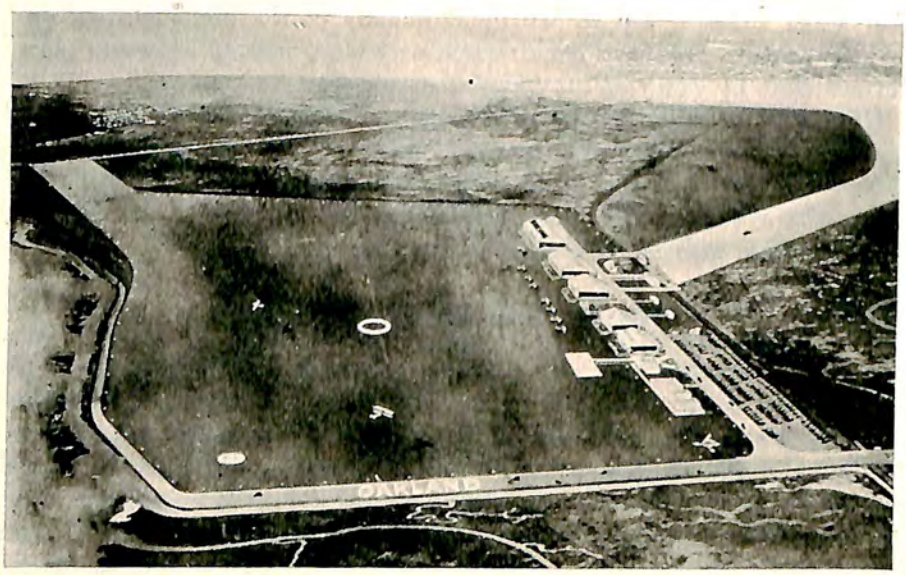
* Complete list of publications of the National Advisory Committee for Aeronautics with directory of its officers included in Appendix.

the North Atlantic had to be found quickly or the occupants perished from exposure. Airplanes could search over large areas quickly and notify surface craft by radio of the location of the boat.

The airplane reporting system established during 1929 along the Atlantic seaboard was continued to observe and report the passage of all planes on the route. Thousands of planes were reported during the year; no plane using the system became lost and many, due to accident or stress of weather, were assisted by Coast Guard Stations.

Other Governmental Boards

Several governmental boards, formed especially to coordinate the work of various departments and bureaus, continued their important work during the year. The Aeronautical Patents and Design Board, created to inquire into the value and possible use by the government of aeronautical inventions submitted to it, considered several hundred designs passed on to it by the National Advisory Committee for Aeranoutics. The Helium Board continued to act as the coordinating and advisory body 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, Tex. Duplication of effort in the Army Air Corps and Navy Bureau of Aeronautics came under the scrutiny of the Aeronautical Board, which continued to act as an important coordinating agency between these bodies. The Board of Surveys and Maps similarly brought together the efforts of all activities in the government concerned with the development of maps. The boards were of great service in the elimination of unnecessary expense resulting from duplication of effort.



SECOND LARGEST IN NATION

Exceeded in size only by Cleveland Municipal Airport, the Oakland Municipal Airport offers land and water terminal facilities.

NEW AIRPORT WAITING ROOM

Rivaling the finest railroad terminals, the new waiting room of the Fairfax Airport at Kansas City, Kan., was completed during 1930.

CHAPTER XII

AIR TERMINALS ON LAND AND SEA

Thirty-five Million Dollars Spent During 1930—Operations Statistics—
1931 Construction Programs—Weather Service Expanded—
Management Problems Studied—Tulsa Leads in Traffic

JUST as the railroads and steamship lines have a major share of their investments in suitable terminals, so aviation centered much of its attention during the past year on the development of suitable airports and seaplane bases. More than $35,000,000 were expended during 1930 in the expansion and improvement of existing airports or in the establishment of new ones. Construction programs for 1931 called for the further expenditure of at least $20,000,000, according to statistical estimates computed by the Aeronautical Chamber of Commerce from reports of more than 100 typical airports.

The Department of Commerce lists 1,655 ports including auxiliary and intermediate fields. There are at least 750 of these ranking as air terminals. The Aeronautical Chamber of Commerce has prepared a list of 753 of the leading ports with detailed information on the facilities available at each. This tabulated list, which does not include intermediate, auxiliary or poorly conditioned ports, is in the Appendix. It provides a striking picture of the advances which have been made in the provision of suitable terminal facilities for air transport lines and adequate bases from which the aerial service operator or private pilot may fly. The Department of Commerce estimated from a survey made late in 1930 that the total investment in airports and landing facilities in the United States was at least $200,000,000.

The Airport survey made by the Aeronautical Chamber of Commerce for "The Aircraft Year Book" showed that 4,961,950 landings were made on the 753 principal ports during 1930. The safety record of the 101 airports reporting was very good. The number of airplane landings per accident, including even the most minor injury to equipment, was 25,577. The number of landings per person killed, including accidents to student fliers and resulting from acrobatics, was 413,485.

More Than 5,000,000 Passengers

The survey showed that 1,475,348 passengers on scheduled transport lines took off during 1930 from the 753 airports taken into the compu-

tations, and that 3,779,099 other passengers took off on charter flights or for short pleasure hops. The total cost of maintenance of the 753 airports was estimated at $7,669,570 on the basis of the reports received. The average expenditure for maintenance was $10,186. The reported maintenance estimates for 1931 totaled $6,021,946, an average of $7,998 for each port. Expenditures for expansion or improvement of these airports in 1930 totaled $35,278,200, an average of $46,853 for each port. The proposed expansion programs for 1931 contemplate expenditure of $22,391,767, an average of $29,739 for each airport.

TYPICAL COMMERCIAL AIRPORT

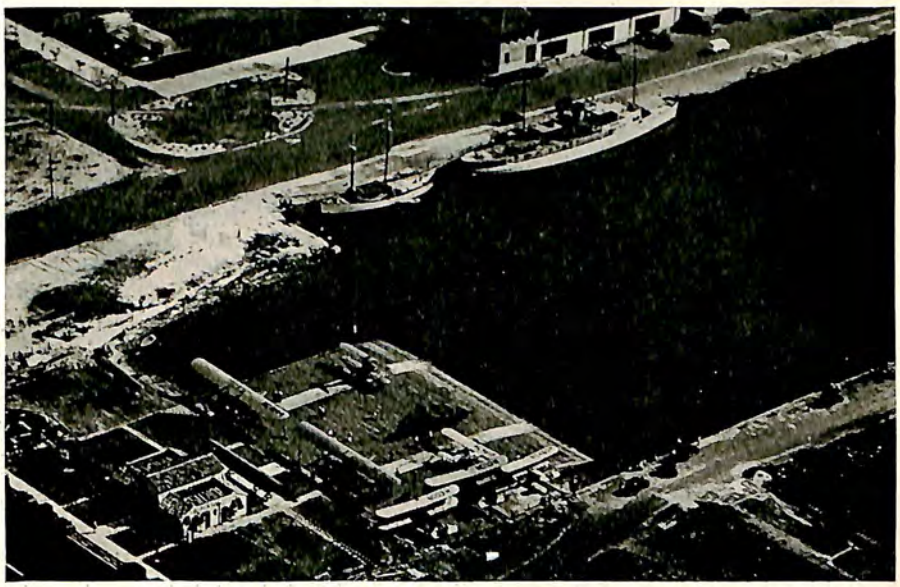
Pal-Waukee Airport at Chicago is the base for dispatching the Chicago Daily News to resort points, and other aerial service operations.

Nearly 30,000 acres were added to existing areas during 1930, and many municipalities and commercial airport owners provided for future expansion and protection against the danger of having their operations curtailed, by buying additional land to provide adequate landing area when needed. Some fields were abandoned during the year because lack of foresight on the part of the constructors resulted in the choosing of inadequate and unsuited sites, many times too far from cities or towns to be of economic value.

Under its program of airway development, the Aeronautics Branch of the Department of Commerce carried out an extensive project during 1930, lighting 3,321 miles of airways, establishing and lighting 56 intermediate

GLENN H. CURTISS AIRPORT

New land and sea air terminal at North Beach in Queens, a short distance from New York City, established by Curtiss-Wright.



SEAPLANE BASE IN MIAMI

Yachts of the air and sea mingle at this Curtiss-Wright marine base in Florida, where seaplanes and amphibians await the winter visitor.

landing fields, and installing and operating 218 standard revolving lights for the guidance of pilots after dark. Five thousand six hundred and fifty miles of airways were equipped with automatic telegraph-typewriter circuits which collect and disseminate weather information to planes in flight at regular intervals both day and night. Two radio range beacons, which guide pilots along the airways by means of radio signals, also were placed in operation and 27 were ready for operation late in 1930 or early in 1931.

SIX MINUTES FROM THE CITY

San Francisco Bay Airdrome at Alameda, Cal., is six minutes from the heart of Oakland (in background) by motor car and six minutes from 'Frisco by air ferry.

Program for 1931

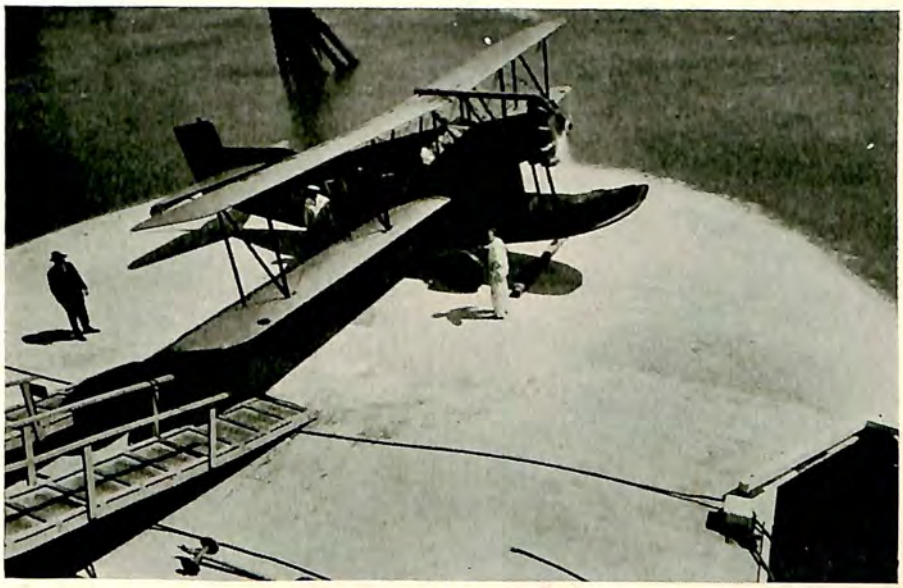
During 1931, 3,000 miles of additional airways will be lighted, 33 additional radio range beacon stations will be established, 2,800 miles of automatic telegraph-typewriter circuits will be placed in operation and 20 radio communication stations will be installed. Upon the completion of these 20 stations, there will be scarcely a square mile of area in the United States where flying is a regular activity that a pilot cannot receive broadcasts of weather information while in flight.

Out of 31,000 miles of airways used regularly by planes in the United States the Department of Commerce had completed the lighting and equipping of about 14,500 miles at the close of 1930. The Department listed 500 municipal airports, 558 commercial airports, 306 intermediate landing

fields, 65 Army airdromes, 14 Naval air stations, 210 marked auxiliary fields, and two fields used by the government. Municipalities and private corporations had reported plans for 1,053 new ports during the year and preparatory studies for many of them had been completed. Airports and landing fields equipped for night flying totaled 583.

Weather Service Expanded

The United States Weather Bureau made great advances during 1930 in the execution of its program for providing accurate weather data for



AIR FERRIES "BUTTON AIRPORT"

Sloping concrete base devised by Air Ferries, Inc., as a loading platform for its Keystone-Loening amphibians (Wright Whirlwind) in service across San Francisco Bay.

pilots at all times. Eight stations having pilot-balloon service were added, making a total of 53. The majority of them were at airports designed to furnish information at frequent intervals during the day and night to collecting centers along the airways. Reports also were received twice daily from more than 200 first-order Weather Bureau stations. These, in combination with upper-air reports, were utilized in making aviation weather forecasts which were transmitted by automatic telegraph-typewriters and radio communication stations to all pilots using the airways.

During the year, the Weather Bureau established 120 special airways weather reporting stations in addition to the 110 stations already in opera-

tion. Information on weather conditions in the areas adjacent to an airway is very valuable in forecasting changes which may be expected on the airway within two or three hours. Because of this, 60 Weather Bureau stations were established from 150 to 200 miles on either side of the main transcontinental airway. Reports were received at three hour intervals day and night from each of these stations and the data is collected at four centers. A résumé of conditions in each area is made and broadcast simultaneously from airway radio stations within the sector. Pilots in the air can in this way keep well informed on weather conditions to be expected ahead.

CAMDEN'S AIRPORT-RECREATION CENTER

Central Airport at Camden, N. J., showing administration building, hangars, miniature golf course and swimming pool open to the public.

The question of state participation in the development of well-equipped airways closely co-ordinated with the federal system received considerable attention during 1930. It was obvious that the federal government could not provide and maintain complicated networks of intrastate airways as well as the principal interstate airways. Therefore, such states as Tennessee, New York, Idaho, Pennsylvania, and Michigan took the lead by appropriating from $50,000 to $150,000 for the establishment of intermediate landing fields on state airways and the provision of other necessary equipment.

The problems of management and maintenance of airports became of paramount consideration as completed airport projects settled down to the

WATCHING WEST COAST MANEUVERS

Thousands crowded the new United Airport at Burbank, Cal., when a squadron of Army pursuit planes passed over the administration building and landed.

UNITED AIRPORT AT BURBANK

Fully equipped for night flying, the new United Airport at Burbank, Cal., is representative of the trend in modern air terminal design.

routine business of providing facilities for commercial aviation. Certainly no single agency did more to aid airport managers, engineers and equipment manufacturers in the solution of these problems than the Airport Section of the Aeronautical Chamber of Commerce.

Through its national convention in Buffalo, May 14–16, and through subsequent surveys and committee studies, the Airport Section acted as a national clearing house for the exchange of information and experience in the fields of airport engineering and airport management. Committees on accounting, hangar construction, surfacing and drainage, servicing and

TULSA'S BUSY PORT

Reporting a greater volume of traffic than any other airport in the world during the summer of 1930, Tulsa's Municipal Airport is being expanded rapidly.

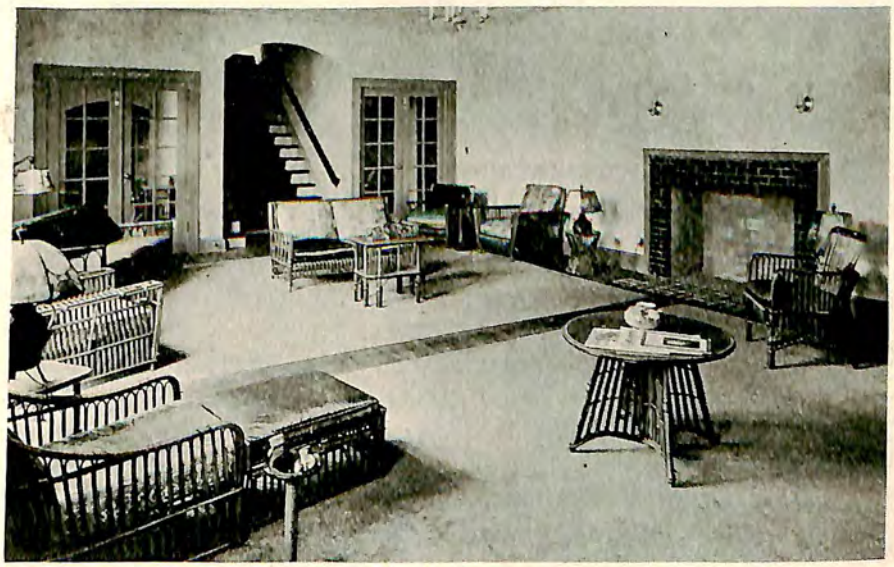
storage, lighting, seaplane and amphibian bases, traffic handling, concessions, sales and advertising, and small town landing fields worked throughout the year on the specific problems in their field and submitted reports at the national convention in Buffalo which represented the results of their researches. The reports were published with the minutes of the convention and distributed by the Aeronautical Chamber of Commerce to municipalities, corporations or individuals concerned with the development of American airports.

Whether the airport should be expected to show a profit was a problem facing many airport officials. Certainly in the case of commercial

Fairchild Aerial Surveys.

NEW BUILDINGS FOR ROOSEVELT

Scene of many an historic Atlantic flight, Roosevelt Field is expanding rapidly to keep pace with the needs of increased traffic.



LOUNGE IN AIRPORT HOTEL

New Airport Hotel at Roosevelt Field, Mineola, L. I., completed during the year, is equipped with a comfortable lounge, writing room and restaurant.

airports they must show a profit or be justified through the success of operations from them. However, it was becoming the consensus of opinion that municipal airports should not be expected to show a profit any more than a public park or other recreational facility. The returns were in the form of more intangible results associated with the building of an attractive community which would induce individuals and industries to locate within its jurisdiction.

Reports made to the Aeronautical Chamber of Commerce at the end of the first six months of 1930 by 122 American airports showed that 26

PORTLAND'S PORT ON ISLAND

One of the finest equipped ports in the Northwest, the Municipal Airport at Portland, Ore., on Swan Island, a few minutes from the heart of the city.

per cent. of them were showing a profit, 39 per cent. reported a loss and 35 per cent. failed to answer the question. That airports are becoming increasingly important as general recreation centers for fliers and non-fliers alike is confirmed by the fact that between 25,000,000 and 30,000,000 persons visited the 753 principal airports during 1930, as shown from the reports submitted.

Concessions to Make Ports Pay

This led to another interesting phase of airport development not directly concerned with aviation, but having an important bearing upon making commercial ports pay. Many airport operators installed miniature golf

Fairchild Aerial Surveys.

AIRPORT IN BOSTON HARBOR

Boston's Municipal Airport at East Boston, Mass., northern terminus of Colonial Air Transport, is being improved rapidly.

LEAVING PORT WASHINGTON RAMP

Giant American Marchetti S-55 flying boat (2 Isotta Fraschinis) sliding down the ramp before taking off for flight.

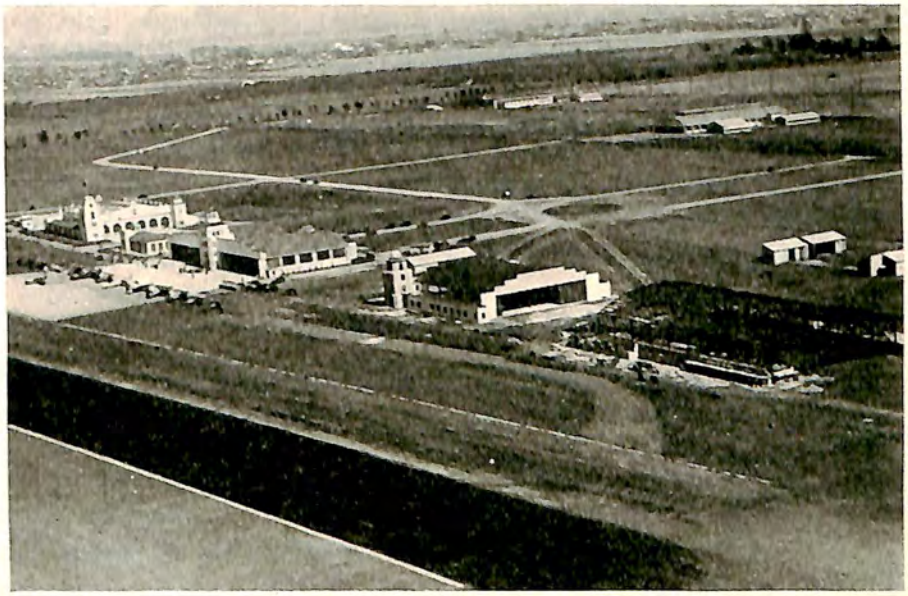
courses, swimming pools, archery ranges and other recreational facilities adjacent to the airports to attract additional throngs to their ports and to provide pastime for regular visitors. One New York airport project contemplated the erection of an extensive amusement park, dance hall and skating rink adjacent to the airport to provide an additional source of revenue and to capitalize upon the increasing popularity of airports as gathering places for pleasure-bent throngs.

Fairfax Airport at Kansas City, Kan., opened a night club, as elaborately furnished as any on Broadway, in its airport administration build-

CINCINNATIANS DEDICATE AIRPORT
Thousands crowd Lunken Airport at Cincinnati, Ohio, for the ceremonies officially opening the newly completed municipal airport.

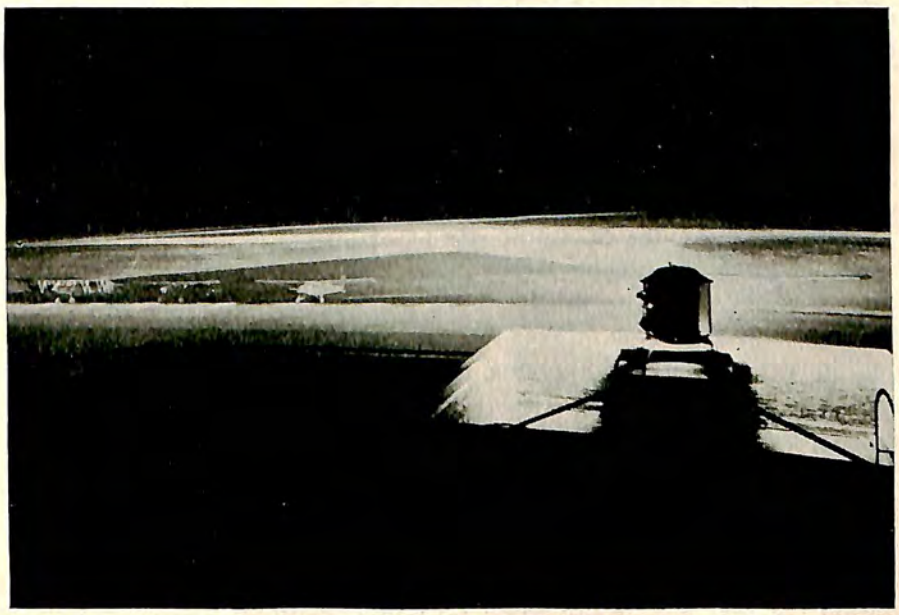
ing which was completed during the year. Roosevelt Field on Long Island, Oakland Municipal Airport in California, Minneapolis Municipal Airport in Minnesota, and Montgomery Airport in Alabama were representative of the development in airport hotels with facilities for guests who did not desire to go into the center of the city for the night. Central Airport at Camden, N. J., was typical of those which included swimming pools and miniature golf courses as a part of their recreational plant.

Birmingham, Ala., voted $1,000,000 in 1930 for the acquisition of a park and its development into a 323 acre airport with equipment capable of obtaining an A-1-A rating. Mobile, Ala., voted a bond issue of $75,000 late in the year to light Bates Field and equip it with a concrete loading apron and an administration building.



LOS ANGELES MUNICIPAL AIRPORT

Another hangar carrying out the general Spanish Mission architectural plan of the port is seen under construction at the right.



TURNING NIGHT INTO DAY

Floodlights installed during 1930 at the Curtiss-Steinberg Airport in St. Louis, one of the Curtiss-Wright chain of airports.

Work on the tide-lands reclamation project at Lindbergh Field, San Diego, Cal., was pushed during 1930 so that the port will be open for general use early in 1931. Los Angeles Municipal Airport planned the erection of additional hangars and an elaborate administration building in 1931 to care for a steady increase in traffic. The San Francisco Bay Airdrome at Alameda, Cal., six minutes from San Francisco by air ferry and six minutes from Oakland by motor car, was opened in July, 1930, and prepared for handling 10,000 passengers a month in 1931.

United Airport Completed

United Airports of California, Ltd., a division of United Aircraft and Transport Corporation, developed one of the finest airports in the country during 1930 at Burbank, Cal. Completely equipped for night flying, the port had a 234 acre landing area with three bituminal runways each 3,500 feet long, with an elaborately equipped administration building and three steel and concrete hangars. Both American Airways and the Boeing System used the port as their Southern California base.

Chicago Municipal Airport, long one of the great air transport centers of the country, constructed three new hangars and doubled the size of its postoffice building during the year. A $450,000 bond issue was voted to build an administration building and passenger terminal and to enlarge the size of the field. The Pontiac, Mich., Municipal Airport, one of the two A-1-A airports in the country, added 80 additional acres to its area, erected a new hangar, and planned the treating of its runways and taxi strips during 1931. Minneapolis completed a $65,000 administration and terminal building on its municipal airport. St. Paul's municipal airport stood out as a model for neatness, cleanliness and systematic handling of operations, which might be followed with profit on many other ports.

Lambert Field, the St. Louis municipal airport, added five long runways, increased its available landing area, built three hangars costing from $50,000 to $80,000 each, and developed maintenance buildings and a comfort station during 1930. Plans for 1931 called for the expenditure of an additional $750,000 in improving the port and building a modern passenger terminal. On Ford Airport at Dearborn, Mich., a large hotel was nearing completion.

Roosevelt Field, a property of the Aviation Corporation, at Mineola, L. I., completed the construction of eight new hangars at a cost of one million dollars in addition to the hotel, restaurant and lunch room mentioned earlier. The Akron, Ohio, Municipal Airport made great strides during the year with construction of a mile of storm sewers to provide adequate drainage, the completion of a grading project necessitating the moving of 1,500,000 yards of earth, and the starting of construction on an

administration building to be completed April 1, 1931. The Akron port is the site of the Goodyear-Zeppelin dock, where two giant dirigibles are under construction for the United States Navy.

Tulsa Leads in Traffic

Tulsa, Okla., Municipal Airport established a record for operations from a single airport in 1930, handling 175,000 passengers without accident to a person. Three steel and concrete hangars valued at $135,000 each and a mile of concrete taxi strips were completed during the year. Portland, Ore., built two concrete hangars and a stucco administration building on its municipal airport during 1930. About $100,000 were spent for improvements on the Brownsville, Tex., Municipal Airport, which was the overland gateway to Central and South America. Seattle, Wash., completed an $80,000 administration building and depot on Boeing Field. Tacoma, Wash., Field completed installation of lighting equipment and the construction of a new hangar to meet the demands for increased facilities. Fifty-nine acres were added to the Cheyenne, Wyo., Municipal Airport and a lighting program completed.

Curtiss-Wright continued the operation of the largest chain of commercially owned airports in the country. While fill work was continued at Secaucus, N. J., the Bronx, Secaucus, Houston and Louisville projects laid out by Curtiss-Wright were not developed during the year. The San Mateo, Cal., project was partially developed. Well-equipped airports were maintained at Valley Stream, L. I., where three new hangars were completed and four others were under construction; at North Beach, Queens, where land and water landing facilities were afforded; at New Brunswick, N. J., where three hangars were completed; at Caldwell, N. J., where a school field was in operation; at Baltimore, Md., where two hangars were in use; at Pittsburgh, Pa., where a hangar, administration building and gas station were under construction; at Cleveland, O., where one hangar was in use; at Glenview (Chicago), Ill., the scene of the 1930 air races; at Milwaukee, Wis., where lighting facilities were being added; at St. Louis, Mo., where a restaurant, three hangars and a repair base were nearing completion; at Los Angeles, Cal., where a well-equipped port was to add facilities for an aviation country club; and at Alameda, Cal., where nine hangars and an administration building were in use.

Uniform Methods Studied

With such projects in widely separated sections of the country under way, naturally many problems of management faced the airport official. The Airport Section of the Aeronautical Chamber of Commerce was called

upon to study existing methods of handling several of these problems with a view toward adopting uniform methods throughout the country.

How best to handle the dispensation of gasoline at airports was a subject of debate among airport officials everywhere, and a study of existing methods was undertaken. Examination of practices on 22 leading municipal and 19 commercial airports showed a decided preference for exclusive sale of fuel by the airport, while some permitted operators or oil companies to sell the gas. Exclusive sale of gasoline by the airport was commended in the preliminary report prepared on the subject, although it was

RAMP AT ATLANTIC CITY

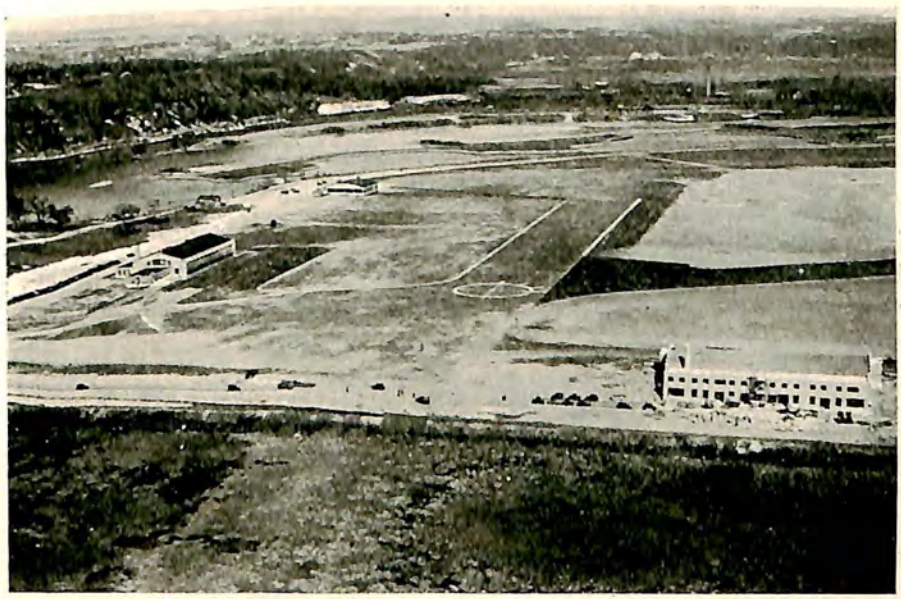
Facilities for seaplanes and amphibians are provided for flying visitors to the New Jersey coast resort at the Curtiss-Wright Flying Station.

pointed out that air transport operators using the field should be permitted to purchase their gasoline as they saw fit. On very large and busy ports, the system in use at Oakland Municipal Airport where oil companies sell the gasoline was believed a successful method. A unique system in operation at Roosevelt Field through which gasoline was metered by the airport to operators who sold it was commended to the attention of commercial and private airport operators.

Uniform rates and charges also came under consideration during the year. A study of existing methods of scaling hangar and storage charges resulted in the development of a report to be considered for adoption at the next National Airport Convention in Tulsa, Okla., in March, 1931. It

was learned that most ports based their storage charges on wing span, while some used wing area, number of places in plane, weight, horsepower of engine, and similar yardsticks. A uniform system was drawn up based on wing span as the criterium, listing all airplanes in a specific classification to serve as a basis for charges.

Another study resulted in the recommendation that airports use an hourly basis for charges on washing of airplanes instead of less popular methods such as size, class, type, etc. The study indicated that a charge of from $1.25 to $1.50 per hour was equitable, depending upon the airport's location and labor conditions.



NORTHWEST AIRWAYS TERMINAL

Only three minutes from the heart of St. Paul, this municipal airport serves as a base for Northwest Airways, headquarters at left, in the Twin Cities.

A uniform system of accounting for airports, under consideration for nearly two years, was completed during the year and forms printed for distribution to ports desiring to use the standardized system. It was worked out by the Aeronautical Chamber of Commerce with the co-operation of accounting experts.

Seaplane Terminals Developed

While aviation in the United States has been built principally around the land plane, seaplanes and amphibians were coming into greater popularity among sportsmen and air transport operators alike who realized the

exceptional possibilities for landing facilities on the thousands of bays, lakes and navigable rivers throughout the country. Because almost every big city is located on a navigable body of water, use of the seaplane and amphibian for ferry service to downtown areas has great potential possibilities.

There were 36 commercial seaplane terminals available in the United States at the close of 1930, and thousands of open stretches of water suitable for emergency landings or future development as bases. Most of these terminals consisted of anchorages in protected stretches of water with gas and oil available, while many provided a ramp for the use of amphibians and some were equipped with marine hangars and repair service. The complete list with their owners and a key explaining the character of the base is printed in the Appendix.

In San Francisco, Air Ferries, Ltd., developed an excellent terminal at the end of Pier 5, but a few steps from the Ferry Building, which is typical of deep water terminal developments for marine planes. A semicircular floating island ninety-seven and one-half feet in width was anchored off the end of the pier. The deck resembles a large mushroom in shape, its smooth rounded top sloping into the water on a 180 degree arc. The internal construction is on the cantilever principle. Buoyancy is obtained by pontoons with water ballast tanks to control the trim. The float weighs about 100 tons. Passenger waiting rooms, ticket offices, etc., are located on the pier, from which an ordinary gangplank allows access to the float.

The terminal landing arrangements of Gorst Air Transport at Seattle and Bremerton, Wash., are even simpler than those at San Francisco. This company, the first to undertake the operation of an air ferry, has been highly successful due almost entirely to the rapidity with which they handle passengers at terminals. Given downtown docking facilities, short amphibian runs promise to be of tremendous value to coastal cities in speeding up transportation previously dependent upon boat service.

Airport Equipment Developments

Experimental laboratories of American industries interested in airports were busy throughout the year developing new appliances, the need for which has become apparent as air traffic has increased. In the field of radio the Western Electric Company, Inc., and the Radiomarine Corporation developed small, compact two-way radio telephone sets for airport use in communicating with itinerant planes. Airport lighting received the attention of the General Electric Company, the American Gas Accumulator Co. which during the year absorbed the B. B. T. Corp. of Philadelphia, the Westinghouse Lamp Co., the Westinghouse Electric & Mfg. Co., Airport Lighting, Inc., Crouse Hinds Co., Pyle National Co., Sperry Gyroscope Company and others. Rainbow Light, Inc., continued its devel-

opment of neon obstruction markers. The Flexlume Corporation of Buffalo, New York, collaborating with Westinghouse Electric & Mfg. Company's engineers developed a new type neon obstruction marker for transmission power lines that promises much in this important field.

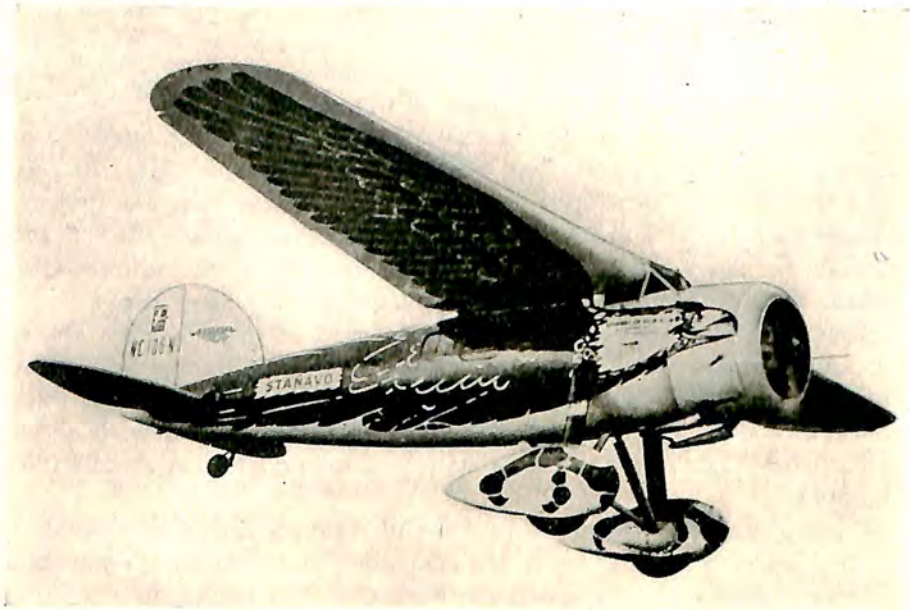
Adequate yet simple systems of traffic control received the attention of Interflash Signal Corp., and Aero Guides, Inc. Rainbow Light, Inc. installed several newly developed neon wind tees. These tees, manipulated from the traffic control tower, show green when landings are allowed and red when no planes are to alight. They combine the wind indicator with a means of traffic control which seems adequate for present needs.

Aqua Systems, Inc. continued the installation of their flotation system of gasoline storage and dispensation while Gilbert and Barker Mfg. Company's equipment appeared on an increasing number of ports. The Fuels and Lubricants Section of the Aeronautical Chamber of Commerce developed a Safety Code for handling aviation gasoline under all types of service conditions.

The Automatic Sprinkler Corporation of America and Walter Kidde & Co., Inc. played a leading role in the adaptation of fire fighting equipment to airport hangars. In the spring the Bureau of Standards held a series of tests in Washington covering the control of hangar fires through the automatic application of water.

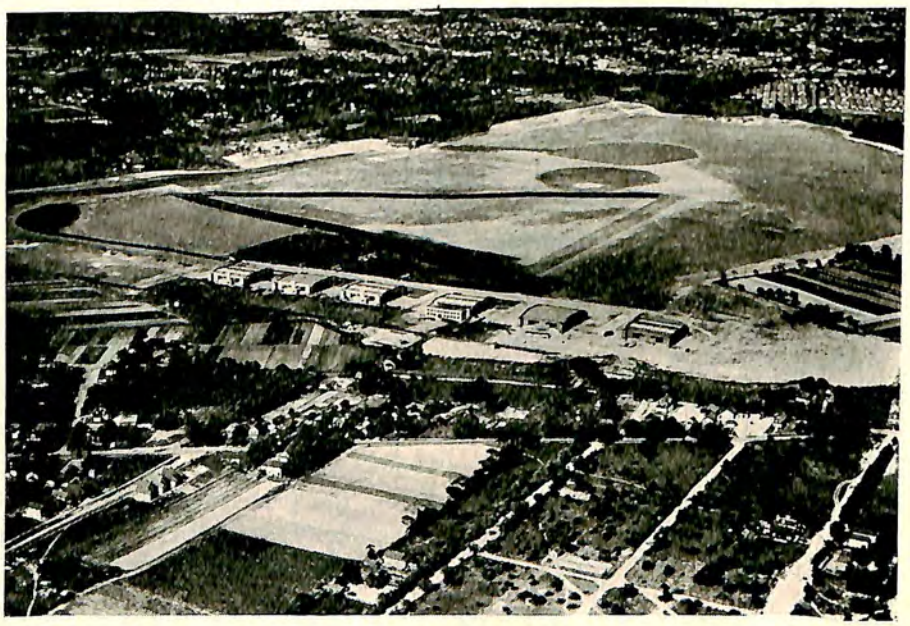
Airport buildings and hangar construction were advanced through the efforts of the Austin Co., H. H. Robertson Co., Detroit Steel Products Co., National Steel Products Co. and others. The General Cable Co. installed many thousands of yards of fencing on American ports and continued to supply a large portion of the electric cable used for airport boundary and other lights.

During the year an Airport Equipment Manufacturers Division was organized in the Airport Section of the Aeronautical Chamber of Commerce. Under the Chairmanship of R. S. Bishop of the Detroit Steel Products Co., the Division adopted a statement of purpose which listed as the goal of the Division's activity: first, establishment of high standards of ethics; second, cooperative technical research of a common nature; third, interchange of information with a view to improved service to airports; fourth, cooperation with airport officials in solving common problems; and fifth, the control of exhibits and demonstrations of airport equipment in connection with airport conferences and conventions. Four sub-committees were set up to carry on research in lighting, fire protection, building construction and operating equipment. These committees were headed by H. C. Ritchie, C. M. Wood, J. S. Ervin and Curtiss Main respectively.



FLYING TRADE MARK

Airplanes may be Jacks of All Trades, but none serve a more unusual purpose than this "Flying Trade Mark" of the Standard Oil Company of New Jersey.



BASE FOR AERIAL SERVICE

Curtiss-Wright's new airport at Valley Stream, L. I., is an important center for aerial service operations in the New York metropolitan area.

CHAPTER XIII

AIRPLANES: JACKS OF ALL TRADES

Aerial Service Operators Fly Million Hours—Efficiency Increased—Rates Lowered—Transport Pilot Training Increases—Flying Schools Expand—Aerial Surveys Economical—Crop Dusting

FROM joy hops to photography and crop dusting, the aerial service operator has found that the airplane must be a "Jack of all trades" to serve the diversified needs of modern business and industry.

Nearly one hundred million miles were flown and more than two and one-half million passengers were carried during 1930 by aerial service operators whose business activities ranged from short pleasure "hops" and charter flights to crop dusting, aerial advertising, student instruction and solo, demonstration and exhibition flying, photography, mapping and aerial surveys.

The Department of Commerce in 1930 listed 297 operators of flying schools, 300 concerns doing short "hops" and charter business, 177 doing aerial advertising, eight engaged in crop dusting, 103 making aerial photographs and maps, and 146 engaged in exhibition flying. Allowing for duplications in which single operators engaged in more than one line of activity, there were 600 aerial service concerns in the United States according to the 1930 Department of Commerce directory. This was about 25 per cent less than the number of such concerns listed in 1929. Consolidations and the weeding out of poorly organized concerns through a survival-of-the-fittest process accounted for the decrease in the total number.

The annual survey of aerial service operations made by the Aeronautical Chamber of Commerce for "The Aircraft Year Book" provides an interesting picture of the scope of activities in this field. The final survey, consisting of statistical estimates based on reports of 66 typical operators and computed to include all aerial service operators listed by the Department of Commerce, showed that such operators were based at 854 airports, nearly half of which were equipped for night flying, widely scattered throughout the country. The number of operators with bases equipped for night flying, ready to serve individuals or corporations 24 hours a day, doubled during 1930.

The survey also showed that a major share of the airplanes in service are in the hands of aerial service operators. The statistical estimates revealed that 5,324 airplanes were being employed in this field, 4,908 of

which were single-engined land planes, ten twin-engined land planes, 55 tri-motored land planes, 85 seaplanes, 248 single-engined amphibians and 18 twin-engined amphibians.

Million Hours Flown

The total volume in hours and miles flown during 1930 was only slightly under the peak figures of 1929, according to the survey's statistical estimates. A total of 1,128,937 hours were flown during the year in all

REFLECTED IN ALASKA'S WATER

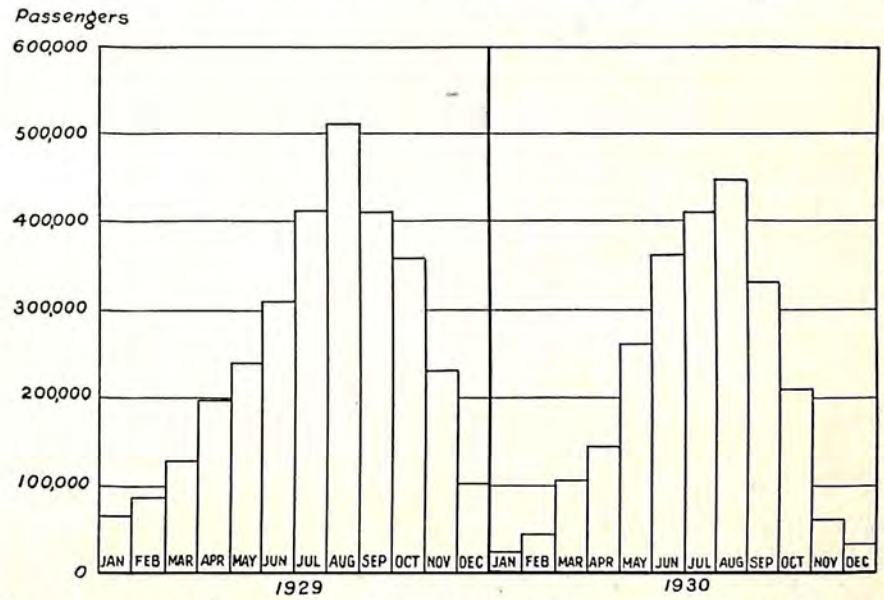
Boeing flying boat (Pratt and Whitney Wasp) used by Canada Western Airways in its mail and passenger service into Alaska.

classes of aerial service operations, which do not include scheduled air transport or private flying. Estimating these flights at an average speed of 85 miles an hour, 95,959,645 miles—nearly 4,000 times the distance around the earth—were flown in 1930 as compared with 104,336,560 miles in 1929. There was a distinct falling off of business in the short "hop" field, while aerial photography and mapping increased in volume and student instruction held at about the 1929 level.

Student solo accounted for 438,363 hours in the air; student instruction, 310,714 hours; short hops, 148,106 hours; charter flights, 112,127 hours; photography, 8,527 hours; mapping, 6,953 hours; dusting, 3,267 hours; and miscellaneous, 100,880 hours. The number of passengers carried by aerial

service operators in 1930 totaled 2,621,769 as compared with 2,995,530 in 1929.

One of the most interesting results of the survey showed that while the number of passengers carried and miles flown in 1930 were only slightly under 1929, the number of pilots and other personnel employed decreased considerably as the operators tightened up the efficiency of their organizations. The number of pilots employed, for instance, was reduced from 3,658 in 1929 to 2,114 in 1930. The number of hours flown by each pilot, however, was almost doubled; 534 hours per pilot in 1930 as com-



AERIAL SERVICE OPERATIONS—PASSENGERS CARRIED ON SHORT HOPS AND CHARTER FLIGHTS IN UNITED STATES

pared with 293 hours in 1929. The total number of employees, all classes, was 12,283 in 1930 as compared to 20,944 in 1929.

Charter Rates Lowered

Consistent with this saving, the majority of operators lowered their rates during 1930. The average charter rate per mile for single-engined land planes in 1930 was 30 cents as compared with 45 cents in 1929. The rate per mile for tri-motored land planes was $1.22 in 1930 as compared with $1.35 in 1929. The charter rates for seaplanes and amphibians advanced slightly in 1930 as operators gained more experience and statistical information on their cost of operation. Seaplanes advanced from 38 to 50 cents a mile, single-engined amphibians from 96 cents to $1.00, and twin-engined amphibians from $1.60 to $2.00.

Rates for short hops reported through the survey averaged $2.46 in 1930 as compared with $3.26 in 1929, although the average duration of such flights was one minute longer in 1930—ten and one-half minutes. The average load was the same both years—2.6 persons.

The equipment used for all types of aerial service operations provided an interesting source of study in the survey. The average carrying capacity of the single-engined land planes used was two to three persons; tri-motored land planes, 12 persons; seaplanes, four persons; single-engined amphibians, four persons; and twin-engined amphibians, eight persons.

MANHATTAN GOES SKYWARD

Taken by Curtiss-Wright Flying Service, this type of aerial photograph showing modern skyscrapers at their best is widely used by advertisers.

The number of air cooled engines in use doubled the number of water-cooled motors. In the air cooled class below 100 horsepower there were 457. The largest number were rated between 100 and 200 horsepower, with 2,298 in this class; while there were 1,057 between 200 and 300 horsepower. Three hundred and three air cooled engines above 300 horsepower were in service. In the water-cooled class, 1,729 were rated at 100 horsepower or less, 267 between 100 and 200 horsepower, 65 between 200 and 300 horsepower and 28 at 300 horsepower or more. The total number of engines employed in aerial service work during 1930 was 6,204, of which 4,115 were air cooled and 2,089 were water-cooled.

During 1930, these engines ran up a total of 1,147,560 hours of usefulness. The average engine was in use about 190 hours during the year. It is interesting to compare this figure with the average number of hours each airplane was used during the year: 650 hours for single-engined land planes and 910 hours for tri-motored land planes. Air cooled engines of between 200 and 300 horsepower averaged 315 hours during the year, while those of more than 300 horsepower averaged 286 hours' use. Water-cooled engines betweeen 100 and 200 horsepower averaged the largest number of hours in their class: 292.

SITE FOR BOULDER DAM

Fairchild Aerial Surveys, Inc., made this aerial photo of Black Canyon to aid engineers in their work of planning the new dam project.

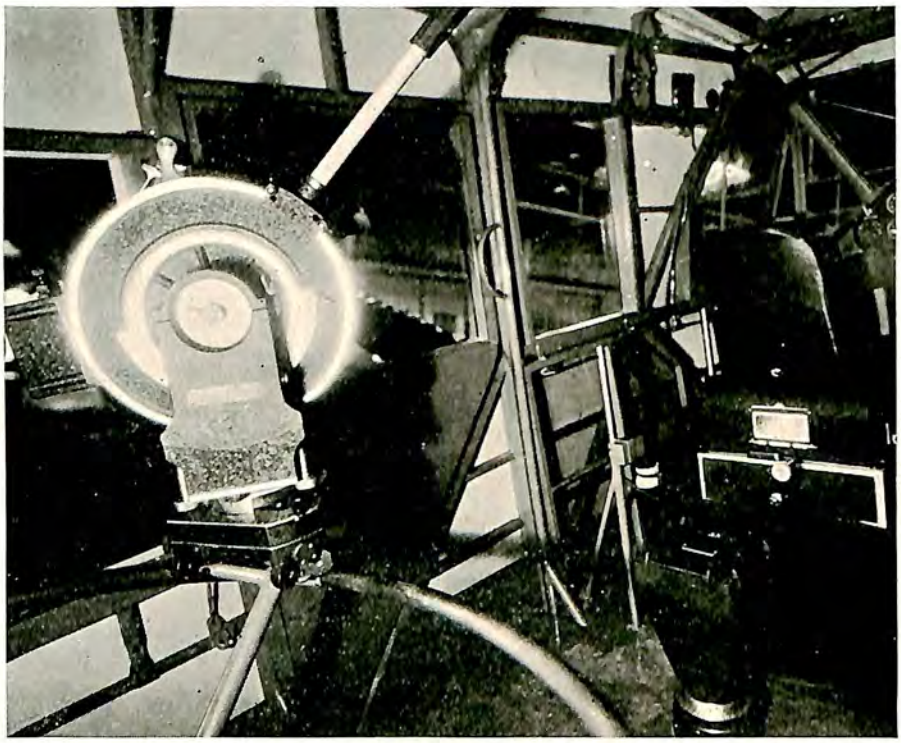
Student Training Figures

The statistical estimates made as a result of the Chamber's survey showed that 6,851 students were given training toward pilots' licenses, 625 receiving instruction and solo toward transport licenses, 2,532 toward limited commercial licenses, and 3,694 toward private licenses. The total number given instruction and solo during 1930 was slightly below that of 1929: 6,968. However, the number trained to transport work was double 1929 and there was a slight increase in the limited commercial to offset a falling off in students in the earlier stages of training for private licenses.

While many of the aerial service operators reporting declared their

business showed an increase in volume of from 10 to 50 per cent, during 1930, there was another group of about the same size who reported a smaller volume during the year. Some reported no change in their gross business from 1929. The total gross receipts from aerial service operations during 1930, not including airplane sales, was estimated between $30,000,000 and $35,000,000.

The Curtiss-Wright Flying Service continued to maintain the largest chain of bases in the aerial service field, operating during 1930 from 32



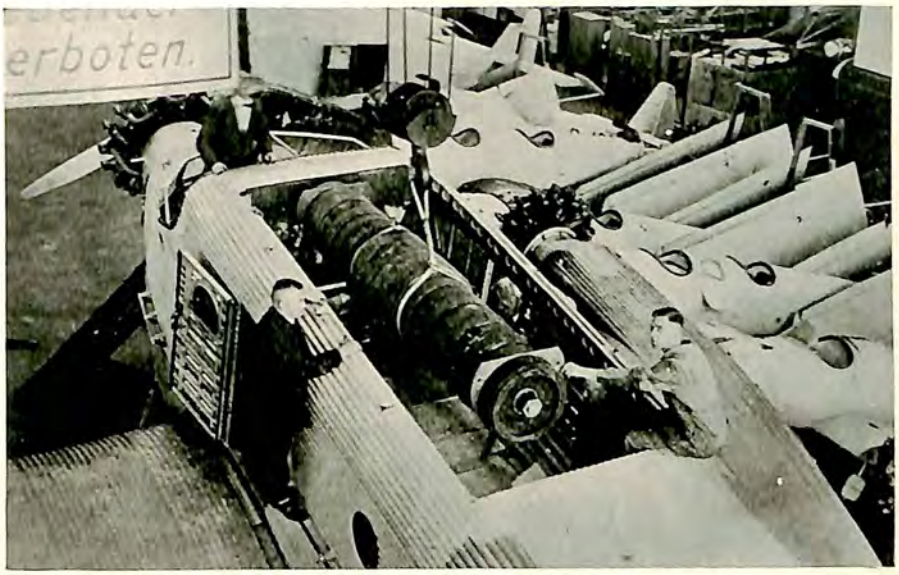
NEW PHOTOGRAPHIC SHIP

Bellanca Pacemaker especially designed as a photographic plane with a movie camera (left) on mounting and an aerial survey camera and finder.

airports in widely scattered sections of the country. Because of the magnitude of the undertaking by a single organization, the Curtiss-Wright Flying Service reported total operation figures easily exceeding those of any other single operator. It carried 214,559 persons during 1930 as compared with 86,589 in 1929 and flew 86,622 hours during the year. The number of hours flown was divided as follows: 7,551 hours in passenger hops; charter flights, 6,320 hours; photography, 1,470 hours; scheduled

operations, 1,768 hours; dusting, 1,278 hours; student instruction, 22,891 hours; student solo, 39,782 hours; and miscellaneous, 4,559 hours.

The seasonal character of the passenger hopping business is indicated from a study of the monthly reports of the Curtiss-Wright organization, which, in this case, can be considered typical of the experience of aerial service operators. The number of passengers carried rose steadily from January to August and then fell off rapidly. There were 1,995 persons carried in January; 12,083 in April; 33,079 in June; 41,117 in August; 18,158 in October and little more than 2,000 in December.



STRANGE BIRDS FOR NEW GUINEA

Gold mining machinery weighing tons being lowered into one of the Junkers monoplanes, powered with three Pratt and Whitney Hornets, for New Guinea service.

Flying Schools Expand

Curtiss-Wright maintained the largest chain of flying schools in the country and trained 497 transport pilots, 426 limited commercial pilots, and 98 private pilots during the year. Schools were located in Los Angeles, San Francisco, Chicago, Kansas City, Detroit, Valley Stream, L. I., Bridgeport, Conn., Hartford, Conn., Portland, Columbus, Indianapolis, Louisville, Memphis, Atlanta and Buffalo.

The Boeing School of Aeronautics at Oakland, Cal., a subsidiary of United Aircraft and Transport Corporation, swung into its ambitious program for raising the standard of ground and flying school instruction through a carefully prepared curriculum which included a graduate trans-

port pilots' course, known as a "Master Pilots' Course," for the most advanced student.

Parks Air College, Inc., a division of Detroit Aircraft Corporation in East St. Louis, Ill., attracted students from all parts of the country for ground and flight instruction. The school averaged about 150 students in attendance throughout the year, many of whom were housed in a new $60,000 dormitory. Parks was one of the first three schools in the country to receive an approved type rating from the Department of Commerce.*

The Aviation Corporation closed its several flying schools operated as the Universal Aviation Schools, but continued to maintain Roosevelt Avia-

BYRD PICTURES FROM PANAMA

Lee Shoenhair of the Goodrich Rubber Company scored a "beat" when he arrived in New York from Panama with the first news pictures of the Byrd Expedition, flying a Lockheed Vega (Pratt and Whitney Wasp).

tion College at Mineola, L. I. The school was one of the first to receive the Department of Commerce approved type rating when they were first examined by the government.

Operators especially equipped for aerial photography and mapping found an increased demand for their services in 1930. The aerial survey, based on the economic use of aerial photographs and maps, was established as a necessity to modern civic and industrial projects.

* Complete list of schools with Approved Ratings in Appendix.

Eight state highway departments used aerial surveys to carry on projects for the extension and maintenance of state road systems. Numerous cities were mapped, forest areas were surveyed for timber cruising, thousands of miles of gas, oil and gasoline pipe line surveys were completed. In fact, aerial surveys were made for various purposes from the Everglades of Florida to the wilderness of Canada. Flood control and mosquito control surveys met with success. Newspapers and large industrial organizations employed specialized aerial surveys in their merchandising campaigns to portray graphically the difference between heavy industrial communities,

"SPORTSMEN'S SPECIAL" FLIES HOME

Kingston-Rhodes Airways, Inc., flying Ryan monoplanes, guarantee moose or deer will be seen and fish caught on every trip of one hour.

high, medium and low buying residential districts, and swamp and wooded areas which represent non-buying power. The engineering profession employed aerial surveys to eliminate hill climbing, swamp wading, brush cutting and laborious phases of its field work.

Fairchild Aerial Surveys, Inc., a division of the Aviation Corporation, reported an increase in the total hours flown during 1930 over 1929 and in the size of the areas mapped during the year. While the surveys were made primarily for utility companies, railroads, lumber concerns, and cities, several thousand square miles were mapped for the United States Engineer Corps in connection with flood control projects. The Airview

Department, which specializes in oblique photography, developed a new focusing camera to take close-up views of other airplanes in the air. Recent additions to their library of oblique photographs have brought the number to more than 60,000 views, which include most of the leading cities throughout the world.

The aerial survey division of Curtiss-Wright Flying Service reported nearly a three-fold increase in the volume of its business during 1930 over 1929. The division showed a profit in 1929 and increased its profit in 1930. Working from 30 bases throughout the country, the division flew 1,000 hours during 1930 in the production of aerial photographs. While numerous phases of photographic production were improved, due to design of cameras, films, chemicals, formulæ, and mathematical procedures, the Cortiss-Wright organization claimed its greatest contribution in the establishing of a nationwide production organization through its established bases, making possible economy and efficiency in the execution of field projects. It established one of the largest and most modern aerial survey and engineering departments in New York City and provided an engineering laboratory at Memphis, Tenn., to speed production on mapping projects in the Mississippi valley.

Crop Dusting Continued

Drought, which cut down the rate of propagation of the boll weevil during 1930, decreased the amount of business for aerial service operators in this specialized field during the year. However, Delta Air Service operating from Monroe, La., dusted 30,000 acres in Arkansas, Texas and Louisiana, and Curtiss-Wright Flying Service continued its extensive crop dusting operations in the South, flying 1,278 hours to fulfill their dusting contracts.

The Department of Agriculture through its crop dusting investigation unit under Dr. B. R. Coad at Tallulah, La., continued its investigation of improved methods for crop dusting and possible new fields for the employment of planes to rid crops of pests. Nearly two score crop pests have been fought by dusting as a result of these investigations. Dr. Coad made an aerial survey trip into Mexico during the year to continue researches into the habits and movements of pink bollworm, the world's most extensive cotton pest.

CHAPTER XIV

AVIATION IN SCHOOL AND COLLEGE

Kindergarten to University Consider Aviation—Seventy-four Colleges Offer Courses—Thirty-five Hundred Students Enrolled—Elementary and Secondary Education—Newspapers—Radio—Aircraft Shows

AERONAUTICAL education commanded the attention of educators during 1930 from the kindergarten to the graduate school of engineering and economics. While every branch of this broad field was expanded during the year, there was a very well-defined movement among educational experts to study and carefully balance the amount of aeronautical training which should be included in any curriculum.

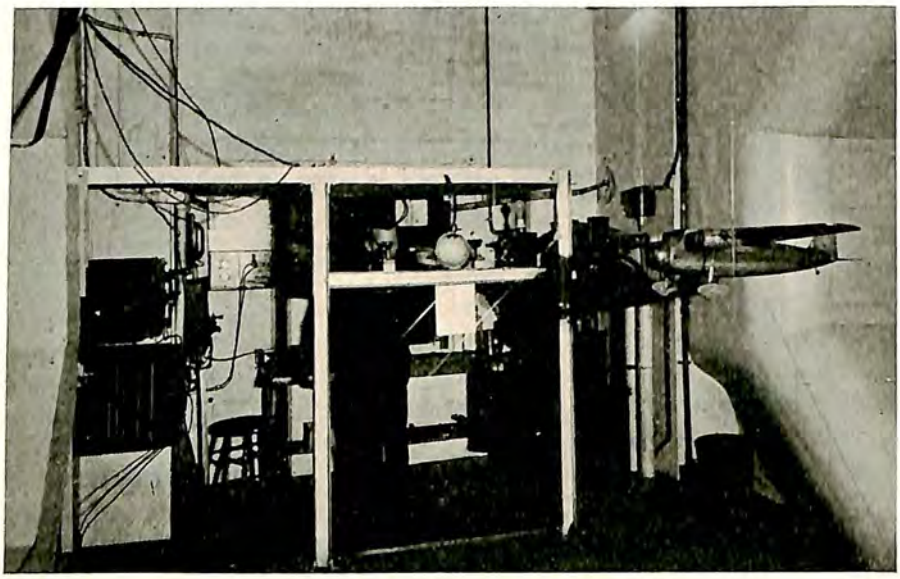
It was considered important by the industry and educational institutions alike that aviation, and particularly air transportation, should take its place in the program of study along with other great industries and modes of transport, but at the same time every effort should be extended to confine the amount of highly specialized training offered to a relatively few well-equipped universities and vocational schools. This was done to prevent a flood of highly trained graduates pouring into the aircraft industry at a rate faster than the industry could normally absorb them.

In line with this policy, fourteen universities and colleges in widely separated sections of the country offered full four-year courses leading to degrees of Bachelor of Science in Aeronautical Engineering or Bachelor of Science in Air Transportation, and provided graduate courses leading to degrees of Master of Science in Aeronautical Engineering or Doctor of Philosophy. These institutions, almost invariably, outlined curricula for the student from his freshman year until graduation, providing a thorough engineering training in the first two or three years and specialized work in aeronautics in the junior and senior years.

The University of Alabama, California Institute of Technology, University of Cincinnati, Carnegie Institute of Technology, 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 Texas and the University of Washington could be classified in this group of institutions, offering advanced training for specialized aeronautic degrees. They were equipped with wind tunnels, engines, laboratory equipment and qualified professors, many of whom have had actual experi-

ence as designers or engineers in the aircraft industry. Several of them, including New York and Georgia, had special buildings built exclusively for aeronautical laboratories.

Quite a large number of universities and colleges offering aeronautical training included aeronautical engineering as an option in their regular mechanical engineering course leading to a degree of Bachelor of Science in Mechanical Engineering. The University of California, North Carolina State College, University of North Carolina, Oregon State College, Virginia Polytechnic Institute, and Worcester Polytechnic Institute are



MICHIGAN'S WIND TUNNEL LAB

Students at the University of Michigan are seen testing a tri-motored monoplane model in huge wind tunnel at Ann Arbor, Mich.

among those who maintained this policy. In effect, their courses were as extensive as those in the first group, but no specialized degree in aeronautics was given the graduate. At least one institution, the University of South Dakota, included its aeronautics option in the regular civil engineering curriculum.

Wide Scope of Curricula

More than fifty other universities and colleges in the United States offered aeronautical education of some kind, varying from a single course in elementary aerodynamics to a dozen courses including airplane design, aircraft engines, navigation, propellers, airships, airplane performance, air transportation and specialized research. These courses were usually offered

at the student's option in his senior year and occasionally to well-advanced students in their junior years.

Universities and colleges offering some kind of aeronautical education, but not designed to fulfill the requirements for a degree in aeronautical engineering or air transportation economics, included: Alabama Polytechnic Institute, University of Arizona, University of Arkansas, Armour Institute of Technology, Bradley Polytechnic Institute, University of Buffalo, Catholic University of America, Clarkson College of Technology, Colorado College, Connecticut Agricultural Colleges, Cornell University, College of City of De-

AERONAUTICAL ENGINEERING STUDENTS

Working on aircraft design problems, students at Worcester Polytechnic Institute in Worcester, Mass., are seen in their study.

troit, University of Detroit, University of Florida, University of Idaho, University of Illinois, Iowa State College, Kansas State Agricultural College, University of Kansas, Lake Forest College, Lehigh University, Marquette University, University of Miami, Montana State College, Morningside College, University of Nebraska, University of Nevada, University of New Hampshire, New Mexico College of Agriculture and Mechanical Arts, North Dakota Agricultural College, Ohio State University, Oklahoma Agricultural and Mechanical College, University of Oklahoma, University of Omaha, University of Oregon, Penn State College, University of Pennsylvania, Purdue University, Rensselaer Polytechnic Institute, Rose Polytechnic Institute, Syracuse University, Tulane University, United States Military Academy,

United States Naval Academy, Utah State Agricultural College, University of Utah, Vanderbilt University, University of Virginia, State College of Washington, Washington University (St. Louis), University of Wisconsin, University of Wyoming and Yale University.

The optional aeronautics courses offered by these institutions were designed to give the college graduates, who desired to take graduate work in aeronautical engineering at some other school in the first group, a background necessary for such work. The courses in many cases were of sufficient scope to permit a graduate to immediately enter the industry as an engineer-apprentice, obtaining his practical experience and specialized knowledge first hand.

Syracuse Opens New Course

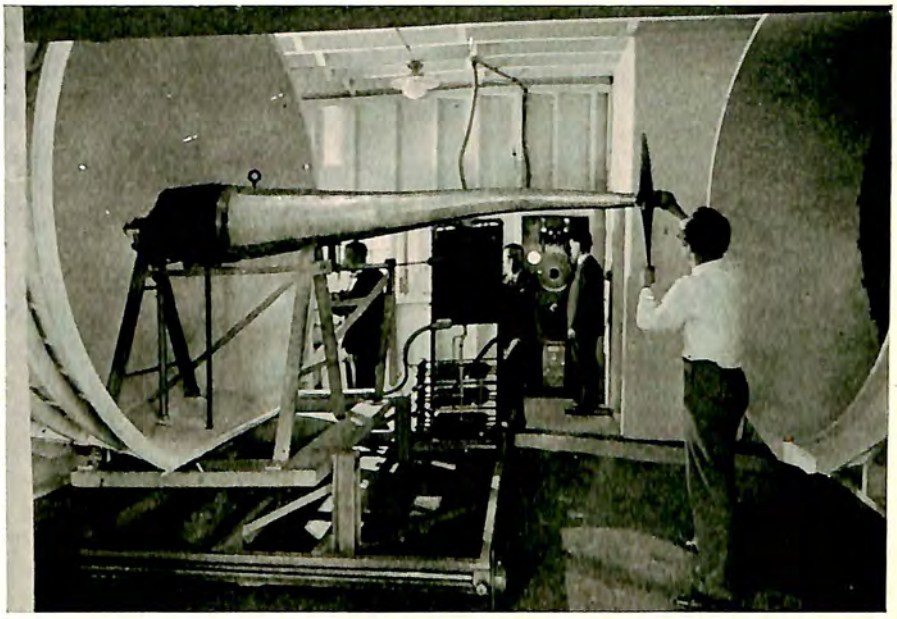
Syracuse University offered for the first time in 1930 a comprehensive course in aerial photo surveying and mapping, the first such course to be offered in an American university. The equipment for the course and for research into this highly specialized field was provided through a grant of $60,000 by the Daniel Guggenheim Fund for the Promotion of Aeronautics.

More than a dozen colleges reporting indicated that they had introduced ground school courses for students desiring to fulfill the Department of Commerce requirements incident to taking flight training at a commercial flying school. Several of them had made arrangements with commercial schools to give their students flight training following the ground school course. More than a score of the institutions reporting had glider or flying clubs operating or in process of organization. Nineteen indicated that flight training was available for students at nearby airports, and twenty-two reported the faculty's attitude to be favorable to students taking such training while in the university. None reported opposition, although many, evidently without any definite policy, did not answer the question asked in the Aeronautical Chamber of Commerce survey.

Seventy-four universities and colleges in the United States were offering courses in aeronautics of some kind during 1930–31. This was thirteen more than the total number reporting such courses in 1929, and some nineteen new ones were on the list for 1930–31. Birmingham-Southern College, University of Akron and University of Delaware reported discontinuance of their courses, and three other institutions, Temple, Oklahoma City, and Union, failed to report in 1930.

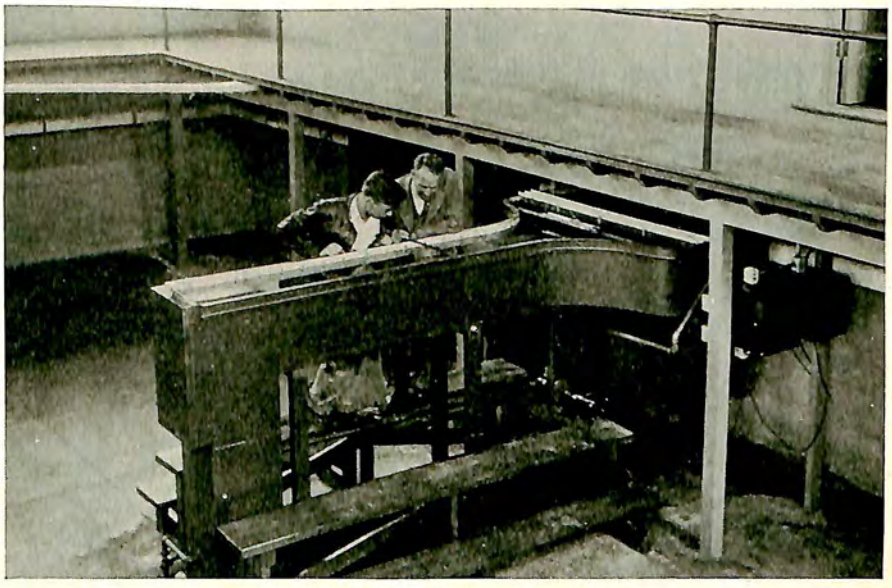
Enrollments Total 3,593

The popularity of these courses and the number of faculty members required to teach them can be learned at a glance from the tabulated list



STANFORD'S DYNAMOMETER LAB

A three foot model propeller is mounted for test on the dynamometer of the Guggenheim Aeronautic Laboratory at Stanford University.



WATCHING FLOW PATTERNS

With powdered aluminum dusted over its surface, the water channel in the Guggenheim Laboratory of Stanford University makes it possible to visualize flow patterns.

of universities and colleges offering aeronautic courses, as compiled by the Aeronautical Chamber of Commerce and published in the Appendix. The reports showed that 3,593 students were enrolled in the seventy-four institutions during 1930–31, and that sixty-three full time instructors and two hundred and fifteen part time instructors were engaged in teaching these specialized subjects. This can be compared with a total enrollment of 2,406 students in sixty-one universities and colleges, employing forty full time and one hundred and fifty part time instructors, in 1929. Many of the colleges reported that they are extending every effort to keep the number of students enrolled in their aeronautic courses to the minimum, so that students would not expect to find numerous lucrative positions upon graduation only to be disappointed because the field was overcrowded.

The problems concerned with the several phases of aeronautical education prompted the Educational Committee of the Aeronautical Chamber of Commerce to call a National Conference on Aeronautical Education during the International Aircraft Exposition in St. Louis, February 17, 18 and 19, 1930, in cooperation with the Daniel Guggenheim Fund Committee on Elementary and Secondary Aeronautical Education. In order to make possible the maximum amount of achievement during the conference, the Educational Committee devised a working plan to permit delegates to get at the heart of their problems quickly. The opening session was devoted to a presentation of addresses designed to provide a comprehensive picture of what had been done in each of the several fields of aeronautical education. The next three sessions were given over to the deliberations of three committees into which the conference was subdivided: the first, studying aeronautical education in universities and colleges; the second, problems of the public schools; and third, aviation ground school instruction. The final reports of these three committees represented a compendium of information of great value to directing the efforts of educators throughout the country. The discussions and reports were printed by the Guggenheim Committee and distributed by the Aeronautical Chamber of Commerce. Success of the conference resulted in plans for a Second National Conference in April, 1931, during the National Aircraft Show in Detroit.

Teachers' Training Courses

The Daniel Guggenheim Fund Committee on Elementary and Secondary Aeronautical Education also continued to carry on its work for the training of aviation ground school teachers in cooperation with the School of Education at New York University, with the emphasis shifting from the training of teachers for commercial schools to the training of teachers in aeronautics for the public schools. The Committee also continued to carry on its research in this field and issued several reports during the

year, one of the most important of which described typical courses of study for aeronautics now being used in the public schools of the country.

The annual meeting of the Advisory Group of the Daniel Guggenheim Fund Committee was held in Atlantic City coincident with the annual convention of the Department of Superintendents of the National Education Association. The Advisory Committee, consisting of about eighty educators in the elementary and secondary school field, expressed its appreciation of the work done by the Executive Committee and voted to continue the activities of the Committee with particular emphasis upon the training of teachers, and the preparation of courses of study and textbooks for the instruction of aviation in the public schools.

The work with the elementary and secondary, trade, and continuation schools in the country was continued by the Guggenheim Committee with some interesting results. The number of schools giving aeronautical work of some kind increased to five hundred. The trend of education of airplane mechanics and airplane engine mechanics, and in the subjects generally included in ground school work, appeared to be from the private commercial schools to the public schools. In several localities, private schools have discontinued this type of instruction and have concentrated their efforts on flying instruction, while the ground and mechanical training has been taken over in a large measure by the public schools.

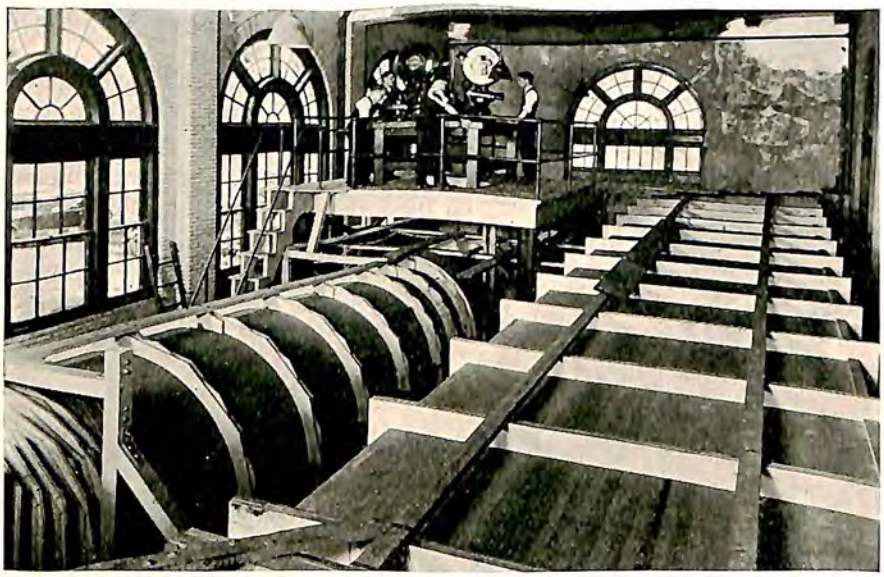
Trend toward Public Schools

If this trend continues, and there seems to be every indication that it will, training in aviation will follow the trends of early automobile education, which has now passed almost entirely into the public schools so far as training for mechanics is concerned. The National Recreation Congress, at its conference in Atlantic City in October, decided to abandon the national model contest which it had been staging annually. It was reported that this action was taken because it was felt that the public schools were now able to sponsor this work and were willing to do so without stimulus of a model contest.

The Guggenheim Committee reported that in two-thirds of the school systems of the country the child's interest in aviation is being used to stimulate his interest in the more prosaic school subjects in the curriculum. For this reason, aviation in some way entered the daily school lives of millions of children from the kindergarten through the high school.

Every agency concerned with the education of mankind was in some way influencing the attitude of the public toward aviation, remolding old, preconceived ideas and better informing the masses as to the facts of aviation. Newspapers, magazines, motion, pictures, radio broadcasts, libraries, advertising and art were among the media through which the public was

learning more about aviation. More than 200 major newspapers had qualified aviation editors writing on some new development in aviation, while the "spot" news of aviation's progress was given a prominent place in every paper in the country. The air transport lines developed new motion pictures taken along their lines to educate the public and theatre distributing agencies cooperated in the projection of them before the theatre-going public. "Flying with Lindbergh", a seven-reel motion picture film presented to the Aeronautical Chamber of Commerce by the Motion Pic-



CARNEGIE TECH WIND TUNNEL

Students tabulating results of a test made on a model in the wind tunnel of the Carnegie aeronautical engineering laboratory.

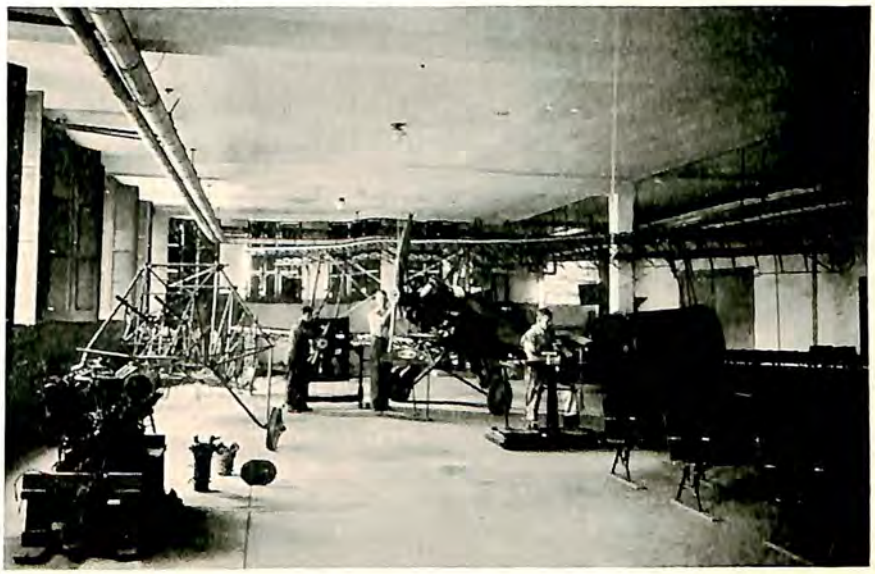
ture Producers of America, was used in an extensive educational campaign being shown before scores of civic and business organizations.

Radio Broadcasts Reach Millions

Aviation programs sponsored by the National Broadcasting Company in 1930 aimed to accomplish three specific things: first, to allay certain fears coincident with aviation, especially parachute jumping; second, to create a larger national interest by giving national network coverage to outstanding events; and third, to encourage the younger generation to enter aviation. Network coverages were given the arrival of the Bermuda fliers, Yancey, Alexander and Bouck, April 10; the Graf Zeppelin on its four-

continent flight in May; the German Atlantic fliers; the French fliers, Coste and Bellonte; the Hunter Brothers record endurance flight; Kingsford-Smith's flight from Ireland to New York and England to Australia; Capt. Hawks' transcontinental flights; the R-100 arrival in Canada; the National Air Races and the New York Aircraft Salon of the Aeronautical Chamber of Commerce. A weekly 15 minute talk of interest to boys was instituted in September as an NBC feature.

The Columbia Broadcasting Company covered the principal aviation



NORTH CAROLINA LABORATORY

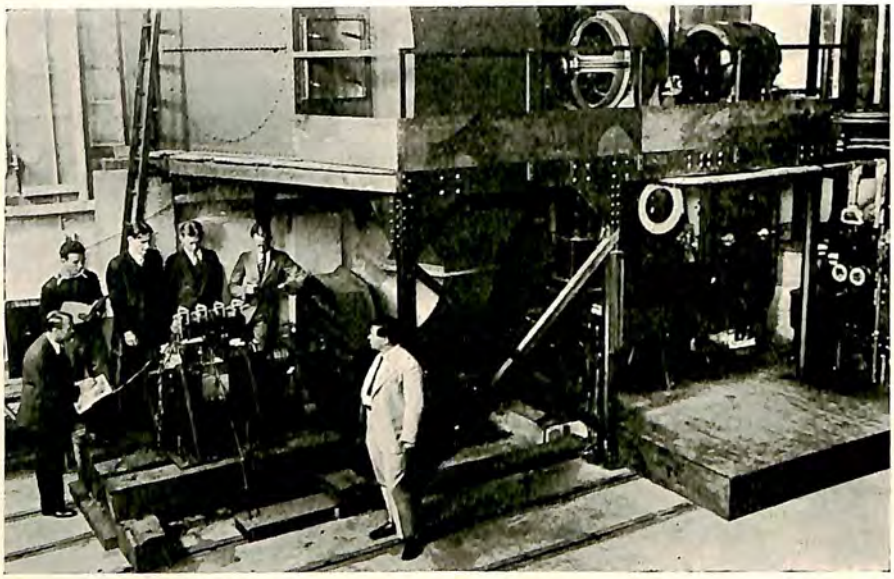
One section of the aeronautical laboratory at North Carolina State College, Raleigh, N. C., showing part of equipment.

events of the year, including the National Air Races in Chicago, the arrival of Coste and Bellonte, the return of Byrd from the Antarctic, and the arrival of Kingsford-Smith. Short wave transmission from airplanes was used on special broadcasts from a blimp during the America's Cup Yacht Races, and a regular feature, Musical Aviators, was put on the air.

Libraries and Aircraft Shows

Both public and private libraries recognized the importance of collecting information on aeronautics, and many of them set aside special sections for these works. The Library of Congress through its Division of

Aeronautics, set up by a grant from the Guggenheim Fund, purchased several important collections during 1930 and brought the total number of volumes and pamphlets on aeronautics in its possession up to 9,327. The Gaston Tissandier collection, Hermann Hoernes collection, Victor Silberer collection and Maggs Brothers collection were purchased in England and brought to the United States in the Spring. Every effort was being made to build up the Library of Congress collections to be the largest in the world open to the public. The Langley collection in Smith-



N. Y. U. ENGINE LABORATORY

Students testing a new engine in the air cooled engine laboratory of the Guggenheim School at New York University

sonian Institution was turned over to the Library of Congress. The Aeronautics Branch of the Department of Commerce, U. S. Army Air Corps, and National Advisory Committee for Aeronautics contributed some volumes from their collections.

The Aeronautical Chamber of Commerce Library in New York was used extensively by newspaper and magazine writers and others interested in aviation, although it was established originally as a private collection for the use of members in the aircraft industry. The Library was considered the largest devoted exclusively to aeronautics in the United States. It includes more than 1,200 bound volumes as well as 62,000 pamphlets, catalogues, reports and other unbound material.

Twenty-four issues of the Library Bulletin prepared by the Aeronautical Chamber of Commerce librarian were sent to members during the year, indexing more than 5,000 aviation articles printed during the year in domestic and foreign periodicals. Every known domestic and foreign periodical on aeronautics was kept on file in the Chamber's library. The Library Bulletin was used for reference by numerous public libraries, colleges, universities, and clubs as well as members of the Chamber.

The Aeronautical Chamber of Commerce sponsored or sanctioned air-

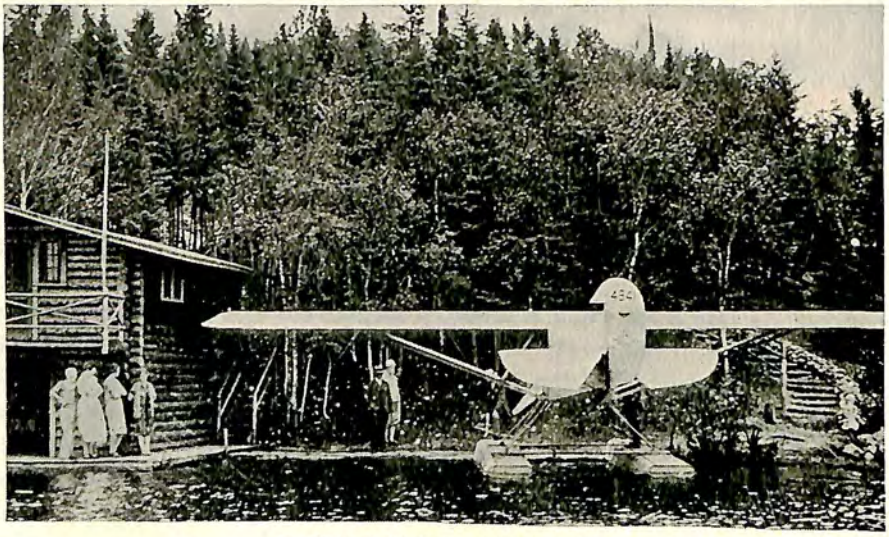
NEW YORK AIRCRAFT SALON

Glimpse of the Transport Arena, containing six giant transport ships, at the greatest aeronautical exhibition ever seen by New Yorkers.

craft shows in several sections of the country to aid in the educating of millions of people who represent the potential aviation market. The International Aircraft Exposition was staged in St. Louis, while the Third All-American Aircraft Show was sanctioned in Detroit and the Chamber staged the New York Aircraft Salon in Madison Square Garden. Smaller shows were sanctioned in Buffalo, Pittsburgh, Cincinnati, Oakland and Camden, N. J. The Chamber's show committee adopted a policy for 1931 calling for one Class A show. It was decided to stage it in Detroit in April, 1931, as the National Aircraft Show.

SNOW NO BARRIER

A few icicles fail to keep this enthusiastic private flier from preparing his Fairchild 71 (Pratt and Whitney Wasp) for flight in northern Canada.



LAKES BECKON SPORTSMEN

Wives scan the skies for hubby and his friends when they are due to arrive at a Minnesota Lake camp. It is a Ryan Brougham equipped with pontoons.

CHAPTER XV

WITH THE PRIVATE FLIER

Forty Million Miles Flown—Sportsmen Enter Flying—Industries Use Planes for Wide Range of Tasks—Newspapers and Oil Companies Enthusiastic Plane Owners—Flying Clubs—Gliding

AS GREATER numbers of business executives, professional men and sportsmen became acquainted with the value and joy of flying through increasing use of the air transport lines, interest in private flying heightened. Private ownership of airplanes by individuals or corporations expanded in six years from five to more than 40 per cent of the total number of planes in use. Manufacturers concentrated on developments which they hoped would stimulate this field. They realized that among the requisites to further building up the market are planes that are extremely easy to fly, that are not too expensive, and for which a private pilot's license may be obtained with facility.

Several manufacturers designed and successfully tested small, one and two place, open cockpit planes during 1930 which were to be placed in quantity production in 1931 and offered to the public at from $800 to $1,800. It was this type of plane which was expected to broaden a section of the market among potential private fliers. The manufacturers also made efforts looking toward obtaining private pilot's licenses with less rigid requirements and still maintain a high degree of safety.

Although general acceptance of airplanes for private travel by great masses of people remained to be achieved, there was a host of private fliers throughout the world who were enjoying the exclusiveness of the sky and the opportunities afforded for rapid transportation for pleasure and business. There were plenty of good airplanes—more than a score—offered to the public at prices ranging from $2,000 to $8,000, and many of the privately owned planes were in this class. However, wealthier aviation enthusiasts and big corporations found many of the bigger planes, ranging from $8,000 to $60,000 in price, better suited to their needs or tastes.

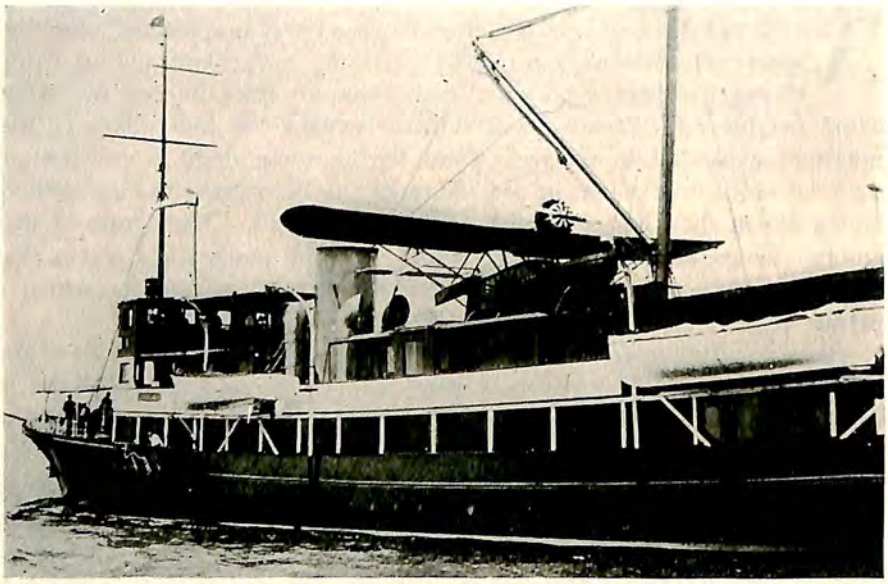
Forty Million Miles Flown

These private and industrial owners of aircraft piled up an impressive mileage flown during 1930. It was conservatively estimated that privately owned planes, bent on business or pleasure missions, flew 40,000,000 miles during the year. 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.*

More than 300 firms were using fleets of privately owned planes in the development of their business. Thousands of business executives, professional men and sportsmen operated their own ships for business or pleasure. Of the two classes, California had the largest number of private fliers, New York was second; Illinois, third; Ohio, fourth; and Texas, fifth.

The range of uses to which such craft were put ran the gamut of business and recreational activities. Gail Borden, dramatic critic for the



AIRPLANE FOR TENDER

Swung on deck of the new million dollar yacht Lotusland owned by Col. E. A. Deeds, the Sikorsky S-39 Amphibion is used to fly to shore.

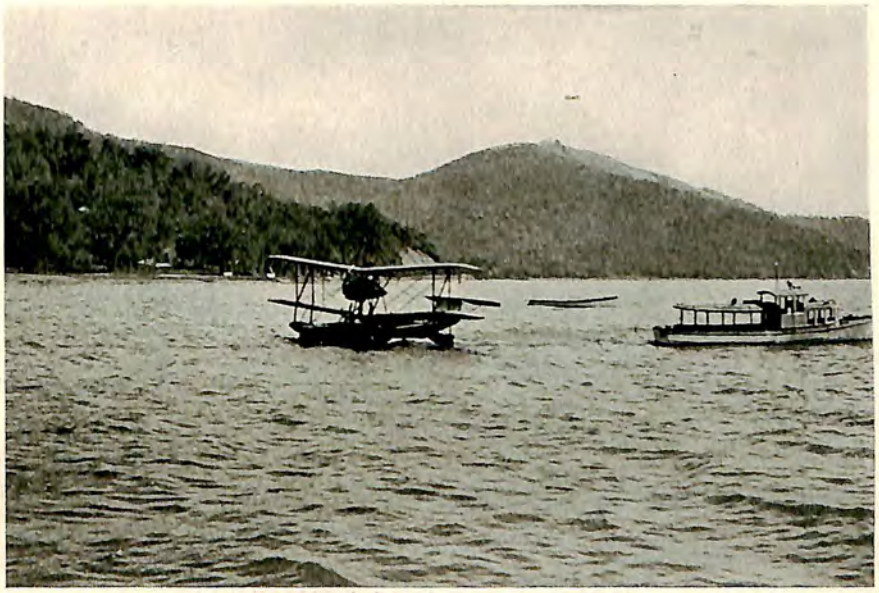
Chicago Daily Illustrated News, flew his own plane to "first nights" in various parts of the country. Dr. Frank A. Brewster of Holdredge, Kan., made all of his out-of-town calls with his own plane, covering more territory in less time than he previously did by motor car and, said he, "saving money and my nervous system." Amos Gramlich, young Sarpy County, Nebraska, farmer, added a plane to the equipment of his 240 acre farm after learning to fly, because he "found an hour or so in the evening clouds refreshing after a hard day on the farm." G. W. Skinner, president of the Alaska Pacific Salmon Corporation, used his plane for a scouting trip

* These classifications discussed in earlier chapters: "Over the Nation's Air Lines" and "Airplanes: Jacks of All Trades".

to a half dozen of the company's canning properties in Southeastern Alaska, making the round trip from Seattle in four days. The Union Electric Light and Power Company of St. Louis used a radio-equipped tri-motored plane to make surveys and patrol the transmission lines of its system extending over rugged country. Political campaigns in New York and Wisconsin were carried on over a lengthy intinerary by plane.

Sell Washing Machines by Air

A Chicago firm engaged in the manufacture of washing and ironing machines began the training of its salesmen as pilots and furnished them



MOUNTAIN LAKES ATTRACT FLIERS

Keystone-Loening Commuter (Wright Whirlwind) taxiing in Clear Lake in the heart of the western mountains after an hour's flight.

with planes, using their most capable men in a larger territory and resulting in a greater volume of business at a less proportionate transportation expense. H. L. Ogg, president of the Automatic Electric Washer Company of Newton, Ia., was authority for the statement that an order for 1,600 machines was taken on a single business trip by air that would not have been possible otherwise.

These were but a few of the industrial uses to which airplanes were being adapted. More than 45 widely different types of businesses, all interested in speedy transportation facilities, were using privately owned

planes. Insurance companies, contractors, attorneys, power interests, express companies, advertising agencies, roofers, department stores, publishing houses, automobile, accessory and tire manufacturers were among them. Newspapers and oil companies represented two of the largest groups of aircraft users, and it might be interesting to examine the experiences of some of the principal ones in the two fields.

Experiences of Oil Industry

Seventy-five airplanes were owned and operated by 45 different oil companies, an independent survey made during 1930 showed. Fifteen

FLYING YACHT NEAR DETROIT

With an all-metal hull of water tight construction, the Eastman Flying Yacht (Curtiss Challenger) accommodates four in two open cockpits.

new planes were sold in this field during the first three months of the year alone. The Vacuum Oil Company bought a fleet of planes to promote sales in the United States and Canada. The Kendall Refining Company had two Travel Air planes. The Texas Company had four ships, headed by Capt. Frank M. Hawks' speedy Mystery ship. The Standard Oil Company of California had a tri-motored Ford and a fleet of three Stearmans. The Standard Oil Company of Indiana had three ships used by executives who have flown 105,000 miles in three years, while the planes also were sent on good-will missions to carry 15,051 passengers and fly 1,644 hours. The Utah Oil Refining Company carried more than 6,000 passengers in its

planes. The Phillips Petroleum Company flew 43,000 miles in nine months, testing and demonstrating a new aviation fuel. Money was saved by the Union Oil Company of California by using its planes to send its attorneys to settle legal questions in connection with a tax problem and to expedite the signing of leases. Two of Union's five planes were used by the geological department for air surveys and quick trips to locations. The Continental Oil Company used a plane for a 5,000 mile tour of its division headquarters in the marketing of a new germ-processed motor oil, saving $2,000 over other means of transport by covering the territory in 21 days.

SPORTSMAN'S AMPHIBIAN

Sikorsky S-39 (Pratt and Whitney Wasp Jr.), while designed for the private flier, is also being used in commercial operations.

A break in a gas line near Ponca City was permitting gas to escape at the rate of $4,000 per day. Because several feet of snow covered the ground, it was feared that it would take a week to locate the break. A company airplane was pressed into service and the break was discovered in 14 minutes. The Moody-Seagraves Company of Houston, Tex., associated with the oil and natural gas industry, bought a Bellanca Pacemaker to carry executives. The Standard Oil Company of New Jersey, Standard Oil Company of Louisiana, and Standard Oil Company of Ohio operate fleets of planes to transport executives and extend sales promotion work. The Shell Oil Company used airplanes in its various divisions throughout the world.

More than two-score newspapers were using planes to deliver papers to rural routes and summer resorts, carry executives to important meetings, get news photographs of distant events, and transport reporters in quest of "beats". F. F. Garside, owner and publisher of the Tonopah, Nev., Daily Times and Las Vegas Review Journal, made weekly trips between the two papers, 220 miles apart, in his private plane. The New York Times employed fleets of planes in delivering papers during the summer months in upstate New York, Vermont, New Hampshire, Maine and Canadian points, and to Florida during the winter. The Burlington, Ia., Gazette bought an American Eagle to get pictures and stories quickly.

LOW WING SPORT PLANE

One of the first low wing monoplanes in the country, the Nicholas Beazley NB-3 employs metal construction throughout its wing members.

The Chicago Daily News, New York Evening World, Boston Transcript, Boston Evening Record and Morning American, Boston Herald Traveller, and New Orleans Times Picayune reported ownership of planes used in delivering papers to distant points. The Des Moines Register and Tribune limited the use of its planes to coverage of important news stories. The Bloomington, Ill., Daily Pantagraph reported that the cost of using planes for delivery in its section was prohibitive, but that for news coverage of 150 Illinois towns reached by the paper, the plane was indispensable.

The Waterbury, Conn., American used a plane to deliver papers to its suburban subscribers and claimed the method to be practical. Josiah

P. Rowe, Jr., publisher of the Fredericksburg, Va., Daily Free Lance Star, piloted his own plane on business and pleasure jaunts. The Cleveland News purchased a Sikorsky amphibian, its second plane, during the year. The Ogden, Utah, Standard Examiner overcame the handicap of a flood and landslide by delivering its papers to subscribers by airplane. The subscribers received their papers even earlier than usual. The Rochester Times-Union participated in the New York State Air Tour. The McCook, Nebr., Daily Gazette discontinued its airplane delivery service after a nine months' trial with the admission that it was too expensive. The publisher

NEWSPAPER OWNS THIS ONE

The Chicago Daily News accepted delivery on its "Blue Streak," a Bellanca tandem sesquiplane (2 Pratt and Whitney Wasps), designed for long distance flights.

said the paper had gained in circulation and lineage, however, and that he believed a better adapted plane would be practical. The Chicago Tribune's flying yacht, 'Arf Pint, made a cruise during the year with its aviation editor aboard.

Haul Gold Mining Machinery

Perhaps one of the most unique uses of industrially owned airplanes during 1931 will be in far-off British New Guinea, the world's second largest and unexplored island. Three monoplanes, powered with nine Pratt and Whitney Hornet engines, were preparing for the Herculean task of transporting heavy gold dredging machinery 60 miles into the interior

of the strange island, where roads are only trails through the wilderness and water transportation is impossible because of treacherous rapids and swirling whirlpools. It will be a strange sight for the pygmies and cannibalistic savages who inhabit the island when the mechanical birds carry 3,000 tons of gold mining machinery into the interior. The heaviest single piece of machinery weighs 7,000 pounds. The specially stressed planes can make the trip in 40 minutes over a route which requires eight days of treacherous travel through jungle swamps and over rugged mountains on mule back. Five emergency landing fields were established along the 60 mile route to insure safety of operations.

PLANES FOR EXECUTIVE USE

Sikorsky amphibian (2 Pratt and Whitney Wasps) and Ford tri-motor (3 Pratt and Whitney Wasps) used by executives of Pratt and Whitney.

In the field of the individual owner, scores of new sportsmen, lured by the thoughts of rapid transportation to favorite fishing or hunting haunts or to distant sport events, joined the ranks of hundreds of private fliers who fly for just the sport of the thing.

Amphibian as Yacht Tender

The new million-dollar Diesel yacht Lotosland, built for Col. Edward A. Deeds, vice-president of the National City Bank, introduced a combined yacht-airplane service to private boat owners. A Sikorsky S-39 (Pratt and Whitney Wasp) amphibian was added to her equipment. While the

yacht is 206 feet long and has a 28 foot beam, the plane has a wingspread of 38 feet and extended 10 feet beyond the foredeck. It was loaded on and off the yacht by the special boom attached to the foremast. The plane was a four-place amphibian with a 400 mile flying range for commuting between yacht and shore.

Marshall Field III, grandson of the founder of Marshall Field and Company, Chicago, soloed at Roosevelt Field, N. Y., in July in his own Fleet (Kinner) biplane after 11 hours of instruction. His solo flight was

STANDARD OIL'S FLEET

Three Stearman biplanes (Pratt and Whitney Wasps), part of a large fleet owned by Standard Oil Company of California, in flight over Oakland.

the first intimation to friends that he had added flying to yachting and polo as his sport interests. He owns a Loening amphibian and has a private ramp on his estate on Long Island Sound. Joseph M. Patterson and his daughter, Alicia, used their several private planes constantly throughout the year. L. M. Lombard and F. M. Blodgett, Boston sportsmen, flew to Alaska in August to hunt big game. J. Cheever Cowdin, Jr., son of the polo player, and Carl Bruer soloed at Aviation Country Club after less than ten hours instruction. John D. Hertz and his wife and

daughter, Helen, made a 3,500 mile tour of the Caribbean in their own plane. Col. Charles A. Lindbergh passed his 375,000th mile in the air during the year and Mrs. Lindbergh had flown nearly 50,000 miles, some of it at the controls. There were literally thousands of sportsmen, business and professional men flying their own planes for business or pleasure. Many women flew their own planes, and their numbers have increased so rapidly that their exploits are reviewed in a separate chapter, "Wings for Women."

FLYING TELEPHONE LABORATORY

New aircraft radio equipment is tested by Bell Telephone Laboratories in this Ford tri-motored monoplane powered with Pratt and Whitney Wasps.

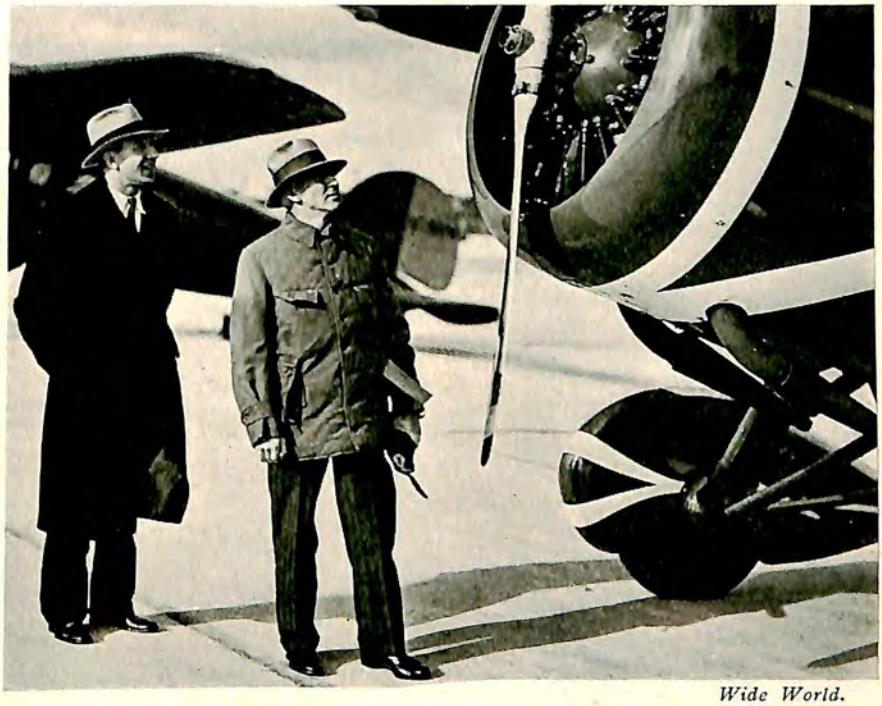
Flying Clubs Own Planes

Flying clubs and aviation country clubs were a powerful influence in interesting larger numbers of private pilots to get into the air. Charles L. Lawrance is authority for the statement that there were 304 flying clubs in the United States owning plane equipment of some kind during 1930. Undoubtedly, many were of very loose organization owning but a single plane and renting hangar space at the nearest airport. Fifty per cent of the clubs had sprung into existence during the last 18 months. By organizing in groups, people could afford to buy and maintain an airplane the cost of which might go beyond the means of any one in the group.

Flying clubs had been organized in many colleges and universities, but only the one at Harvard owned and operated its own plane. Several

operated gliders and were training their members in the elementary details of flying. The Harvard Club was awarded the Loening trophy in April for its advancement in this pioneer field. Yale, Cornell, Pennsylvania, New York, Carnegie Tech, University of Detroit, Illinois, Ohio State, Michigan and Southern California were among the institutions with organized flying clubs. Alpha Eta Rho was organized at the University of Southern California as a national collegiate aviation fraternity.

The National Aeronautic Association launched a campaign in 1930 to



Wide World.

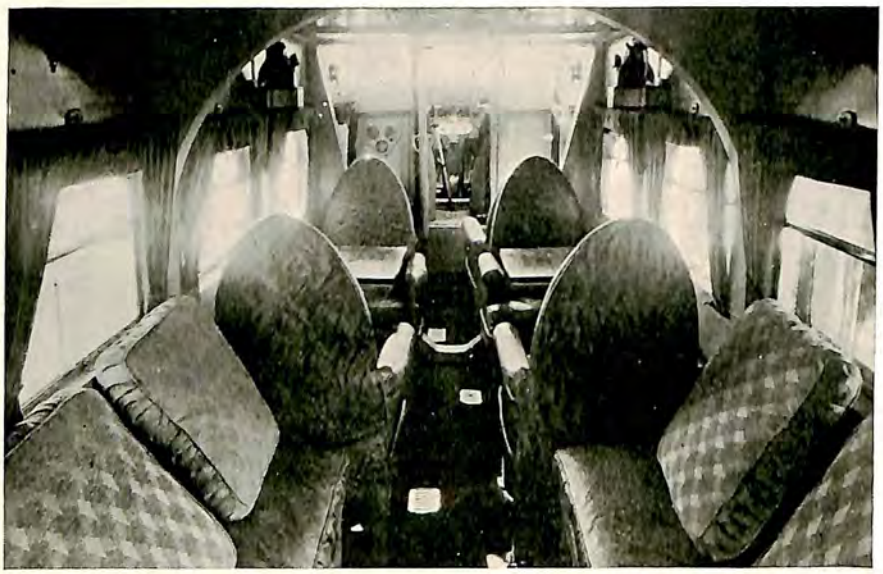
SPEED BOAT KING'S NEW SHIP

Gar Wood (right), America's premier speed boat racer, and "Duke" Schiller, his personal pilot, examining Wood's new Lockheed (Pratt and Whitney Wasp).

popularize private flying clubs and acquired a plane for its club secretary to use on trips around the country. The work was started through a grant of the Guggenheim Fund.

The Curtiss-Wright Corporation developed a flying club plan to show the way to individuals who desire to form clubs and obtain well-equipped airplanes at reasonable rates. A booklet describing the plan and giving operating costs for Curtiss-Wright planes adapted to such a plan was widely distributed.

Perhaps the most elaborate club plan yet devised was in its second successful year of operation at the Aviation Country Club at Hicksville, L. I. The club owned its own field, clubhouse and four planes; maintained an exclusive membership; and provided space for 50 planes privately owned by members of the club. The success of the Long Island club prompted the national organization to speed the development of clubs in Los Angeles, San Francisco, Philadelphia and at Long Ridge, Conn. Financing of the Philadelphia club was completed at a meeting November 20 and construction of the clubhouse and field was started at once, to be



LUXURIOUS PRIVATE PLANE

Interior of Ford all-metal tri-motored plane showing the luxurious accommodations afforded the private owner of this ship.

completed in 1931. The Westchester club at Long Ridge obtained property for its field and planned construction work in the Spring of 1931. The Long Island club showed a profit for the last six months of 1930 despite reduced rates of $7.50 per hour for solo time and $12.50 per hour for instruction.

Gliding Gains in Popularity

Gliding continued to gain in favor among sportsmen who did not mind the labor of taking their turns at the snap cord in launching the gliders on their relatively short flights. Several hundred gliders, most of them of the primary type, were built in the United States during 1930

and many of them were sold to individuals or clubs. Some enthusiasts claimed that gliding was the logical training for the student flier to take before using powered airplanes. Others felt that the strenuous exercise connected with primary and secondary gliding would keep the number of enthusiasts at a minimum. Nevertheless, the movement was gaining impetus in America as it had previously in Germany, where more than 200,000 persons have participated in the sport. Robert Kronfield of Austria set a new distance record during 1930 when he rode a thunder cloud 101 miles.

NEW THRILL FOR WATER DOGS

Detroit Seagull glider equipped with pontoons being towed at 50 miles an hour by a speed boat over Detroit River, seeking new record.

The world duration record was made in Germany in 1927 by Ferdinand Schultz who stayed aloft 14 hours and seven minutes. The world altitude record for gliders was made in 1929 by Johannes Nehring who climbed 3,940 feet.

During the First National Soaring Contest held by the National Glider Association in September at Elmira, N. Y., Warren Eaton headed his motorless ship into the wind to climb to 2,409 feet, for a new American

record. Ninety-nine qualified soaring flights were made during the contest, 70 of which were for endurance records, lasting more than 30 minutes each. Jack O'Meara kept his slender winged soarer aloft six hours and 48 minutes for an official American record, although Jack Barstow had unofficially placed the American record at 15 hours and 12 minutes earlier in the year. Wallace Backus aided in staging a "refueling" flight during the contest when he took off and fed O'Meara who had been in the air for hours headed for a record. Wallace Franklin, flying one of his own gliders, made a spot landing within three inches of the flag to demonstrate his skill with the motorless craft. Eight first class glider pilot's licenses were earned during the meet by Eaton, Backus, A. P. Artan, Prof. R. E. Franklin, Wallace Franklin, Capt. Frank M. Hawks, C. S. Jones, and Major W. C. Purcell. It is necessary to circle the field from which the glider is launched for five minutes to obtain a first class license.

Col. and Mrs. Charles A. Lindbergh made their first glider flights earlier in the year at San Diego and earned first class licenses. Mrs. Lindbergh stayed aloft six minutes and was the first woman in the United States to earn a first class license. Both said they enjoyed it and thought the possibilities for gliding as a sport were unlimited. Sixty-five glider clubs had been organized and were affiliated with the National Glider Association before the close of 1930.

CHAPTER XVI

WINGS FOR WOMEN

Backseat-Pilots Take the Stick—Woman's Influence on Plane Luxury—Color's Part in Sales—Pilots from All Walks of Life—Exploits of World's Best Women Fliers

THE hand that rocked the cradle flies the family's plane today. No more content with a place as backseat-pilot than they were with backseat motoring, women are turning to aviation in increasing numbers. More than 300 women have qualified as pilots, some of them to enter the aircraft industry, many of them to enjoy the sport of flying or join their husbands in piloting the family plane.

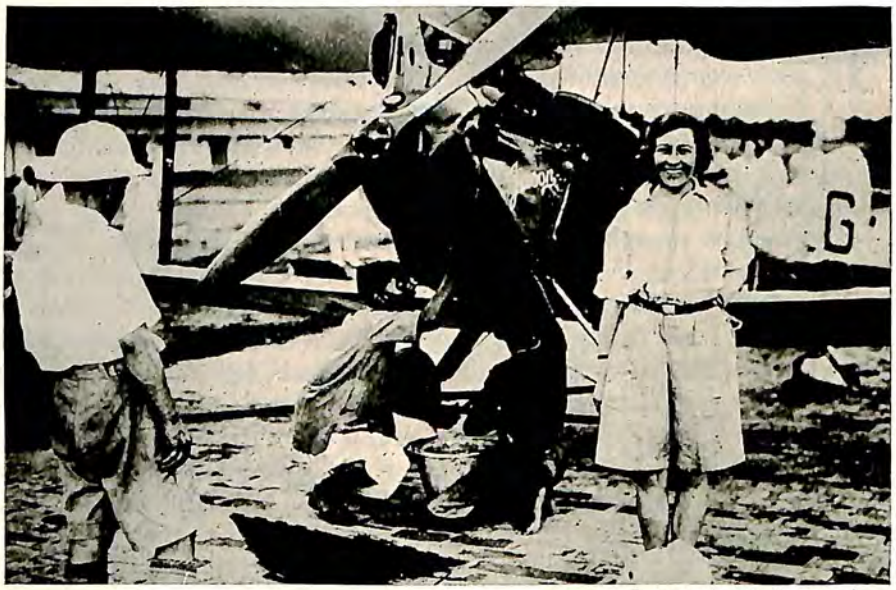
The number of women pilots has been more than doubled in the past year, quadrupled in the past two years. This does not mean, however, that women have not taken their places alongside men since the birth of flying. Five years before George Washington became President of the United States, the first feminine air passenger ascended into the air. She was Madame Thible, a French woman who ascended in a Montgolfier balloon from Lyons, France, in 1784, a year after the first authenticated balloon ascension. Mrs. Hart O. Berg was the first woman to fly in a heavier-than-air machine, taking off with Wilbur Wright at Le Mans, France, October 7, 1908. Harriet Quimby of Boston was the first American woman to receive a pilot's license—1911. The following year she flew the English channel, the first of her sex to achieve such a feat. However, there were no more than a dozen women pilots before the World War.

American women have taken far more interest in aviation than their sisters abroad in England, France, Germany or Russia, although those countries boast some outstanding women pilots. In January, 1929, the United States had only 34 licensed women pilots. In July, 1929, there were 70; January, 1930, 126; July, 1930, 270; and more than 300 at the end of the year. Twice this number were registered in flying schools throughout the country, learning to fly. England has less than half the number of American women pilots.

Just as women were an important force in hastening the motor car out of the linen-duster stage, so they have influenced the building of luxury and comfort into the 1931 model planes, ranging from the well-furnished transport liners to the colorfully painted sport planes. The air lines have

learned that when they use a woman's judgment as the yardstick for decorating and furnishing their planes and passenger terminals, they not only attract other women passengers but overcome wives' and sisters' objections to hubands' and brothers' flying.

An independent survey of the air transport lines made during 1930 indicates that a large percentage of the passengers flying the regular air lines are women. Leaders in the aircraft industry feel that this is an important factor in further building the volume of business. Forty-three per cent of the passengers on Pan American Airways between Miami,



International Newsreel.

"AMY" REACHES INDIA

England's flying heroine, Amy Johnson, in Calcutta on her solo flight from England to Australia awaits preparation of her plane.

Havana and Nassau are women; 35 per cent of those who fly in the special night plane of Boeing Air Transport between San Francisco and Salt Lake are women; 30 per cent of Colonial Air Transport's passengers between New York and Boston are women; and 28 per cent of the commuters between San Francisco and points across the bay, via Air Ferries, are women. Transcontinental and Western Air estimated that 20 per cent of their transcontinental passengers are members of the fair sex.

Color's Influence on Sales

Color, which commands a place in the modern home from refrigerator to alarm clock, is taking an increasingly important place in aviation. Again,

women are the direct cause for the movement. When Miss E. A. Samarow of Montreal, Canada's first woman pilot, came to New York to buy an American sport plane she ordered one with silver wings, yellow struts, blue fuselage, black top decking and a yellow stripe. Violette de Sibour flew around the world with her husband on a vagabond jaunt in a silver and cobalt sport plane; Phoebe Omlie, first woman to hold a transport license, selected a plane in an entrancing shade of scarlet; Mrs. Beryl Hart owns a bronze-winged ship and Amelia Earhart chose a gleaming white to make her high-powered plane distinctive. Robin's egg blue and silver is a com-

Wide World.

FLIER, ADVENTURER, EXECUTIVE

Amelia Earhart, first woman to fly the Atlantic, flies her Lockheed Vega on frequent missions as vice-president of the Ludington line.

bination which a California woman chose and cream and purple was the color scheme ordered by another woman customer.

Keeping pace with "friend hubby" has taken some women into the air. The list of licensed pilots published by the Aeronautical Chamber of Commerce contained this entry one week: Kenyon, C. W.—Pvt. 9949; Kenyon, T. W.—Trans. 963; also this one: Fenno, J. K.—Trans. 6546; Fenno, S. S.—Pvt. 9920. Brothers? No, husband and wife! The first are known about Boston Airport as Ted and Teddie; the other two fly out of the Providence, R. I., Airport and the "S" stands for Sarah.

Other notable flying couples: the Thadens of Pittsburgh; O'Donnells of California; May and Jim Haizlip of Tulsa; Blanche and Dewey Noyes

of Cleveland; Esther and Earl Vance; Phyllis and Norman Goddard; Frances and Bill Marsalis; Betty Huyler of candy millions and B. Allison Gillies. There will be others when the "better half" of the following couples are officially licensed: Anne and Charles Lindbergh; Mr. and Mrs. Stanley Stanton; Alicia Grant Patten Jordanoff and Assen Jordanoff; and Hazel and Ivan Gates.

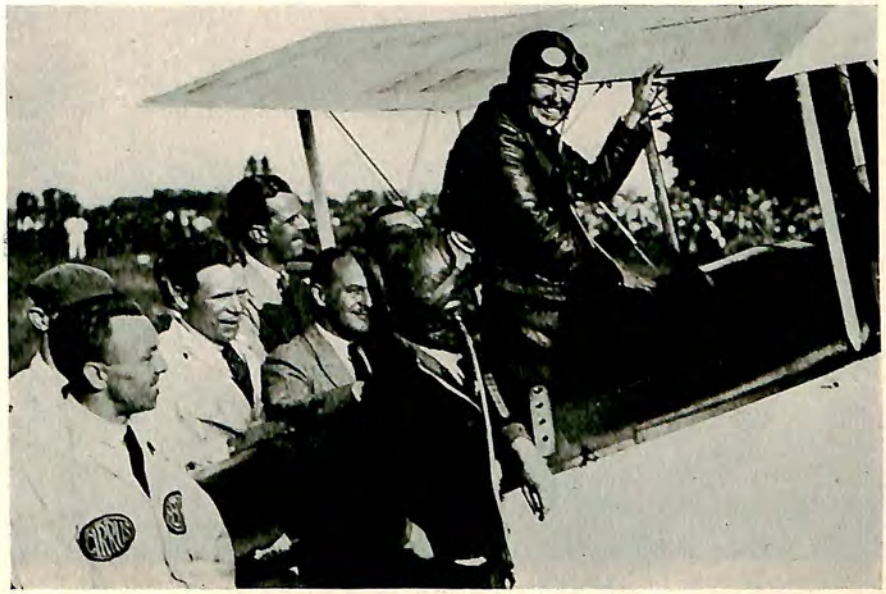
A school teacher's desire to keep abreast of new developments so that she may teach others and, perhaps, enlarge the scope of her own enjoyment has led many "schoolmarms" into the air. Here are a few of them: Mrs. Laura Harney, general science and mathematics teacher in Washington Junior high school, Mount Vernon, N. Y.; Frances Moore, teacher in Cochran Junior high school, Johnstown, Pa.; Wilma Walsh, Spanish teacher in Belleville, N. Y.; Agnew A. Mills, teacher in New York apprentice school; Retha McCullough, fourth grade teacher in Beaumont, Tex.; Meta Rothholz, mathematics teacher in Erasmus Hall high school, Brooklyn; Jane W. Willis, physical training teacher in Denver; and Helen Irene Hyde, teacher in George Washington high school, Los Angeles.

Debutante to Waitress

Analysis of the list of licensed women pilots or of women students under instruction will show that they come from all walks of life; from waitress to debutante. Miss Loranda Prochnik, daughter of the Minister of Austria who was presented to Washington society during the year, was the first of the "diplomatic daughters" to solo. Mary Lincoln Beckwith, grand-daughter of Abraham Lincoln, bought two planes and began her flying course in Washington. Gladys Normand, sister of the late Mabel Norman, screen actress, started flying in Los Angeles. Martha Candler, daughter of Asa G. Candler, Jr., of Atlanta, "wished" for an airplane as a Commencement present, and was met in Nashville upon her graduation from Ward-Belmont with a four-place cabin plane. She then started her flying course in Atlanta. Alice du Pont of Wilmington, Del., 18-year-old daughter of A. Felix du Pont, won her wings in Boston during the year. Beulah Unruh saved thousands of ten-cent tips while she was a waitress in a New York restaurant to pay for her limited commercial flying course, completed during the year. Mrs. A. M. Kleavland, 56, Alameda, Cal., who was the first member of her family to drive a motor car, decided she would be the first to pilot the family plane.

Some women have taken to the air to get on the stage or into the movies, but Elinor Smith and Laura Ingalls left the stage to get into the air. Both have managed, however, to keep a touch of the spectacular or dramatic in their flying exploits. Miss Smith opened her professional flying career in 1928 by flying under all of the East River bridges and had

her license suspended. Since then she has held the world's altitude record for women; the women's endurance record; and with Bobbie Trout, the women's refueling endurance record. Miss Ingalls went in for barrel rolls and loops in a big way. She completed 714 barrel rolls to better by 297 the mark for men set by Dale Jackson. Then she invaded Charles "Speed" Holman's province and completed 980 loops, bettering her own record of 636, and being only a few hundred short of Holman's 1,433. She flew a Moth (Gipsy) biplane across the continent and back in 56 hours and two minutes flying time for a women's record, taking two weeks to do it.



London News.

WOMAN WINS KING'S CUP

Outdistancing scores of her male competitors, Winifred Brown flies an Avro Avian to victory in the King's Cup race.

Careers in Aviation

Some women take up flying to train for a career in the aircraft industry, and not a few have been successful as aircraft saleswomen, airport hostesses or managers, publicity directors, or personal pilots. Louise Thaden, women's derby winner in 1929, was in charge of Oakland, Cal., sales for Travel Air planes and during two years sold 25 ships. Ruth Nichols was in the sales department of an aviation corporation. The New York Police Department bought its Savoia Marchetti amphibians from a sales corporation of which Morilla Del Carveth is general manager. Mary Victoria

Wessen had the sales agency for Bellanca, Moth and Stinson in the Springfield, Mass., territory. Mary Von Mach became a saleswoman for the Airplanes Sales Company of Michigan, distributors of Consolidated-Fleet. Lorraine Defren, Madeleine Kelly and Betty Russell were on the Curtiss-Wright sales staff.

Airport manager or "hostess" attracted the services of several. Florence E. Klingensmith completed her limited commercial flying course and became manager of the Fargo, N. D., airport in charge of all flying opera-

AIR MEET DRAWS SPORTSMEN

Busy day on the private airport of the Long Island Aviation Country Club at Hicksville, L. I., during an air meet held in 1930.

tions there. Margaret Perry, among the first half dozen women to become transport pilots, leased and managed the Culver City, Cal., airport. Helen Cox acted as hostess at the Curtiss-Wright Valley Stream port. Myrtle M. Brown, sister of Mrs. G. M. Bellanca, wife of the aircraft manufacturer, opened her own flying field at Painters Cross Roads, near Concordsville, Pa., named the flying field after herself. Nancy Hopkins turned from her position as hostess at the Roosevelt, L. I., Field to manage sales for Kitty Hawk planes there. When Mary Linda Bradley selected a pilot for her personal plane she chose a woman, Marie C. Graham. Not content with backseat-piloting alone, Mrs. Bradley, 43, also learned to fly. Mrs. Mary L. Moore was manager of Interstate Airways, Hartford, Conn.

Amelia Earhart, tall, lithe, blonde-haired, the first woman to fly the Atlantic, found time away from her writing for Cosmopolitan magazine and her post as vice-president in charge of public relations for New York, Philadelphia and Washington Airways to set a new world's speed record for women at 181 miles an hour in her Lockheed (Pratt and Whitney Wasp) Vega. On one lap she averaged 197 miles an hour.

Florence Lowe Barnes bettered Miss Earhart's record flying a low-winged Travel Air (Wright Whirlwind) Mystery ship over a measured course near Los Angeles, August 6, to average 196.16 miles an hour. Ruth

NATIONAL AIR RACES AT CHICAGO
Army planes pass over the stands in formation at the Curtiss-Reynolds Airport near Chicago during the tenth annual races.

Alexander of San Diego became the first woman to fly non-stop from Canada to Mexico in September when she flew from Vancouver, B. C., to Agua Caliente, 1,460 miles, in 16 hours despite headwinds most of the way. Alicia Patterson, daughter of Joseph Medill Patterson of Chicago, established a woman's record between Cleveland and New York when she completed the trip in her Laird biplane in two hours and 49 minutes.

Elinor Smith, 18-year-old girl flier, climbed a Bellanca (Wright Whirlwind) Pacemaker to 27,418 feet in March, 1930, for a new woman's altitude record. She fainted at the top of the climb to add the dramatic touch so characteristic of her flights, but made a safe landing. Miss Smith's old endurance record of 26 hours was bettered twice by women in France during the year. Mlle. Lena Bernstein, a Russian trained to fly in France, broke

Miss Smith's record by staying aloft 35 hours and 46 minutes. Later, while Coste and Bellonte were flying from Paris to New York, Mlle. Maryse Bastie, French aviatrix, established a new world record by staying aloft 38 hours, bettering the time of her dark-haired Russian competitor.

Dorothy Hester, 19-year-old Portland, Ore., girl, was anxious to show the world that women can do any aerial acrobatic feat achieved by men. After obtaining only a private pilot's license she completed three out of five attempted outside loops, a feat accomplished previously only by men.

MONOCOACH FOR FAMILY USE

Four place cabin monoplane powered with a Wright Whirlwind engine manufactured by the Mono Aircraft Corporation of Moline, Ill.

Phoebe Omilie outwitted her men competitors to win the Reliability Trophy in the Second All-Indiana Air Tour.

Winifred Brown, a 26-year-old girl from Manchester, England, rose out of obscurity to win the King's Cup Race for 1930, defeating even the winners of the 1929 Schneider Cup Race and 86 other competitors, many of them men. The Hon. Mrs. Victor Bruce, wife of the youngest son of Lord Aberdare, made a solo flight from England to India in 1930, kept her friends in anxiety while friendly Arabs in Persia aided her. She had engine trouble. Mrs. Keith Miller, another British woman flier, bettered Miss Laura Ingalls' east-west transcontinental speed record by making the trip in 25 hours and 44 minutes, flying time, four hours and 43 minutes under Miss Ingalls' time.

Amy "Johnny" Johnson won the hearts of the world in 1930 when she flew from London to Australia alone in a light sport plane, after deserting the humdrum life of a London office to learn to fly. Hers was the outstanding flight by a woman in 1930 and deserves a place among the "history-making" flights of the year. It is reviewed under that heading in an earlier chapter.

Anne Morrow Lindbergh acted as navigator on her husband's high altitude transcontinental flight which set a new coast-to-coast record, later broken by Capt. Frank Hawks. Mrs. Lindbergh also showed the way for other women to take up flying by soloing her own Bird (Kinner) biplane and by qualifying for a first class glider pilot's license.

Ruth Nichols established a new transcontinental speed record for women in December, dashing from Los Angeles to New York in 13 hours and 22 minutes, flying time, in a Lockheed Vega powered with a Pratt and Whitney Wasp engine. She stopped over night, however, in Wichita. Ten days before she bettered Mrs. Keith Miller's time for the east-west women's record, making the trip in 16 hours, 59 minutes and 30 seconds, flying time.

The "99" Club

American women pilots also developed their national flying organization during the year, claiming more than half of the licensed women pilots in the membership of the "99" club. The club was organized on a national scale to promote interest in flying among women and win proper recognition for the exploits of women in the air. For the first time, women's records have come to be officially recognized by the Fédération Aéronautique Internationale.

So the achievements of women were finding their way into the pages of aviation history, and 1931 promised to be a banner year.

JERKED INTO THE AIR

Detroit Gull glider being launched from a small hill, a sport gaining in popularity among those who like exercise.

ALL-METAL SESQUIPLANE

An eight place all-metal sesquiplane, powered with a Pratt and Whitney Wasp engine, introduced by Solar Aircraft Corporation.

CHAPTER XVII

THE LAWMAKER IN AVIATION

Legislatures Face Busy 1931 Sessions—Sixty-one Bills Introduced in 1929–30 Session—Many Airport Enabling Acts—Uniformity in Licensing Noted—Taxation—Insurance

THE legislator interested in aeronautics faced a busy year as the 1931–32 sessions of the several state legislatures got into action, with reports coming from many of the states in general session that aviation bills of some kind were to be considered.

The work of the 1931–32 sessions was considered of such importance to the proper development of aviation law that the Secretary of Commerce called a national conference of the states in December to consider the subject of aeronautic regulatory laws, and to attempt to attain a measure of uniformity in the character of the legislation enacted. Earlier in the fall of 1930, the Chamber of Commerce of the United States with the co-operation of the Aeronautical Chamber of Commerce held regional aviation conferences in Philadelphia, Boston, Chicago, Minneapolis, Atlanta, Dallas and Portland, Ore., to enlist the aid of business organizations in the movement for uniformity in aeronautical legislation.

Although 1929–30 was an "off year" in state legislative activity, only nine of the 48 states being in general session, enough aviation measures were considered to indicate the trend of legislation on this subject and to provide a background of experience for the 1931–32 sessions. While more than 300 aviation bills were considered in 1929–30,* only 61 such measures were introduced during the 1929–30 session.†

The bills covered a wide range of subjects, including: establishment, operation and maintenance of airports; licensing of aircraft and airmen; flying regulations; regulatory bodies; aviation schools; civil and criminal liability; taxation; insurance; and miscellaneous matters.

The nine states in general session during 1929–30 considered aviation bills: Kentucky, Louisiana, Massachusetts, Mississippi, New Jersey, New York, Rhode Island, South Carolina and Virginia. Of the 14 states called into special session, three, Louisiana, Tennessee and Texas, considered aeronautical subjects.

The so-called "Airport Enabling Act" received more legislative atten-

* See "The Aircraft Year Book for 1930".

† Table showing number of bills introduced, enacted and defeated in Appendix.

tion than any of the other special subjects considered. In six states, Kentucky, Louisiana, Massachusetts, New York, Tennessee and Virginia, laws were enacted authorizing the acquisition of land for airport purposes. Three of these laws embrace fairly general authority: for example, in Kentucky, second and third class cities; in New York, third class villages (authority had previously been granted to towns, counties, cities and villages of the first and second class); and in Virginia, cities and incorporated towns.

The legislation of Louisiana, Massachusetts and Tennessee was more special in character. There were also instances of special legislation in Virginia. In New York and North Carolina, bills for particular airports were defeated, and in Massachusetts bills for a state airport and a public airport in a certain city were referred to the next annual session to be held in 1931.

Inclusive of this legislation, the following states, 37 in number, now have general statutes under which establishment, maintenance and operation of airports by political sub-divisions of the state are authorized: Arizona, Arkansas, California, Connecticut, Florida, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Texas, Vermont, Virginia, Washington, West Virginia, Wisconsin and Wyoming.

States having laws providing for the maintenance of an airport by the state itself are: Arizona, Arkansas, California, Colorado, Connecticut, Illinois, Kentucky, Massachusetts, Michigan, New Jersey, New Mexico and Rhode Island.

In Georgia, South Carolina and Tennessee, laws are in force providing for particular airports, and the only states now remaining without any laws pertaining to airports of any type are: Alabama, Delaware, Maine, Mississippi, Nevada and Utah. Of these, only Maine and Utah were in session during 1929–30 (both special sessions) and there were no aeronautical measures introduced before their legislatures. With all of these remaining states, excepting Mississippi, having regular sessions scheduled for 1931, it is qute likely that some action of the character under discussion will be taken by these states during the year.

Licensing of Aircraft and Airmen

During the 1929–30 session, Kentucky and South Carolina joined the lengthening list of states which require federal licenses for aircraft and airmen in intrastate flying. Such licenses are required by the federal government for all interstate flying. In addition, Kentucky also required state registration of Kentucky planes and pilots.

New Jersey amended its laws (under which a federal license was required for all aircraft and airmen engaged in commercial flight) so as to provide that aircraft "to be avigated within the state" shall meet with the requirements of the federal government, and to make unlawful the avigation of aircraft within the state without its being registered pursuant to the federal regulations applicable to aircraft in interstate commerce.

The Virginia law, which previously required either a state or federal license for all aircraft and airmen now provides that no civil aircraft (all but those used exclusively in the service of the state and federal governments) may be flown in the state unless licensed both under federal law and in accordance with the regulations of the Virginia Corporation Commission, and that no person may operate an aircraft unless he is licensed by both the federal government and the State Corporation Commission.

In Louisiana, a proposed law providing for federal licenses for all aircraft and airmen passed the House, but received no action in the Senate and therefore failed to pass.

Including legislation enacted during 1929–30, 21 states require federal licenses for all aircraft and airmen: Arizona, California, Delaware, Idaho, Indiana, Iowa, Kentucky, Michigan, Mississippi, Missouri (except solo pleasure flights), Montana, New Mexico, North Dakota (by order Board of Railway Commissioners), Rhode Island, South Carolina, South Dakota, Texas, Vermont, Washington, Wisconsin and Wyoming.

Nine states require federal licenses for all aircraft and airmen in commercial flights: Colorado, Illinois, Nebraska, Nevada (by order Public Service Commission), New Jersey (all aircraft must be registered with federal government), New York, North Carolina, Ohio and West Virginia.

Six states require state or federal licenses for all aircraft and airmen: Maine, Maryland, Minnesota, New Hampshire, Oregon and Virginia (both licenses are required for all airmen and all civil aircraft).

Six states require a state license for all aircraft and airmen: Arkansas, Connecticut, Florida, Kansas, Massachusetts and Pennsylvania. No license laws are in force in Alabama, Georgia, Louisiana, Oklahoma, Tennessee and Utah.

Flying Regulations

Without indulging in a discussion of the various air traffic rules in the several states, it is worthy to note that of the eight states having no air traffic rules previous to the 1929–30 session, New York and Kentucky now have such legislation. In New York, a very comprehensive set of rules is now in force to govern both commercial and non-commercial flying within the state. These rules have no application to aircraft used exclusively in the federal or New York State National Guard service. In Kentucky, the State Air Board is empowered by statute to enforce such air

traffic rules as it shall promulgate to govern the operation of all aircraft within that state.

In New York, three measures having to do with flying regulations were defeated. One bill provided for the insertion of the federal air traffic rules in the state penal law. Another provided for a law "regulating the operation and use of aircraft in the state" and requiring reports of accidents involving aircraft. The third would have required the operator of an aircraft to attain an altitude of 500 feet or more above the airport

NEW YORK'S "FLYING COPS"
Fleet biplane (Kinner), one of several planes used by the New York Police Department's aerial squadron, at North Beach airport.

from which he took off before starting on his flight, except where conditions of weather should require low flying.

The only states now without any air traffic rules are: Alabama, Georgia, Louisiana, Mississippi, Oklahoma and Texas.

State Regulatory Bodies

Prior to the 1929–30 legislative sessions, 18 states had no regulatory bodies having to do with state aviation matters. They were: Alabama, Delaware, Georgia, Indiana, Iowa, Louisiana, Mississippi, Missouri, Montana, North Carolina, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, Utah, Washington and West Virginia.

In Louisiana, a Concurrent Resolution was adopted establishing a standing joint committee on aeronautics from both the House and Senate. In New York, a previously authorized temporary commission was continued to study the needs of aviation in the state and to install a state system of weather observation service.

In Tennessee, a Division of Aeronautics in the State Department of Highways and Public Works was created, the Commissioner of the Department to serve as head of the division with authority to appoint an advisory board and to prescribe and enforce rules and regulations relating to the use of airports and landing fields. In Mississippi and New Jersey, bills of similar character were defeated.

Schools of Aviation

No legislation was enacted during 1929–30 pertaining to aviation schools. New York was the only state having such measures introduced, and both bills, one providing for the approval and licensing of aviation schools in the state and the other establishing a course of instruction in avigation at Cornell University, were defeated.

Civil and Criminal Liability

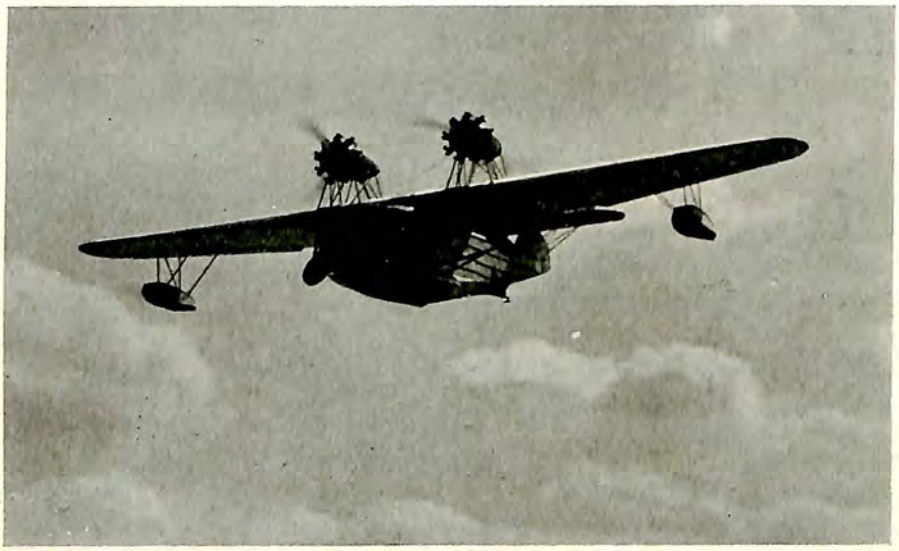
None of the states acted favorably on measures pertaining to civil and criminal liability related to aviation. In only one state, New York, were such measures introduced and the two bills failed to pass. One of them provided that the owner, proprietor or lessee of an airport should not be liable to the owner, operator or passengers of an aircraft for injuries to person or property unless those injuries resulted from the negligence of the owner, proprietor or lessee of the airport; and that the owner or operator of an aircraft should not be liable to passengers for personal injuries or property damage unless caused by negligence of the aircraft owner or operator. This bill passed the Senate and Assembly, but was vetoed by the Governor.

The other bill provided for the crime of "involuntary homicide", where an aircraft used in a culpably negligent manner causes death. The bill was defeated.

Taxation

Taxation measures affecting aviation were introduced in four states during 1929–30. Louisiana was the only state to pass such legislation: a bill authorizing police juries to dedicate taxes for the establishment of airports was defeated in general session, but was again introduced in the September, 1930, special session, where it succeeded in passage.

The unsuccessful measures may be summarized as follows: in Mississippi, a bill allowing dealers in motor fuels an exemption from state tax on gasoline to be used exclusively in aircraft was defeated; in South Carolina, a measure designed to exempt from taxation privately owned property used exclusively for aviation purposes was defeated; and in Virginia, a bill failed which would have imposed a tax of five cents per gallon on all fuel sold for aircraft use at or by any municipally owned or controlled airport, one-half of one per cent of the revenue to go into the state treas-



ALL-METAL AMPHIBIAN

Towle TA-3, a new amphibian powered with two Packard Diesel engines mounted above the monoplane wing, shown on test flight.

ury, and the balance to be used for the mainteanance of the airport where the fuel was sold.

The trend toward exemption of aircraft fuel from state gasoline taxes, generally used for highways, was increasing in the several states which fail to exempt aircraft fuel from the tax or provide a system of refund. New Jersey, Connecticut and Washington found their method for exempting aircraft fuel satisfactory, and other states considered following their lead. Gas tax legislation failing to provide for exemption or refund of the tax collected on gasoline used in aircraft was obviously unjust, and many states have moved to correct this feature of existing statutes.

The United States District Court for the Western District of Oklahoma handed down a decision August 13, 1930, granting to certain air transport operators a permanent injunction restraining the state of Oklahoma

from collecting excise taxes on gasoline consumed by airplanes in interstate commerce. The decision had considerable effect in guiding other courts and states' attorney generals in similar cases. A Nebraska District Court handed down a similar decision in the application of the Boeing Air Transport for an injunction. The Third District Court of Utah then permanently restrained the state from collecting a tax on gasoline used in interstate aviation. Michigan, through its Attorney General, clarified its law to exempt interstate operators. Similar actions were expected in other states.

The state gas tax situation as it affects aircraft can be determined at a glance from a table in the Appendix, showing the amount of the tax, disposition of receipts, whether applicable to aircraft fuel, and whether an exemption or refund is provided.

Aviation Insurance

With the constantly increasing use of aircraft in the daily life and affairs of the nation, it may be reasonably anticipated that the subject of insurance, as it relates to aviation, will be one of increasing importance not only to the aviation industry but to the public generally.

The subject itself is of such a legal and legislative magnitude that a comprehensive discussion would be inappropriate here. Suffice it to say that it has already been a topic for extensive legislative activity throughout the country.

During the 1929–30 session, New York was the only state which enacted new laws on insurance as it applies to aviation. Two bills were passed: one permitting the writing of insurance against the loss or damage to property resulting from the maintenance and use of aircraft and the breakage of glass in aircraft, and the other amending the insurance law so as to permit the writing of insurance against loss or damage to aircraft or property resulting from the maintenance and use of aircraft.

Proposed measures in Louisiana and Massachusetts failed. In Louisiana, a bill requiring a common carrier by air to carry public liability and property damage insurance and another repealing a law requiring an indemnity bond for aircraft, were defeated. In Massachusetts, a bill requiring the furnishing of adequate surety for the payment of damages resulting from the ownership, operation and control of aircraft was referred to the next (1931) annual session.

Miscellaneous Aviation Bills

Kentucky, Louisiana, Massachusetts, New York and Texas acted favorably upon bills of a miscellaneous character. Nine such bills were defeated in Massachusetts, New York and Rhode Island.

In Massachusetts, an unsuccessful attempt was made to enact a law providing "no enjoyment for any length of time of the privilege of operating any aircraft over the land of other persons shall give a legal right to the continued enjoyment of such easement or raise any presumption of a grant thereof."

In Rhode Island, a bill was defeated which provided penalties for operating aircraft while under the influence of drugs or liquor.

Use of Inland Waters by Aircraft

Although not related to the direct action of state legislatures on aviation matters, it is interesting to consider a decision made September 13,

LIGHT SEAPLANE TAKES OFF

Monocoupe, a two place cabin monoplane powered with a Warner Scarab engine, is seen equipped with Edo floats, throwing a spray in its wake.

by the New Jersey State Board of Commerce and Navigation prohibiting the use by aircraft of any of New Jersey's inland waters. The ruling was made by the Board as an incident to the denial of application for permission to operate a flying boat from Lake Hopatcong, N. J. The Board held that aircraft flying over inland waters "constitute a menace to surface navigation".

The Aeronautical Chamber of Commerce filed a formal protest against this ruling, and was granted a hearing before the Board October 20. Claiming that the ruling was too sweeping and extensive in scope, the Chamber's representative suggested that the ruling be modified to cover

the Lake Hopatcong situation only, leaving decision on other use of inland waters suspended until the occasion should arise for the need of a specific ruling. After hearing all arguments, the Board adopted a resolution modifying its previous ruling so that the use of Lake Hopatcong by aircraft is specifically forbidden and other permits will be considered on their own merits at the time application for them is made.

The Attorney General of Wisconsin wrote an opinion during the year specifically stating that use of Wisconsin's inland waters by aircraft constituted a "proper use."

Aeronautics in Congress

Without doubt, the outstanding piece of federal legislation enacted during the year was the McNary-Watres Act, providing for amendment of the Kelly Air Mail Act of 1925 and amendments to further encourage commercial aviation. The bill authorizes the Postmaster General to award contracts for the transportation of air mail by aircraft at fixed rates per mile for definite space.

The McNary-Watres Act * was referred to the Committee on the Post Office and Post Roads, April 16, 1930; reported with an amendment and referred to the Committee of the Whole House on the state of the union, April 17; passed the House as amended, April 21; sent to the Senate Committee on Post Offices and Post Roads, April 22; reported back favorably and placed on the calendar, April 23; passed the Senate, April 24; presented to the President, April 28; and approved April 29. It became Public Law No. 178.

The importance and far reaching effects of the McNary-Watres Act already have been discussed in an earlier chapter. Suffice it to say that it was considered a basic necessity to the sound development of air transport and the commercial aircraft industry, generally.

The second session of the Seventy-First Congress considered little other aeronautical legislation other than routine bills providing appropriations or administrative machinery for the carrying out of the federal government's business in maintaining the national defense and providing for the promotion of commercial aviation.

Legal and Legislative Research

The Legal and Legislative Research Service undertaken by the Aeronautical Chamber of Commerce in 1929 was continued in 1930 to provide a central clearing house for the collection and dissemination of information on aeronautical legislation and regulation. The work of this agency

* Act printed in full in Appendix.

was responsible for the collection and compilation of the information contained in this chapter.

The special bulletins of the Chamber kept its members abreast of the trends in both national and state legislation, and proved of great value to executives within the industry as well as an interesting study for lawyers, educators and legislators who were among the subscribers.

At a meeting late in 1930, the Chamber's Legal and Legislative Committee recommended the continuance of this research service in 1931.

CHAPTER XVIII

WORLD AVIATION IN 1930

World Air Routes Exceed 153,000 Miles—United States Leads in Every Phase of Aeronautic Activity—France's and England's Exports Greatest—Progress Reviewed in Europe, Asia and Africa

NATIONS throughout the world during 1930 continued to realize the increasingly important part being played by aviation in the economic and political spheres of their existence. With American leadership established in every phase of aeronautic activity, the greatest progress made during the year was witnessed in the Americas, although there were some striking examples of advancement in certain countries of Europe, Asia and Africa.

The development of air transport lines, particularly in the United States, Latin America, France, Russia, Spain, Poland and the Netherlands, accounted for the greatest measure of world progress in aviation during the year. Other important nations, notably Germany, Great Britain and Italy, proceeded with a normal development of their air transport services without any spectacular increases in the total mileage of their routes flown.

The total length of air transport routes regularly flown throughout the world at the close of 1930 reached 153,000 miles, representing an increase of about 22 per cent over 1929. Routes flown regularly under the flags of all European nations totaled 72,000 miles, while routes flown under the American flag alone totaled more than 49,500 miles. Latin American routes, including those flown under American and European flags, totaled 38,000 miles. Russia, China, Japan, Siam and South Africa had routes regularly flown totaling 21,000 miles. Australia had an additional 9,000 miles of air routes, and Canada had 7,000 miles including about 1,000 miles flown by ships carrying the American flag.

The United States air transport companies flew about three times as many miles daily as the next nearest nation, Germany, and carried almost three times as many passengers, mail and express. The United States also had more than twice the total mileage of air routes regularly flown by the next nearest nation, France, and while most of the American lines were flown daily, many of the French routes were used only weekly or biweekly.

Aircraft manufacturing throughout the world showed a general decrease in production, according to the best information available, although some of the smaller countries of Europe, whose factories catered principally

to supplying domestic air lines, held their production at 1929 levels. Although production of aircraft in the United States during 1930 was less than half that of 1929, America produced far more airplanes during the year than any other nation.

France and Italy concentrated a great deal of attention upon the development of seaplanes during 1930, not to be outdone by Germany, which had specialized in the construction of large, powerful seaplanes and flying boats. France and England devoted considerable attention to the problem of increased speeds in airplanes and made some important progress during the year in this field. Research and experimental work was reported proceeding at a normal pace, despite the depressed condition of the manufacturing industry in most parts of the world. This was expected to have an important effect upon progress in future years.

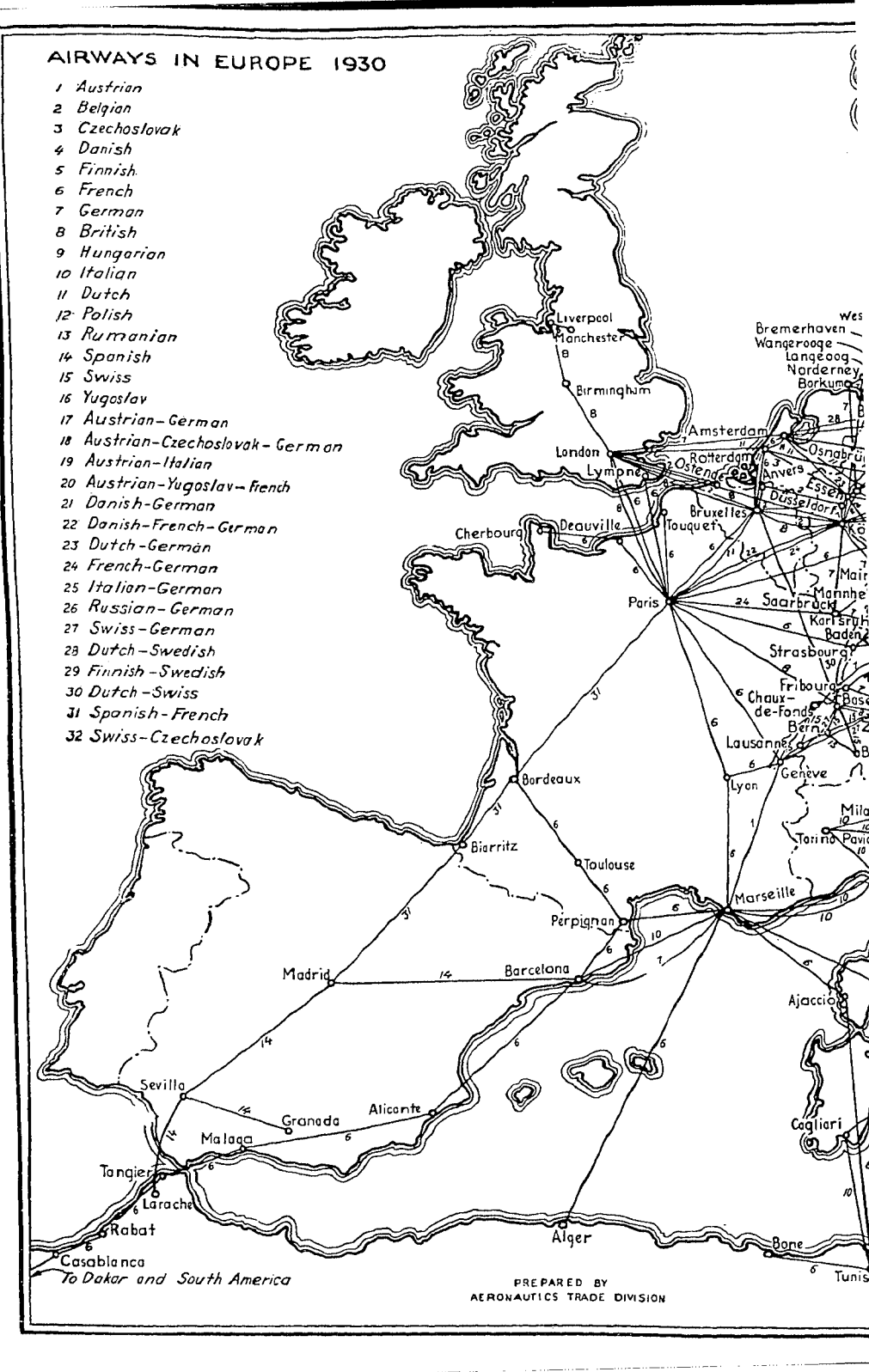
Although the domestic aircraft market was depressed during 1930, American manufacturers seeking new trade outlets experienced less than a five per cent. decrease in their exports to foreign countries.* France and England held their volume of aeronautical exports at approximately the 1929 levels, aided by important military construction business from colonial possessions and countries in which they exerted a strong political influence. France and England continued to lead the United States in the volume of aeronautical exports, chiefly because of their important colonial markets, most of which were closed to the United States.

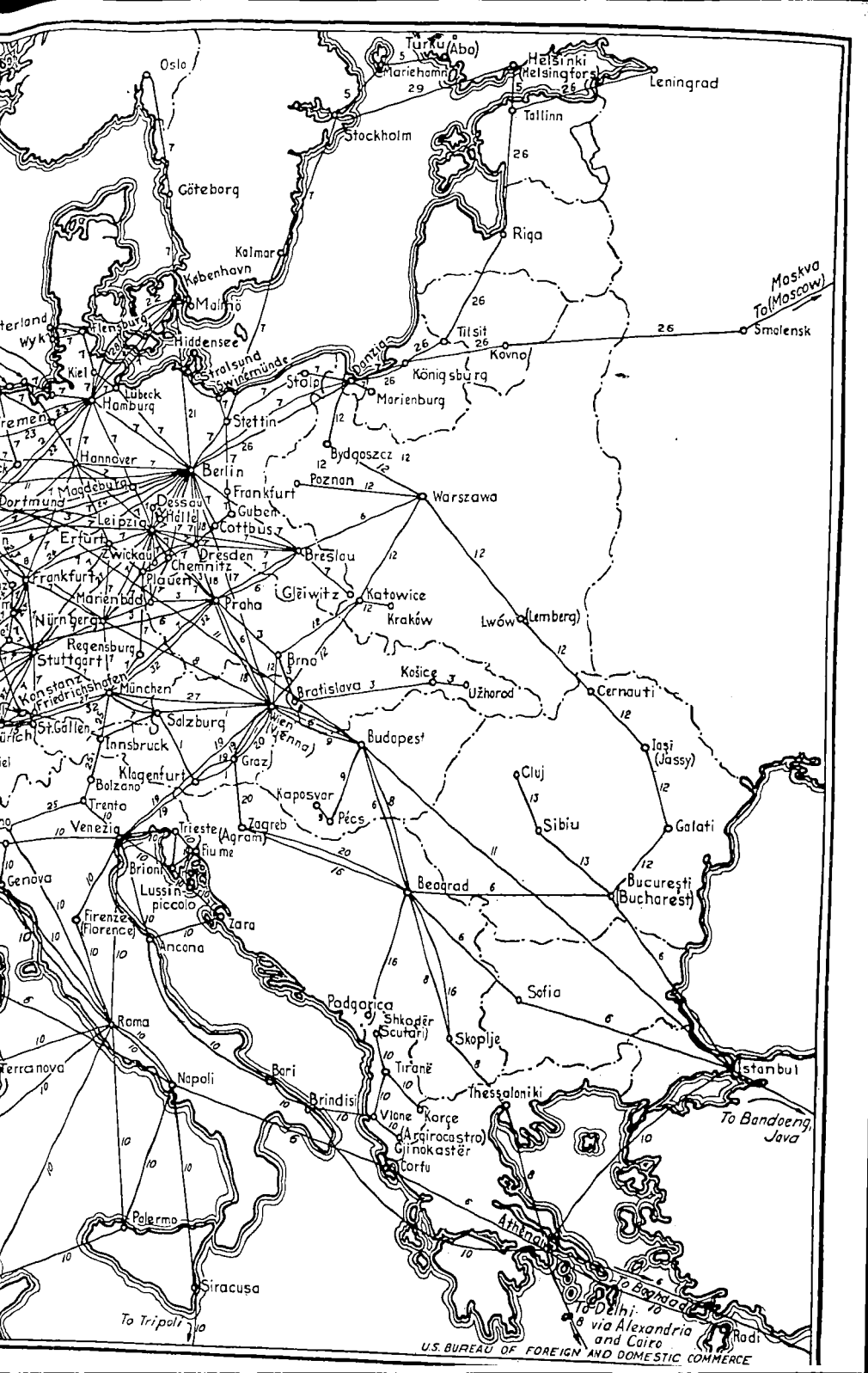
The light airplane club movement, particularly in the British Empire, continued to gain impetus throughout the year and proved a stimulus to the development of private flying in the countries where flying clubs were established. However, no nation had nearly the volume of private and industrial flying which existed in the United States. Canada probably stood second to the United States in this field. The nations of Europe had little or no private or industrial flying.

There was steady progress throughout the year in the linking of nations through treaties and laws affecting aviation, although there was no outstanding document signed during 1930. The chief advances were made in minor revisions and amendments to existing regulations and agreements. Mexico, Japan and several Central American countries promulgated air regulations for the first time. The First International Safety Congress held in France during the fall was expected to prove an important step toward concentrating upon this problem the genius of more than two score nations represented.

As has been seen in an earlier chapter, lighter-than-air development came into a more prominent position during the year with the announcement of plans for extensive world airship services. The United States was

* Complete table of American exports in Appendix.


AIRWAYS IN EUROPE 1930
1 Austrian
2 Belgian
3 Czechoslovak
4 Danish
5 Finnish
6 French
7 German
8 British
9 Hungarian
10 Italian
11 Dutch
12 Polish
13 Rumanian
14 Spanish
15 Swiss
16 Yugoslav
17 Austrian-German
18 Austrian-Czechoslovak-German
19 Austrian-Italian
20 Austrian-Yugoslav-French
21 Danish-German
22 Danish-French-German
23 Dutch-German
24 French-German
25 Italian-German
26 Russian-German
27 Swiss-German
28 Dutch-Swedish
29 Finnish-Swedish
30 Dutch-Swiss
31 Spanish-French
32 Swiss-Czechoslovak
Liverpool
Manchester
Birmingham
London
Lympne
Amsterdam
Rotterdam
Ostend
Anvers
Bruxelles
Touquet
Deauville
Cherbourg
Paris
Bremerhaven
Wangerooge
Langeoog
Norderney
Borkum
Osnabr
Essen
Dusseldorf
Saarbrück
Strasbourg
Fribourg
Chaux-de-Fonds
Berne
Lausanne
Genève
Lyon
Bordeaux
Biarritz
Toulouse
Perpignan
Marseille
Madrid
Barcelona
Sevilla
Granada
Alicante
Malaga
Tangier
Larache
Rabat
Casablanca
To Dakar and South America
Alger
Bone
Tunis
Ajaccio
Cagliari
PREPARED BY
AERONAUTICS TRADE DIVISION



U.S. BUREAU OF FOREIGN AND DOMESTIC COMMERCE

fast assuming leadership in this field with the construction of the world's largest dirigible under way in Akron.

The strides made in the development of Latin American aviation during the year by American and foreign capital already has been reviewed in an earlier chapter. It might be interesting now to turn the spotlight upon the activities of two score other nations in Europe, Asia, Africa and Australia which had some kind of aeronautical service within their borders during 1930. The countries are listed alphabetically for convenience in future reference.

Australia

Endowed with naturally favorable conditions for flying and inspired by the exploits of their national flying hero—Wing Commander Charles Kingsford-Smith—Australians showed an increased interest in commercial and private aviation during 1930. The light airplane clubs, popular for several years under a plan of government aid, received added stimulus during the year as new candidates applied for instruction. The air lines, too, experienced heavier traffic than in any preceding year.

Western Australian Airways, Ltd., granted an annual subsidy of £25,000 per year from the government, operated weekly service during 1930 from Perth to Derby, 1,467 miles. The Australian National Airways, Ltd., inaugurated service June 1, 1930, from Melbourne to Sydney, using Fokker tri-motored monoplanes of English manufacture. The Queensland and Northern Territory Aerial Service, Ltd. ("Qantas") operated from Brisbane to Camooweal, 1,269 miles, and from Cloncurry to Normanton, 215 miles, receiving a subsidy of £17,000 per year from the government. The Larkin Aircraft and Supply Company, receiving £29,500 annually from the government, maintained weekly service from Adelaide to Cootamundra, 578 miles; from Miludra to Broken Hill, 189 miles; from Melbourne to Hay, 233 miles; and from Camooweal to Daly Waters, 475 miles. Several less important companies maintained taxi and aerial survey services.

The manufacture of aircraft in Australia was confined principally to the De Havilland Company, which operated an assembly plant at Sydney. The Larkin Aircraft Supply Company continued experiments with its six place closed monoplane, Lasconder, built and flown in 1929. No engines were manufactured in Australia, all being imported from England.

There were more than 80 airports in the country and 100 emergency landing fields. There were six aero clubs in operation during the year, the most active being the Aero Clubs of New South Wales, which had a membership of more than 1,000 and had a long waiting list of candidates for instruction. The government paid these clubs £20 for each student trained as a pilot if equipment used was loaned by the government, and £50 if the club owned its own equipment.

The Royal Australian Air Force was nominally maintained independent of the British Royal Air Force though exchanges of personnel were frequently made. The force had about three score planes of all types in service during 1930. Equipment used was purchased largely at the direction of the Air Ministry of England and was entirely of British or Australian manufacture.

There were 212 registered civil planes in Australia early in 1930, 17 of which were American. Pratt and Whitney Hornet engines were shipped to New Guinea during the year to power three tri-motored Junkers monoplanes to be used in transporting heavy gold mining machinery into the interior of the strange island.

Austria

Austria, situated in the heart of Europe, had air lines radiating from its capital to the principal neighboring countries like the spokes of a wheel. Aided by government subsidy amounting to 1,750,000 Austrian schillings (about $240,000) in 1929 and approximately the same amount in 1930, the Oesterreichische Luftverkehrs A. G. (Austrian Air Transport Company) cooperated with air transport companies of other nations to expand its service. During the year ending June 30, 1930, 1,983,289 kilometers * were flown, 21,273 passengers were carried, and 829,014 kilograms † of mail, express and luggage were transported without a single fatal accident.

Four air transport lines were operated into this Alpine country throughout the year, while 13 other services were offered during the summer months. The Oesterreichische Luftverkehrs, Deutsche Luft Hansa and Czechoslovak Luftverkehrsgesellschaft jointly operated the Vienna-Prague-Dresden-Berlin line. Similarly, the Vienna-Budapest route with connections to Belgrade, Bucharest, Constantinople and Sofia was maintained cooperatively by the Compagnie Internationale de Navigation Aérienne, the Ungarische Luftverkehrs and Deutsche Luft Hansa. Polish interests, the Polskie Linje Lotnicze Aerolot, linked Vienna, Kattowitz and Warsaw; and French interests, the Compagnie Internationale de Navigation Aérienne, maintained service from Vienna to Bruenn, Kattowitz and Warsaw. These four routes were operated throughout the year.

The England-India air line of Imperial Airways, Ltd., crossed Austria on its hop from Nuernberg to Vienna and Budapest. Other services operated during the summer of 1930 connected Vienna with Berlin, Munich, Salzburg, Innsbruck, Zurich, Prague, Strasburg, Paris, Venice, Graz, Klagenfurt, Agram, Rome and London. Twenty-four airplanes used by these regular air transport lines were in Austria.

* Kilometer is .62137 mile.
† Kilogram is 2.20462 pounds.

Two aviation schools, one in Salzburg and the other in Thalerhof, near Graz, trained pilots for the civil air lines, and three companies had planes available for charter flights. Licenses were required for all airplanes, pilots, mechanics and radio operators. There was no military aviation in Austria.

Belgium

Spurred by the largest appropriation ever made for aviation, Belgium developed its mail and passenger lines during 1930 and prepared to manufacture aircraft through the Société Anonyme Belge d'Exploitation de la Navigation Aérienne, or "Sabena" company. The budget for 1930 included an approved item of $2,300,000 for aviation. By Royal Decree, the Superior Air Council under the Ministry of Transportation was set up January 22, 1930, to act in advisory capacity on aviation matters.

In April the "Sabena" company opened night service between Brussels and London, permitting the delivery of letters in London early in the morning although they were mailed in Brussels late the night before. Several other services were maintained by the "Sabena" company: London to Antwerp, Antwerp to Amsterdam, Antwerp to Liege, Brussels to Luxemburg, and Ostend to Liege. Preparations were advanced for the establishment of the line connecting Belgium with her African colony, Belgian Congo, over a 7,500 mile route which was to be lighted by 1933. The French interests, through a subsidiary of Aéropostale, were to cooperate in the project.

Foreign air lines flying over Belgium included: Imperial Airways from London to Cologne; Farman, connecting Paris, Brussels, Rotterdam and Amsterdam; K. L. M., linking Rotterdam, Brussels and Basle; Farman, between Paris, Cologne and Berlin; and K. L. M., connecting Amsterdam, Rotterdam and London.

The Belgian Aeronautic Construction Company ("Sabca"), aided by government subsidy, manufactured airplanes of the Fokker type under licenses of the Dutch inventor. The manufacturing was capitalized at 20,000,000 Belgian francs ($560,000). The Ministry of National Defense subsidized three schools engaged in training pilots for civil and military service.

Bulgaria

Bulgaria's government limited its aviation activity to the training of pilots with 24 planes under the supervision of the Ministry of Railways. Under terms of the Treaty of Neuilly, the nation was not permitted to own or operate airplanes for military purposes, and its "state aviation" program had not been extended to transportation of mail or passengers, principally because of the lack of funds.

However, Bulgaria was served with air transportation through the Deutsche Luft Hansa and Compagnie Internationale de Navigation Aérienne. The former operated through Bulgaria on its Berlin-Prague-Belgrade-Sofia-Istanbul line and the latter from Belgrade to Constantinople by way of Sofia. The German line was permitted to stop at the airport near Sofia during 1930 for technical needs only. The French line carried 303 passengers, 2,510 kilograms of mail and 4,322 kilograms of goods without an accident. Arrangements were completed to permit the German line to land and receive passengers at Sofia in 1931.

Airplanes used by the government in its "state aviation" program were manufactured at Bojourishte, near Sofia, 14 two place biplanes valued at 10,000,000 leva* being produced. Engines were imported, none being produced in the country. Seventeen planes used by "Cidna" in its Bulgarian service were registered in France and five planes of the Deutsche Luft Hansa were licensed in Germany.

The only privately owned airplane in Bulgaria belonged to a German subject, the director of the German bank in Sofia, and was registered in Germany. The Bulgarian government was presented with a four place Focke-Wulf monoplane, powered with a Wright Whirlwind engine, during 1930.

Canada

Canada's air transport lines continued to expand during the year while its manufacturing activities, like those of most nations throughout the world, were temporarily curtailed. From January 1 to September 30, 1930, 1,500,000 miles were flown by Canadian air lines with 95 per cent schedule efficiency, carrying 8,000 passengers and 379,424 pounds of mail over 6,382 miles of routes. Two pilots and three passengers were killed in these operations. Thirty-seven planes and 45 pilots and mechanics were employed in the maintenance of the services.

While the government granted no cash subsidies to air transport lines, it pursued a policy similar to that of the United States in awarding 17 mail contracts which amounted to $1,912,000 during the first nine months of 1930, and in providing $900,700 for maintenance of intermediate landing fields, lighting and radio. Nine hundred miles of airways had been lighted for night flying. Air mail routes operated regularly throughout the year included: Montreal to Detroit, 588 miles; Montreal to Albany, 200 miles; Sioux Lookout to Jackson Manion, 325 miles; Cranberry Portage to Kississing, 45 miles; Toronto to Buffalo, 100 miles; Fort McMurray to Aklavik, 1,676 miles; Oskelaneo to Chobougamou, 130 miles; Montreal to Moncton, 467 miles; and Winnipeg, Calgary, Regina and Edmonton,

* $1.00 is equal to 139 leva.

1,252 miles. During the summer, three additional routes were operated: Rimouski to Montreal, 330 miles; Montreal to Ottawa, 110 miles; and Lac du Bonnet to Wadhope, 82 miles.

Using planes to reach points inaccessible by other modes of transportation during winter, five other routes were operated during the cold months: Leamington to Pelee Island, 22 miles; Quebec to Seven Islands, 350 miles; Seven Islands to Anticosti Island, 120 miles; Moncton to Magdalen Islands, 200 miles; and Moncton to Charlottetown, 110 miles. Another route from Whitehorse to Dawson over a 275 mile route in the northwest was operated with mail on special schedules. Canadian Colonial Airways and Canadian Western Airways, both divisions of the Aviation Corporation, and Northwest Airways were among the American operators carrying mail and passengers into Canada from the United States on regular schedule.

Eight aircraft manufacturers produced 69 planes valued at $1,098,086 during the first nine months of 1930, while 54 planes were assembled or rebuilt with a value of $401,500. Three engine manufacturers assembled and rebuilt 123 engines in Canada during this period at a value of $413,839, exclusive of United States or British engines sold in Canada. The manufacturing industry was concentrated principally at Toronto, Montreal and Vancouver. The Curtiss-Reid Aircraft Company, Ltd., of Cartierville, Quebec, associated with the Curtiss Aeroplane and Motor Company, manufactured the two place Reid Rambler biplane. Boeing Aircraft of Canada, Ltd., affiliated with the American Boeing Company, concentrated on production of the Boeing six place flying boat. Bellanca Aircraft of Canada, Ltd., at Montreal was organized to sell and service planes of the American Bellanca company. Fairchild Aircraft, Ltd., at Montreal produced planes under license of its American parent company. Canadian Vickers, Ltd., of Montreal, manufactured the Vedette, a single-engined biplane; the Vancouver, a twin-engined biplane; and an American type. The De Havilland Aircraft of Canada, Ltd., imported units from its parent company in Great Britain and assembled the planes in Toronto. Ottawa Car Manufacturing Company, Ltd., of Montreal, held manufacturing rights to the Avro Avian. Three engine companies, two of them American, assembled and rebuilt engines in Canada. The American companies were Canadian Wright, Ltd., operating under manufacturing licenses of the Wright Aeronautical Corporation, and Canadian Pratt and Whitney Aircraft Company, affiliated with Pratt and Whitney Aircraft Company.

Aerial service operators did extensive charter and special work throughout Canada. Operators in the class totaled 115, using 400 airplanes. There were 50 privately owned airplanes in Canada during 1930. One hundred and six planes were employed in operations of the civil government, flying 11,552 hours during the first nine months of the year. Twenty-one light airplane clubs, operating under financial aid of the Dominion government,

had 2,887 members and flew 11,567 hours during this period, qualifying 120 commercial pilots and 374 private pilots. There were 403 commercial pilots' licenses in force during 1930 and 314 private pilots' licenses. Seventy-two airports were maintained, widely scattered throughout the Dominion, many of them lighted for night flying under a government provision allowing half the cost of such lighting on the regular air mail routes. Canada also maintained an air force using British equipment.

In cooperation with Great Britain, Canada constructed an airship base during 1930 at St. Hubert, Montreal, in support of the development of Empire communications by airship. The British airship R-100 made a successful experimental flight from England to Canada in July and made two flights in Canada as far as Toronto, returning to England in August.

China

Although all aviation in China was under control of the military authorities, aircraft saw action during 1930 in this far eastern country in both military and civil pursuits. Realizing that airplanes were well adapted to the transportation needs of a great country served by less than 6,000 miles of railways for an enormous, widely scattered population, China continued to encourage the development of regular air lines. Nationalistic rebellions during the year resulted in military skirmishes requiring aircraft, and provided an added market for American planes.

Air mail and passenger service was maintained daily each way between Shanghai and Hankow, 500 miles, with eight place Keystone-Loening amphibians powered with Wright engines. During the first year of operations ending October 21, 1930, 350,000 miles were flown without an accident or forced landing. On only two occasions were flights postponed, when typhoons were reported near Shanghai. The line was operated by the China Airways Federal, Inc., U. S. A. (formerly Aviation Exploration Company, Inc.), which is a joint Sino Curtiss-Wright enterprise responsible to the Chinese National Aviation Company. American pilots and Chinese copilots flew the amphibians along the great Yangtze river, whose broad surface provided excellent landing facilities at all times.

On the fighting side of Chinese military aviation, the use of pursuit and light bombing planes by the National forces during the summer of 1930 to defeat the Northerners in rebellion was considered an outstanding victory. Most of the fliers received their training at Canton and many of the planes came from that area. The air tactics employed by the government forces in this war were more extensive than ever before, and were considered far more effective. In Manchuria the young general, Marshal Hsueh-liang, had a fighting air force as an adjunct to his troops. An order was placed late in the year with an American firm in China for

six Waco fighting planes, powered with Wright Whirlwind 240 engines and equipped with two machine guns and two bombing racks, each carrying eight 25 pound bombs.

Although most aircraft used in China had been imported from the United States or Great Britain, there were three Chinese factories in operation during 1930, one in Shanghai, one in Canton, and one at Pagoda Anchorage, Amoy, Fukien province. The Shanghai and Canton factories were established to produce both civil and military planes, while the one in Fukien was to concentrate on the manufacture of seaplanes for the Chinese Navy. Only seven planes had been made in the three factories, most of them being produced in 1930. Parts, wings and fuselages were made in China of native materials, the engines alone being imported. A Wright Whirlwind engine was used in the three place reconnaissance seaplane Chiang Hung completed in 1930 at the Fukien factory.

Aside from several government training schools for military fliers, there was no activity which could be classed as aerial service operations. Since all flying in China was under the military arm of the government, there was no private aviation. A permit or "huchao" also must be obtained before an airplane can be imported into the country. Without a single airport which would meet American standards for a first class terminal, China faced the problem of building suitable ports during 1931 and the government planned a program to meet this immediate need.

Czechoslovakia

Granted cash subsidies from the government, three air transport companies operated the principal air lines in Czechoslovakia during 1930, cooperating closely with air transport interests in neighboring countries to double and triple traffic of the previous year.

The Czechoslovak Air Transport Company in conjunction with a newly organized Swiss company, Ad Astra, opened a new line during 1930 from Prague to Munich, Zurich and Basle. The company continued operation of the Vienna-Prague-Dresden-Berlin line in cooperation with the Deutsche Luft Hansa and the Austrian Air Transport Company, as well as its Prague-Rotterdam route, making 2,414 flights totaling 434,844 kilometers and carrying 3,413 passengers, 14,285 kilograms of mail, 41,929 kilograms of baggage, and 99,733 kilograms of goods to double and triple operating statistics for 1928. The company received a cash subsidy of 7,600,000 crowns ($223,529) in 1930 and was to receive 9,000,000 crowns ($264,705) for 1931. Eleven planes were used.

The Czechoslovak State Air Lines continued operation of its two lines: Prague-Marienbad and Prague-Brno-Bratislava-Kosice-Uzhorod. The company made 3,004 flights on these routes, covering 473,067 kilometers and

carrying 8,268 passengers and 183,859 kilograms of mail, baggage and goods. Compared with 1928, the company flew eight times as far and carried four times as many passengers during the year. Seventeen planes of six different types were used.

Compagnie Internationale de Navigation Aérienne, a French line operating the Paris-Warsaw route through Prague and the Prague-Istanbul line, made 2,294 flights from Prague, carrying 2,453 passengers, 4,920 kilograms of mail and 121,162 kilograms of baggage and goods. The Czechoslovak State Air Lines were provided with a cash subsidy of 7,400,000 crowns ($217,647) in 1930 and were to receive 8,500,000 crowns ($250,000) in 1931. The French line was given 3,500,000 crowns ($102,941) in 1930 and 4,600,000 crowns ($135,294) were to be provided for 1931. Contracts for lighting the route from Prague to Brno, the first to be lighted, were awarded in 1930.

Four aircraft manufacturers and five aircraft engine producers were operating in the country during 1930, although no official figures on the volume of their production were available. There was little activity in the aerial service field, while an official aviation school for training civilian pilots was operated in connection with the Prague Aeroklub. Fifty planes were being used by aviation clubs and only nine planes were owned by private individuals. Six well-equipped airports were situated at Prague, Brno, Bratislava, Kosice, Uzhorod and Marienbad; all were built and operated by the government. Licenses were required for airplanes and pilots, but not for mechanics. Planes were registered with the Minister of Public Works.

Denmark

Denmark's civil aviation activities were centered in the operations of Det Danske Luftfartselskab A. S. (The Danish Air Traffic Company, Ltd.), which operated in cooperation with the Deutsche Luft Hansa between Copenhagen and Hamburg from April to October and from Malmo, Sweden, to Copenhagen and Berlin from May until September. The Danish company maintained a line of its own from Malmo to Copenhagen and Hamburg from June until September.

The year witnessed 181,183 kilometers flown on these routes with 2,071 passengers, 6,722 kilograms of mail, and 40,675 kilograms of express. There were no fatalities during 1930 on the regular air lines of Denmark. Four Fokker monoplanes (Bristol Jupiters) were used in the service, which was subsidized by the Danish government to the extent of 250,000 kroner ($66,666) and by the City of Copenhagen to 100,000 kroner ($26,600) for 1930. No routes were lighted for night flying, but the government had spent about 1,000,000 kroner for buildings and lighting of the principal airport known as Kastrup Lufthavn. Licenses were required for all pilots,

mechanics and aircraft and periodic government inspection maintained. Three planes were privately owned in the country and 14 private fliers had been licensed.

While there were only seven civil airplanes in use, there were about 60 military planes in the country. The Naval Aircraft Factory at the Royal Dock-Yard and the Army Flying Corps maintained the only factories in Denmark for the production of aircraft, and concentrated during 1930 on military machines.

Egypt

Imperial Airways, Ltd., served Egypt with regular air transport service from London to Cairo, Basra and Karachi. The Air Survey Company, a British organization, undertook an air survey of the Upper Nile during 1930 under contract with the Egyptian Ministry of Public Works. There was practically no other aviation activity in the country, with the exception of visits of itinerant fliers.

Estonia

The Finnish Air Service Company continued operation of its service between Helsingfors and Tallinn, using four place Junkers monoplanes on the 54 mile route to connect with the operations of the German "Deruluft" company serving Berlin, Riga, Tallinn, Leningrad, Helsingfors and Stockholm.

Finland

The Aero Osakeyhtiö (Finnish Air Service Company) increased its traffic on the three regularly operated routes: Helsingfors-Stockholm, Helsingfors-Tallinn, and Abo-Mariehamn-Stockholm. The lines were operated throughout the summer months, when flying was possible 24 hours a day because of the light nights and landings were made on the water, and during the winter months when hard ice was available for landings with skiis. There were no fatalities on the lines during 1930.

The Osakeyhtiö Sääski manufactured 11 airplanes for the military authorities valued at 1,980,000 Finnish marks ($49,896). A group of amateurs at Jyväaskylä built four small planes during 1930, while no information on production in the government's military plant was available. No engines were produced, all being imported. Production of engines was planned by the Ahjo Mekaniska Verkstads A. B.

One flying school maintained by the government at Kauhava trained 50 pilots during the year. There was no private flying, and the one airport under construction at Helsingfors was not yet completed.

France

With increases in traffic reported by each of the country's five major air transport companies, French air transport concentrated mainly on the

development of lines already established during 1930. There also was little change in the complexion of the aircraft manufacturing industry in France during 1930, although for the first time the appropriations for subsidies to private individuals for part of the purchase price of touring airplanes was exhausted. Manufacturers specializing in small private planes expected a substantial increase in this appropriation to be voted by Parliament for 1931–32. The Government proposed 10,000,000 francs (nearly $400,000) as compared to 5,000,000 francs appropriated for 1930. The French aircraft industry produced planes valued at one billion francs ($40,000,000) during 1929.*

Subsidies continued to play an important part in the development of French aviation. Not only air transport lines, but manufacturers were granted government aid through cash disbursements and private purchasers of planes were given help. The principal subsidy in the general state budget provided 196,000,000 francs ($7,685,000) in 1930–31 with a proposal for 200,000,000 francs ($7,836,00) in the 1931–32 budget. In addition, the air lines were given premiums out of the postal budget for carrying the mail and the companies profited indirectly through subsidies provided for the training of civilian pilots and the operation of airports.

The Air Union Lignes d'Orient, organized as a subsidiary of Air Union for connections to the Near and Far East from Syria to China, was developed into a full-fledged independent company during 1930 taking the name Air Orient. In 1930, the company's lines extended over a sea route from Marseille to Naples, Corfu, Athens and Beirut, and by land plane to Damascus and Baghdad. From Baghdad to Bangkok, the service was assured by British and Dutch lines, the French line operating from Bangkok to Saigon with short branches from the latter point. Plans called for all-French operation of the line from Marseille to Saigon beginning in January, 1931.

Aéropostale, the principal French air transport company, operated lines during 1930 totaling 16,335 kilometers: Marseille-Perpignan-Palma-Alger, 1,075; Paris-Bordeaux-Madrid, 1,200; and Toulouse-Dakar-Natal-Buenos Aires and extensions, 13,980. Night operations were continued across the Pyrenees from France to Spain and between Tangier and Casablanca. On the France-South America route, planes were used from Toulouse to Dakar in Africa, where fast cruisers took the mail across the South Atlantic to Natal to turn over their cargoes to airplanes bound for Buenos Aires. Seaplanes were to replace the cruisers on the South Atlantic hop during 1931, although a round trip over this route during 1930 met with only partial success.

Air-Union continued to cater to its greatest traffic on the Paris-London route, with schedules coordinated to prevent conflict with the operations

* Principal manufacturers listed in "The Aircraft Year Book for 1930," p. 276.

of Imperial Airways, Ltd., on the same route. The Antibes-Tunis line was reorganized during 1930 to operate seaplanes from Marseille to Ajaccio and Tunis, with an extension from Tunis to Bône in Algeria. Other lines of the company included Paris-Marseille and Lyons-Geneva, with plans for operations in French Indo-China.

Compagnie Internationale de Navigation Aérienne, generally known as "Cidna" and controlled principally by French interests, operated from Paris to Prague and Warsaw. From Prague, another line was extended to Belgrade and Constantinople with alternate intermediate calls at Sofia and Bucharest. As the result of a Franco-Polish air convention in 1930, there was a prospect for the establishment of a second Paris-Warsaw line by way of Berlin. The company received subsidies from France, Czechoslovakia, Rumania, Yugoslavia and Poland.

Société Générale de Transports Aériens, more commonly known as "Sgta" or Farman lines, remained independent of other French lines and operated joint services, in collaboration with the Deutsche Luft Hansa and K. L. M., to Germany and the Netherlands. In cooperation with Aktb. Aerotransport, it offered regular service from Paris to Denmark and the Scandinavian peninsula. Passenger service was operated from Paris to Cologne and Berlin; freight service from Paris to Cologne, Essen and Berlin; Sunday passenger service from Paris to Berlin; passenger and freight service from Paris to Saarbrucken, Frankfort and Berlin; and twice daily passenger and freight service from Paris to Brussels, Antwerp and Rotterdam.

The Compagnie Transafricaine d'Aviation explored a route during 1930 from Oran to Gao and Niamey in West Africa, to the Chad region and Libengué, French Congo. In cooperation with Aéropostale in France and Spain, and with the Belgian "Sabena" in Africa, commercial services were to be inaugurated from Europe to the Belgian Congo, and later to Madagascar.

The Compagnie Transatlantique Aérienne maintained regular postal service from Paris to Cherbourg and less frequent postal service from continental points to Paris.

With the operating companies reporting increased traffic in 1930, it is interesting to examine the final operating statistics for 1929, the previous peak year in which increases of from 25 to 35 per cent. were experienced over 1928. French air lines flew 5,862,877 miles during 1929, completing 18,610 out of 21,363 announced flights for a general average of 87 per cent. Aéropostale led with 97 per cent regularity and Farman was second with 91 per cent. Passenger-miles in 1929 totaled 7,743,000. While the French companies did not announce the total number of passengers carried, it was estimated by them at 25,000. Mail measured in pound-miles in 1929 totaled 429,176,000, and express stood at 1,216,893,000 pound-miles.

Accident reports for 1929 showed 37 serious accidents to civil or commercial planes of which 18 were on air lines and 19 were in miscellaneous flying. The air lines employed 360 airplanes and 140 pilots in their services.

Since the French Army is recruited mainly by conscription, thousands of the nation's youths enter training at military air schools each year. However, there was a need for private schools and five of them were operated by airplane manufacturers: Hanriot, Morane, Caudron, Blériot and Farman. There were 993 civil airplanes registered in France August 1, 1930, of which 110 could be identified as property of private individuals. There were 15 first class airports in France and Algeria, most of them operated by the government. All planes, pilots and mechanics were licensed by the government. France maintained an air force in its military establishment.

Germany

Aviation in Germany and the Deutsche Luft Hansa, the principal operating company, came to be recognized almost as synonymous. Since there was no military aviation in Germany (prohibited by the Versailles treaty) and since more than 90 per cent of German aviation activity was concentrated in this one subsidized company, the Deutsche Luft Hansa grew to a predominant position. The eleven companies engaged in the manufacture of aircraft and the four producers of engines,* consequently, concentrated their attention on the transport field, although some private sport planes were built. Private flying was relatively unimportant in Germany, judged by American standards, since there were only 120 privately owned planes and only 110 private pilots in the country.

Principally because the government had reduced the amount of its subsidy to the Deutsche Luft Hansa, no new lines were opened during 1930 and there was a slight reduction in the number of persons employed and the number of planes used. The subsidy for the fiscal year April 1, 1930, to March 31, 1931, was to be 19,000,000 marks ($4,525,000), greater than 1929 but less than the 22,500,000 marks granted in 1928. Operating statistics for 1929 showed that 9,087,694 kilometers were flown by the Luft Hansa, carrying 89,019 passengers, 690,609 kilograms of luggage, 366,845 kilograms of mail, and 1,198,790 kilograms of express. The number of miles scheduled daily in the summer of 1930 totaled 54,000 kilometers. Out of 56,000 regular landings at airports in 1929, there were 30 accidents which caused the death of two pilots and injured three, while six passengers were killed.

One hundred and fifty planes were employed by the Luft Hansa on its lines as compared with 225 in the preceding year, while 1,700 pilots, mechanics, and other employees were in its service as compared with 2,500

* Principal manufacturers listed in "The Aircraft Year Book for 1930," p. 279.

previously. The reduction in subsidies was responsible for the cut. The total length of lighted airways was 1,435 kilometers. During the first ten months of 1930, 670,000 kilometers were flown over night routes.

The Luft Hansa's principal mail and passenger routes operated during 1930 included: Berlin-Hanover-Amsterdam-London; Berlin-Danzig-Koenigsburg; Berlin-Hanover-Köln-Brussels-Paris; Berlin-Stettin; Berlin-Hamburg-Travemunde-Copenhagen-Malmo; Berlin-Leipzig-Nürnberg-München; Berlin-Leipzig-Stuttgart-Zurich; Basle-Barcelona; Berlin-Gleiwitz; Berlin-

International Newsreel.

DO-X HEADS FOR NEW YORK

Largest airplane in the world, the giant Dornier DO-X (12 Curtiss Conquerors) is seen over the Rhine country headed west. A slight mishap delayed its projected hop to New York from Lisbon.

Frankfurt-Mannheim; Heidelberg-Düsseldorf-Essen; Berlin-Dresden-Prag-Wien; Genf-Zurich-Budapest; Freiburg-Stuttgart-München; Frankfurt-Darmstadt; Frankfurt-Köln; Dortmund-Köln; Frankfurt-Nürnberg; Dortmund-Hanover; Hanover-Magdeburg-Berlin; Bremen-Hanover-Leipzig-Prague; Hamburg-Kiel-Flensburg; and Essen-Düsseldorf.

The Nordbayerische Verkehrsflug, a Bavarian company subsidized by several city governments but receiving no subsidy from the Reich, was the only other air transport company in Germany. It operated within Bavaria on four routes: Plauen-Leipzig; Leipzig-Erfurt; Dresden-Leipzig;

and Nürnberg-Dresden. It employed about 100 persons, including 15 pilots.

While planes could be hired from the Luft Hansa for short hops or taxi service, there was no aerial service operation in Germany comparable to that in the United States. There were 28 first class airports in the country, two of which were land and sea terminals, and 61 second class airports of which three were of the combination type. Aside from a few ports near the principal aircraft manufacturers, all airports in Germany were built by a concern whose members consisted one half of the municipalities and the other half of the state or federal authorities. All weather bureaus were maintained by the federal government, and the lighting of airways also was carried on by the Reich.

Germany's important position in the field of lighter-than-air development has already been reviewed in an earlier chapter, "Projected World Airship Services." The giant Dornier DO-X, the largest flying boat in the world, built in 1929, remained an unkonwn quantity as it prepared for a trans-Atlantic flight to New York in 1931. It was equipped with 12 Curtiss Conqueror engines in 1930 when the difficult flight to America was projected. The Junkers G-38, a huge land plane built in 1929, was used during the year principally in flights to state fairs and other exhibitions in Germany. There were no outstanding manufacturing developments in Germany during 1930, designs principally representing refinements of earlier models.

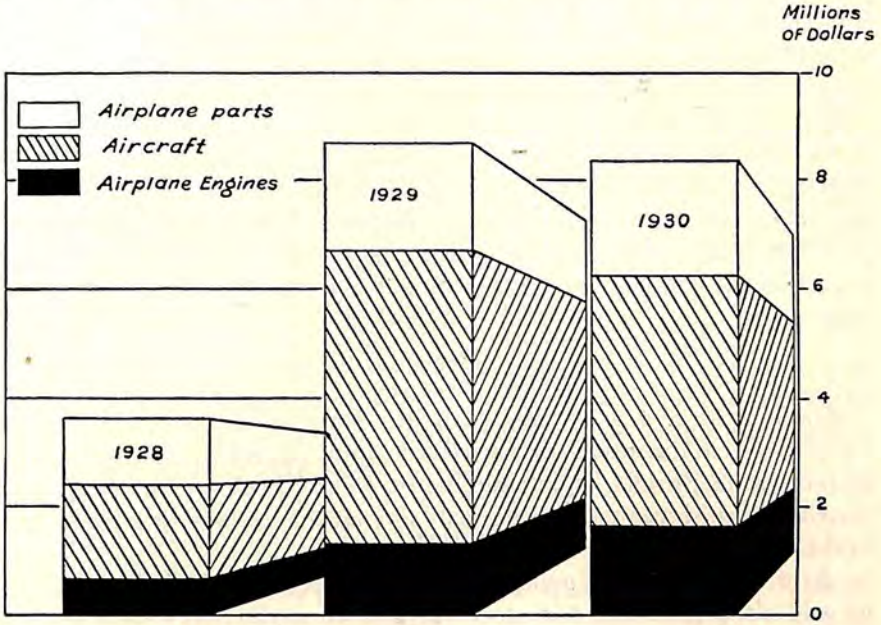
Great Britain

Imperial Airways, Ltd., the only air transport company operating on regular schedules in Great Britain supported by British capital, concentrated its operations during 1930 on existing routes, inaugurating no new services during the year. Regular service was maintained from London to Paris; London to Paris, Basle and Zurich; London to Brussels and Cologne; and England to India, the latter one of the longest air routes in the world, stretching 5,000 miles across ten different countries. Through the purchase of Cobham-Blackburn Air Lines, Ltd., Imperial Airways prepared to start weekly service between London and Capetown by way of Egypt.

Operating statistics of the company for its fiscal year ending March 31, 1930, showed that 1,345,217 miles were flown, compared with 1,032,842 miles in the preceding year. Passengers carried totaled 29,312 as compared with 28,483 in the preceding year. Mail poundage increased from 82.9 tons to 99.2 tons, while the volume of freight increased from 734.7 tons to 839.7 tons. The daily mileage flown by the lines totaled 5,305 as compared with 2,215 miles in the preceding twelve months. There were three major air transport accidents resulting in fatalities during the year.

Early in 1930, Imperial Airways had 22 transport planes in operation and three others were delivered for service later in the year. During the summer of 1930, the first four-engined 40 place Handley-Page air liners for use in England to India service were put into operation, and the Mediterranean division ordered a fleet of all-metal four-engined flying boats.

Subsidies for civil aviation in Great Britain during 1929–30 totaled £465,160, which represented a decrease of about £3,000 from the previous year. Increased provision was included for subsidy payments to Imperial Airways for its England to India service, but this was offset due to a



EXPORTS OF AIRCRAFT PRODUCTS FROM UNITED STATES

decrease in capital expenditure on the Croydon Aerodrome. Imperial Airways was to receive £341,500 for its European and Indian services; Light Aeroplane Clubs, £18,000; and National Flying Services, Ltd., £500.

While the principal organized transport operations were carried on by Imperial Airways, several other companies engaged in aerial service and taxi work: Aircraft Operating Company, Ltd., Air Survey Company, Ltd., National Flying Services, Ltd., Air Taxis, Ltd., and Trost Brothers. Trost Brothers flew 23,150 miles and Air Taxis planes were in the air 700 hours during the year. Trost Brothers also transported 17,972 pounds of freight. Thirteen light airplane clubs with a total membership of 3,288 early in 1930 were assisted financially by the government, while there were eight non-assisted clubs. Out of the total membership, 750 held civil pilots'

licenses, an increase of nearly 60 per cent over the preceding year. There were four government-owned, five municipally-owned, and 20 privately-owned airports in Great Britain open to the public.

Since all airplanes must have government licenses, it was possible to check the number and uses of aircraft in Great Britain: air transport, 28; aerial service, 146; schools and R. A. F. training, 82; light airplane clubs, 62; experimental, 98; private, 184. This indicated a total of 600 civil and commercial airplanes in Great Britain. There were 3,349 pilots holding certificates early in 1930. Since British aircraft manufacturers do not make public their production figures, it was impossible to determine the number of aircraft produced by nearly a score of factories during 1930.* There were no new manufacturers established during the year.

The R-100, one of the government's two giant airships, was successfully flown to Canada and return during 1930, while its sistership, the R-101, crashed on a projected flight to India killing most of its crew and passengers. The successful flight of the R-100 and the R-101 disaster have been discussed in an earlier chapter, "Projected World Airship Services."

Great Britain maintained one of the largest air forces in the world as a part of its military establishment, but the strength of its units was kept secret.

Greece

Greece was served by an Italian air transport company, the Societa Anonima Aero-Espresso Italiana, which made Athens a regular stop on its route from Brindisi to Constantinople. The Blackburn Company, supported by British capital, was the only aircraft manufacturing organization in the country.

As a result of a new policy established by Premier Venizelos, who set up a Ministry of Aviation in 1929 with himself as director, Greece showed a new interest in military aviation during 1930. Contracts were signed during the year for the purchase of 52 British and French military planes for the new air force, and as many more planes were to be bought in 1931.

Hawaii

Service between the principal islands of the American mid-Pacific territory was maintained during 1930 by Inter-Island Airways, Ltd., operating two Sikorsky Amphibions and a Bellanca Pacemaker seaplane.

Hawaiian Airways, Ltd., had two planes for its aerial service operations. Hawaiian Aeronautical Industries, Ltd., had an American Eagle and a Swallow used in student instruction, and Western Pacific Air Transport had two Travel Air biplanes used in training student pilots.

* Principal manufacturers listed in "The Aircraft Year Book for 1930," p. 281.

The U. S. Army Air Corps base at Wheeler Field, 20 miles from Honolulu, and the Naval Air Station at Pearl Harbor, 10 miles from Honolulu, were continued in operation with new equipment supplied to the air forces there.

Hungary

Forbidden by the Trianon treaty of 1920 to maintain military services, Hungary's civil and commercial aviation activities were under the direct supervision of the Royal Hungarian Ministry of Commerce. Government subsidies of about $225,000 were continued during 1930.

Regular schedules were maintained between Budapest and Vienna by the Hungarian Air Traffic Company in cooperation with the Austrian Air Traffic Company and the Deutsche Luft Hansa. The Hungarian company also operated a daily round trip service from Budapest to Belgrade, and one daily flight from Budapest to Graz.

The Manfred Weiss Aeroplane and Motor Manufacturing Company of Csepel held rights to manufacture Fokker, Caproni and Heinkel airplanes in Hungary as well as Gnome Jupiter and Siemens and Halske engines.

Iceland

Two Junkers planes leased from the Deutsche Luft Hansa were used by the Icelandic Aviation Company for service between Seydisfjord, Siglufjord, Akureyri, and Reykjavik. The planes also were used for scouting herring during the fishing season.

India

India was linked with England and the nations of Europe through the England to India service of Imperial Airways, Ltd., which operated in India from Karachi to Delhi, the capital. The service was operated weekly in both directions throughout the year.

The British government maintained an air force in India of 224 officers, 1,789 men and 96 airplanes. There were 49 airports in India, including those used by the Royal Air Force. Private flying was concentrated in several light airplane clubs, subsidized by the government and operated at Delhi, Karachi, Bombay, Calcutta, Madras, Rangoon and Allahabad.

Irish Free State

Despite announcements in 1929 of the formation of an Irish air transport company to link Galway with London, 1930 found the Irish Free State without an air transport service. However, one taxi service had three airplanes in use for charter work and the Irish Aero Club in Dublin was

engaged in training civil pilots. There were nine privately owned airplanes.

The Irish Free State Government in March, 1930, promulgated Air Navigation Regulations providing for the granting of licenses for airplanes, pilots, and ground engineers and set up air traffic rules for the guidance of all fliers. No licenses had yet been issued at the close of 1930.

Seven new British planes were delivered to the Irish Free State Army Air Corps during 1930, four of them training planes and three fighting planes. The Irish Aero Club sought to obtain a subsidy from the government for an air transport line.

Italy

Italy, with its Premier definitely convinced of the value of aviation for civil and military purposes, continued to carry out its extensive program for developing Italian air transport lines, encouraging Italian aircraft manufacture, and maintaining a military establishment with an adequate air force.

Since the program for civil aviation was undertaken in 1926, the length of routes in operation increased three and one half times, the total distances flown five and a half times, the number of passengers carried five times, the amount of mail and newspapers carried 40 times, and the weight of baggage and freight 11 times. In 1929 as compared to 1928, the length of routes operating increased 73 per cent., total mileage flown 48 per cent., passengers carried 61 per cent., baggage and freight carried 57 per cent., while the quantity of mail and newspapers carried increased more than threefold. As 1930 opened, Italy had air routes totaling 13,332 kilometers in operation. The year just passed had seen 2,962,277 kilometers flown on these routes, with 25,298 passengers, 61,480 kilograms of mail and newspapers, and 453,029 kilograms of baggage and freight carried. There were 25 civil transport lines in operation covering all of Italy and most of the Mediterranean basin. Passenger rates were reduced practically to rail and steamship rates as heavy government subsidies aided the operators.

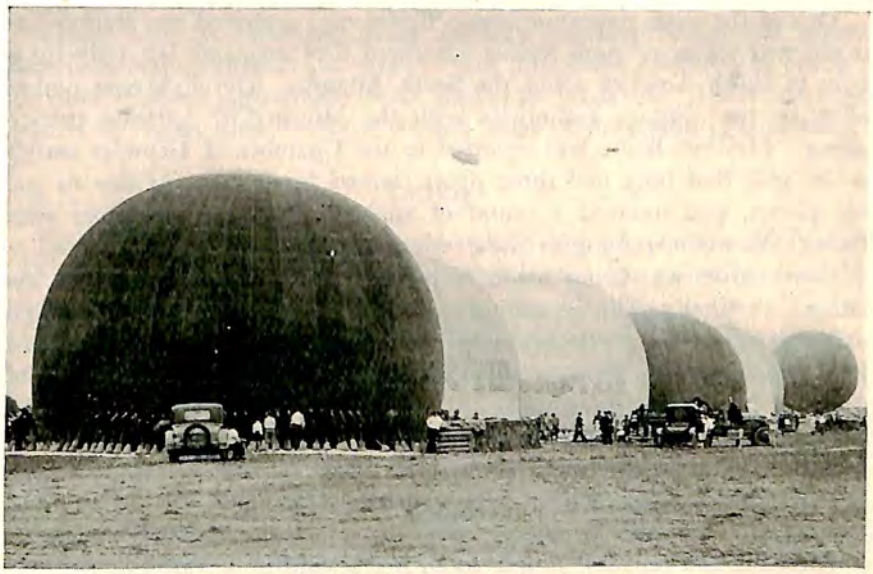
The Italian aviation budget for 1930–31 totaled 718,000,000 lire (about $40,000,000), of which 79,418,000 lire, or 11 per cent of the total, was for civil aviation. This represented an increase of 18,000,000 lire over the previous year, almost all of which was added for civil aviation. The air transport lines received 74,500,000 lire for 1930–31, the remainder of the subsidies being used for competitions, conferences, flying clubs, air fields, and meteorological services. Seven major air transport companies were the recipients of most of the subsidy.

The Societa Italiana Servisi Aerei (S. I. S. A.) with its base near Trieste, operated five lines: Trieste-Lussino-Zara-Ancona, 337 kilometers; Trieste-

Fiume-Lussino-Zara, 310 kilometers; Trieste-Fiume-Brioni-Venice, 220 kilometers; Trieste-Venice-Pavia-Genoa, 595 kilometers; and Turin-Pavia, 132 kilometers. Seaplanes were used exclusively on the line.

The Societa Anonima Navigazione Aerea at Genoa operated from Genoa to Rome, Naples to Palmero, Rome to Barcelona, Rome to Marseille and Rome to Tripoli. Fares on this line were radically reduced during the year.

The Societa Anonima Aero-Espresso Italiana, based at Rome, operated between Brindisi, Athens and Constantinople.



PREPARING FOR INTERNATIONAL RACE

Seven entries in the Gordon Bennett Balloon Race are filled with gas at the starting point in Cleveland. Goodyear VIII (second from left) won.

The Societa Anonima Transadriatica with headquarters at Venice continued operation of its service between Rome, Venice and Vienna and added a new service in September, 1930, from Venice to Ancona and Brindisi. In May, another line from Venice to Trent had been opened to connect with lines to Munich, Paris and London.

The Societa Anonima Adria Aero Lloyd at Tirana, Albania, operated solely within Albanian territory between Tirana and Koritza; Tirana and Scutari; and Tirana and Valona.

The Societa Aerea Mediterranea, with its base at Rome, entered into a new contract with the Ministry of Aviation during 1930 for the subsidization of its routes: Rome-Tunis, Cagliari-Tunis, Rome-Palmero-Tunis and Rome-Naples-Brindisi.

The Societa Anonima Avio Linee Italiane also entered into a new contract for daily service between Rome and Milan, a daily service for six months of the year between Milan and Munich, a daily service for eight months of the year between Milan and Turin, and tri-weekly service for six months between Milan and Trent.

Private ownership of light planes was encouraged through the subsidization of clubs and the development of a touring competition around Italy. Sixty private planes were entered in the reliability tour, 52 started and 37 finished. The winner, Col. Paridi Sacchi, averaged 104 miles an hour.

One of the most important group flights ever projected was started late in the year when 14 giant Savoia Marchetti S-55 seaplanes left Italy for a flight to South America across the South Atlantic. The flight was undertaken by the military authorities with the Minister of Aviation participating. Minister Balbo had reported to the Chamber of Deputies earlier in the year that Italy had three pilots trained for each of its 800 to 900 war planes, and received a round of applause from the legislators with Premier Mussolini joining in the ovation.

Every effort was being made to perfect Italian planes for use on the nation's air lines and in its military services, but the reliability of foreign craft was not being overlooked where it promised to be of greater service than domestic craft. Foreign manufacturers had been encouraged to build planes in Italy with government aid and Italian materials, looking to the day when Italy might turn out all of her aircraft without foreign aid.

Japan

Although the Japanese people could not be said to be "air-minded," the Japanese government has recognized the importance of aviation for military and civil purposes. Organized as a separate military arm, the Japanese Military Flying Corps in 1930 had 3,700 officers and men, 26 squadrons and 500 first line airplanes. German, British, French and American planes, as well as some of Japanese manufacture, were in use in Japan.

The Nippon-Koku-Yuso-Kaisha (Japan Air Transport Company) continued to be the principal operating company in Japanese civil aviation, charged with the ambitious program of the government for carrying mail, passengers and express from Tokyo to Dairen. During the first year of operation, the company carried 2,755 passengers and 18,946 pounds of mail in its 12 Fokker monoplanes purchased in the United States and Holland. Traffic increased so rapidly that from April to July, 1930, almost as many passengers and as much mail were carried as during the entire first year: 2,325 passengers and 15,251 pounds of mail.

The only other air transport company in Japan, the Nippon-Koku-Yuso-

Kenkyuko, also was subsidized by the government and carried mail and passengers from Osaka to Matsuyana. Its traffic was about one fourth that of the former company. There were no accidents in Japanese commercial aviation during 1929 or 1930.

The projected route from Fukuoka, Japan, to Shanghai had not been opened at the close of the year. It was reported that the German government had proposed the establishment of service between Tokyo and Berlin, via Suez. Japanese officials were reported to favor the proposition and negotiations were still under way at the close of the year. Such a line would, of course, include the Fukuoka-Shanghai route.

There were 11 civil and three military aviation schools in Japan. Manufacturing of aircraft and engines was principally confined to production under license agreements with European concerns. There were 34 airports in Japan, three of them civilian ports of outstanding importance.

Latvia

Latvia, without air lines or commercial aviation of its own, was linked with the extensive European air line network through a line operated by the German-Russian "Deruluft" company through Riga between Berlin, Koenigsberg and Tallinn. From Tallinn, service was available to Leningrad, Helsingfors and Stockholm. The planes were well patronized by the travelling public.

From May until November, 1929, the "Deruluft" reported 300 passengers carried on the line from Riga alone, with 449 passengers passing through the city from other points. Mail totaled 1,560 kilograms and freight weighed 2.01 metric tons. The volume of business in 1930 was considerably above the 1929 level, with as many passengers carried in April and May as were transported during 1929.

The Latvian army had 45 airplanes in service, operating from its base in Riga. The navy, devoted to coast defense, had 12 airplanes in use.

Netherlands and Netherlands East Indies

The Netherlands during 1930 continued the development of its extensive air transport services, one of which extended over the long route to the East Indies, as well as its military air force. Four companies were engaged in the manufacture of aircraft with a large share of their output being exported. No engines were produced, all being imported from foreign countries.

The Koninklijke Luchtvaart Maatschappij (Royal Dutch Air Lines) or K. L. M. reopened its fortnightly service from Amsterdam, Netherlands, to Batavia, Dutch East Indies, in September, 1930, when a tri-motored Fokker piloted by Evert van Dijk, co-pilot of the "Southern Cross" with

Kingsford-Smith, left Holland on the long flight to the east. Cities served enroute included: Nuremberg, Germany; Athens, Greece; Cairo, Egypt; Baghdad, Arabia; Bushir, Djask, Karachi, Jodphur, Allahabad, Calcutta, Akyab and Rangoon, all in India; Bangkok, Siam; Sengora, Straits Settlements; Medan, Palembang, Bandoeng and Batavia, all in the Netherlands East Indies.

The K. L. M. continued the operation of its European routes with increased traffic loads during 1930: Amsterdam-Rotterdam-London; Amsterdam-London; Amsterdam-Rotterdam-Paris; Amsterdam-Hamburg-Copenhagen-Malmo; Brussels-Paris; Lympne-Ostende; and Amsterdam-Bremen-Hamburg. Because of the necessity for adding extra sections to care for increased traffic, K. L. M. flew 1,028,000 miles during the year ended September 30, 1930, although the schedule called for 861,771 miles. During this period, the company carried 17,726 passengers, 209,138 pounds of mail, and 2,112,129 pounds of freight. The lines called for 4,672 miles to be flown daily during the summer of 1930 and 1,078 miles daily during the winter months. There were no accidents during the year. Twenty-one Fokker planes were used, with 18 pilots and 430 other persons employed.

The K. L. M. received a government subsidy of Fl. 1,000,000 ($400,000) during 1930, the largest amount it had ever received in a single year. There were no aerial service operations in the Netherlands except occasional flights of the K. L. M. The National School of Flying at Rotterdam had exclusive rights to train non-commercial pilots. Ten were trained during 1930, with 48 under instruction. Nineteen licenses had been issued to private fliers and ten planes were owned privately, principally by members of the Rotterdam Aero Club, which had 300 interested members. Schiphol and Waalhaven, the two principal commercial airports in Holland, ranked with the best in Europe.

Aircraft manufacturers in the Netherlands included: Nederlandsche Vliegtuigenfabriek, the original plant of Anthony Fokker; Maatschappij voor Vliegtuigbouw, manufacturers of Dornier metal flying boats; H. Pander and Zoon and Koolhoven Vliegtuigen, both manufacturers of light planes. No engines were made in Holland. Fifty-four planes were exported in 1929, and 50 were sent out of the country during the first eight months of 1930. There were no statistics on the total volume of domestic manufacture.

In the Netherlands East Indies, the K. N. I. L. M. (Koninklijk Nederlandsch-Indische Luchtvaart Maatschappij) maintained five routes: Batavia-Bandoeng, 70 miles; Batavia-Semerang-Surabaya, 400 miles; Batavia-Palembang, 370 miles; Batavia-Palembang-Singapore, 725 miles; and Batavia-Palembang-Pakan Barce-Medan, 1,100 miles. From November 1, 1928, to September 1, 1930, 4,494 flights covering 663,800 miles were made over

these routes, carrying 28,046 passengers, 420 metric tons of baggage, 142 metric tons of freight and 15,862 pounds of mail. The company received a subsidy from the colonial government. One private plane was owned by the Netherland India Aero Club.

The Netherlands military establishment includes an army air unit with 172 airplanes, including 100 observation planes and 35 training ships. The navy air unit had two seaplanes aside from several on naval ships and one on a submarine.

New Zealand

While there were no air line services in New Zealand, the government encouraged aviation development by granting subsidies to 21 light airplane clubs. Many of the clubs had their own landing fields, hangars and other facilities. The government furnished each club of 30 members with two light planes and provided $150 as a cash subsidy for each new pilot trained by the club.

Norway

The Norske Luftruter (Norwegian Air Transport Company) cooperated with the Deutsche Luft Hansa in the operation of passenger service between Oslo, Malmo and Copenhagen during the summer months, with more than 1,500 passengers carried on the route.

Air mail service between Oslo and Malmo was again given a trial through a government contract with Halle and Peterson, who carried on the service successfully for two months, carrying 4,000,000 letters. The government considered making a permanent contract for the service.

Persia

The Junkers Luftverkehr Persien, a German company, continued to hold a monopoly on civil aviation in Persia, although Imperial Airways was permitted to cross southern Persia from Baghdad to Karachi with stops at Bushire and Jask on their England to India service. The German company linked Teheran with Baghdad, a flight of six hours as compared to three and a half days by train and motor.

The Persian army continued its activities with six or more Junkers planes.

Philippine Islands

The Aviation Corporation of the Philippines continued preparations for the opening of regular service from Manila to Iloilo, Cebu and Davao, and eventually to China and Australia. Equipment had been ordered for operation of the line.

Poland

The semi-governmental communal air transport company, Polske Linje Lot, which took over all Polish air transport with the exception of one

line in 1929, continued the development of its services during 1930. Its regularly operated routes totaled 2,892 kilometers with more than 5,000 kilometers being flown daily: Warsaw-Danzig; Warsaw-Lwow; Warsaw-Poznan; Warsaw-Katowice-Krakow; Katowice-Brno and Brno-Vienna. The system was extended during the year to Bucharest through Rumania to provide connections to the Baltic and Black Seas during a single day's flight. Fares charged by the line approximated first class rail rates.

The Compagnie Internationale de Navigation Aérienne, a French line which had previously been granted certain concessions, continued to operate from Warsaw to Prague and Paris.

Twenty-six planes were used by the Polish air line on its routes, making 2,696 flights over 623,149 kilometers during the first six months of 1930, carrying 5,778 passengers, 19,057 kilograms of mail and 254,419 kilograms of merchandise. The company also undertook aerial survey and taxi work during 1930.

Private flying in Poland was centered about the activities of the Polish Aeroklub and 12 affiliated flying clubs, which made 12,370 flights during 1929–30 for a total of 5,317 hours in the air. Gliding also was becoming popular. The Polish government devoted considerable attention to the provision of radio navigational facilities for planes and to the lighting of airports and routes for night flying.

Four manufacturers of aircraft and three producers of engines were operating in Poland during 1930.

Portugal

Regular biweekly service between Lisbon and Madrid operated for four months during 1929 by the Serviços Aereos Portugueses, in connection with the German Junkers interests, was discontinued because of lack of traffic. During the four months of operation only 79 passengers and 2,714 kilograms of mail and merchandise were transported. The company opened a taxi service in July, 1930, and 190 passengers were carried during the three months that the single Junkers plane was used in this operation.

The Companhia Portuguesa de Aviaçao announced an ambitious program for 1931: Lisbon to Paris, Lisbon to the Azores, Lisbon to Madeira, Lisbon to Tangier, and Lisbon to Algiers. In cooperation with the French Aéropostale, it planned service from Cape Verde Island to Dakar and from Portuguese Guinea to Dakar. Two other services were considered in coordination with the French Compagnie Transafricaine d'Aviation: Lisbon to Angola and Lisbon to Mozambique. Air lines in Portugal were not aided by the government in any way.

The Portuguese Army Air Corps had 68 planes in use and the Navy Air Service had 29 ships. Three planes owned by the two transport com-

panies were the only other aircraft in the nation in 1930. There was an international airport at Alverca, 18 miles north of Lisbon, and about five small landing fields at other points. The Aero Club of Portugal organized a school at Lisbon in 1930 and 12 students were under instruction, but none had been graduated.

Rumania

Rumanian army planes and pilots were used during 1930 on four services operated by the Rumanian government: Bucharest to Galatz; Galatz to Issay; Issay to Czernowitz; Bucharest to Sibiu; and Sibiu to Cluj. Fares were slightly lower than first class railroad rates.

Siam

Siam was linked by air with Europe during 1930 with the establishment of the K. L. M. (Royal Dutch Air Lines) service from the Netherlands to the Dutch East Indies with a stop at Bangkok, Siam. The service also provided fast transportation to important cities in India passing through enroute to Holland.

The Siamese Army had maintained air lines into the interior of Siam for six years, using Army planes and pilots. These services were continued during 1930 with passengers, mail and merchandise being transported to points in the interior, unpenetrated by roads or railroads. Siam had several American airplanes, including two Curtiss Hawk pursuit ships, in its service and held rights to manufacture the Curtiss planes for domestic use.

Spain

Spain was served with air lines totaling 874.2 miles on October 1, 1930. The principal operating company, Concesionaria de Lineas Subvencionadas or "Classa," received 1,500,000 pesetas annually from the government and held certain monopolistic rights. Allied with the corporation, although operating independently, were Unión Aerea Española and Jorge Loring.

Services in operation during 1930 included: Madrid-Barcelona; Madrid-Sevilla; Sevilla-Larache, Morocco and Sevilla-Granada. The Madrid-Lisbon and Madrid-Biarritz-Paris services, operated in 1929, were discontinued as unprofitable. During 1929, 242,711 miles were flown on these lines, carrying 4,888 passengers, 19,223 pounds of mail and 42,372 pounds of express. Wright Whirlwind engines were used for the initial flight on a new line from Madrid to the Canary Islands, over a difficult airway of desert and sea.

Three aircraft manufacturers and four engine producers, most of whom were operating under rights to foreign patents, were in production during 1930. During 1929, 174 complete planes were manufactured in Spain. Aviation schools were operated in Madrid, Barcelona, Alcalá de Henares,

Guadalajara, Cartagena and Albacete. Thirty planes were in use at the last named school alone. Private flying was confined principally to flights of visiting tourists from other countries. Nineteen first class airports and 40 landing fields, constructed with government aid, served Spain. Licenses were required for planes, pilots and mechanics.

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 was destined to become a port of call on the Europe-South America airship route.

Spain maintained an air corps in its military establishment, and experienced a shock late in 1930 when the rebel hero, Ramon Franco, who attempted a trans-Atlantic flight, used Army planes to distribute revolutionary propaganda over the capital. He was later held in Portugal when refuge was sought there.

Straits Settlement

Straits Settlement found itself linked with the principal countries of Asia and Europe in the fall of 1930 when the K. L. M. (Royal Dutch Air Lines) opened service from the Netherlands to the Dutch East Indies, stopping at Sengora in the Straits Settlements. Several local services also were considered.

Sportsmen in the Federated Malay States established an airplane club to promote interest in aviation.

Sweden

The Aktb. Aerotransport (Swedish Air Transportation Company or A. B. A.) received a subsidy from the Swedish government of 500,000 crowns ($133,900) to aid it in the operation of its services within Sweden and, with the cooperation of the Deutsche Luft Hansa, the Finnish Aero O/Y, and the Dutch K. L. M. lines, to neighboring countries.

The A. B. A. maintained regular service during favorable months of the year between Malmo and Amsterdam, Stockholm and Helsingfors, and Malmo and Hamburg. During 1929, 2,582 passengers, 35,052 kilograms of freight, 47,245 kilograms of baggage and 56,047 kilograms of mail were carried on these lines. The total distance flown on the regular lines during the year was 283,821 kilometers. There was an increase in traffic reported for 1930, although statistics for the year had not yet been compiled. Halle and Peterson, contractors to the Norwegian government, also operated a trial service from Oslo to Malmo. The Deutsche Luft Hansa opened a service in May, 1930, from Berlin to Copenhagen, Goteborg (Sweden) and Oslo.

The Flying Club of Stockholm obtained a Junkers training plane during 1930 for the use of its members. The Royal Swedish Aero Club

promoted a flying meet which attracted 40,000 persons to the Bulltofta airport, near Malmo, to witness 16 airplanes perform. Considerable work was done during 1930 in equipping and improving the airports at Malmo and Stockholm. Two manufacturers continued their production of planes, principally for use by the Swedish Air Transportation Company.

Switzerland

Eight air lines, all but one of which were foreign companies, served Basel in the heart of Switzerland during 1930. The single exception was the Basel Air Traffic Company, generally known as "Balair," which was capitalized at 500,000 Swiss francs ($96,525). It used five Fokker trimotored monoplanes on its services which hurdled the difficult Alps and Pyrenees on regular schedule. Eighteen Wright Whirlwind engines were imported during the year at a cost of $79,560 to power these planes on their difficult daily flights.

The Basel air routes during 1930 included: Basel-Zurich-Munich-Prague, Geneva-Basel-Mannheim-Frankfurt-Cologne-Amsterdam, Zurich-Basel-Paris-London, Basel-Berne-Lausanne-Geneva, Basel-Berne-Biel, Basel-Lausanne-La Chaux de Fonds-Le Locle, Basel-St. Gall-Zurich, and Basel-Lucerne.

On July 5, 1930, a new air mail service was inaugurated between Basel and the French ports of Cherbourg and Le Havre for improving the postal service between the United States and Switzerland. Steamers from or to the United States were met by airplanes with a saving of from 24 to 48 hours in the delivery of mail.

From January 1 to September 30, 1930, 6,634 passengers were carried on the several air lines entering Basel. These lines carried 56,028 kilograms of mail, 100,979 kilograms of freight, and 48,500 kilograms of baggage. School and training flights at Basel during this period totaled 1,903. There were no casualties during 1930.

The Swiss Military department maintained an air unit with more than 100 planes in use.

Turkey

Two air lines, one French and the other Italian, served Turkey during 1930 and represented all civil aviation activity in the country. The Societa Anonima Aero-Espresso Italiana maintained a semiweekly service between Constantinople and Brindisi by way of Piraeus, Greece. The Compagnie Internationale de Navigation Aérienne (French) operated between Constantinople and Paris.

There were no privately owned planes in Turkey. Numerous sections of the country were marked off as military zones through which no airplane might pass. This fact had no small influence upon the curbing of private interest in aeronautics.

The Ministry of National Defense directed all military aviation in Turkey and the government maintained a rigid censorship of all matters pertaining to the conduct of its affairs.

Union of Soviet Socialist Republics

Spurred by the ambitious program of the Soviet government to place the U. S. S. R. in a predominant position among the nations of the world in aviation, traffic increases were effected on the air transport lines, the first all-Russian tri-motored airplane was built, and the military air forces were further developed during 1930.

Soviet airways in 1930 totaled well over 20,000 kilometers, linking the principal cities of the country with centers in Europe and Asia. Three organizations operated air transport services in Russia. The oldest, a German-Russian company known as the "Deruluft," connected Moscow with Berlin and Leningrad with Koeningsberg in the only existing air links between Soviet Russia and western Europe.

The Ukranian Airways Company (Ukrvozdukhput) operated from Moscow through central southern Russia to the Caucasus and Persia, going as far as Teheran. The most important Soviet air transport company was the "Dobrolet," which maintained 12,000 kilometers of airways into Siberia and Central Asia, operating at temperatures as low as 67 degrees below zero with full loads.

There were 20 aircraft manufacturing companies in Soviet Russia during 1930, but the majority of them were either engaged in producing planes on foreign patent rights or fabricating foreign planes shipped in as parts. Early in 1930, the first tri-motored all-metal monoplane produced entirely of Russian materials with Russian labor was produced. It was designated as the A. N. T. 3, and carried 11 passengers.

Thirty-five airports throughout Soviet Russia were maintained by a society of affiliated flying clubs known as the Ossaviachim. Airplanes and pilots were licensed by the government. The Soviet military air service had approximately 90 squadrons of 12 planes each with about 800 pilots who had been trained in 14 military flying schools maintained by the government.

Yugoslavia

The Yugoslav government moved to aid aviation enterprises by making provisions to exempt aviation companies from taxation for a period of 25 years. The Yugoslav Air Transportation Company operated mail, passenger and express service between Belgrade and Zagreb, 235 miles, and the Compagnie Internationale de Navigation Aérienne (French) maintained daily service from Belgrade to Paris and triweekly service from Belgrade to Constantinople.

CHAPTER XIX

OUT OF THE ENGINEERING LABORATORY

Design Trend Toward Greater Pay Load and Higher Speed—Attention Concentrated on Aerodynamic Efficiency—Effect of Watres Bill Metal Utilized—Autogiro—Helicopter—Safety Devices

UNMARKED by any radically new developments in aircraft design, 1930 witnessed a concentration upon projects in the engineering laboratory which were productive of important refinements in airplanes, engines and instruments. Not concerned with problems of volume production during a decidedly lean year, engineers and designers employed by the more substantially financed companies were able to focus their attention upon improvements of products which might not have been possible during a period of heavy production. Inspired by confidence in the future of a normal market, the major manufacturing companies proceeded with their experimental programs, taking proper regard for economy into consideration.

The truth of the definition of a commercial airplane as one which can support itself in the air financially became increasingly evident among designers and production managers, although one of their number originally concocted the definition in jest. There was a distinct movement toward effecting production economies which might make possible the manufacture of airplanes and engines suitable for specific tasks at a cost low enough to command an economic price and efficient enough to permit low operation expenses. It caused some manufacturers to take certain models out of production and to concentrate on other established types or new designs which showed greater promise of commanding a place in the potential market of the immediate future.

The events of the year had a marked influence on the trends of design. This can be readily observed from reviews of the manufacturing activities of the various companies in the chapters "Manufacturing American Aircraft" and "Producing American Engines." This also can be learned from an examination of the extensive section of three-view drawings immediately following this chapter, which shows the types and models produced during 1930 in the several fields, including multi-motored transports, light transports, mail transports, planes for private operations and aerial service, and important military types for the Army and Navy. It is not the purpose of this chapter to present a detailed review of the changes made by each manufacturer on his product, but rather to indicate the year's trend

in engineering investigation and design as seen through the critical eyes of more than a score of the nation's leading aeronautical engineers whose composite observations will be presented. Each submitted a comprehensive memorandum outlining his views at the request of the editor of "The Aircraft Year Book" to be used as the basis for this chapter.

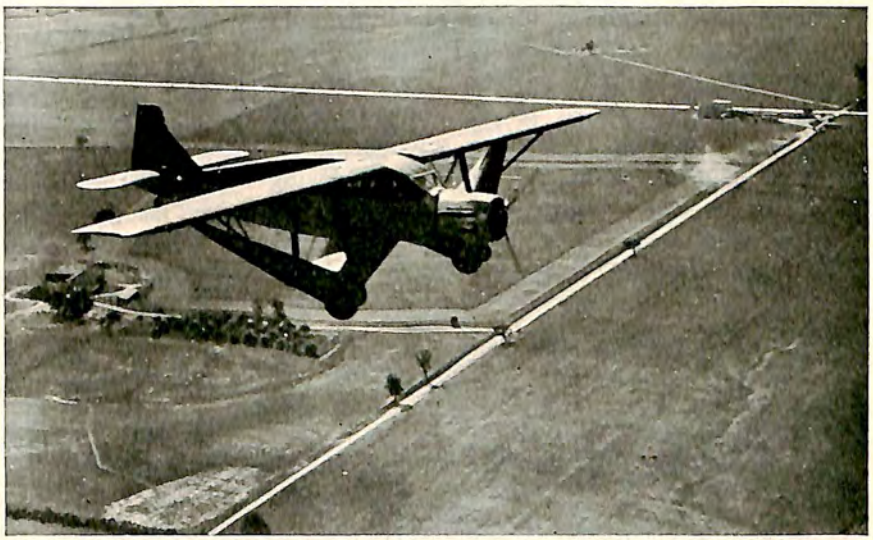
Effect of McNary-Watres Act

The stimulation of passenger carrying business and the remaking of the air mail map resulting from the McNary-Watres Act had a profound

HIGH SPEED MAIL PLANE

Boeing Monomail (Pratt and Whitney Hornet), new metal low wing monoplane, is designed to carry heavy load of mail at speeds 150 miles an hour.

effect upon the cleaning up of designs in the heavy transport field and the introduction of new light transport models which promised to meet the needs of contractors for carrying both mail and passengers on frequent schedules. The air transport operators wanted faster ships with greater pay loads and designers concentrated their attention upon this problem. Frequency of schedules placed a premium on efficient ships which could carry from four to twelve passengers in addition to a mail load, rather than stimulating the huge transport types which carried a score or more passengers. The big transport ships found favor, however, on heavily patronized routes, especially on the west coast. East coast operators, competing with frequent rail service over relatively short distances, preferred



RESULT OF McNARY-WATRES ACT

Bellanca's answer to the new air mail act, a 12 place sesquiplane carrying mail in the lower wings, powered with a Curtiss Conqueror and known as the Airbus.

BELLANCA AIRBUS INTERIOR

Passenger cabin of the new Bellanca single-engined transport introduced during 1930 for mail and passenger carrying under Watres Act.

to employ extra sections of the ten place type when necessary on frequent schedules, rather than consider the larger ships.

Increases in airplane performance, often obtained in past years simply through increased power, were achieved during 1930 through refinements resulting in greater aerodynamic efficiency. Speeds were increased from 15 to 25 per cent. by employing low drag cowling on air cooled engines. Increased attention also was given to the fairing of wing fillets, strut intersections and landing gears. "Pants" or "spats" made their general appearance upon the landing gears of many

IN MOTOR CAR PRICE CLASS

American Eaglet, a two place open cockpit monoplane powered with a 40 horsepower Salmson engine, is illustrative of the trend in the low-price field

established designs, while several new designs employed retractable landing gears to reduce the air resistance of exposed parts. The refined Ford tri-motor was an outstanding example of how manufacturers were able to boost the speed of models already in production through a cleaning up of the design. The Boeing Monomail, Northrop Alpha, Travel Air Mystery Ship, Lockheed Sirius, Consolidated Fleetster, Fokker XO-27 and Bellanca Airbus were outstanding examples of the new trend which emphasized the importance of greater aerodynamic efficiency in design. The progress toward increased design efficiency was particularly commendable as opposed to the past tendency of obtaining higher speeds through increased power. Such designs tended to decrease the ratio of pay load to

horsepower, which is quite an accurate measure of a ship's inherent operating economy. The new increases in speed, made without a sacrifice of pay load, not only resulted in a saving of fuel and a reduction of time for a given trip, but also in a reduction of the number of airplanes necessary to operate an air transport line. This meant a saving in overhead expenses which constitute a major part of the cost of air line operation.

Use of Metal Increased

One of the most promising advances made during the year in the construction of airplanes was the increased use of metal to replace wood

NEW AERONCA MONOPLANE

Aeronca C-3, a new side-by-side monoplane powered with an Aeronca engine which was to be put into production in 1931.

and fabric in all major structures. Development of stressed skin all-metal wings and monocoque fuselages, such as those used in the Boeing Monomail, Northrop Alpha, Thaden T-4, and Fleetster were considered particularly important. The fact that this project was being attacked by leading designers throughout the country simultaneously was bound to result in a faster and more general accomplishment. The intelligent utilization of aluminum alloy sheets in the structure of monoplane wings accomplished greater rigidity in torsion to resist incipient wing flutter and produced a smoother and more aerodynamically efficient outside surface. It

was found through the use of such metals that the wing covering could be made to carry an appreciable part of the load and to obtain a degree of rigidity never before accomplished in monoplane wings.

The increasing use of metal made improvements in production methods obligatory. The production engineers were responding to the demands, and as a result improved methods of assembly and improved tools were keeping pace with design. These production improvements were rather diversified and embraced such important factors as spot welding and rapid machine riveting. Although little of its possibilities were yet known in

MONOCOQUE WING CONSTRUCTION

With an inspection panel removed, the unusual construction of the Thaden T-4 metal monocoque wing is shown. Corrugated duralumin sheet is used.

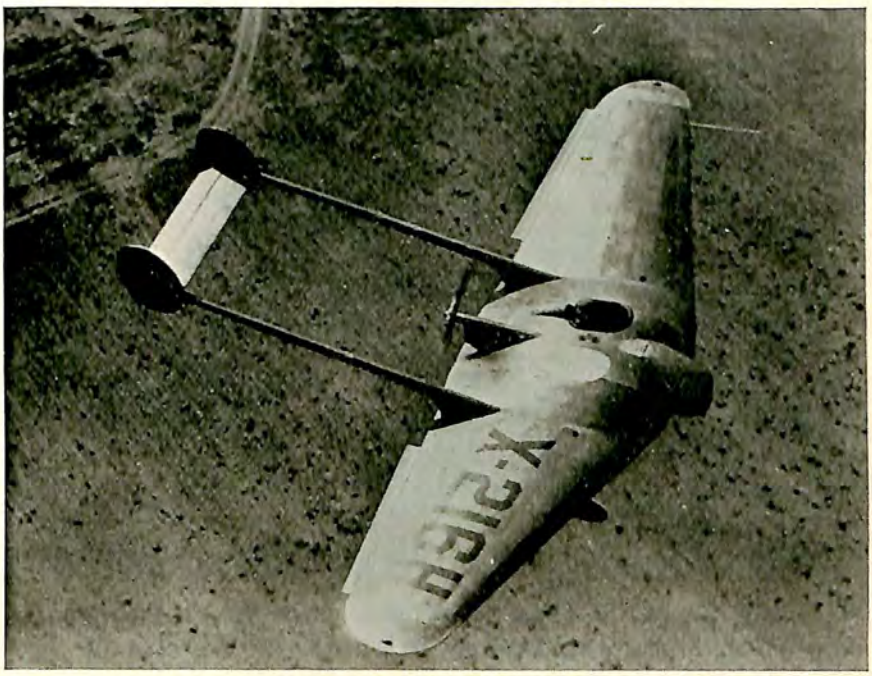
1930, the introduction of stainless steel in the thinner gauges was considered of outstanding importance to aircraft construction. It was expected to prove the best material yet produced, and many engineers predicted its general use "in the not too far distant future." Stainless steel presented the ideal characteristics of physical properties and corrosion resistance. The latter was a factor of such paramount importance that some designers declared it would exert a trend toward the replacing of duralumin in airplane structure with stainless steel. This, however, was for the future to determine.

Greater Pay Loads

In the single-engined transport field, the Bellanca Airbus, two Boeing Monomail models, Consolidated Fleetster, Fokker F-14, and Northrop

Alpha were illustrative of the trend toward ships with greater pay load in proportion to their horsepower. The new Bellanca and Boeing planes showed performance better in most respects than that of tri-motored ships double their horsepower, and their indicated cost of operation was approximately 50 per cent of their three-engined sisters. The design of these ships included many interesting departures from the conventional.

The Bellanca Airbus was a sesqui-plane having large upper wings, short lower wings and auxiliary wings joining the two together to act as



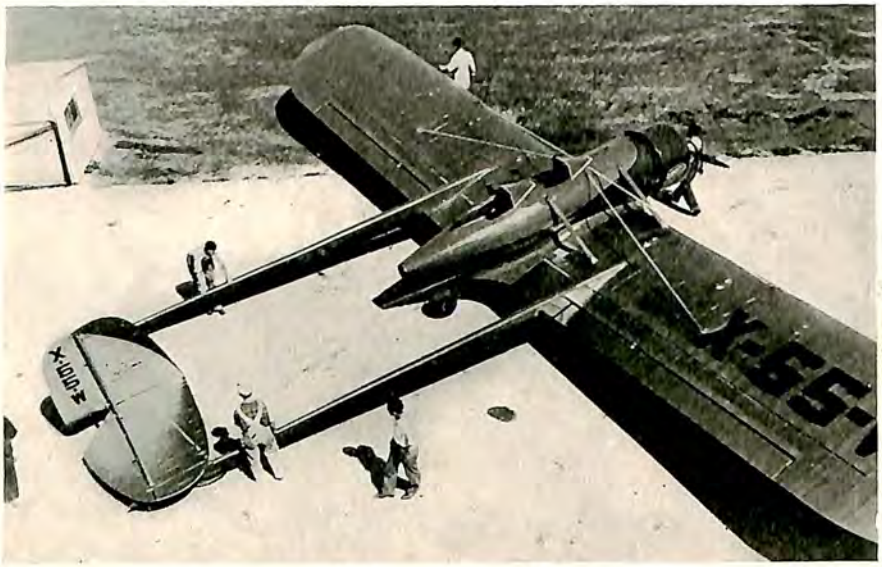
"FLYING WING" IN FLIGHT

Long discussed by engineers as the most efficient design aerodynamically, a ship of the "flying wing" type was flown experimentally by Northrop Aircraft Corporation during 1930.

bracing struts in addition to lifting surfaces. The lower stub wings formed the landing gear structure, the wheels being faired into them where the auxiliary wings join, thus eliminating the drag of the landing gear as a separate unit. It was powered with a Curtiss Conqueror, Pratt and Whitney Hornet or Wright Cyclone engine. Baggage was carried in specially constructed pits underneath the seats rather than in a compartment at the rear of the cabin. Designed to meet the requirements of air transport operators under the McNary-Watres Act, it had provisions for carrying mail in pits in the lower stub wings having a capacity of 60 cubic feet. Loading and

unloading was accomplished outside the cabin without interfering with passengers.

The Boeing Monomail was a low-wing, all-metal, single-engined monoplane powered with a 575 horsepower Pratt and Whitney Hornet engine. Completed during the summer of 1930, it carried a pay load of 2,300 pounds at a cruising speed of 140 miles an hour and a high speed of 158 miles an hour. The Monomail 200 was designed as an all-cargo ship with the pilot in an open rear cockpit, while the Monomail 221 carried from



EMSCO "FLYING WING"

Huge Emsco low wing monoplane of the "flying wing" type, powered with a Wasp Jr. engine, is designed for 70 hours of continuous flying.

six to eight passengers in addition to a cargo of mail in an enclosed fuselage cabin with the pilot in an open rear cockpit.

The Model 20 Consolidated Fleetster was introduced in 1930 as an adaptation of the Model 17 to meet the needs of contractors operating under the McNary-Watres Act. It incorporated a 60 cubic foot mail and express compartment immediately aft of the firewall, entirely closed off and locked from the passenger compartment which accommodated five persons. The pilot sat in an open rear cockpit, and the monoplane wing was raised 18 inches above the monocoque metal fuselage to provide him with good vision. It was powered with a Pratt and Whitney Hornet or a Wright Cyclone engine, using an N. A. C. A. cowling to permit it to cruise at 150 miles an hour for 500 miles with a net pay load of 1,700 pounds.

The Fokker F-14, introduced in 1929 when the McNary-Watres Bill was under consideration, carried six passengers in a cabin with a special compartment for mail and express, while the pilot was placed in an open rear cockpit. The parasol type wing was similar to that of the Fleetster in that the monoplane wing was raised above the fuselage to give the pilot better vision. The F-14 was powered with either a Pratt and Whitney Hornet or a Wright Cyclone engine. It had a cruising speed of 140 miles an hour with a full load.

The Northrop Alpha, an all-metal, low-wing, seven place monoplane

AUTOGIRO OVER LOWER MANHATTAN

With New York as a background, a Pitcairn-Cierva Autogiro (Wright Whirlwind) flies toward the Hudson River on a public demonstration.

powered with a Pratt and Whitney Wasp engine, represented one of the most interesting new designs of the year. It had a multi-cellular wing on which the metal skin took the tension and compression beam loads. Shear loads were taken through vertical members. The fuselage was an all-metal monocoque stressed skin structure in which formed gores ran longitudinally and stiffening rings were spaced transversely at various intervals. All control surfaces were similar in construction to the wing. Six passengers were accommodated in the monocoque fuselage cabin and the pilot was placed in an open rear cockpit. The plane was designed for exceptionally fast, light transport.

The "flying wing" type of plane, long the dream of designers as fulfilling the characteristics of aerodynamic efficiency strived for in all

airplanes, attracted considerable attention during 1930 among designers and engineers of the Northrop Aircraft Corporation, the newest unit of United Aircraft and Transport Corporation. A small experimental plane of 30-foot wing span was built and flown during the year. The results of the tests indicated that the type has considerable promise. It was a pusher type, with the propeller mounted behind the wing, and the tail surfaces carried on outriggers running from the wing. The wing was very heavily tapered from root to tip, the root being so thick that the small nacelle in which the crew and engine were placed was practically hidden in the wing.

While referred to popularly as a "flying wing," the Fokker XO-27, a new type observation-reconnaissance plane built for the Army Air Corps, was really of conventional design except that its two Curtiss Conqueror engines were faired into the thick monoplane wing, the landing gear folded into pockets beneath the engines, and the nose of the fuselage extended out further than the usual ship. Of metal construction, it had a high cruising speed and represented a distinct advance in the development of military observation planes for specific purposes. It carried a crew of three and was designed to penetrate deep into enemy territory on photographic missions, carrying machine guns to protect itself in flight.

There were no completely new designs introduced in the multi-motored transport field during 1930. The Stinson Aircraft Corporation took over the Corman tri-motored 11 place design and placed it in production with some refinements. It was powered with three Lycoming engines. The Fokker F-32, the largest land plane produced in the United States; the Consolidated Commodore, the largest flying boat in the country; the Curtiss Condor; Fokker F-10A; Ford 5-AT-C; and Sikorsky S-41 were continued in production as super-transports. All being developments of 1929, they were described extensively in "The Aircraft Year Book for 1930" and have been described briefly in the earlier chapter of this book on aircraft manufacturing.

Mystery Ship Dominates Speed Field

Probably because manufacturers sought to make their new models carry a pay load which would pay the bills for operation, no new design introduced during the year surpassed the performance of the Travel Air Mystery Ship, introduced in 1929 and produced during 1930 as high speed sport jobs. Powered with a Wright Whirlwind 300 engine, the Mystery Ship held all transcontinental speed records and hung up many shorter distance speed marks during the year. These record performances have been discussed in detail in an earlier chapter. It is sufficient to say that many engineers attributed the year's trend toward low-wing streamlined monoplanes to the early success of this Travel Air model, which consistently attained

speeds well in excess of 200 miles an hour. The Laird LC-DW 300 was a good example of the efficient use of the Pratt and Whitney Wasp Jr. engine introduced early in 1930. A single place biplane especially designed for racing, it won the high speed Thompson Trophy race in Chicago.

The Detroit Aircraft Corporation sought to turn its high speed Lockheed Sirius design to economic advantage during 1930 when it constructed the Detroit Lockheed Sirius Mail Plane on the same basic design with the use of a metal monocoque fuselage and the incorporation of a large mail compartment in the forward part of the ship. Utilizing the advantages of metal construction, the company also introduced its Detroit Lockheed Vega with a metal monocoque fuselage. Weighing only 30 pounds more than the wood fuselage, the metal ship's performance was approximately the same as that of the earlier design.

Monocoque box type beam construction was incorporated in the metal monoplane wing of the Thaden T-4, a new development in the employment of metal with a view toward low production cost, ruggedness and light weight. It consisted of laterally disposed tapered corrugated sheet in the form of a box, shaped to the contour of the wing and covered both top and bottom with a layer of longitudinally disposed corrugated sheet. The fuselage also was of metal monocoque construction, consisting of a shell of corrugated skin supported internally by a series of tubular duralumin frames.

New Light Planes Developed

Perhaps no development of the year was watched closer by manufacturers catering to the private flier market than the design of very light airplanes with power plants of from 30 to 50 horsepower. The flights of these little ships, carrying one or two passengers at speeds up to 70 and 80 miles an hour, certainly marked a distinct advance in efficiency when their pay load to horsepower ratio was considered. These planes were designed to sell from $800 to $1,500 and could be flown after about five hours instruction. The Aeronca C-2, a single place light monoplane powered with a 30 horsepower Aeronca engine, was the pioneer in this field, introduced early in 1930. It was to be followed in 1931 by the Aeronca C-3, a two place side-by-side dual control monoplane of similar construction. It was demonstrated that a solo flight could be made in the new ship after 20 minutes dual instruction, and its manufacturers estimated that a five hour course costing no more than $50 would be the maximum instruction needed. Dealers were to include a solo course with the cost of the ship. The Aeronca C-2 was flown during 1930 from Cincinnati to Boise, Idaho, 2,500 miles, at a cost of $16.50 and from Cincinnati to New York at a cost of $8.20, including gas, oil and any necessary mechanical adjustments.

The American Eaglet also made its debut in this field during the year

as an open cockpit monoplane carrying one or two persons depending upon the power plant used. It was offered with either a Cleone or Szekely engine. Cessna successfully flew a small two place monoplane powered with a Continental engine during the year, and Curtiss-Wright, Huntington and Waco had similar designs in the experimental stage. The Curtiss-Wright Junior was a two place monoplane with a 40 horsepower engine. Several other companies were reported to have light airplane designs on their drafting boards, but no other ships in this class were test flown during 1930. It was a development which was to reach its full stature by the summer of 1931 and many engineers watched the results of these pioneering models with keen interest.

Flying Boats and Amphibians

General use of the nation's natural airways—rivers, lakes, bays, and seas—by aircraft still remained to be achieved. Interest in flying boats, seaplanes and amphibians for commercial and private use continued to grow, but the surface of the potential field had barely been scratched. Development during 1930 was principally concerned with the refinement of models in production or the manufacture of larger types based on experience of smaller ships of similar design. Amphibions, Inc., formerly Ireland Aircraft, Inc., introduced the Privateer, a two-place side-by-side open cockpit amphibian monoplane powered with a Warner Scarab engine, to supplement their standard line of amphibians and flying boats. Harry Rogers designed and successfully flew a new flying boat, powered with a Wright Whirlwind 240, which demonstrated excellent flying characteristics. Carrying a pilot and four passengers, it had a high speed of 105 miles an hour, took off in a dead calm in 16 seconds, and climbed at the rate of 740 feet per minute. The Towle TA-3, a high wing cabin monoplane amphibian powered with two Packard Diesel engines, received an Approved Type Certificate. It was to be placed in production early in 1931.

The Sikorsky Aviation Corporation, a division of United Aircraft and Transport Corporation, had the S-40, a new 41 passenger commercial amphibian under construction. Scheduled to be launched in 1931 for South American air transport service, it was to be the world's largest amphibian. With a wing span of 114 feet and an overall length of 72 feet 11 inches, it was designed to carry a useful load of 11,250 pounds. It was to be of all metal construction, powered with four Pratt and Whitney Hornet engines mounted abreast below the monoplane wing, and designed for a high speed of 129 miles an hour, a cruising speed of 108 miles an hour, and a 900 mile flying range without refueling. It was to be equipped with a retractable landing gear. Sikorsky brought out the S-41, a twelve

place monoplane, as a successor to the S-38, a ten place sesqui-plane. The S-39, a four place all metal monoplane amphibian powered with a Pratt and Whitney Wasp Jr. also was placed in production during the year. Fokker, Keystone and Boeing continued their standard marine models in production.

In the flying boat field, Consolidated completed construction of its fourteenth giant Commodore for South American service. Twelve were produced to accommodate 22 passengers and two were enlarged for 30 passengers, besides a crew of three. The Dornier DO-X, the world's largest flying boat, remained an unknown quantity at the end of the year, although some engineers looked upon it as the logical development to solve the problems of trans-oceanic air transportation. Its trans-Atlantic flight projected for 1931 was looked upon as an opportunity for the big ship to prove its economic value.

Autogiros for Commercial Market

Engineers generally agreed that the Autogiro, while not strictly a development of 1930, made the outstanding contributions of the year to the advancement of aeronautic design, outside the conventional field. Several American-built Autogiros, constructed for experimental purposes by the Pitcairn-Cierva Autogiro Company, were operated throughout the year and several outstanding refinements in their design achieved. The Autogiro, invented by Juan de la Cierva, converts all the functions of fixed wing flight into moving wing flight in the same way that boat propellers utilize the propulsive principles of the oar. Four vanes revolving around the mast and turned by the force of the air stream bear the burdens of lift. They make possible take-offs in short distances and landings in even smaller areas. The Autogiro is able to retain flying speed after its power is cut off, making landings possible at a steeper angle with a minimum forward speed. Probably the most important technical advance of the year on the Autogiro was the starting of the rotor vanes directly from the engine. A clutch enabled the pilot to use the engine to set the vanes in motion on the ground so that a take-off could be made without a long period of taxiing. The clutch was released as soon as the machine was in the air and the normal slip stream kept them in motion. The Pitcairn-Cierva organization announced its readiness to permit production of the Autogiros for the commercial market late in 1930, and several companies prepared to manufacture them in 1931.

Helicopter in Hangar Tests

The Curtiss-Bleecker helicopter, shown to the public for the first time in 1930, attracted considerable attention among aeronautical engineers

although it remained an unknown quantity at the end of the year. Flight tests of the machine were scheduled for 1931. It had been hopped off the ground in the still air of its hangar several times, but engineers in charge of the project were not yet ready for flight tests. Resembling the Autogiro somewhat in outward appearance, the helicopter had one apparent fundamental difference in that its wings were propelled by the pull of its propellers, while the Autogiro obtained its forward motion in the air from the forward motion of the machine. The Curtiss-Bleecker machine consisted of four large wings or blades, mounted at right angles to one another and revolving in a horizontal plane. The wings were revolved by propellers, one to each wing, mounted forward of the leading edge, about two-thirds of the way out. The propellers were driven through a gear and shaft arrangement from one central Pratt and Whitney Wasp engine, mounted horizontally. To each of the wings were attached outrigger booms mounting small elevators or tail surfaces. Thus, each unit was in reality a small airplane, consisting of a power driven wing with a tail which can control the angle of incidence of the wing at any point. Beneath the four wings was suspended a small fuselage in which the crew was located.

Safety Devices and Navigation Instruments

"Slots," "flaps" and "floating ailerons," fundamental changes in wing design which received marked attention during 1929 in the Guggenheim Safe Aircraft Competition, were conspicuous by their absence from models during 1930. Only one commercial model in production offered the purchaser "slots" as optional equipment. The Curtiss Company considered adapting its "floating aileron" to standard commercial models early in the year, but held up its plans temporarily due to the necessity for conserving resources. Some designers considered these devices "just so many more gadgets to be kept in working order," while others felt they offered a distinct aerodynamic advantage which would be realized at a future time when manufacturers are inspired by a more ready market for their products.

All aircraft incorporated a certain degree of stability in their design which made them easy to fly, and designers generally agreed that it would be a mistake to make the present airplane more stable. Many engineers looked upon the development of mechanical control to relieve the pilot as an important step in improving the system of airplane control. With mechanical devices operating the controls, the pilot would be left free to attend to his navigation tasks and to keep a closer check of the operation of his power plant. Full automatic mechanical control has been applied to steamships and many engineers believed such control was certain to be adopted for transport airplanes in the near future. More than 50 hours of flight tests, including several long distance flights, were made during

the year by the Army Air Corps with the gyroscopic stabilizer or "robot" developed by the Sperry Gyroscope Company. It automatically compensated for lateral, longitudinal or horizontal changes in flight through a system of electro-magnets. The mechanically controlled airplane could be given nearly neutral stability in design so that it would be much less affected by momentary changes in the direction of the relative wind, adding to the passengers' comfort and the pilot's ease of operation. Several transport lines planned to employ the "robot" on their planes experimentally during 1931.

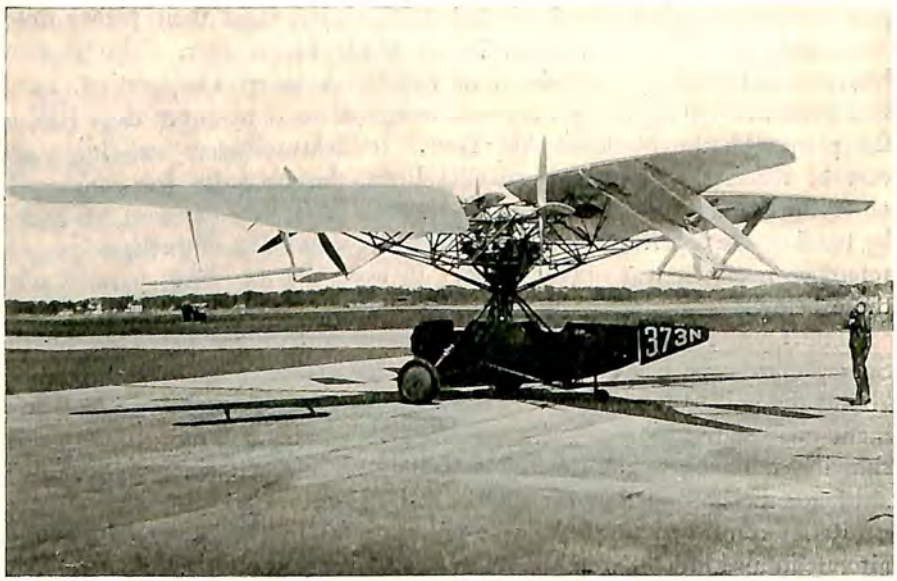
Instrument flying became increasingly important during 1930 as transport schedules were maintained and private fliers used their planes more extensively over extended areas in all kinds of weather. The Pioneer Instrument Company, a division of Bendix Aviation Corporation, introduced its new Straightway magnetic compass, used by more than half of the planes on the National Air Tour. Its features were steadiness and ease of reading. By use of parallel lines, the necessity for continually observing numbers on a dial was eliminated. After the pilot set his course by turning the top ring so the desired course coincided with the triangular reference mark, it was only necessary to keep the top wires parallel with those below.

The Gyro Horizon, an artificial horizon instrument perfected by the Sperry Gyroscope Company, was considered an important contribution to "blind flying." Weighing less than four pounds, this unimposing instrument enabled pilots to fly through fog, clouds or darkness in safety by showing the relative position of the plane with the horizon at all times, although the natural horizon could not be seen.

Radio continued to play an important part in the safe navigation of aircraft in all kinds of weather. Two-way voice communication was maintained on most of the transport planes flying the scheduled air lines, and most planes were equipped with radio sets to receive weather reports in flight. The radio beacons, both aural and visual types, were proving a distinct aid to regular navigation. Development of the visual reed indicator, produced by Julien P. Friez and Sons, was accomplished during the year for commercial use. The instrument provided the pilot with a visual check of his course at all times, day and night. Used in connection with the beacon system maintained by the Department of Commerce, the instrument indicated the course through two vibrating reeds, the relative amplitudes of which showed the position of the airplane in relation to the beacon course. Equal amplitude of the two reeds indicated that the plane was on its course. The company also developed a complete set of accurate weather instruments for use at airports and by weather bureaus for obtaining aviation weather data.

The importance of keeping instruments accurate at all times prompted

the Aircraft Control Corporation, a division of the Bendix Aviation Corporation, to develop a complete line of testing equipment for airplane instruments. The three most important perfected were the thermometer tester, altimeter tester, and pressure gauge tester. Others included an airspeed indicator tester, bank and turn indicator tester, and tachometer tester. The Motor Vita, an instrument invented by Dr. Miller Reese Hutchison, was successfully tried out during the year and arrangements made for its manufacture. This instrument indicated through a gauge on the instrument board the composition of the gas mixture passing through the engine



STRAIGHT UP: ITS AIM
Curtiss-Bleecker Helicopter (Pratt and Whitney Wasp) showing its unusual design, with each wing really a complete "airplane."

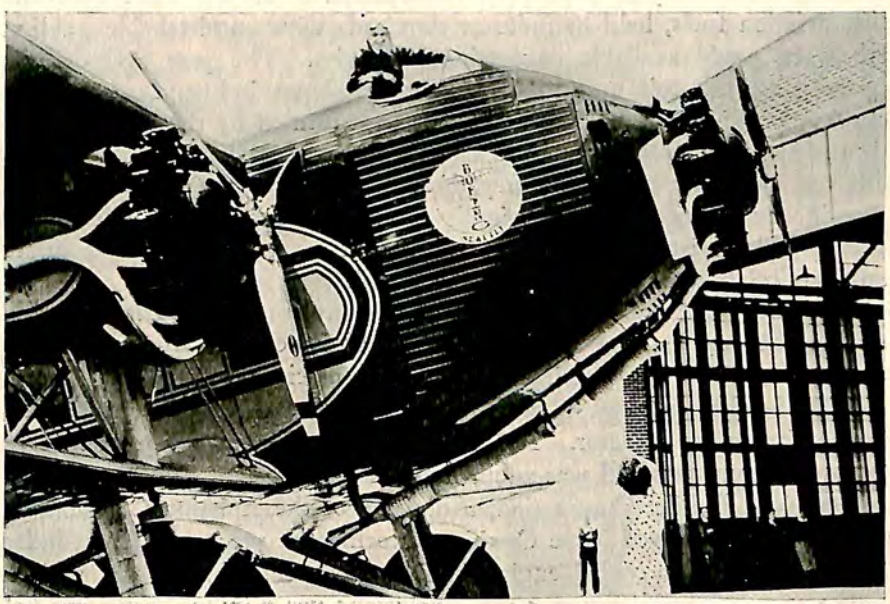
and provided means whereby air could be introduced into the intake manifold sufficiently to make perfect combustion, eliminating carbon monoxide and at the same time increasing the efficiency of the fuel from 20 to 40 per cent. The instrument was used by Capt. Frank Hawks in his Mystery Ship and the range of the plane was increased about 40 per cent.

Power Plant Development

The trend in engine development during the year was toward higher performance and consequent lower operating costs. In most cases this was achieved through refinements of design, rather than by the development of

NEW NORTHROP ALPHA IN FLIGHT

With a cruising speed of 150 miles an hour, the Northrop Alpha (Pratt and Whitney Wasp) is the first all-metal low wing cabin monoplane in America.



OPEN COCKPIT FOR TRI-MOTOR

New Boeing 80B, super transport biplane powered with three Pratt and Whitney Hornet engines, is equipped with an open pilot's cockpit for the first time.

any distinctly new type of power plant. The Packard Diesel and Pratt and Whitney fuel injection engines were the only distinctly new types introduced. There also was a marked degree of progress in the low horsepower field, where engines were developed to power new light airplanes built or under construction.

Engines of higher output were offered for commercial use, although a year or two before they could only have been used for racing, military operations or special purposes. In all these engines, the weight-horsepower ratio was reduced by continued "stepping up" of power. The usual procedure to effect the power increase was through supercharging, operating at greater crankshaft speeds, improving cylinder head and spark plug cooling, and using higher compression ratios. Higher cylinder temperatures for higher thermal efficiency also were permitted with both liquid-cooled and air cooled engines. These 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.

Inability of fliers to obtain fuel of uniform specification, when making cross country flights, retarded refinements in commercial engine design with a resulting loss of possible power estimated at from 15 to 20 per cent. and an increase in fuel consumption of at least 10 per cent. It was considered necessary to the future development of commercial aeronautics that aviation fuels, held to uniform standards with unmistakable grading labels, be made available over wide territories. The year saw definite progress toward this goal made by the petroleum industry. As an example, the Stanavo Specification Board, Inc., formed by the Standard Oil Company of California, Standard Oil Company of Indiana and the Standard Oil Company of New Jersey, brought out during the year Stanavo gasoline in addition to its previously announced Stanavo Oil. Its object was to make aviation gasoline and oil of uniform analysis available under an identical brand in all parts of the world.

The Curtiss Aeroplane and Motor Company concentrated its attention during the year on the chemical cooling of its 600 horsepower Curtiss Conqueror. The new cooling increased the efficiency of the engine and reduced head resistance and weight by effecting a three-fourths reduction in the size of the radiator. The Prestone cooled Conqueror passed all of its government tests and was adopted as standard.

Fairchild Engine Corporation, a division of the Aviation Corporation, obtained an Approved Type Certificate during the year on a six cylinder inverted in-line air cooled engine known as the Fairchild 6-390, with a rating of 120 horsepower at 2,150 revolutions per minute. Experimental development of a 12 cylinder inverted vee engine with the same cylinders also was undertaken.

Packard Motor Car Company introduced the only distinctly new type engine for the commercial field during 1930, the Packard Diesel. Operating on ordinary furnace oil, the engine completed the 4,935 miles of the National Air Tour, averaging 11.3 miles per gallon of fuel. It weighed 520 pounds and was rated at 225 horsepower at 1,950 revolutions per minute. It had no carburetor, magneto or spark plugs. Ignition was obtained by spraying fuel into air, compressed in the cylinders until it reached a temperature of about 1,000 degrees Fahrenheit. Because of its simplicity of design and construction, it could be disassembled in 17 minutes. First engines of the new type could be distinguished at any airport by a plume of smoke rising from them during a take-off, climb or other full throttle operating conditions. Means of reducing the smoke to a volume no greater than the conventional gas engine were found and incorporated into the design.

Pratt and Whitney Aircraft Company, a division of United Aircraft and Transport Corporation, perfected a device which eliminated the usual carburetor and intake system of the gasoline engine. A Boeing fighter powered with a stock model Wasp, with the fuel injection device attached, was successfully flown in April and experimentation continued throughout the year. The new injection system measured the fuel precisely and delivered it mechanically to each cylinder. Atomization was so perfect that a large range of fuels from furnace oil to aviation gasoline could be used. The system developed greater power with gasoline and provided perfect operation regardless of temperature of the engine or its position in the air. Cold starting was facilitated and trouble encountered as the result of ice forming on the carburetor was eliminated. Several engines using the device were put into service on the transport lines for tests. Early in the year, a standard nose cowl and a combined exhaust collector and air stove were made available for the Wasp Jr., offered to the commercial market in January. It was designed to decrease the drag of the engine and at the same time provide ample hot air for the carburetor under extremely cold operating conditions. The power output of engines in production, reviewed in the chapter "Producing American Engines," was increased through supercharging and use of higher compression ratios.

Wright Aeronautical Corporation, a division of the Curtiss-Wright Corporation, introduced a new model of its Cyclone series, the R-1820-E. It was rated at 575 horsepower as compared with 525 horsepower of the R-1750-E, and developed well over 600 horsepower at the normal 1,900 revolutions per minute. Temperature reduction over any other pre-existing models was accomplished by refinements in design of the cylinder head, ingenious spark plug coolers, and by air deflectors which properly directed the air around the cylinder head and barrel. The marked decrease in the temperature of the heads and in the spark plug area reduced, to a large

extent, any tendency of distortion in the cylinders. The supercharger centrifugal clutch was incorporated on all standard Whirlwind and Cyclone engines. The chief advantages of the clutch resulted through increasing the reliability of the engines by decreasing the shock on the teeth of the supercharger gears and in easing the strain on the entire unit. The new Cyclone developed nearly three times the power of Lindbergh's trans-Atlantic Whirlwind with only a 60 per cent. increase in weight. The average cylinder head temperatures of the new Cyclone was about 375 degrees Fahrenheit as compared to 575 degrees of the Lindbergh engine.

"ROBOT" PILOTS PLANE

Lieut. Marion Huggins (left) and Elmer A. Sperry, Jr., inventor (right), holding the two gyroscopes which piloted an Army bomber with greater accuracy than the best trained pilot.

It was demonstrated that 400 horsepower with 975 cubic inches displacement was practical with reasonably high grade fuels, and brake mean effective pressures as high as 165 pounds per square inch were not dangerous under proper conditions. Air cooled engines had reached a stage where they approximated water-cooled engines in their performance, a marked progress.

The products of other manufacturers in production or in various stages of experimentation also are described fully in that chapter. It might be interesting to point out here, however, that the development in the light airplane field resulted in a complementary stimulation of the low-powered

engine field. The Aeronca, Continental, and Szekely 30 and 40 horsepower engines were illustrative of this trend. Other low horsepower engines were certain to make their appearance during 1931.

Controllable Pitch Propeller

The outstanding development in propeller design during 1930 was the perfection of controllable pitch propellers, one by the Hamilton Standard Propeller Corporation, a division of United Aircraft and Transport Cor-

TWO-WAY COMMUNICATION

Pilot using the new Western Electric "silencer" type transmitter and phonette headset to talk with ground base while in flight.

portation and another by the Curtiss Aeroplane and Motor Company, a division of Curtiss-Wright. These new types of propellers, represented an achievement desired for years by leading aircraft and engine designers. In the Hamilton type, the variation in pitch was obtained through an hydraulic adjustment mechanism, built integral with the propeller and controllable from the pilot's cockpit. The mechanism was operated by means of the motor oil pressure lead to it through the hollow crankshaft. The pilot's control in the cockpit consisted simply of a two-way valve permitting a flow of oil into the mechanism or away from it. A flow of oil into the mechanism decreased the pitch, and flow of oil out of the mechanism with the aid of centrifugal force returned the pitch to normal

or increased it. It made possible the advantages of low pitch at the take-off and high pitch during level flight and for cruising.

The Curtiss type, perfected by the Curtiss Aeroplane and Motor Company, Inc., in cooperation with W. R. Turnbull, was an electrically controlled, variable pitch propeller. It successfully underwent exhaustive flight tests during the year. A switch on the dashboard operated a motor in the hub of the propeller which through the use of heliocentric gears made the pitch of the blade controllable at will by the pilot without any compli-

ENGINE BURNS FURNACE OIL

Furnace oil is poured into a Pratt and Whitney Wasp engine equipped with a new device which eliminates the usual carburetor and intake for gas engines.

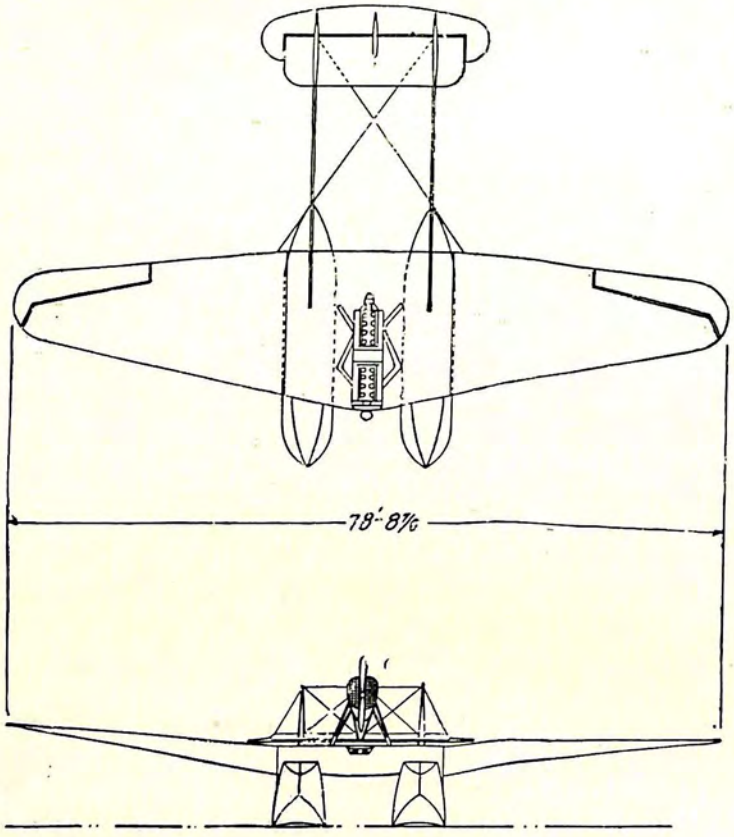
cated mechanical connecting devices, electric control being transmitted through contact rings on the hub of the motor from the cockpit.

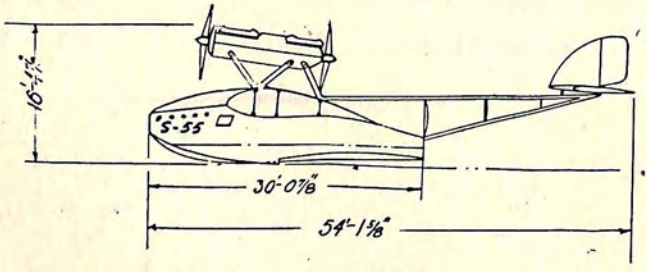
The important part played in the refinement of component parts for airplane power plants already has been discussed in the chapter "Producing American Engines." It should be sufficient here to point out that starters, generators, ignition devices, magnetos, superchargers, carburetors, batteries and similar parts manufactured by specialists all played their part in improving the efficiency of the present day engine.

The Society of Automotive Engineers in cooperation with the Aeronautical Chamber of Commerce made valuable contributions to the technical field during the year by providing a forum of discussion through numerous meetings throughout the country and through the development

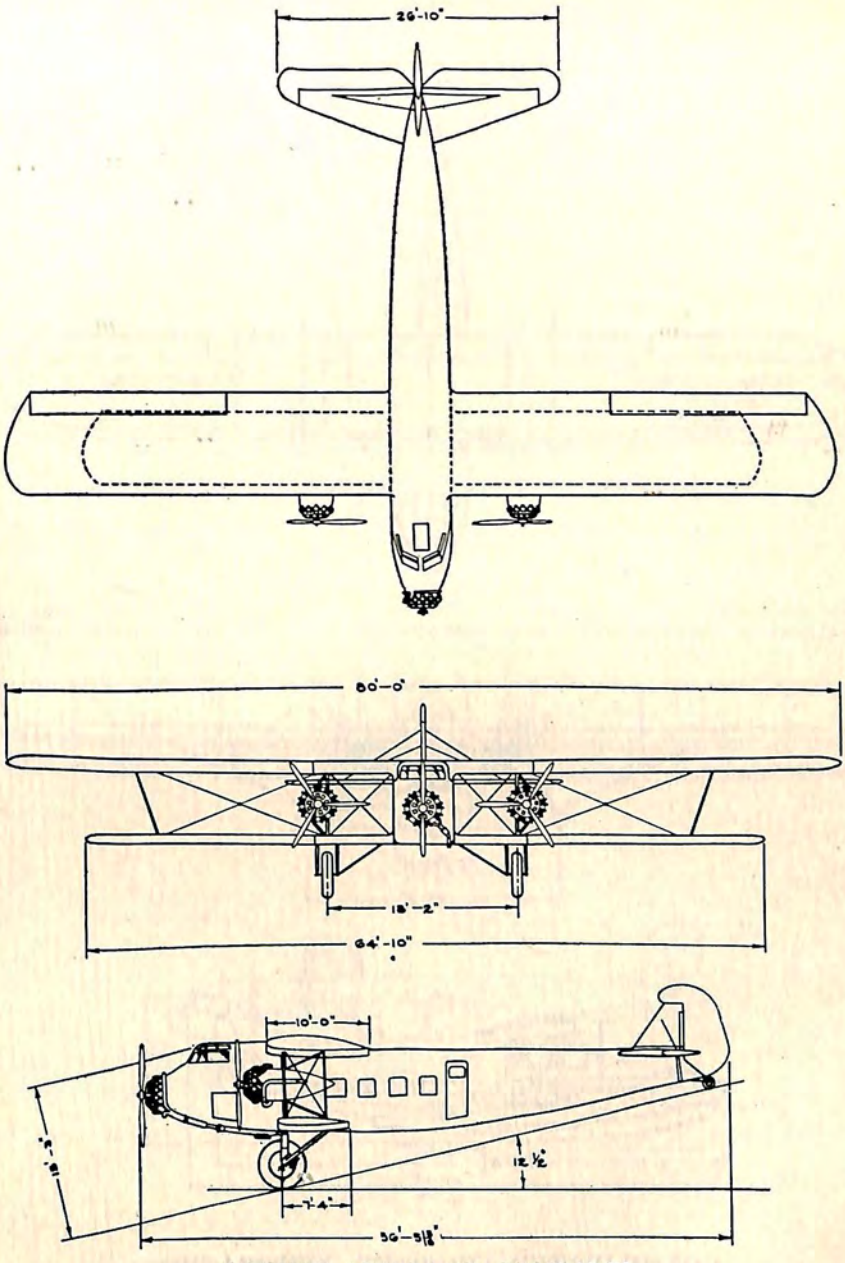
of new aircraft and engine standards. New specifications were adopted by the industry on flat-head pins, internal tie rods, pulley spacers, anti-friction bearing pulleys, small size tapered shaft-end and hub, streamline tie rods, extruded aluminum alloy sheets, aluminum and duralumin rivets, and shock absorber strut ends. Important projects under consideration included the further development of the splined shaft-end and hub specifications, propeller hub cones and nuts, and aircraft carburetor flanges.

DESIGN SECTION

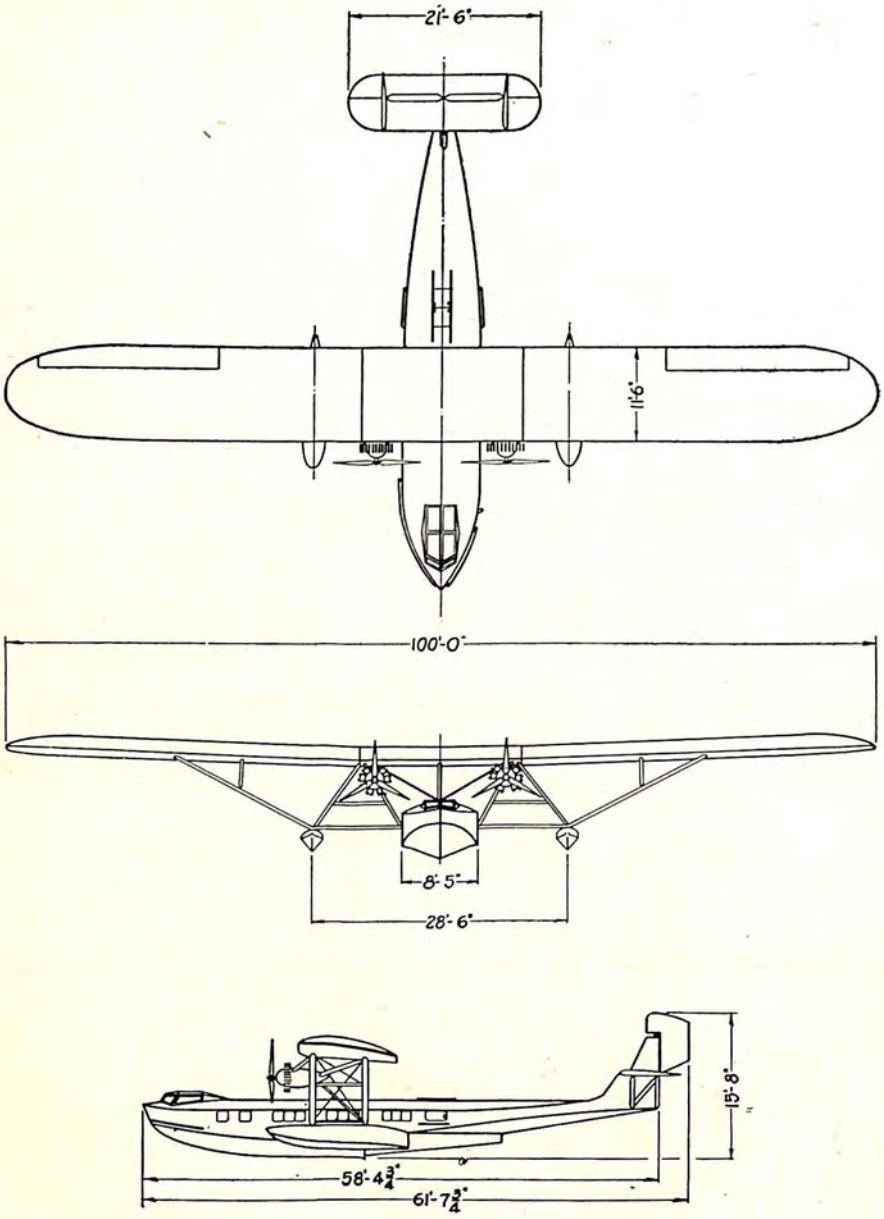




AMERICAN AERONAUTICAL CORPORATION
New York City
MODEL S-55 — 15 PLACE
ENGINE: TWO ISOTTA FRASCHINI
TWO WRIGHT CYCLONE



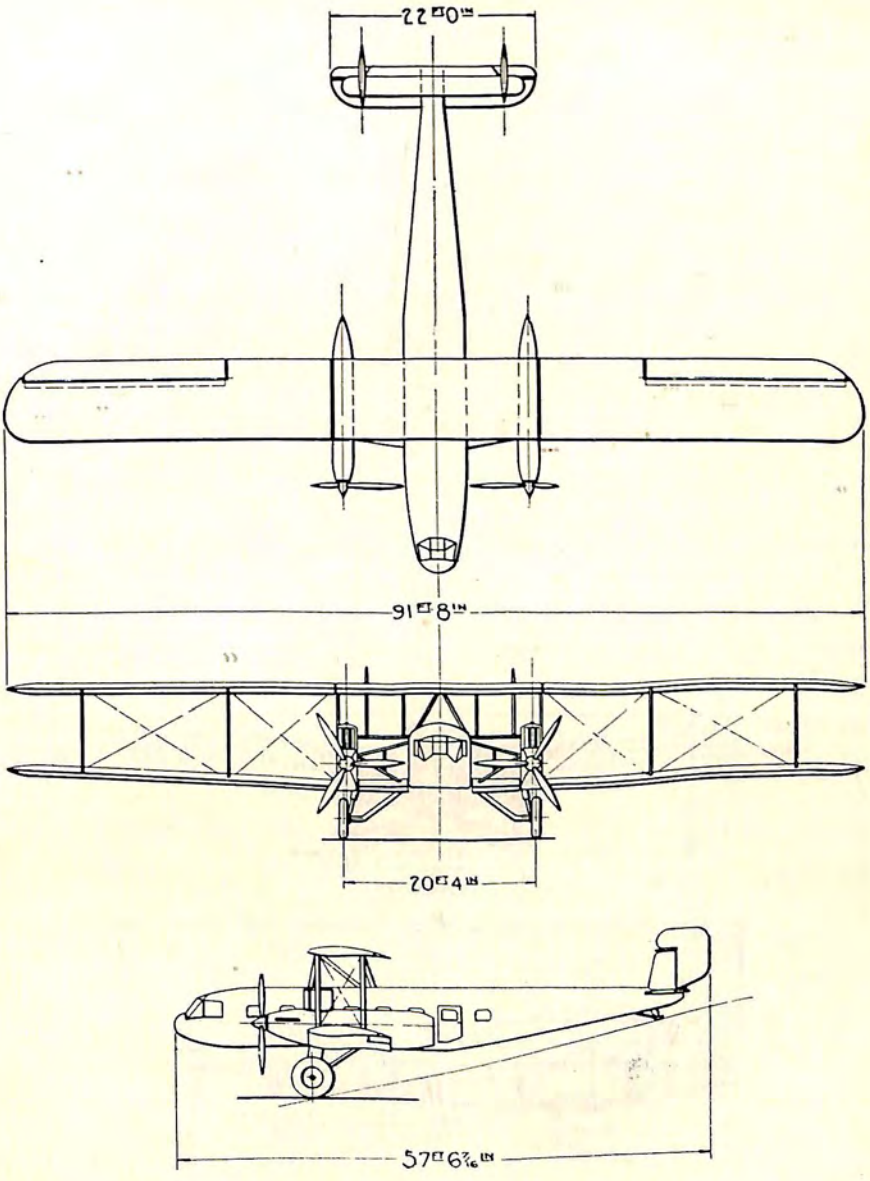
BOEING AIRPLANE COMPANY
Seattle, Wash.
MODEL 80–A — 20 PLACE
ENGINE: THREE PRATT & WHITNEY HORNETS



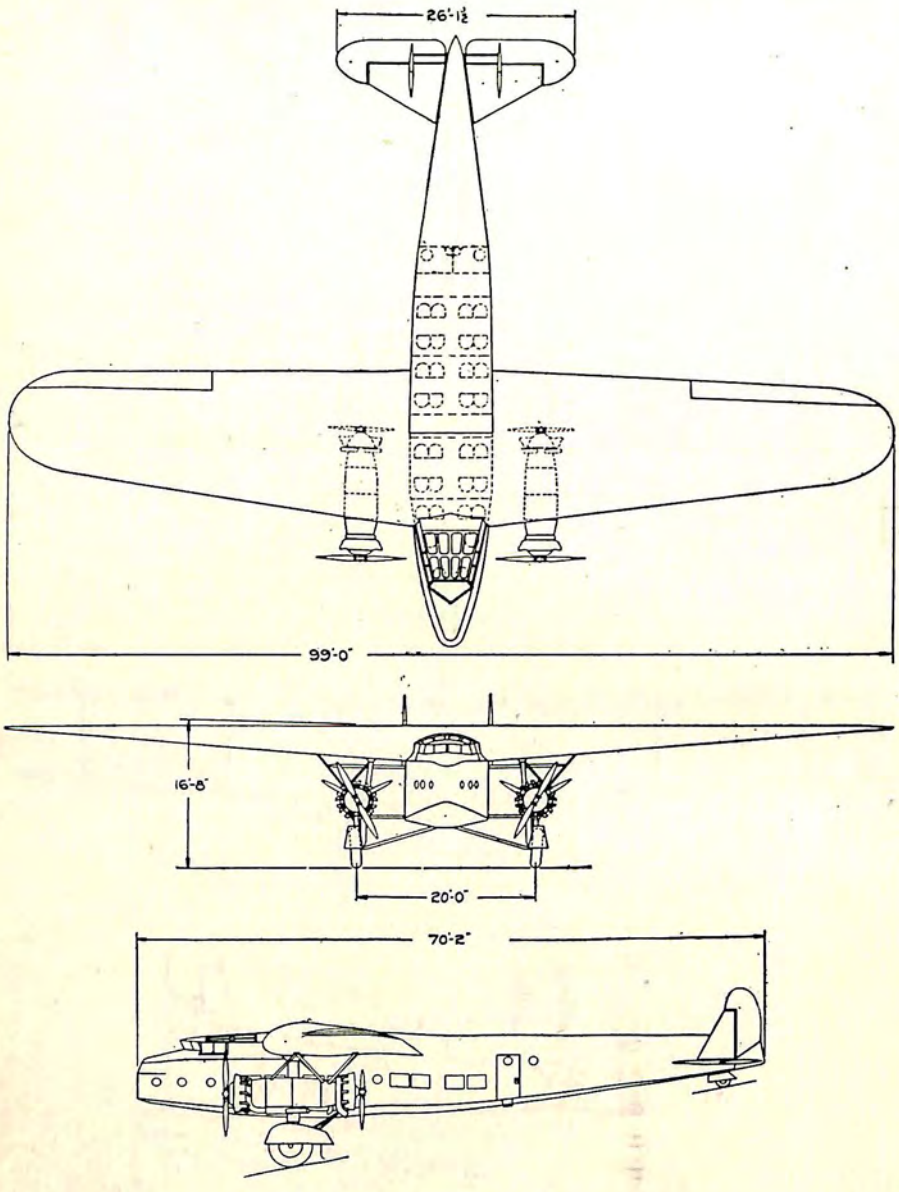
CONSOLIDATED AIRCRAFT CORPORATION
Buffalo, N. Y.

COMMODORE — 22 PLACE

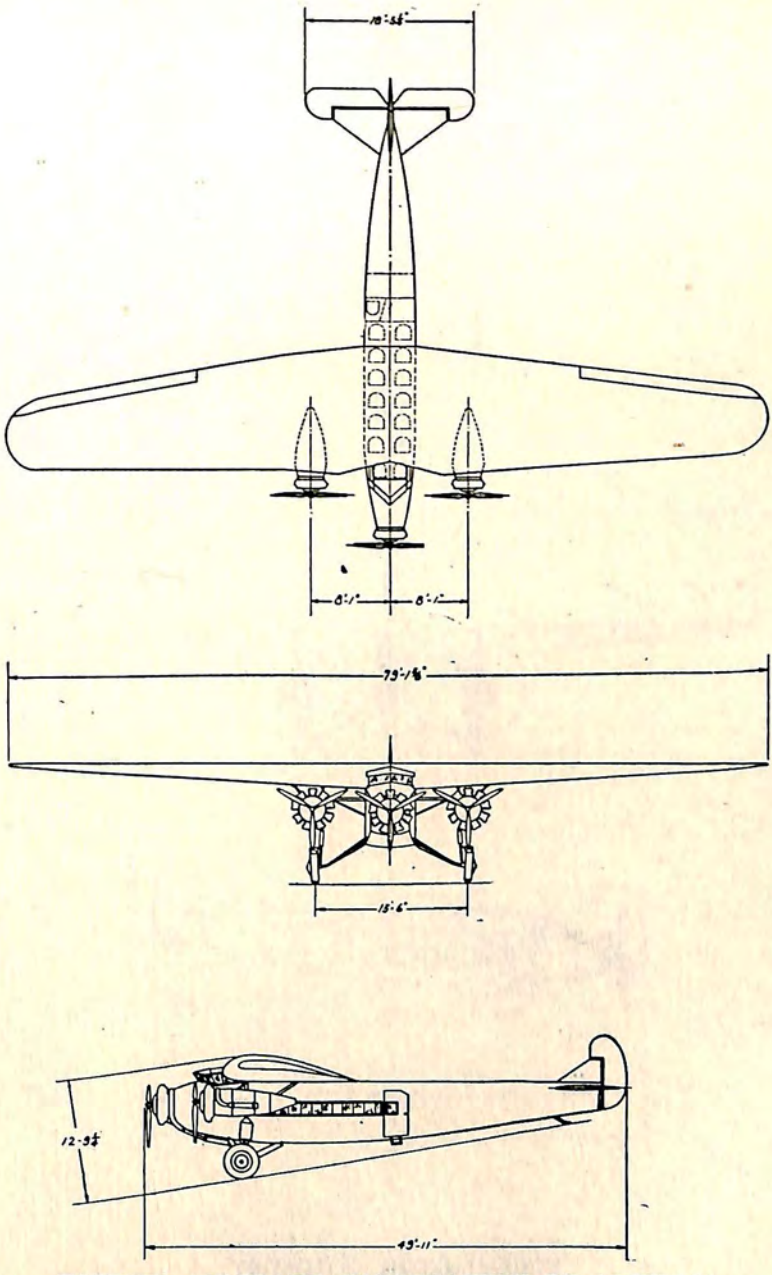
ENGINE: TWO PRATT & WHITNEY HORNETS



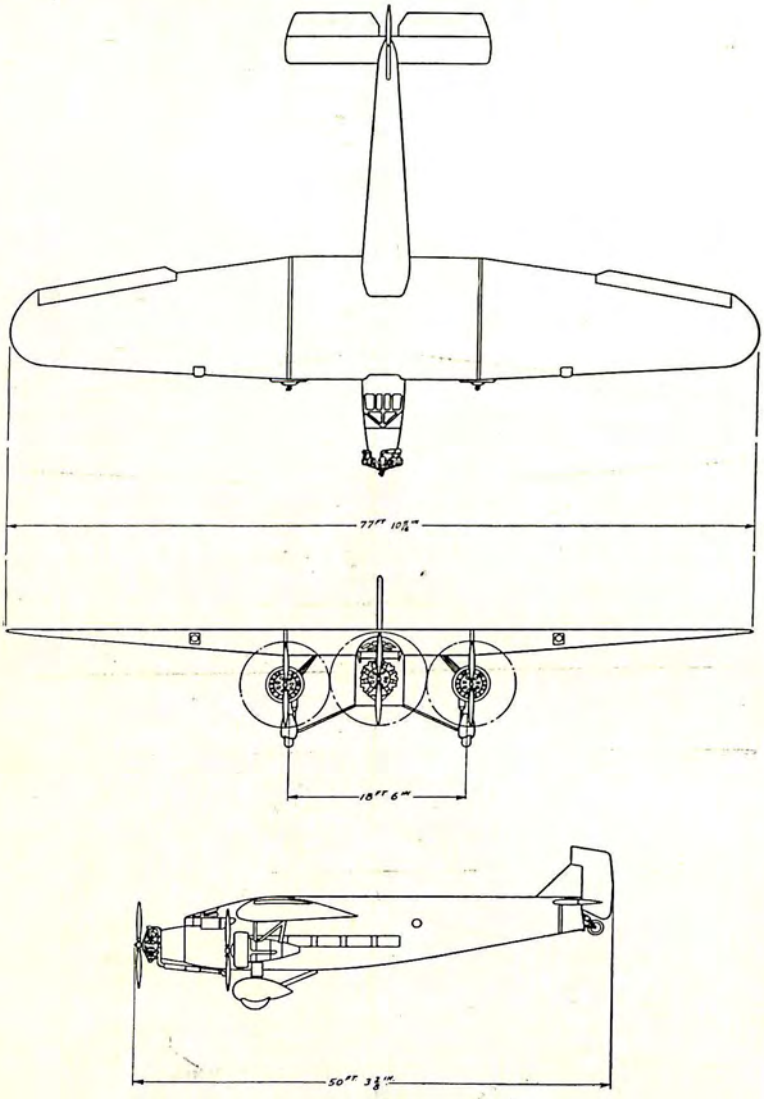
CURTISS AEROPLANE & MOTOR COMPANY
Garden City, L. I., N. Y.
CONDOR — 20 PLACE
ENGINE: TWO CURTISS GEARED CONQUERORS



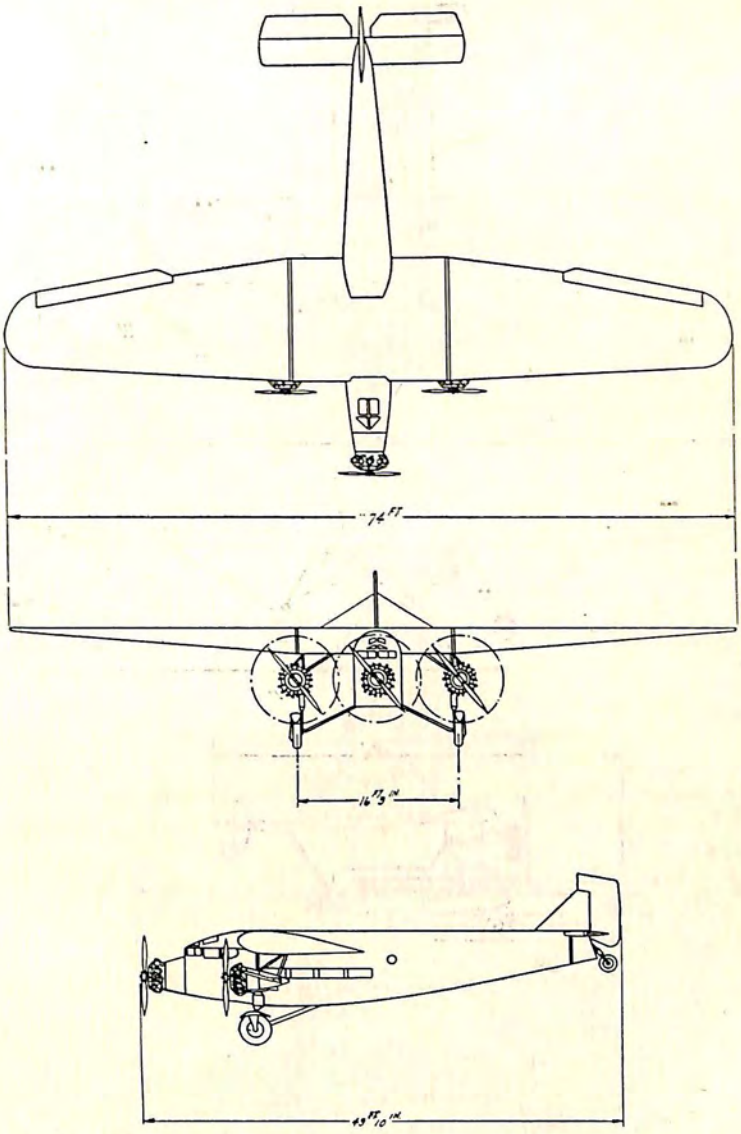
FOKKER AIRCRAFT CORPORATION OF AMERICA
New York City
MODEL F–32 — 32 PLACE
ENGINE: FOUR PRATT & WHITNEY HORNETS



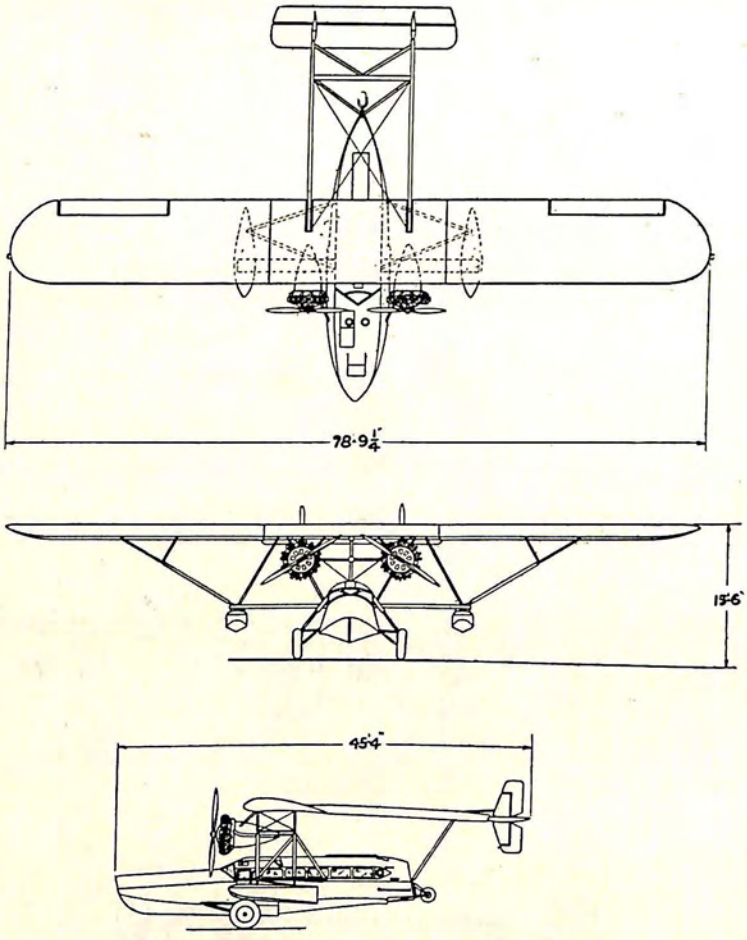
FOKKER AIRCRAFT CORPORATION OF AMERICA
New York City
MODEL F–10 — 14 PLACE
ENGINE: THREE PRATT & WHITNEY WASPS



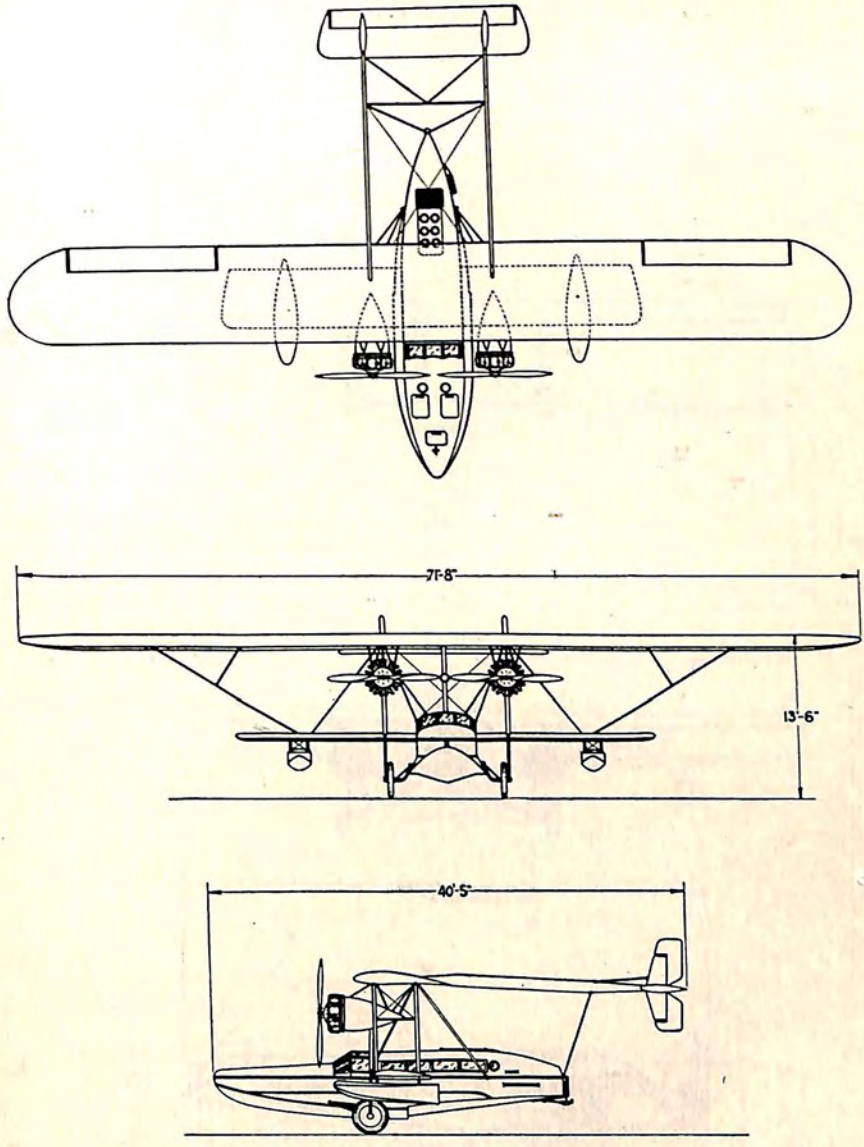
FORD MOTOR COMPANY
Stout Metal Airplane Division
Dearborn, Mich.
MODEL 5-AT-C — 15 PLACE
ENGINE: THREE PRATT & WHITNEY WASPS



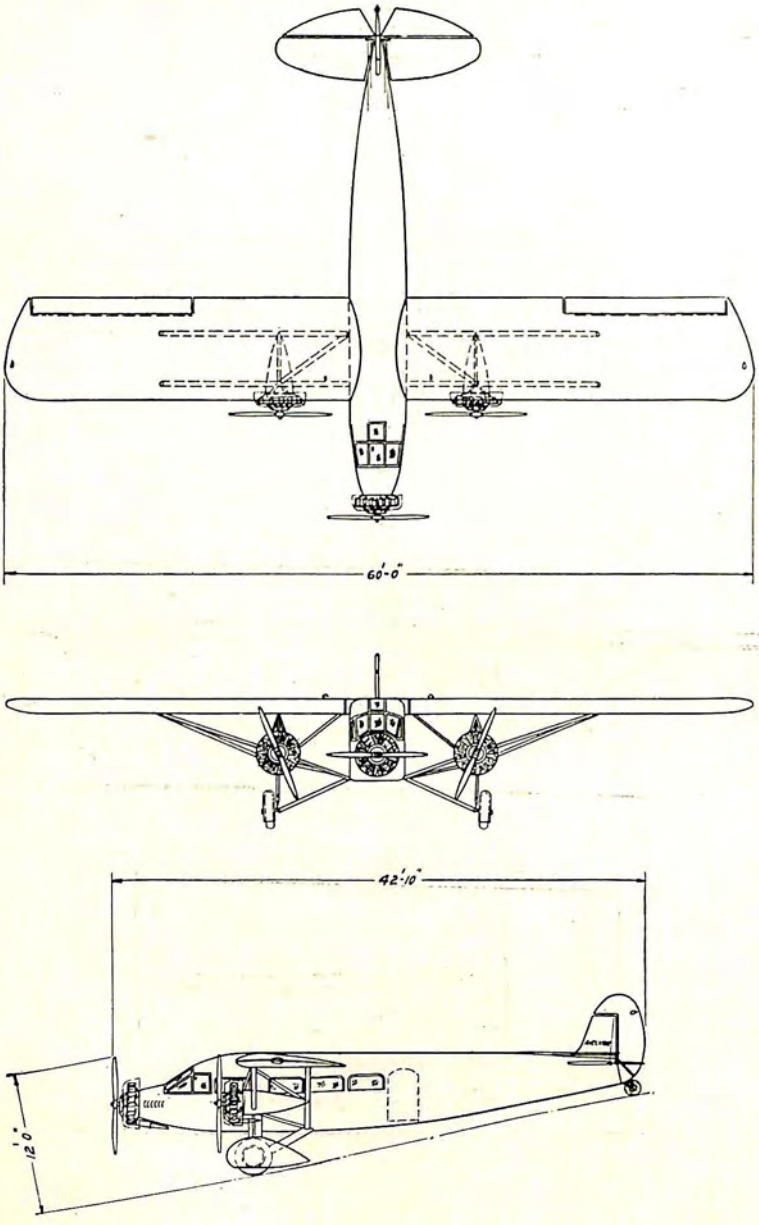
FORD MOTOR COMPANY
Stout Metal Airplane Division
Dearborn, Mich.
MODEL 4-AT — 14 PLACE
ENGINE: THREE PRATT & WHITNEY WASP, JRS.
THREE WRIGHT WHIRLWIND, 300



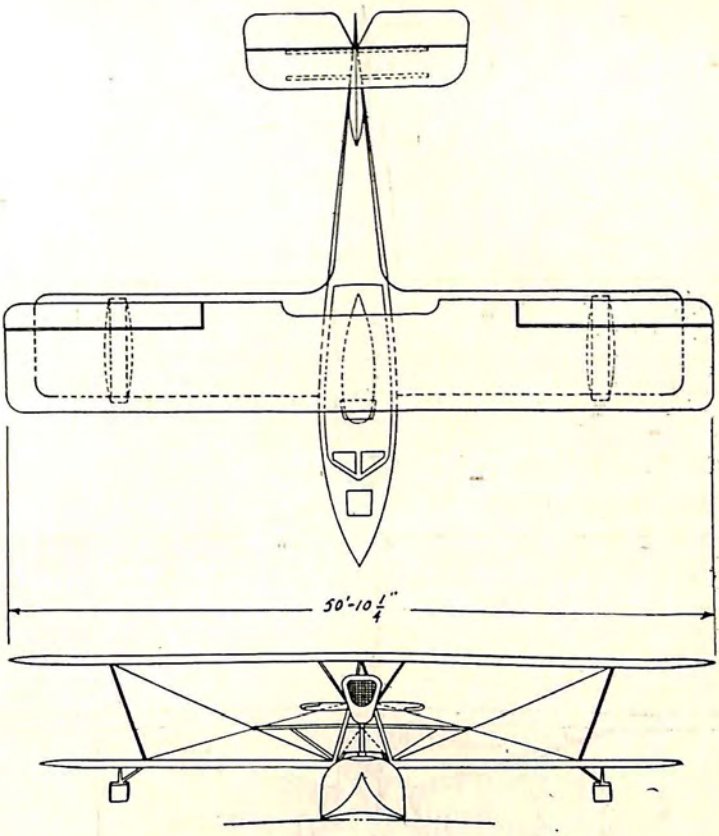
SIKORSKY AVIATION CORPORATION
Bridgeport, Conn.
AMPHIBION S-41 — 16 PLACE
ENGINE: TWO PRATT & WHITNEY HORNETS

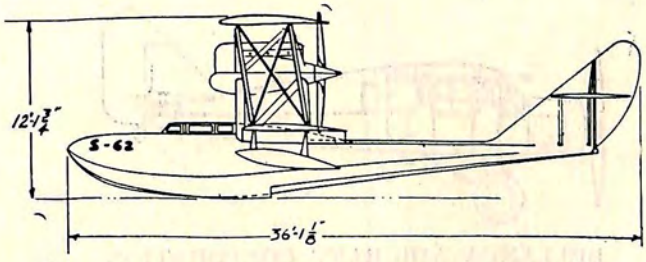


SIKORSKY AVIATION CORPORATION
Bridgeport, Conn.
AMPHIBION S-38 — 10-12 PLACE
ENGINE: TWO PRATT & WHITNEY WASPS

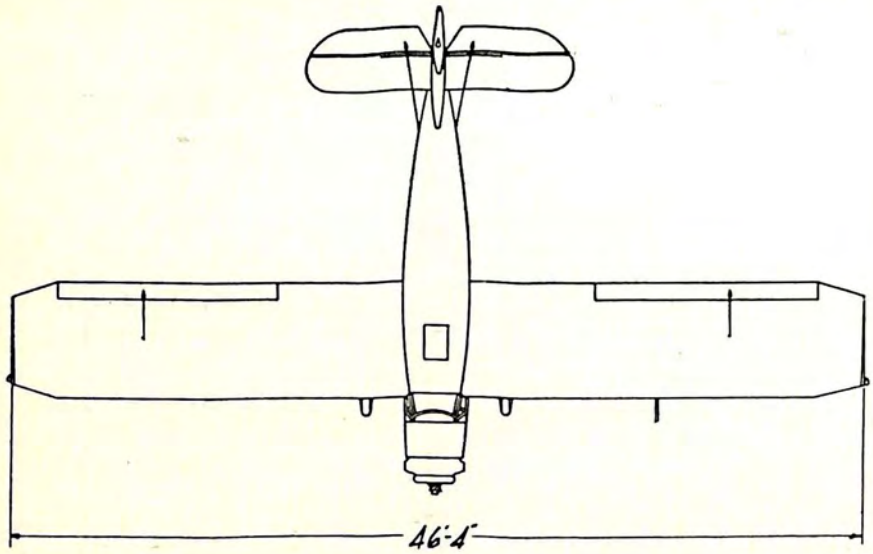


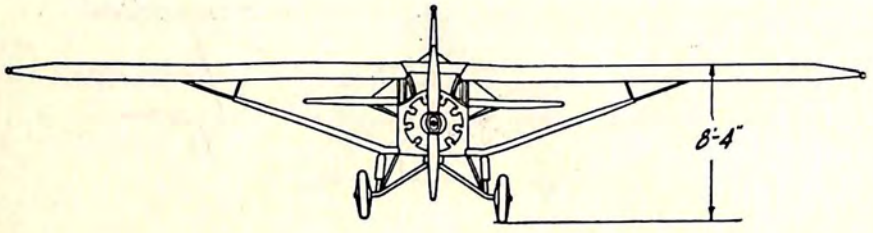
STINSON AIRCRAFT CORPORATION
Wayne, Mich.
MODEL SM–6000 — 11 PLACE
ENGINE: THREE LYCOMINGS

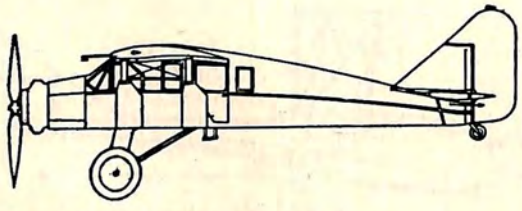




AMERICAN AERONAUTICAL CORPORATION
New York City
MODEL S 62 — 7 PLACE
ENGINE: ISOTTA FRASCHINI



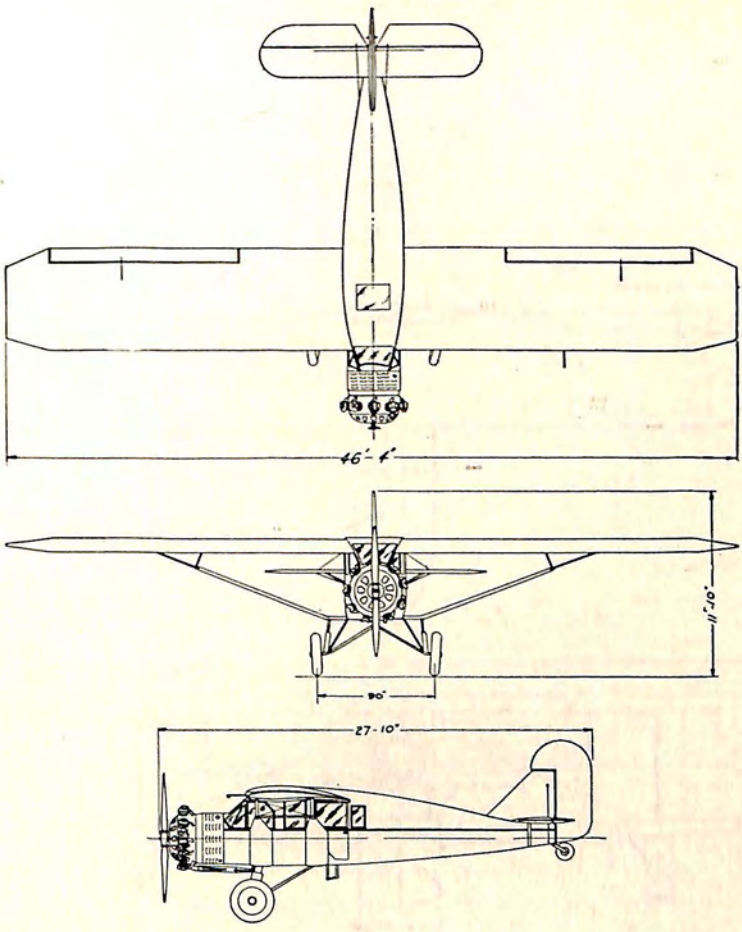




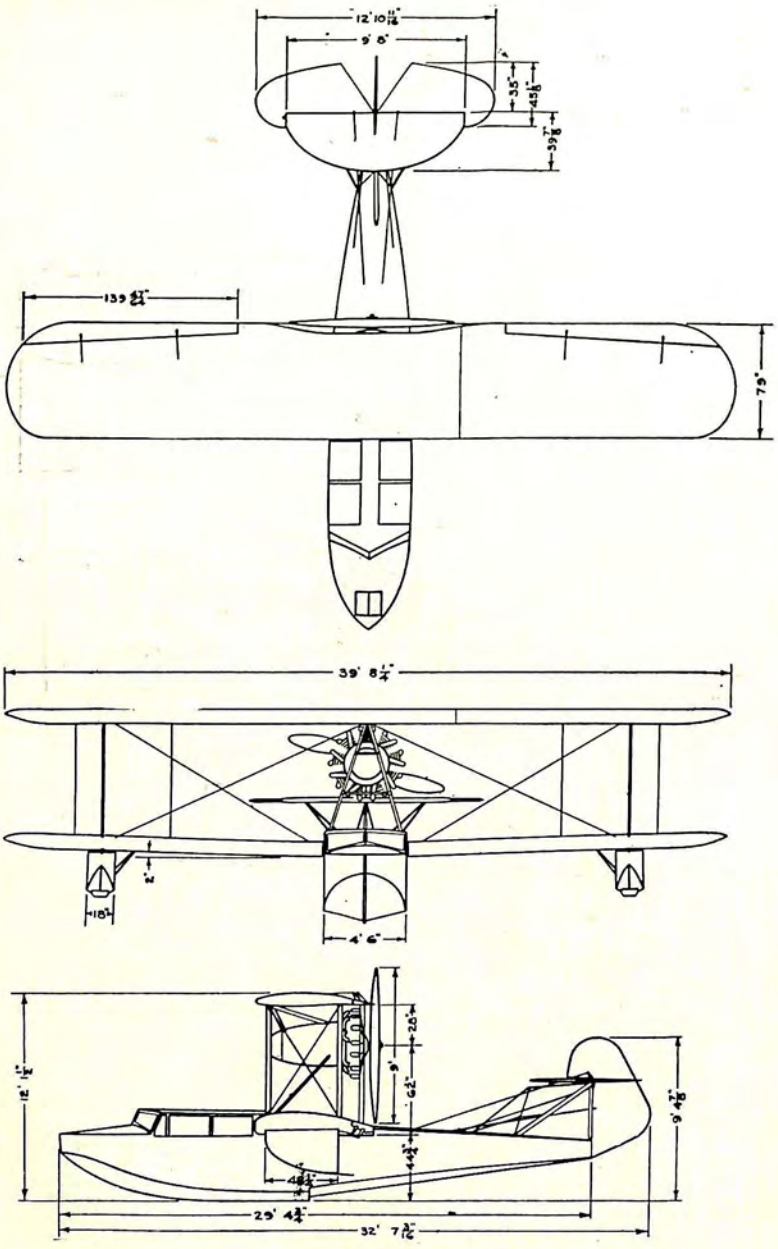
BELLANCA AIRCRAFT CORPORATION
New Castle, Del.

PACEMAKER — 6 PLACE

ENGINE: PACKARD DIESEL
PRATT & WHITNEY WASP, JR.
WRIGHT WHIRLWIND 300



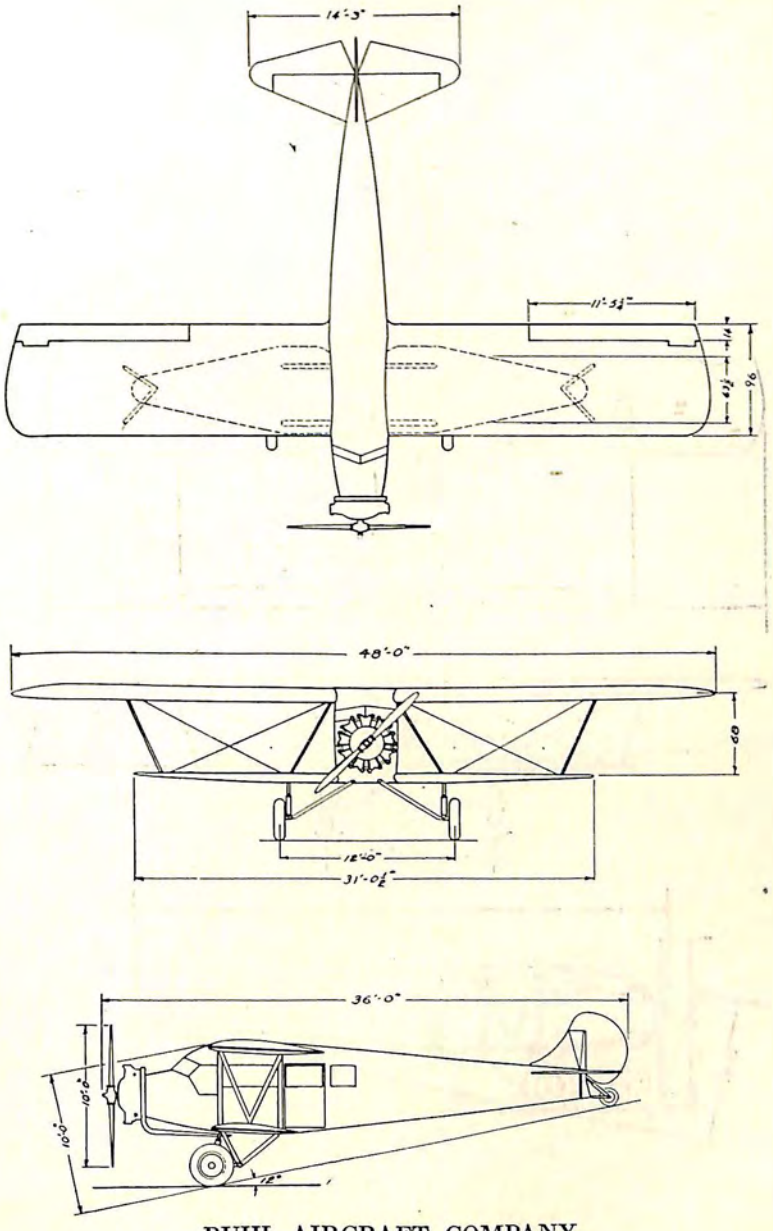
BELLANCA AIRCRAFT CORPORATION
New Castle, Del.
SKYROCKET — 6 PLACE
ENGINE: PRATT & WHITNEY WASP



BOEING AIRPLANE COMPANY
Seattle, Wash.

MODEL 204 — 6 PLACE

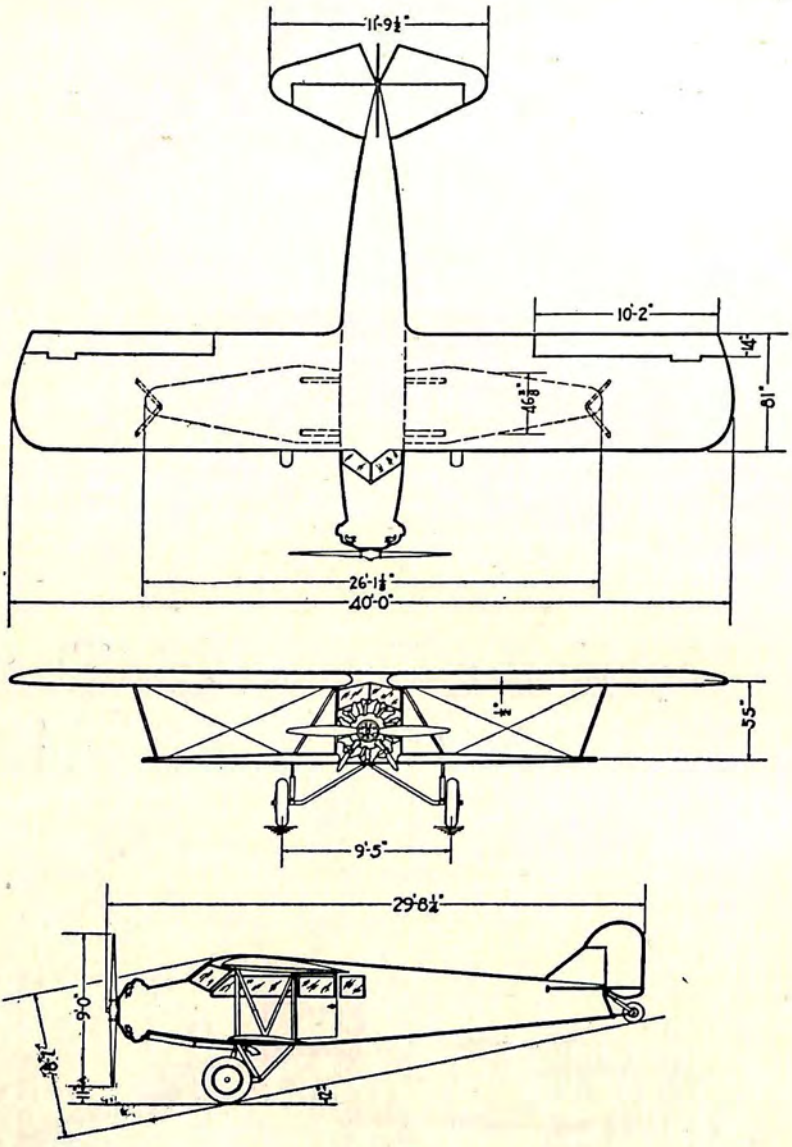
ENGINE: PRATT & WHITNEY WASP



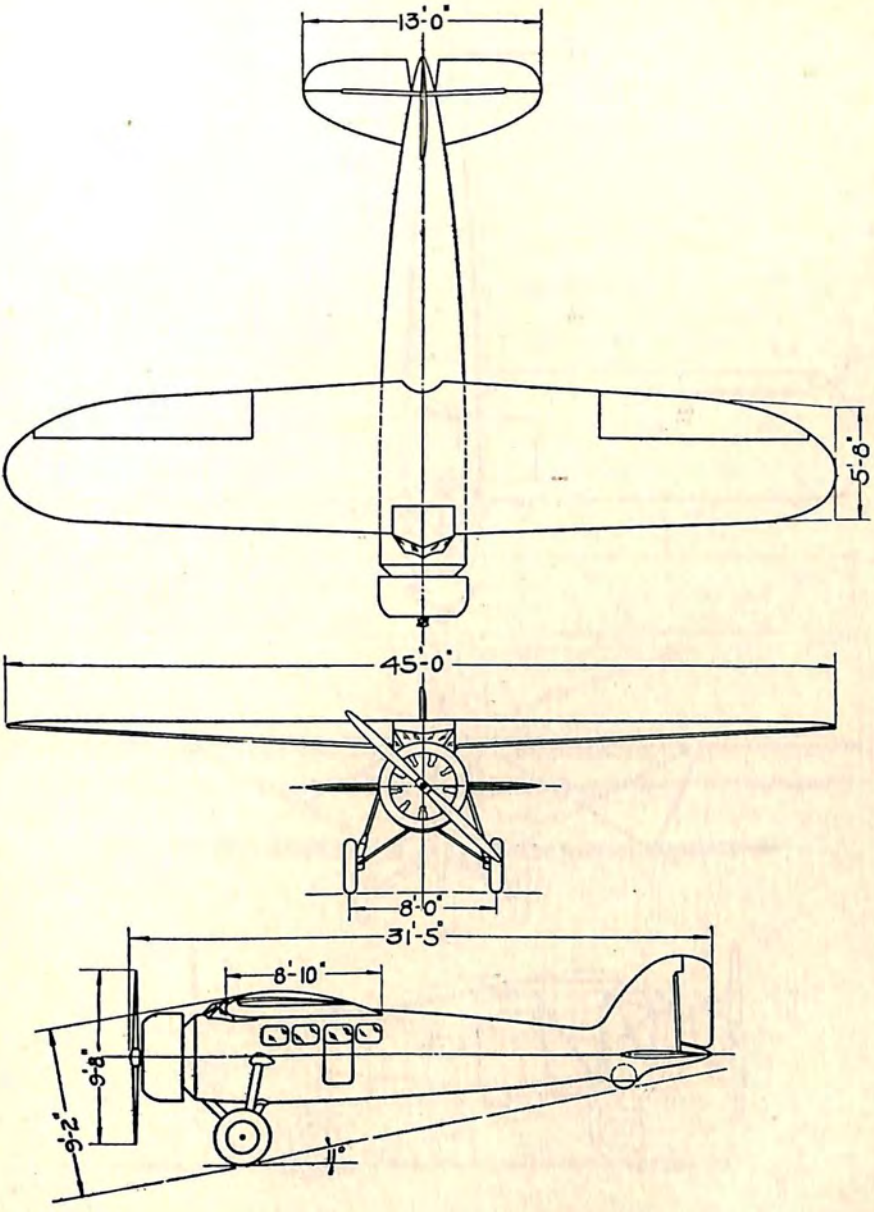
BUHL AIRCRAFT COMPANY
Marysville, Mich.

SENIOR AIRSEDAN CA–8 — 8 PLACE

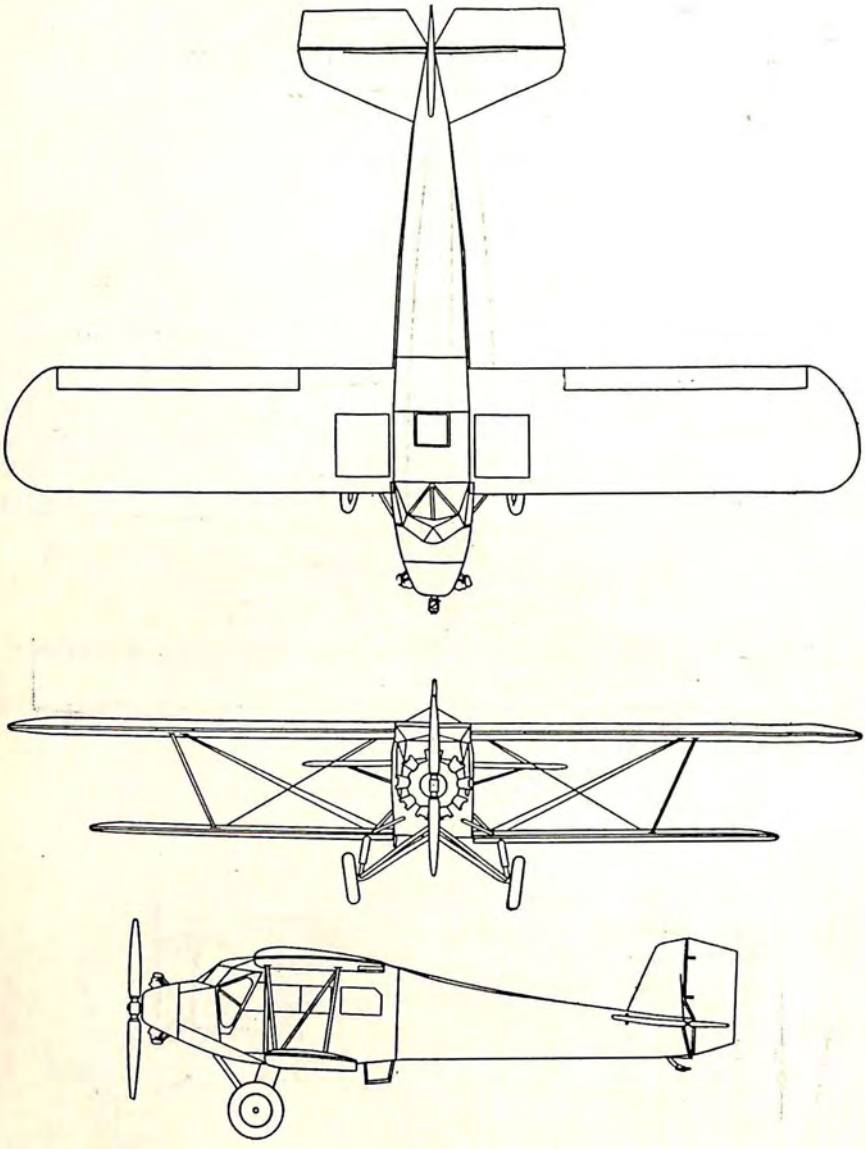
ENGINE: PRATT & WHITNEY WASP
PRATT & WHITNEY HORNET
WRIGHT CYCLONE



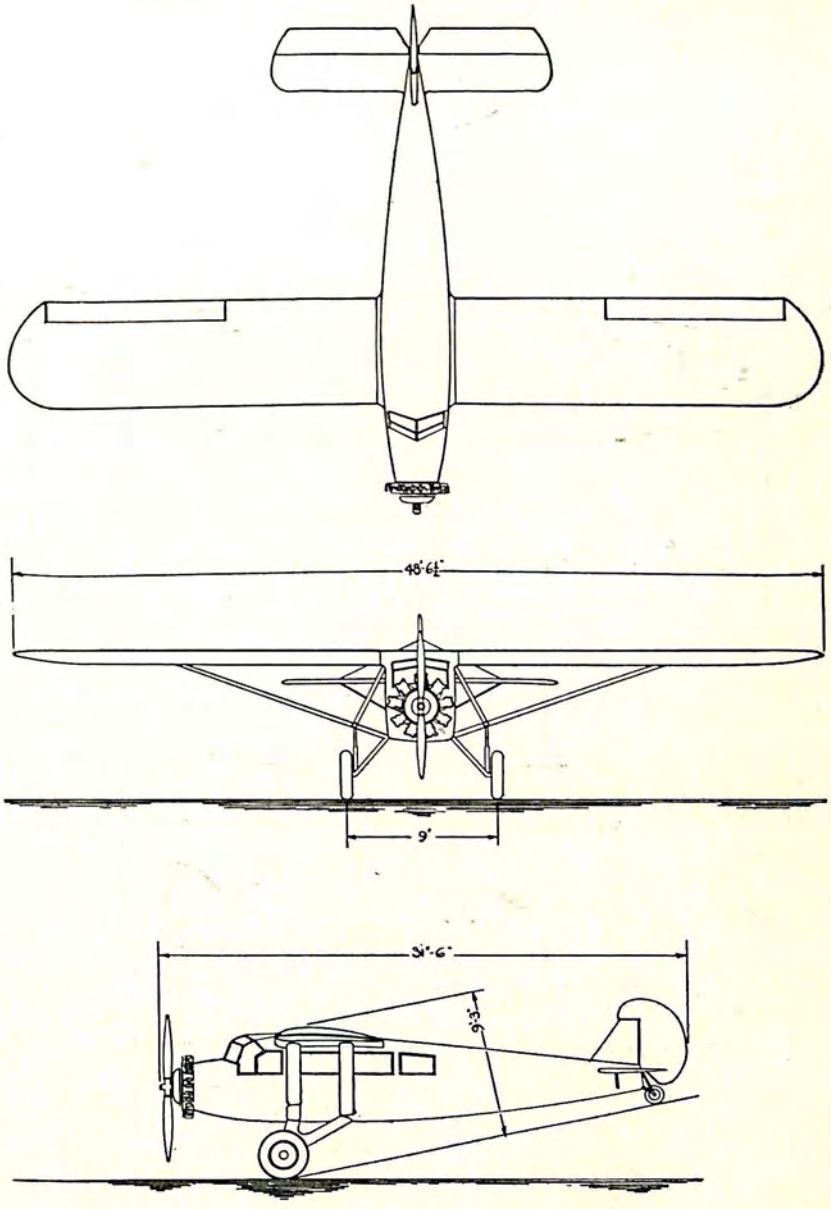
BUHL AIRCRAFT COMPANY
Marysville, Mich.
STANDARD AIRSEDAN CA-6 — 6 PLACE
ENGINE: WRIGHT WHIRLWIND 300



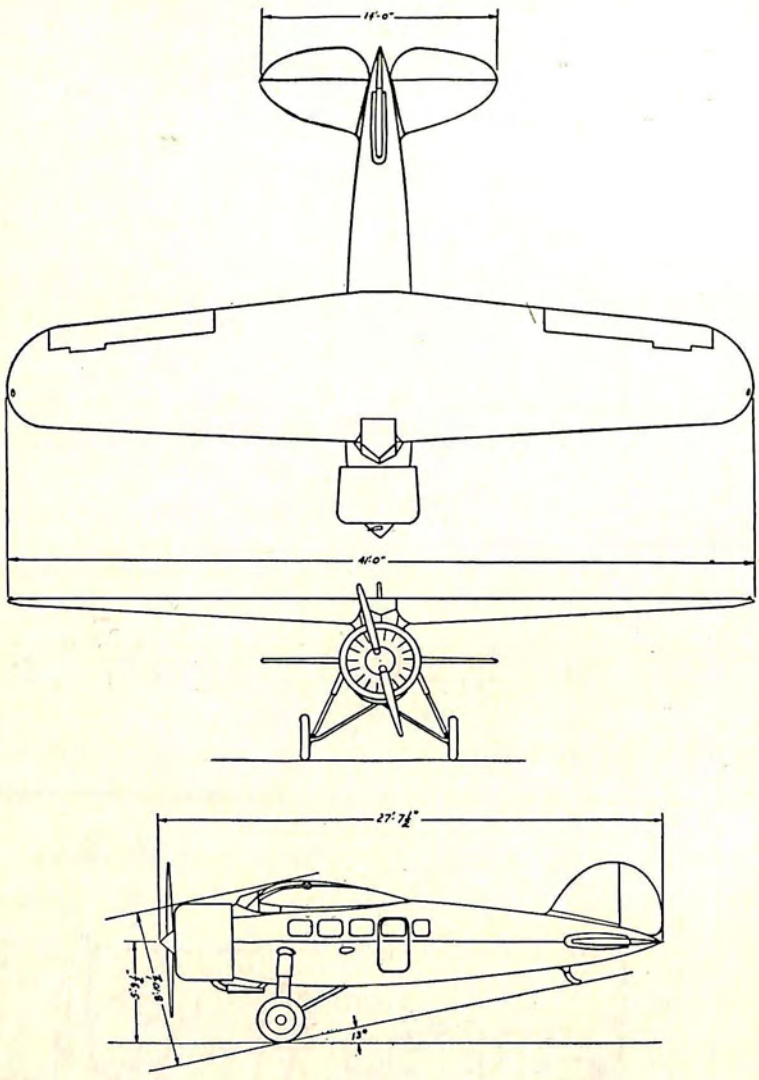
CONSOLIDATED AIRCRAFT CORPORATION
Buffalo, N. Y.
FLEETSTER — 8 PLACE
ENGINE: PRATT & WHITNEY HORNET



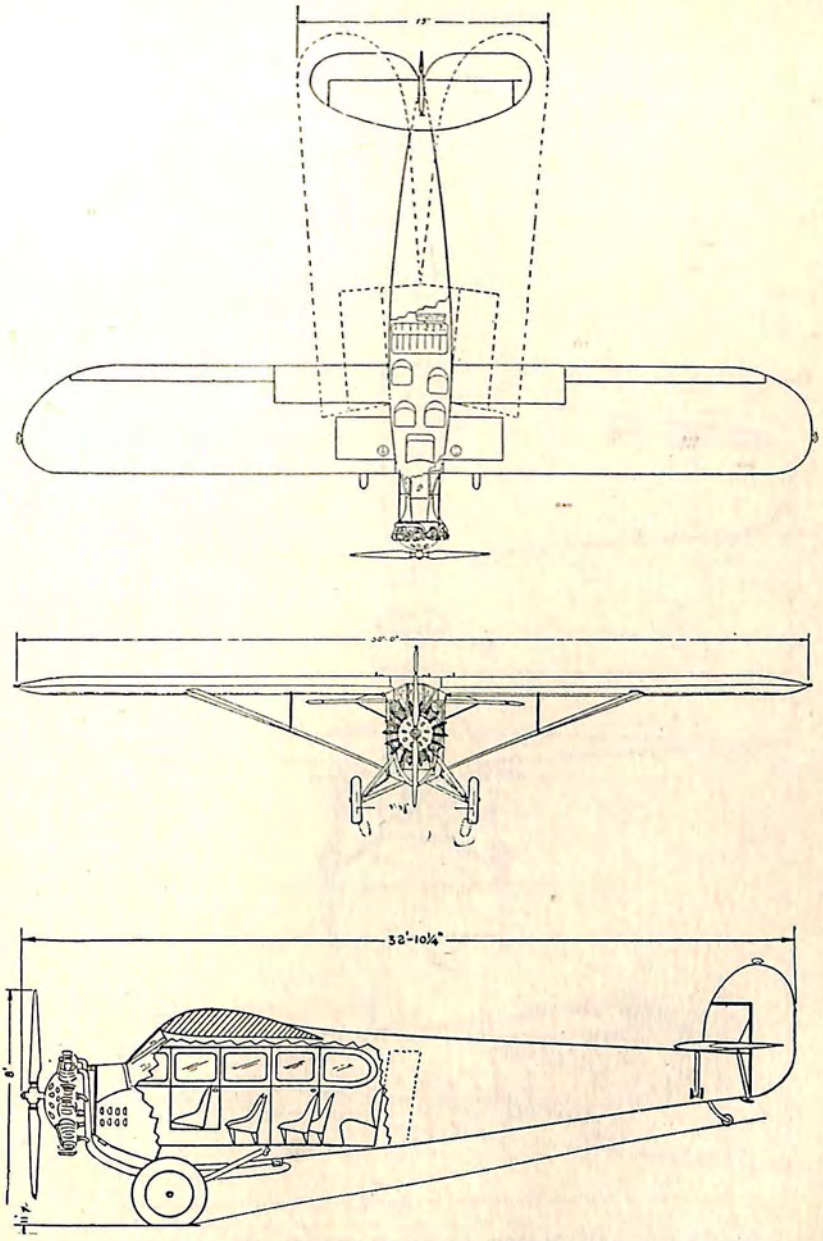
CUNNINGHAM HALL AIRCRAFT CORPORATION
Rochester, N. Y.
P T 6 — 6 Place
Engine: Wright Whirlwind 300



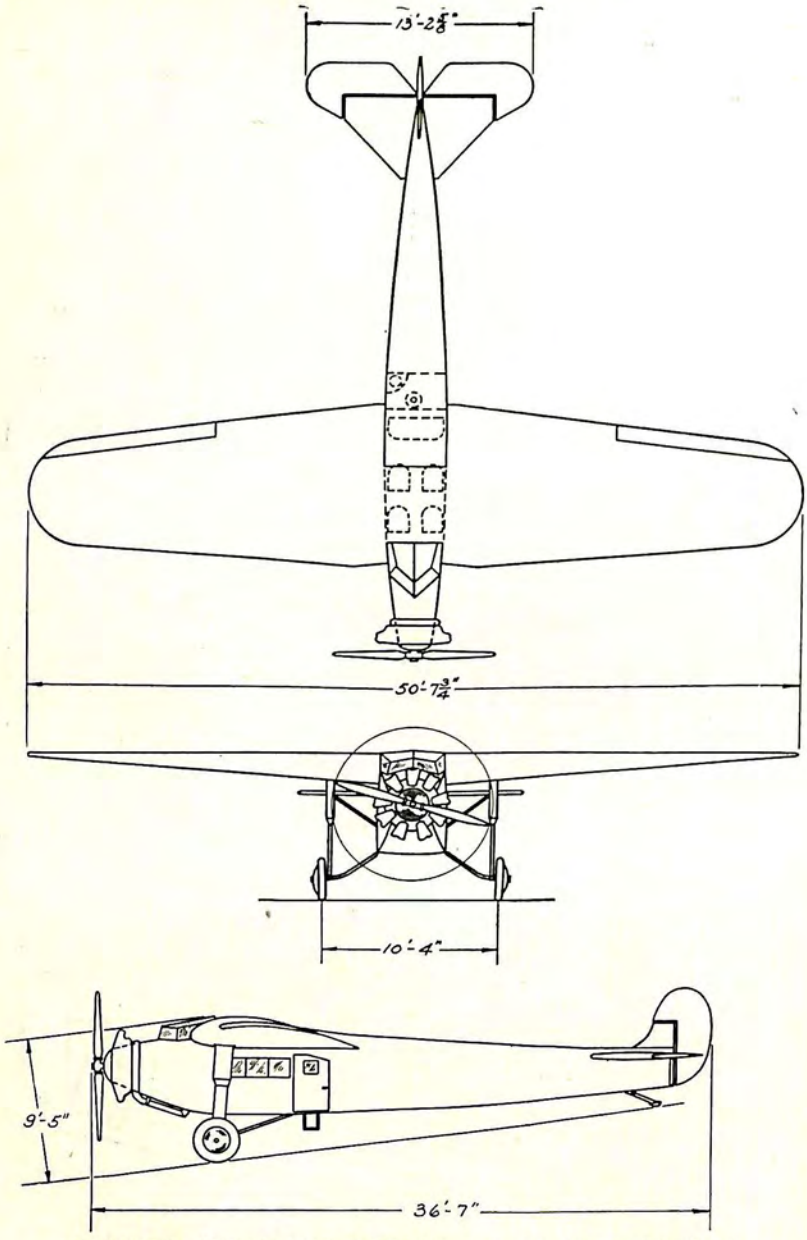
CURTISS-WRIGHT AIRPLANE COMPANY
Wichita, Kan.
MODEL 6000A–6000B — 6 PLACE
ENGINE: PRATT & WHITNEY WASP
WRIGHT WHIRLWIND 300



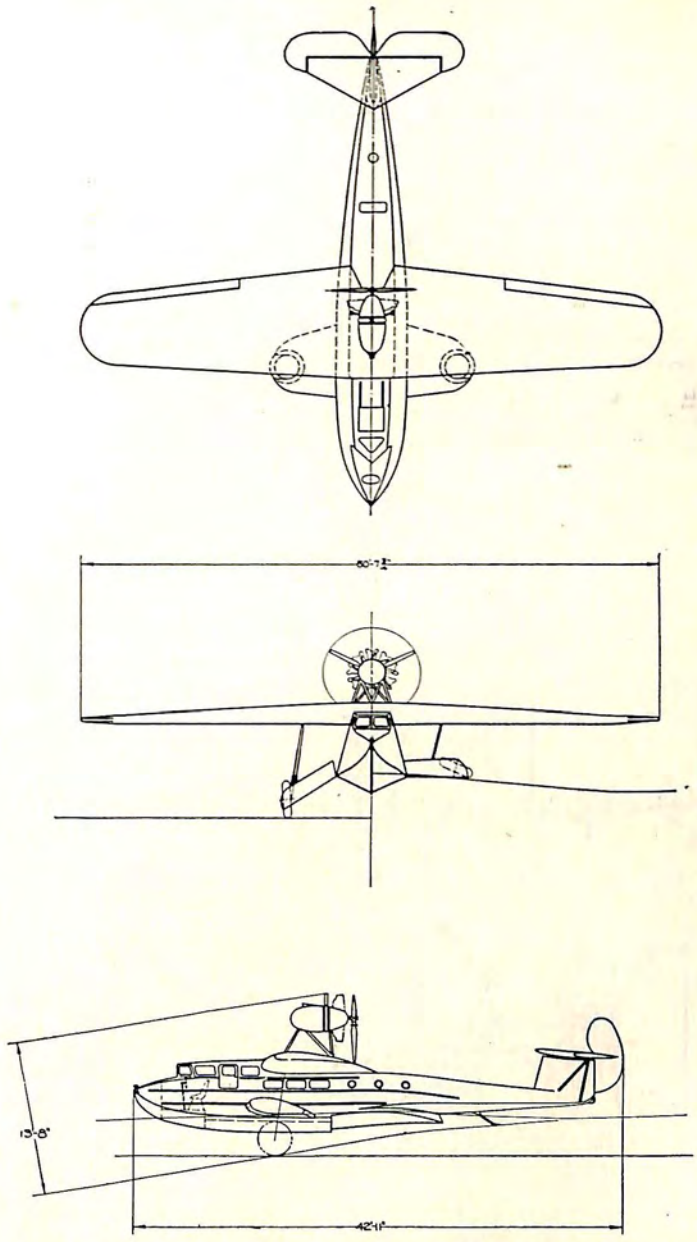
DETROIT AIRCRAFT CORPORATION
Detroit, Mich.
DETROIT LOCKHEED METAL VEGA — 7 PLACE
ENGINE: PRATT & WHITNEY WASP



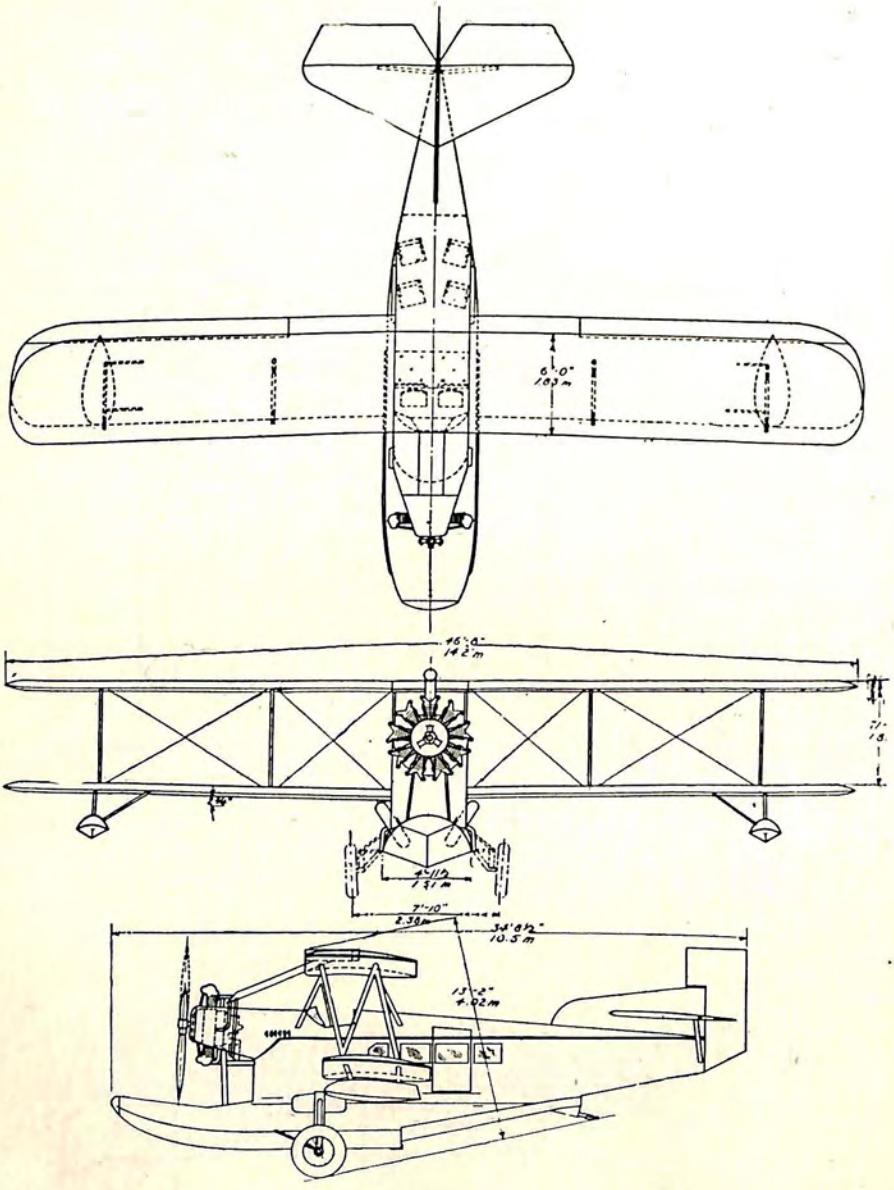
FAIRCHILD AIRPLANE MANUFACTURING CORPORATION
Farmingdale, L. I., N. Y.
FAIRCHILD 71 — 7 PLACE
ENGINE: PRATT & WHITNEY WASP



FOKKER AIRCRAFT CORPORATION OF AMERICA
New York City
UNIVERSAL–SUPER UNIVERSAL — 5–7 PLACE
ENGINE: PRATT & WHITNEY WASP
WRIGHT WHIRLWIND 300

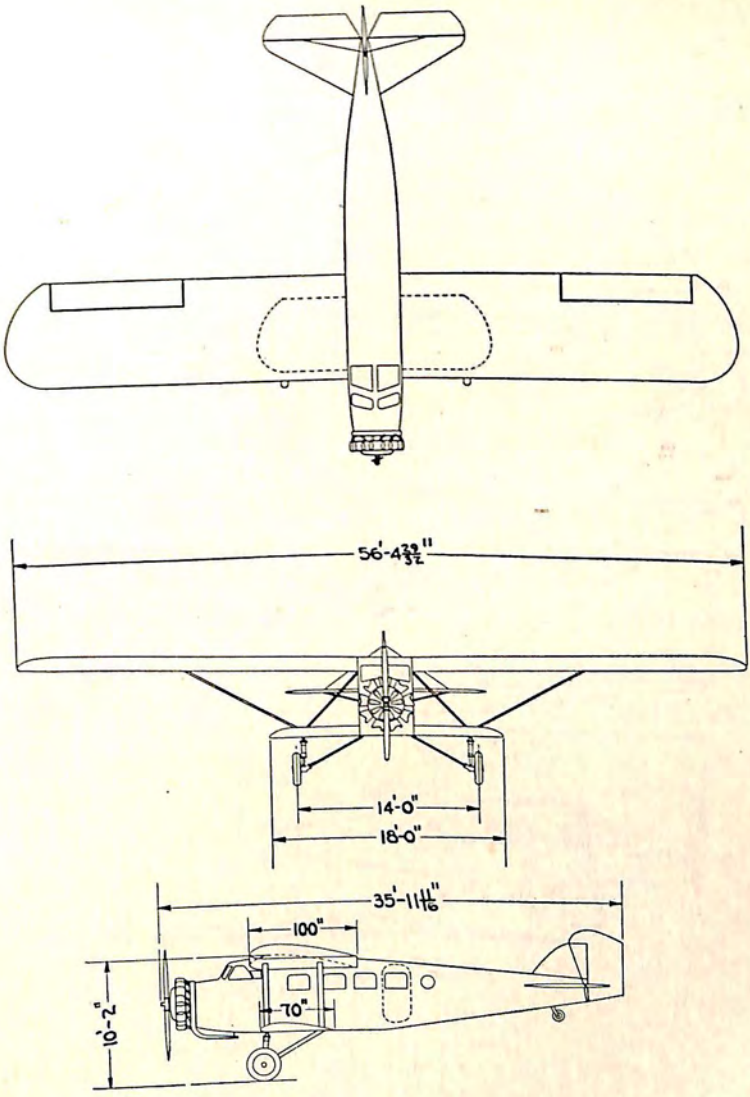


FOKKER AIRCRAFT CORPORATION OF AMERICA
New York City
F–11–A — 8 PLACE
ENGINE: PRATT & WHITNEY HORNET
WRIGHT CYCLONE

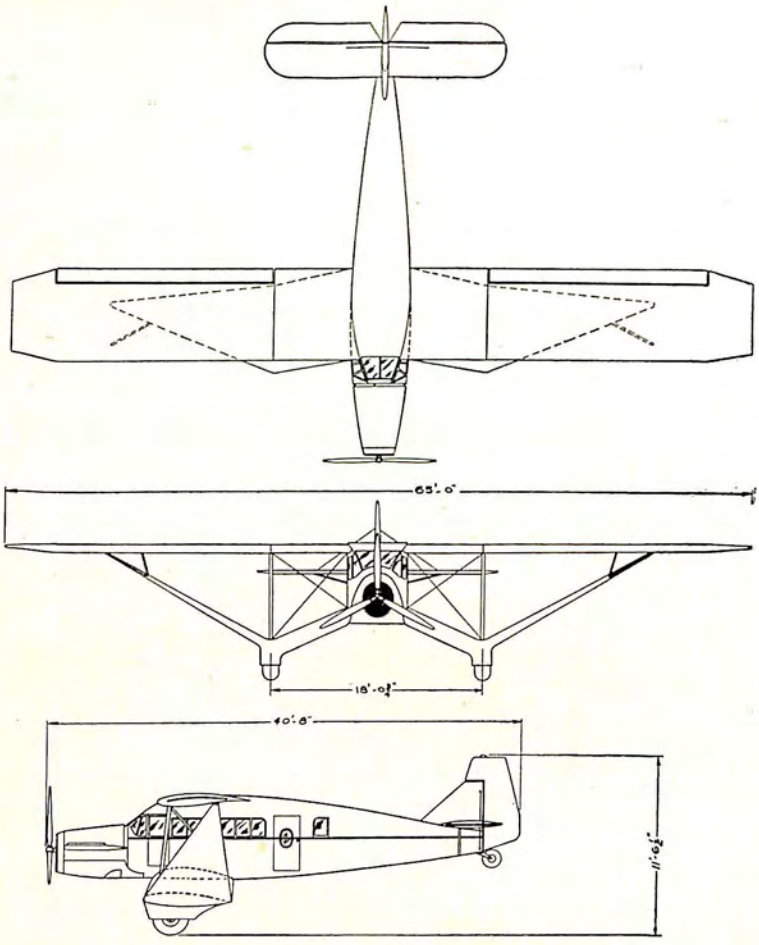


KEYSTONE AIRCRAFT CORPORATION
Bristol, Pa.

AIR YACHT — 8 PLACE
ENGINE: WRIGHT CYCLONE



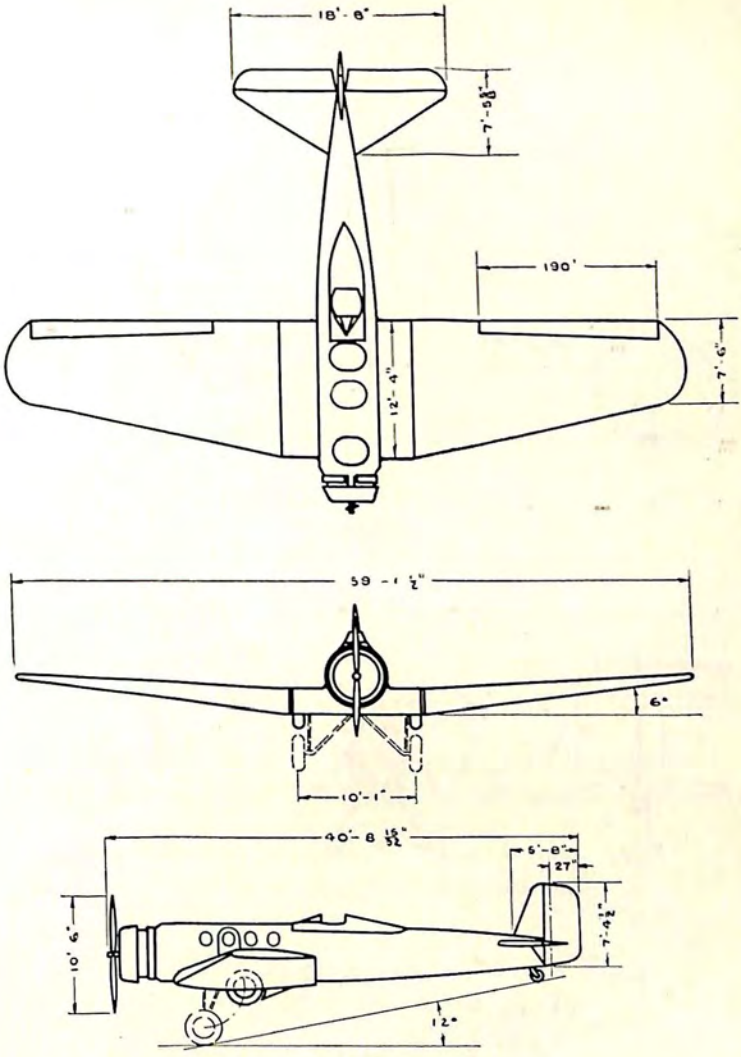
SOLAR AIRCRAFT COMPANY, LTD.
San Diego, Cal.
MODEL MS-1 — 8 PLACE
ENGINE: PRATT & WHITNEY WASP



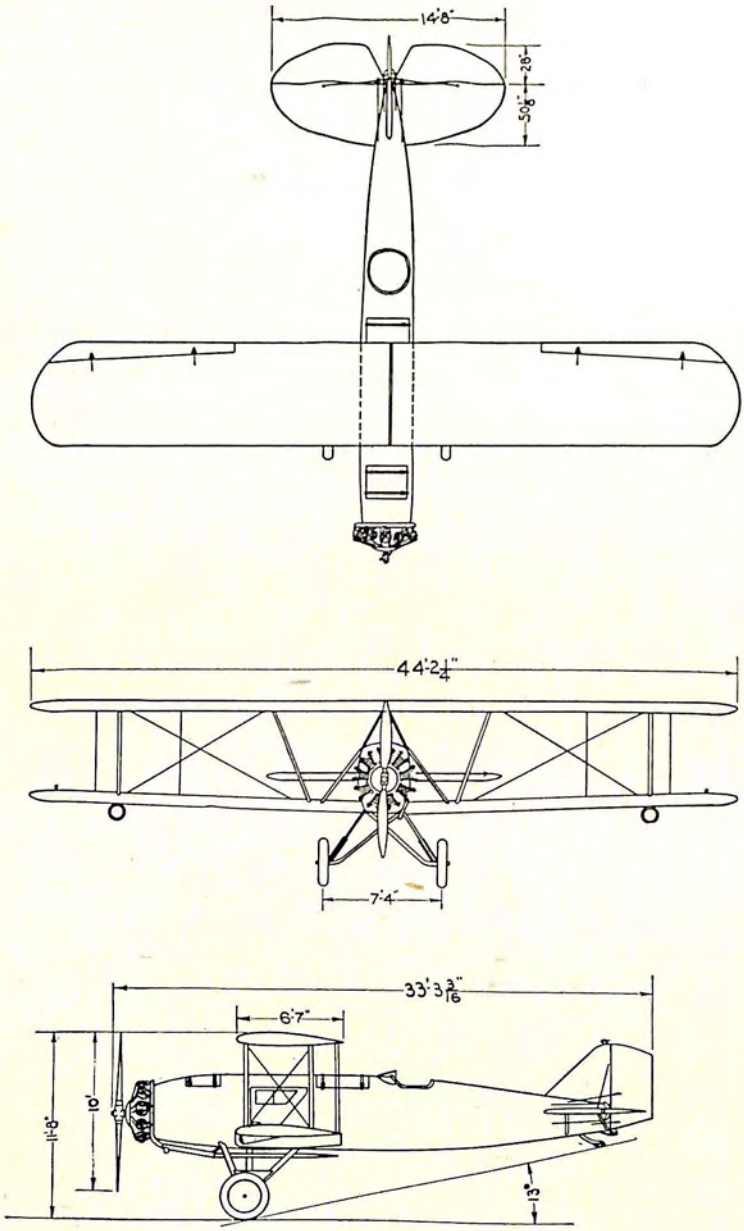
BELLANCA AIRCRAFT CORPORATION
New Castle, Del.

AIRBUS — 12 PLACE

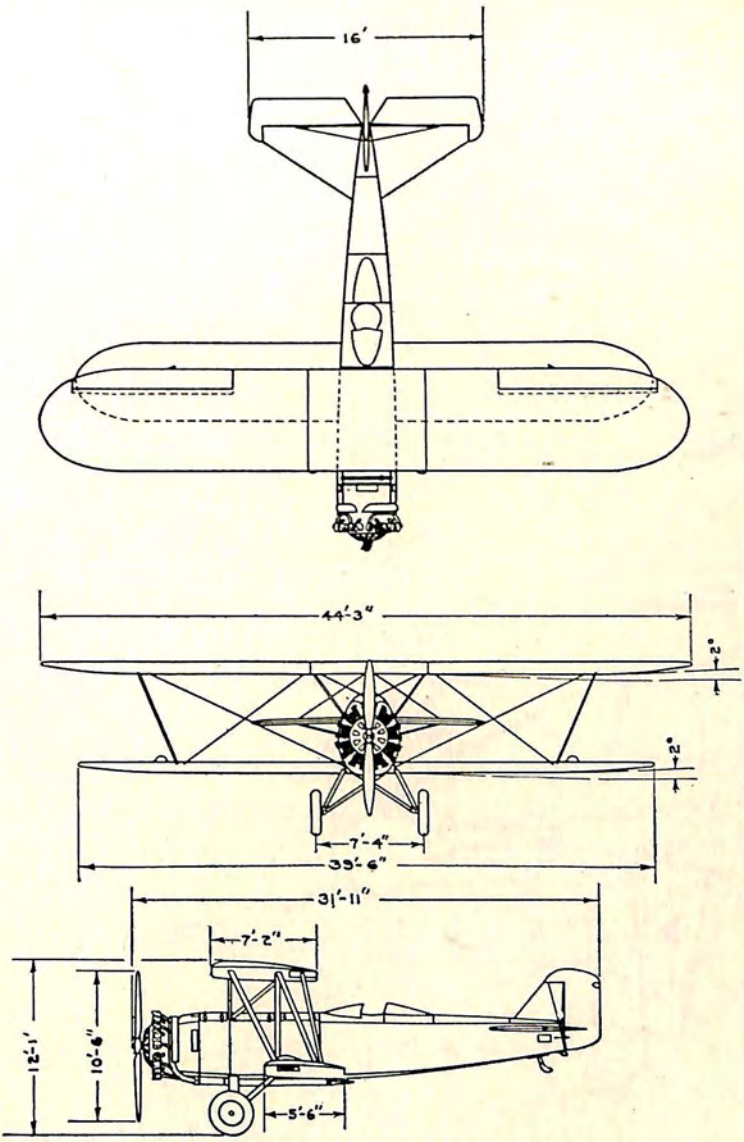
ENGINE: CURTISS CONQUEROR
PRATT & WHITNEY HORNET
WRIGHT CYCLONE



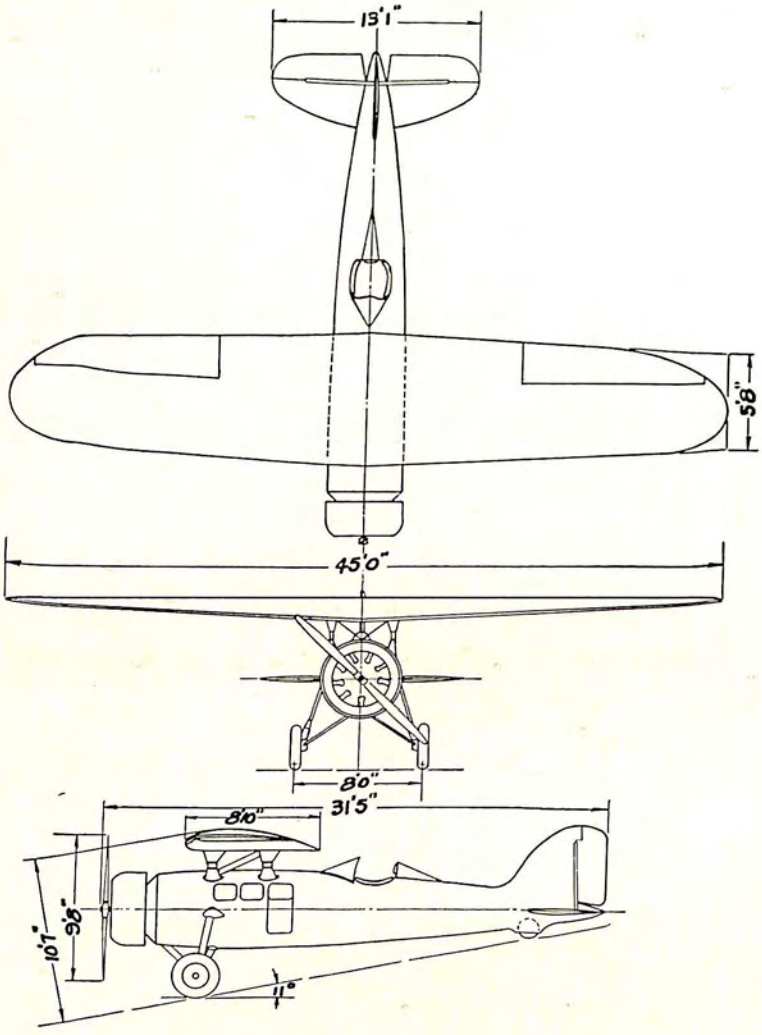
BOEING AIRPLANE COMPANY
Seattle, Wash.
MONOMAIL 221 — 7–9 PLACE
ENGINE: PRATT & WHITNEY HORNET



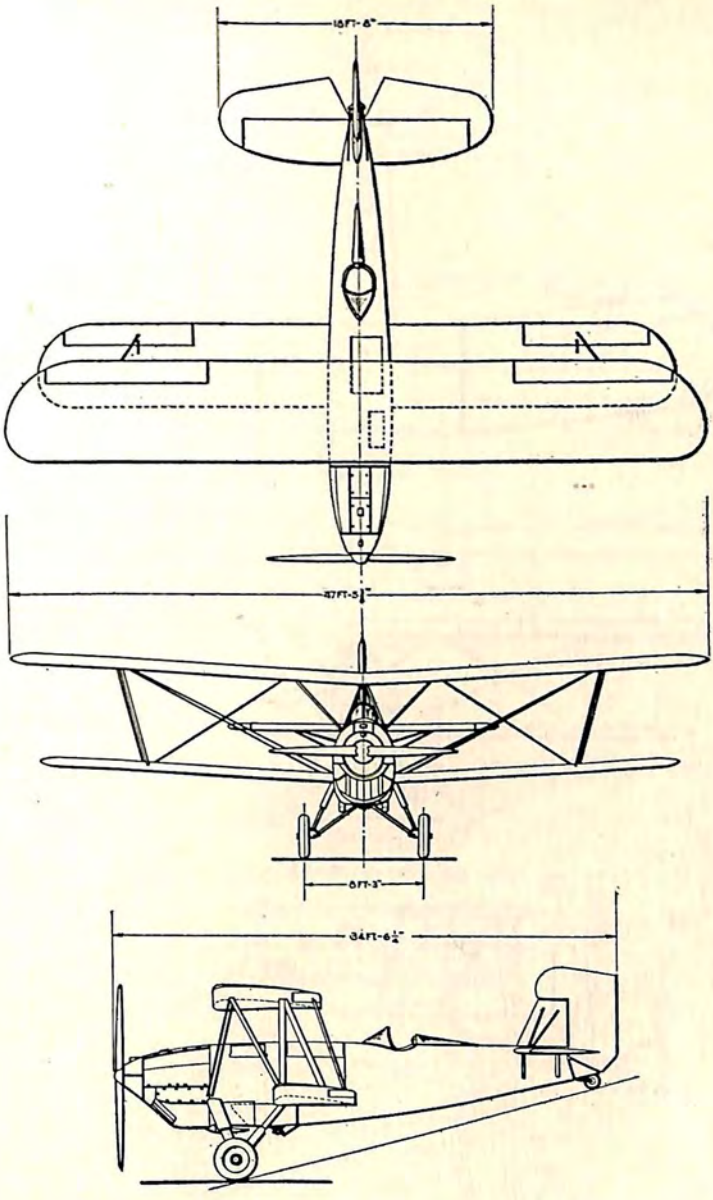
BOEING AIRPLANE COMPANY
Seattle, Wash.
MODEL 40 B–4 — 5 PLACE
ENGINE: PRATT & WHITNEY HORNET



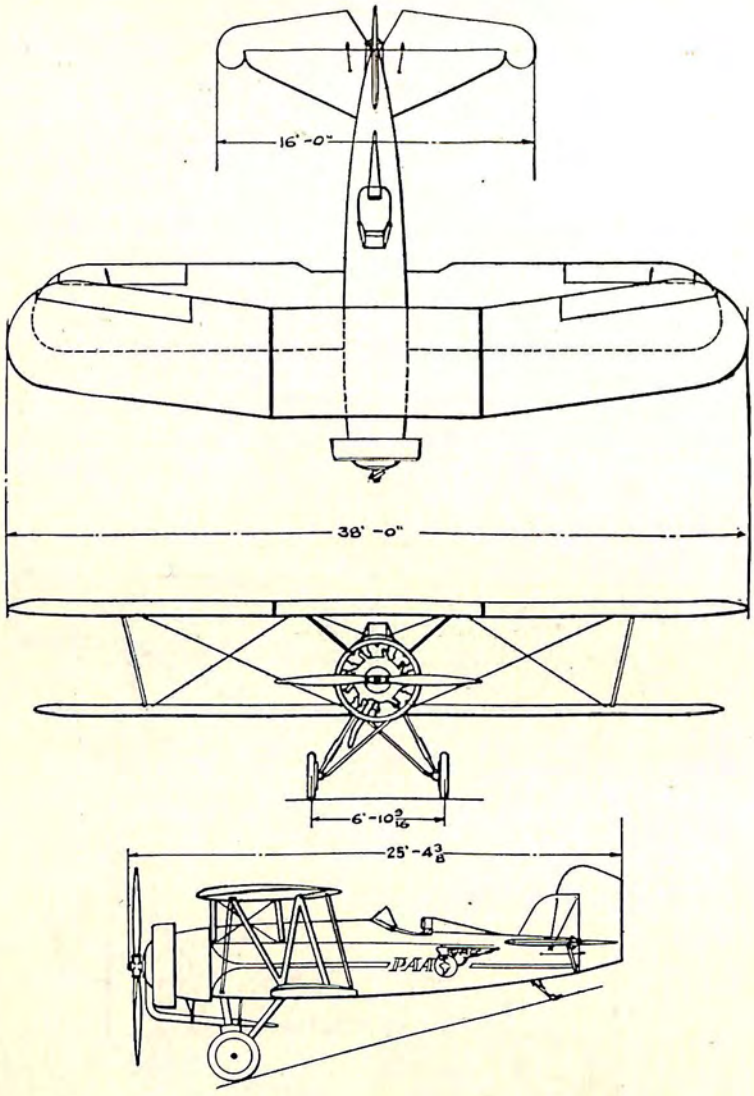
BOEING AIRPLANE COMPANY
Seattle, Wash.
MODEL 95 — 1 PLACE
ENGINE: PRATT & WHITNEY HORNET



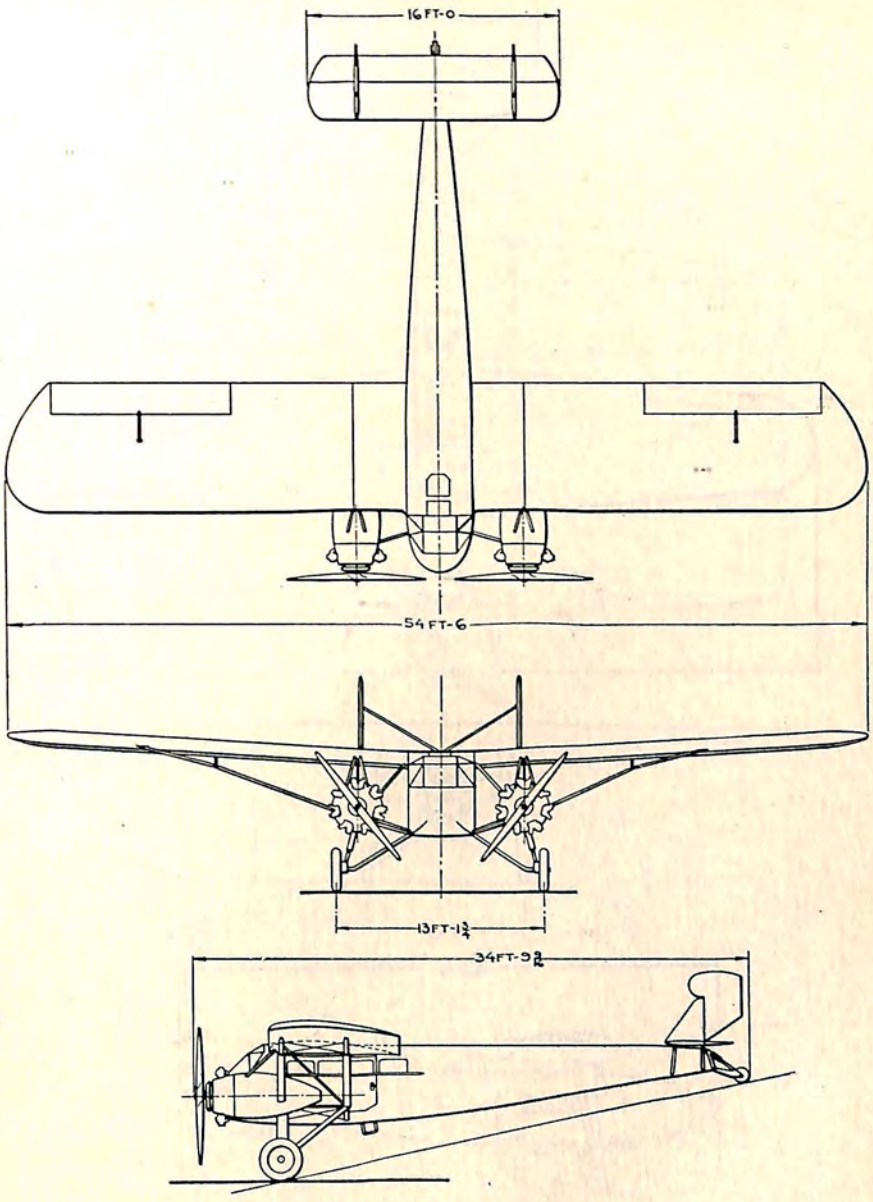
CONSOLIDATED AIRCRAFT CORPORATION
Buffalo, N. Y.
MODEL 20 — 6 PLACE
ENGINE: PRATT & WHITNEY HORNET



CURTISS AEROPLANE & MOTOR COMPANY, INC.
Garden City, L. I., N. Y.
CARRIER PIGEON II — 1 PLACE
ENGINE: CURTISS GEARED CONQUEROR



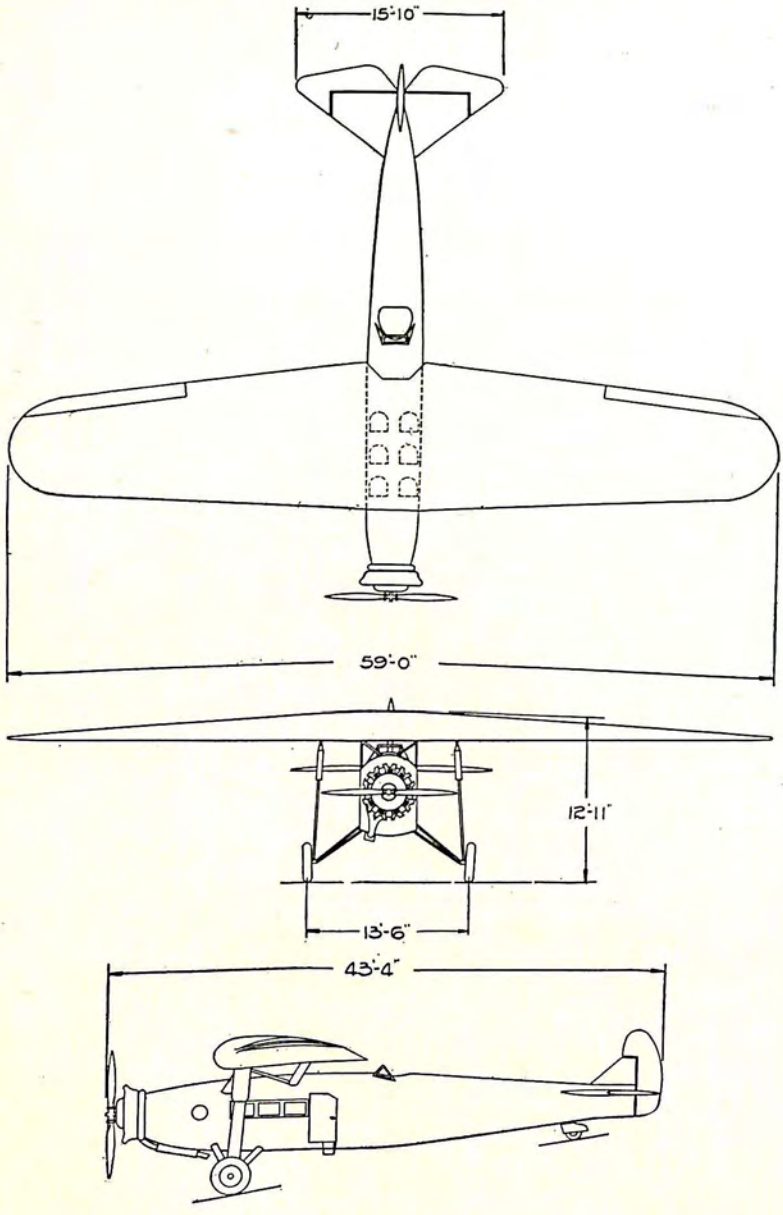
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Garden City, L. I., N. Y.
FALCON MAILPLANE — 1 PLACE
ENGINE: WRIGHT CYCLONE



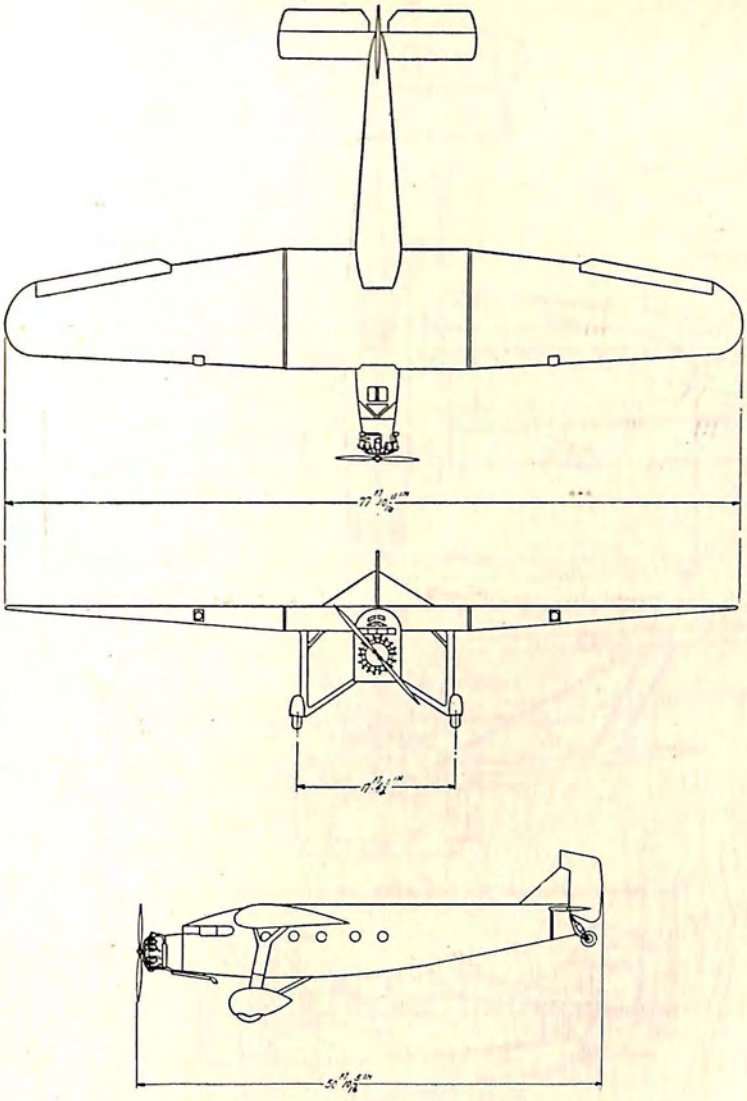
CURTISS-WRIGHT AIRPLANE COMPANY
St. Louis, Mo.

KING BIRD — 7–8 PLACE

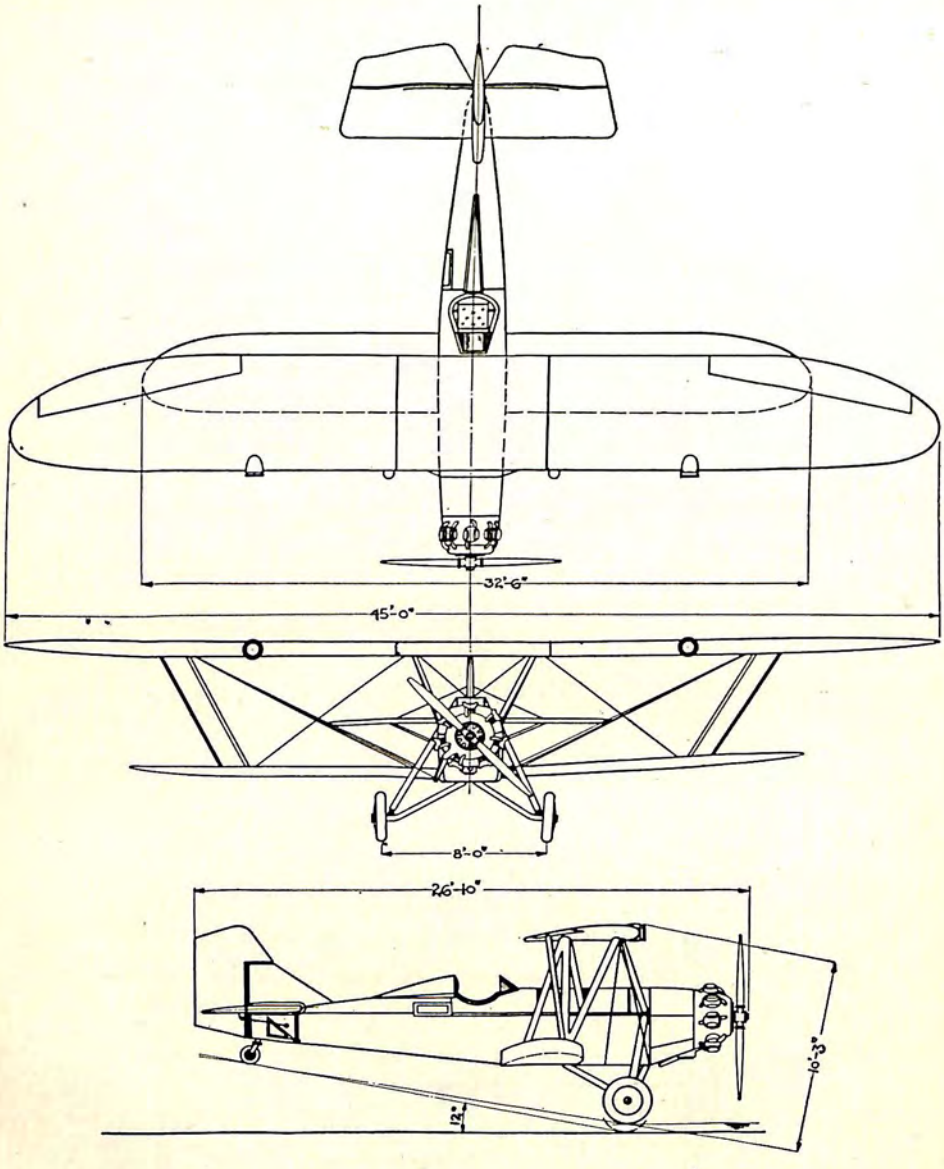
ENGINE: TWO WRIGHT WHIRLWINDS 240
TWO WRIGHT WHIRLWINDS 300



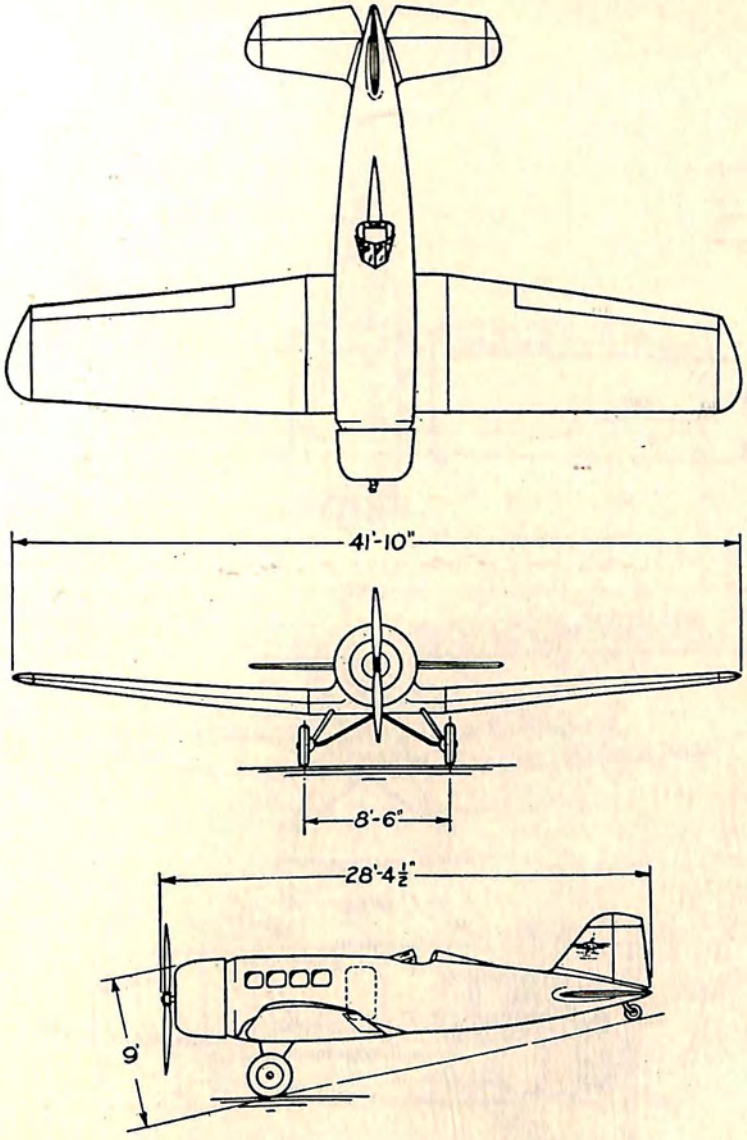
FOKKER AIRCRAFT CORPORATION OF AMERICA
New York City
MODEL F14 — 7 PLACE
ENGINE: PRATT & WHITNEY HORNET
WRIGHT CYCLONE



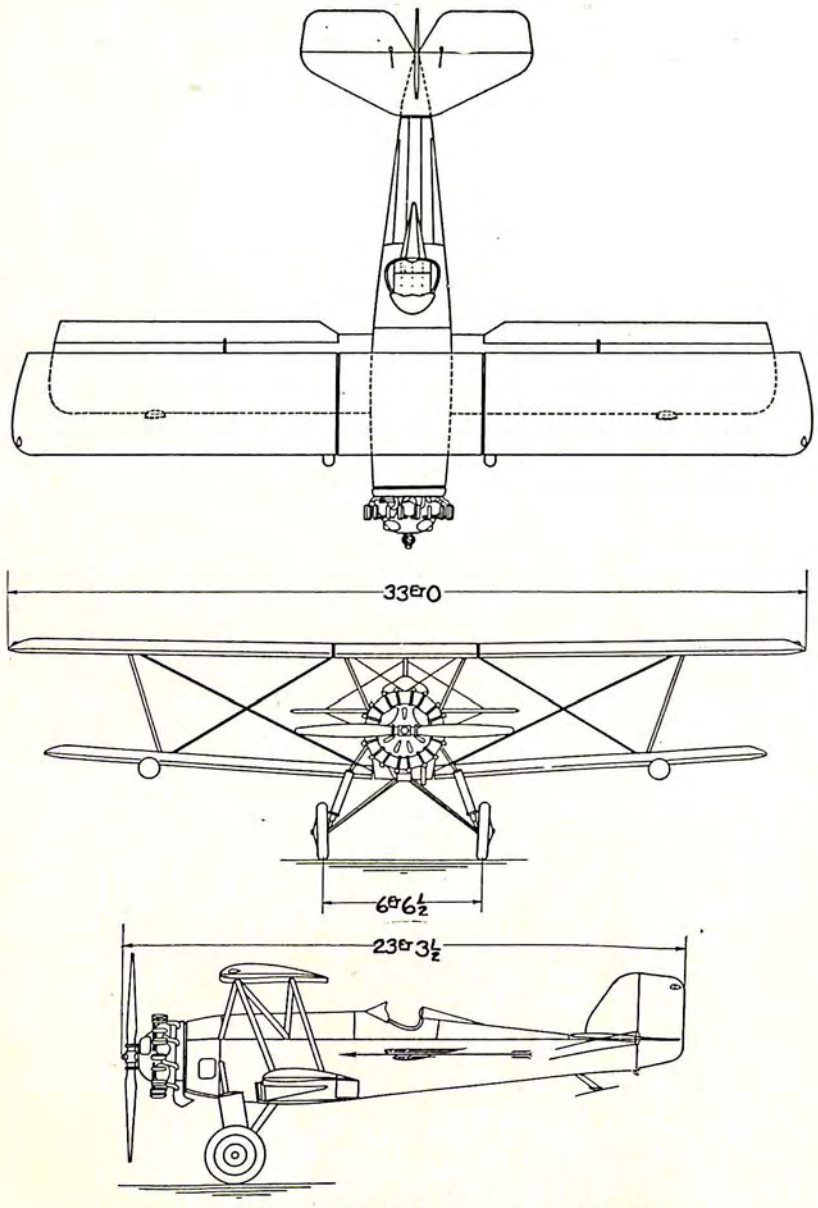
FORD MOTOR COMPANY
Stout Metal Airplane Division
Dearborn, Mich.
MODEL 8-A EXPRESS — 2 PLACE
ENGINE: WRIGHT CYCLONE, GEARED



NEW STANDARD AIRCRAFT CORPORATION
Paterson, N. J.
MODEL D27A — 1 PLACE
ENGINE: WRIGHT WHIRLWIND 240



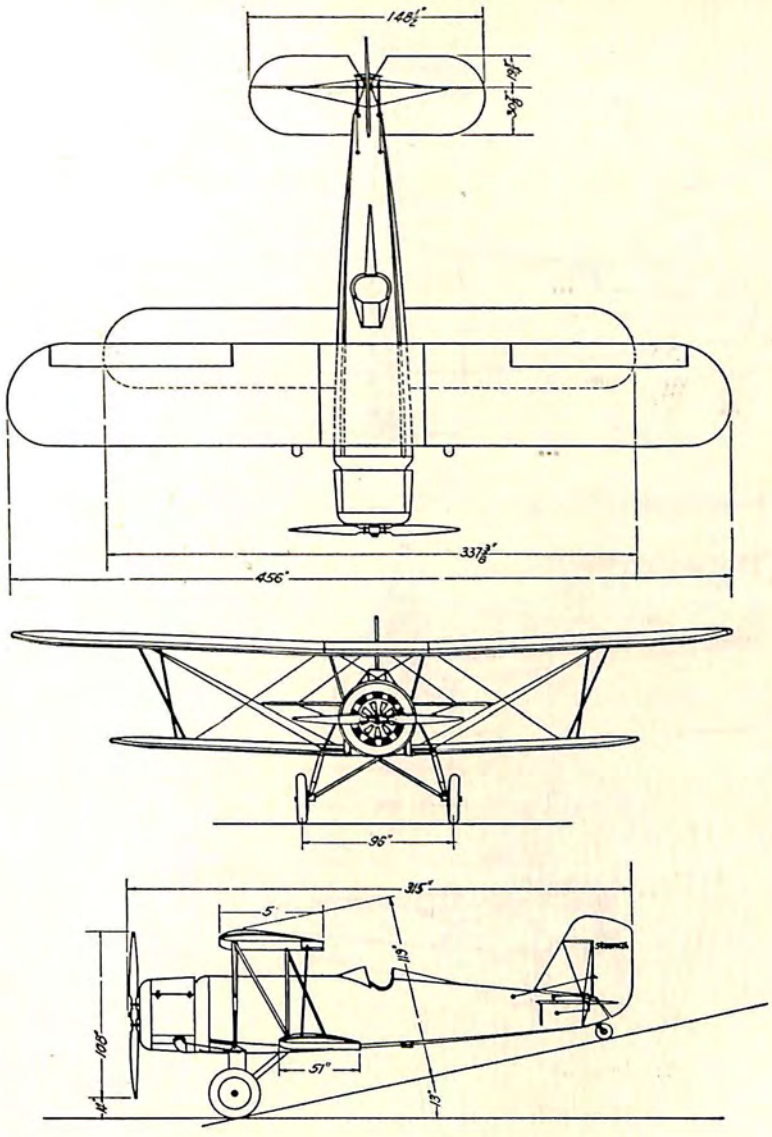
NORTHROP AIRCRAFT CORPORATION
Burbank, Calif.
ALPHA — 5–7 PLACE
ENGINE: PRATT & WHITNEY WASP



PITCAIRN AIRCRAFT, INCORPORATED
Philadelphia, Pa.

SUPER MAILWING — 1 PLACE

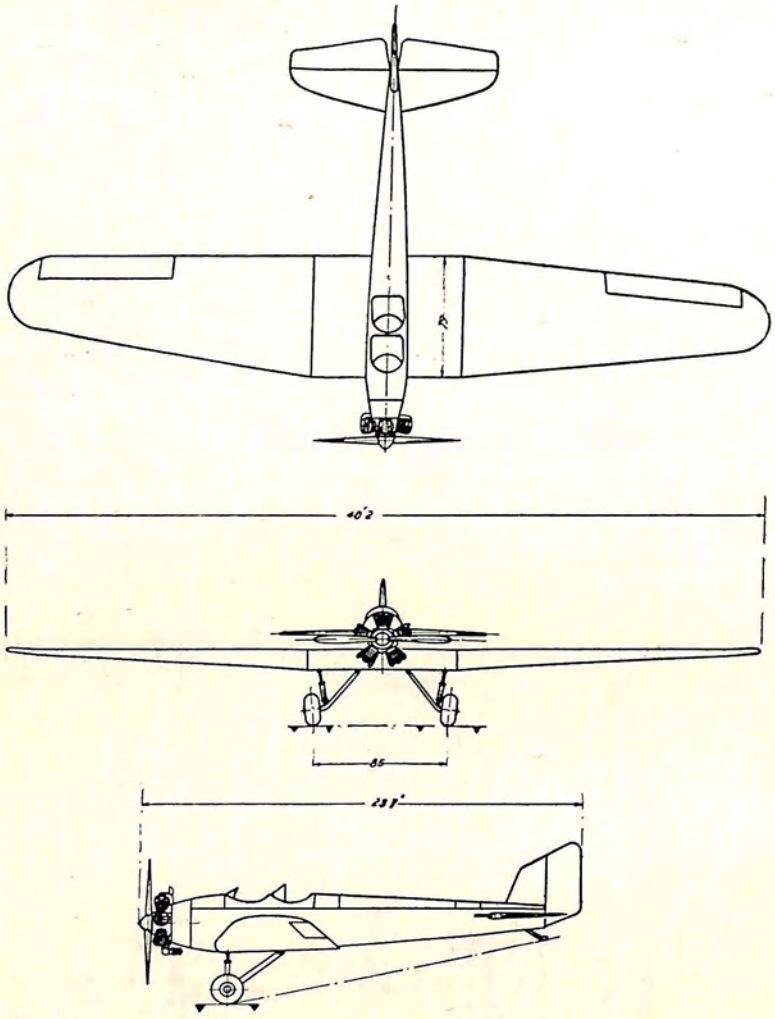
ENGINE: PRATT & WHITNEY WASP, JR.
WRIGHT WHIRLWIND 240
WRIGHT WHIRLWIND 300



STEARMAN AIRCRAFT COMPANY
Wichita, Kan.

JUNIOR SPEEDMAIL — 1 PLACE

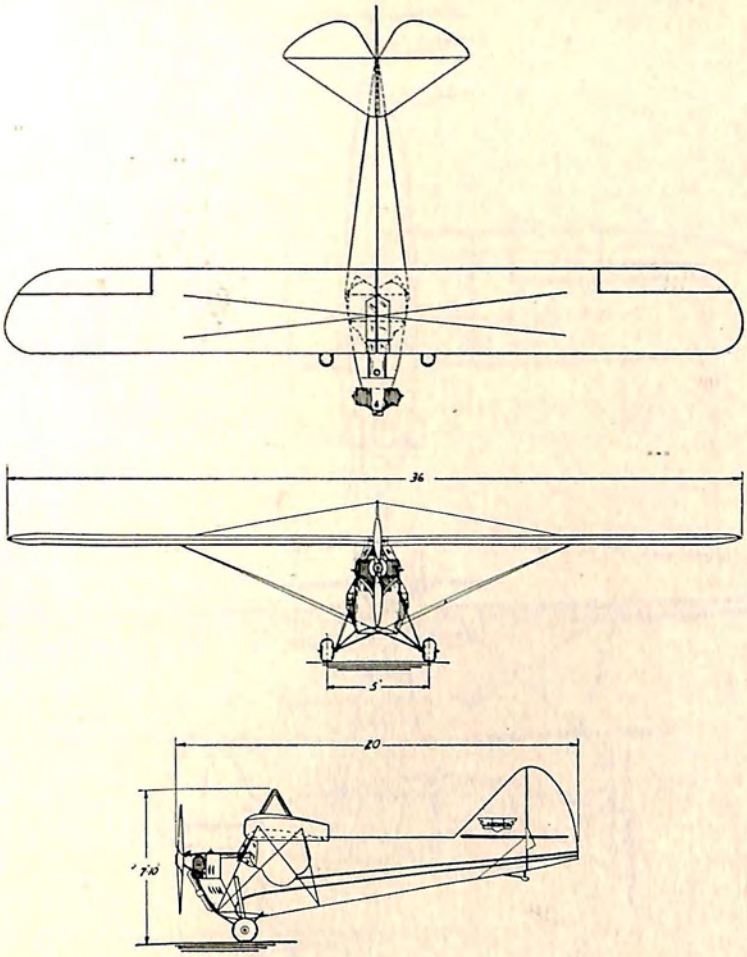
ENGINE: PRATT & WHITNEY WASP
PRATT & WHITNEY WASP, JR.
WRIGHT WHIRLWIND 300



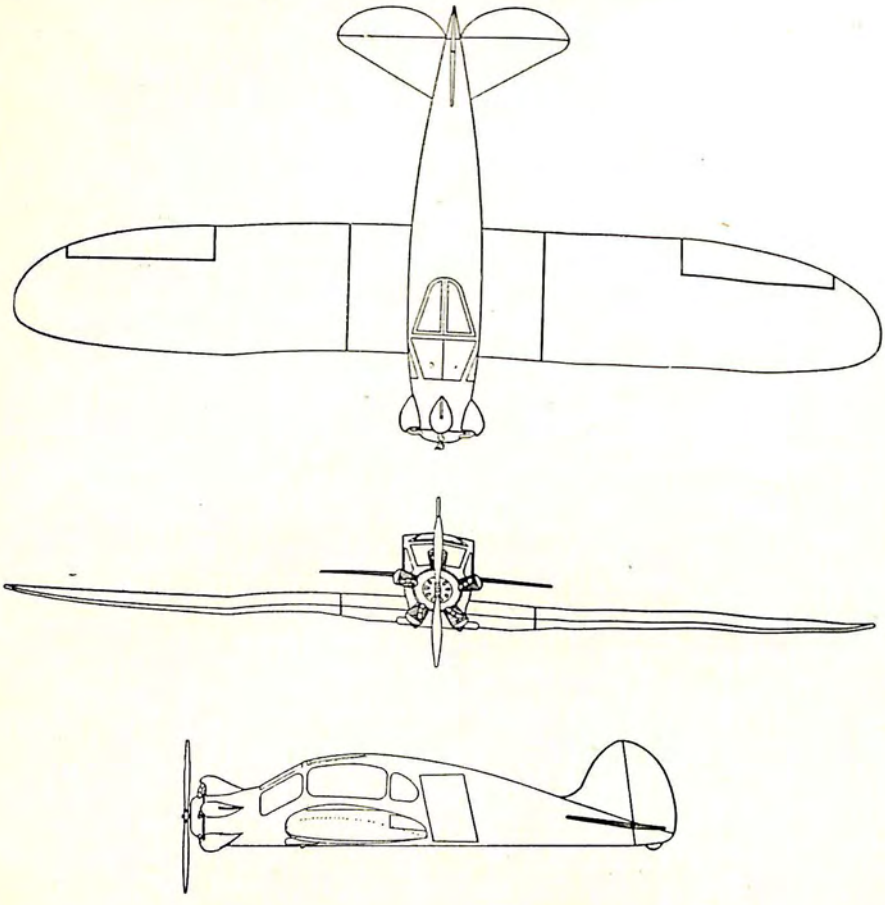
AEROMARINE KLEMM CORPORATION
Keyport, N. J.

AEROMARINE 85, 70, 40 — 2 PLACE

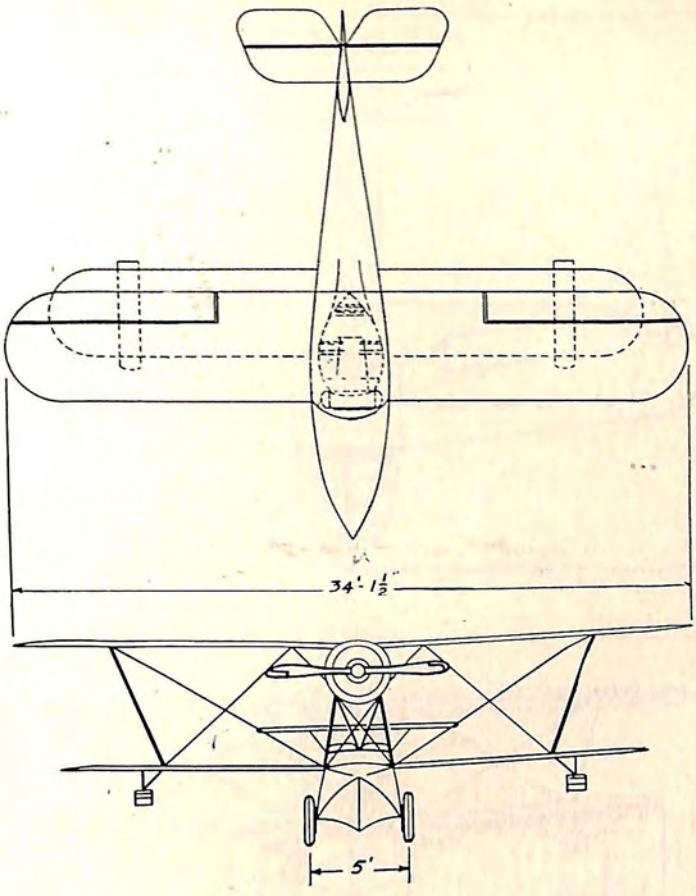
ENGINE: LEBLOND 85
LEBLOND 70
SALMSON

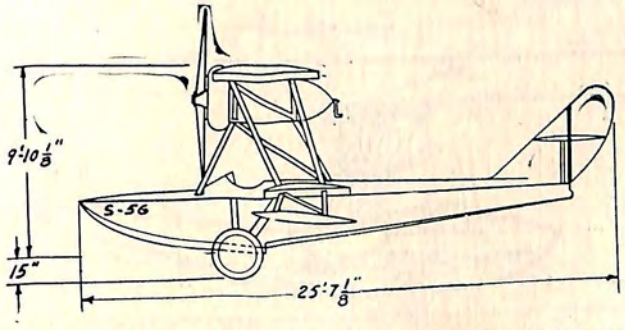


AERONAUTICAL CORPORATION OF AMERICA
Cincinnati, Ohio
AERONCA C-2, C-3
ENGINE: AERONCA

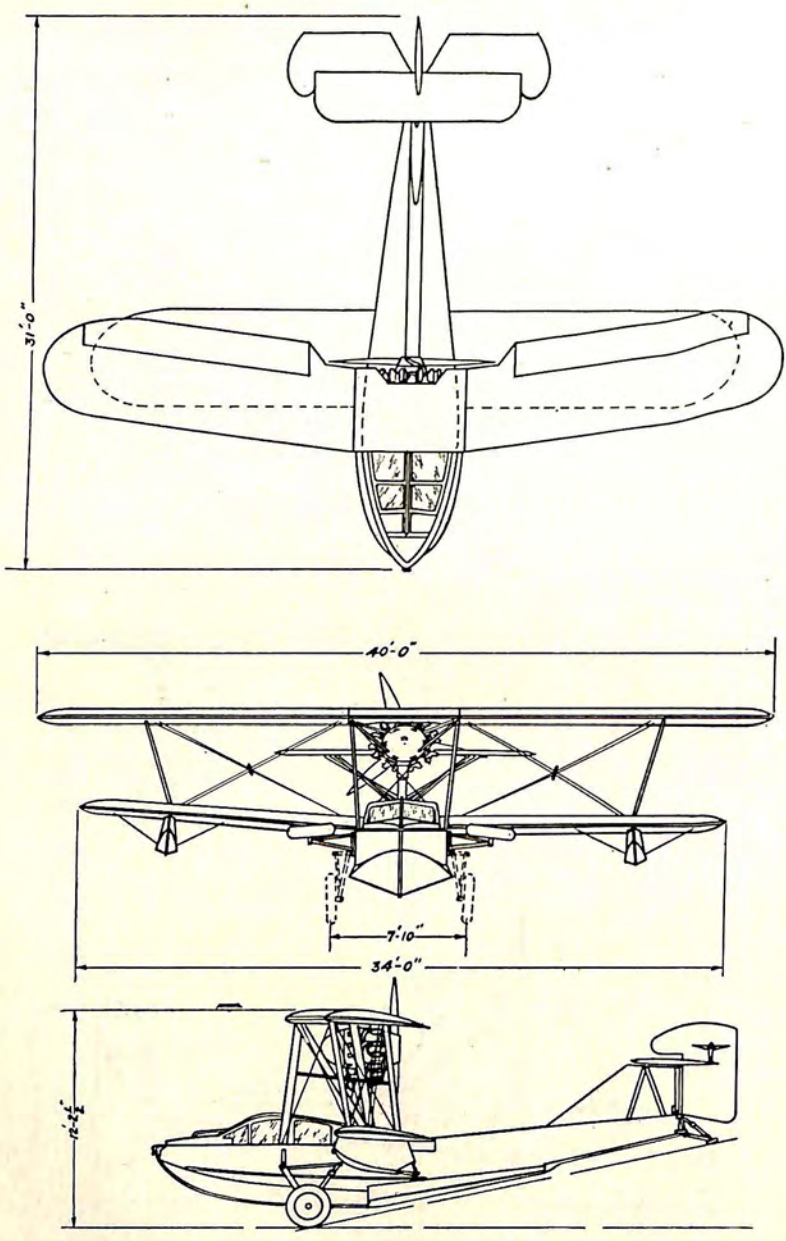


ALEXANDER AIRCRAFT CORPORATION
Colorado Springs, Colo.
BULLET — 4 PLACE
ENGINE: WRIGHT WHIRLWIND 165

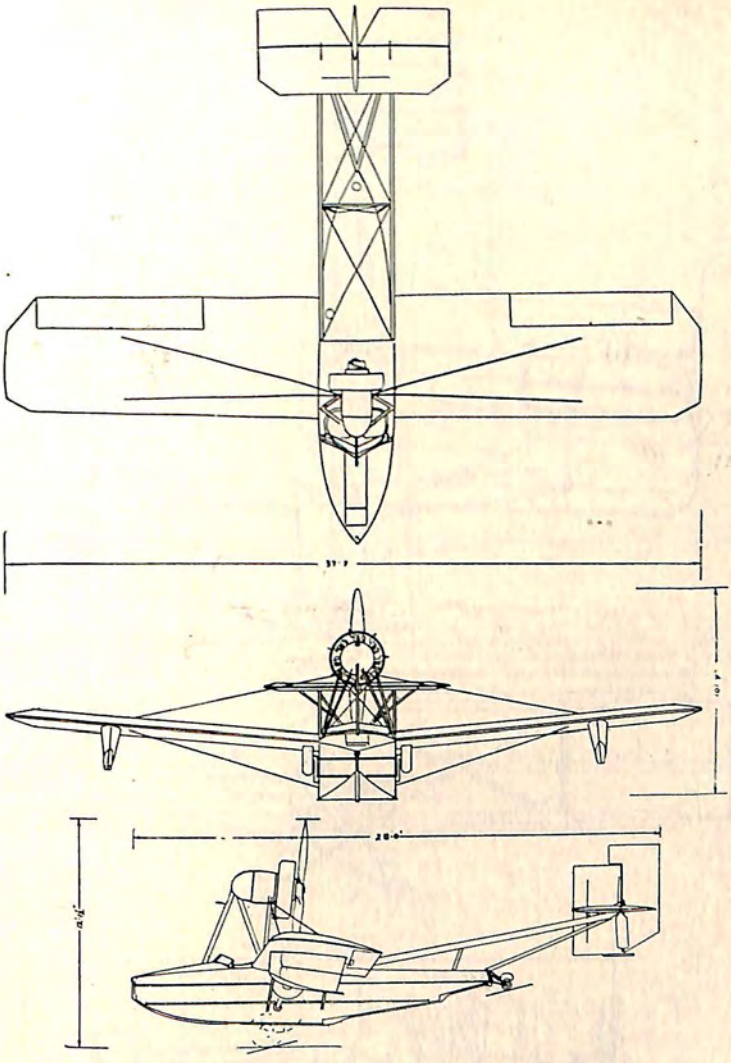




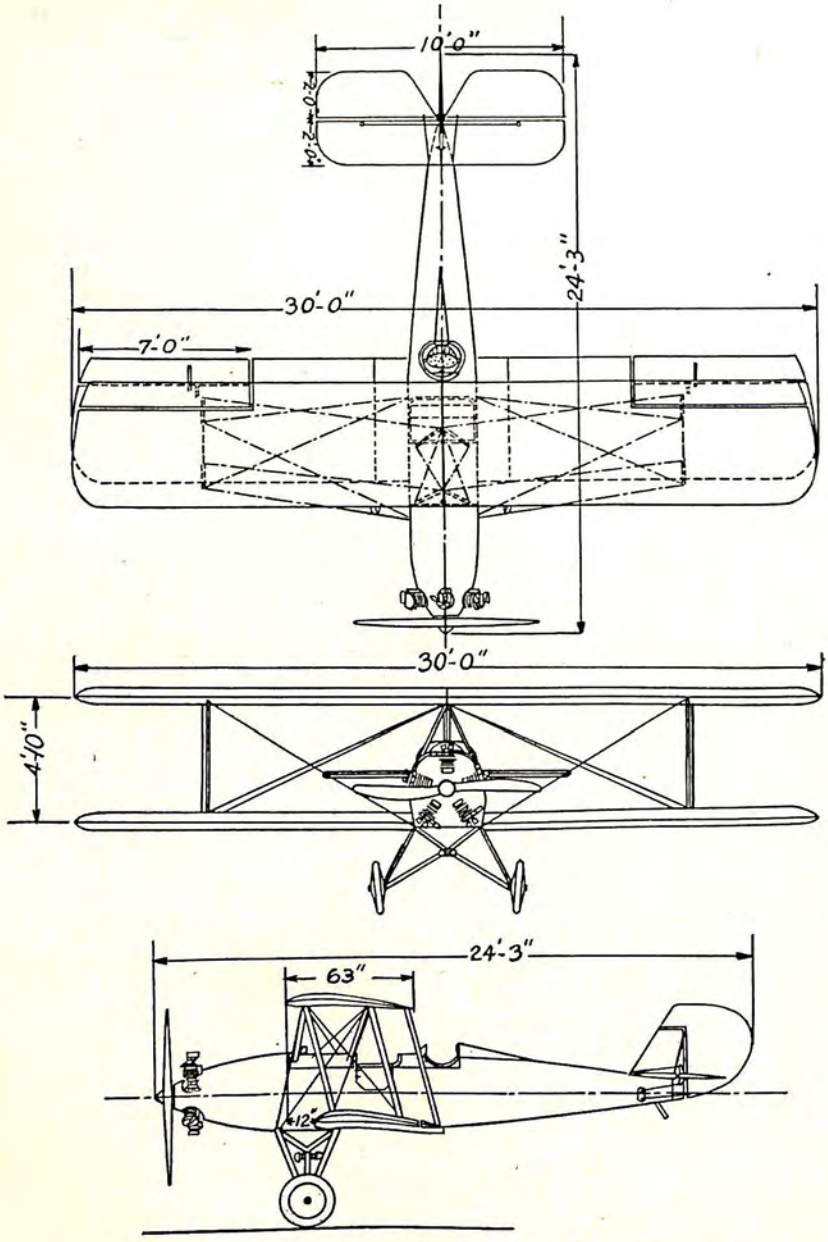
AMERICAN AERONAUTICAL CORPORATION
New York City
MODELS S 56–S 56B — 3 PLACE
ENGINE: KINNER K 5
KINNER B 5



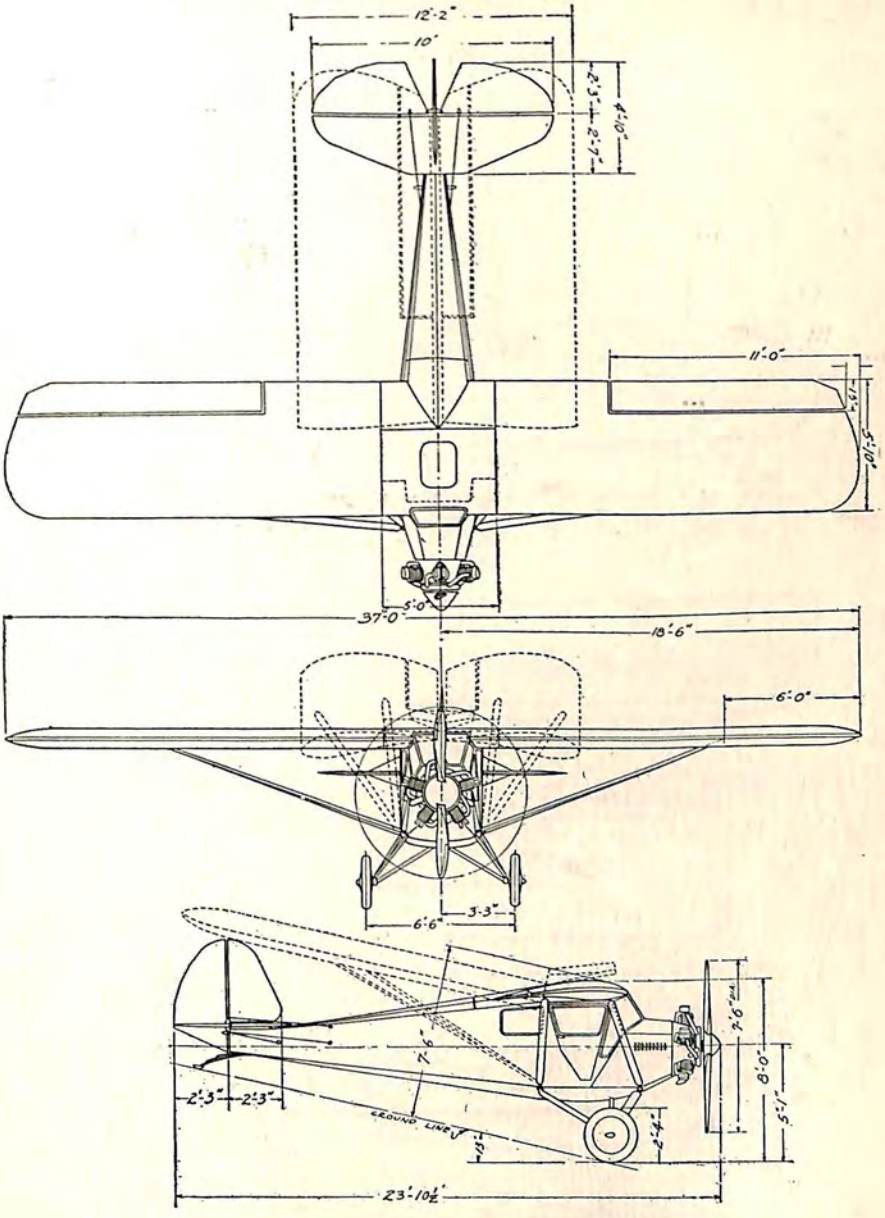
AMPHIBIONS, INCORPORATED
Garden City, L. I., N. Y.
MODELS N 2B–N 2C — 5–6 PLACE
ENGINE: PRATT & WHITNEY WASP
WRIGHT WHIRLWIND 300



AMPHIBIONS, INCORPORATED
Garden City, L. I., N. Y.
PRIVATEER P–2 — 2 PLACE
ENGINE: WARNER SCARAB



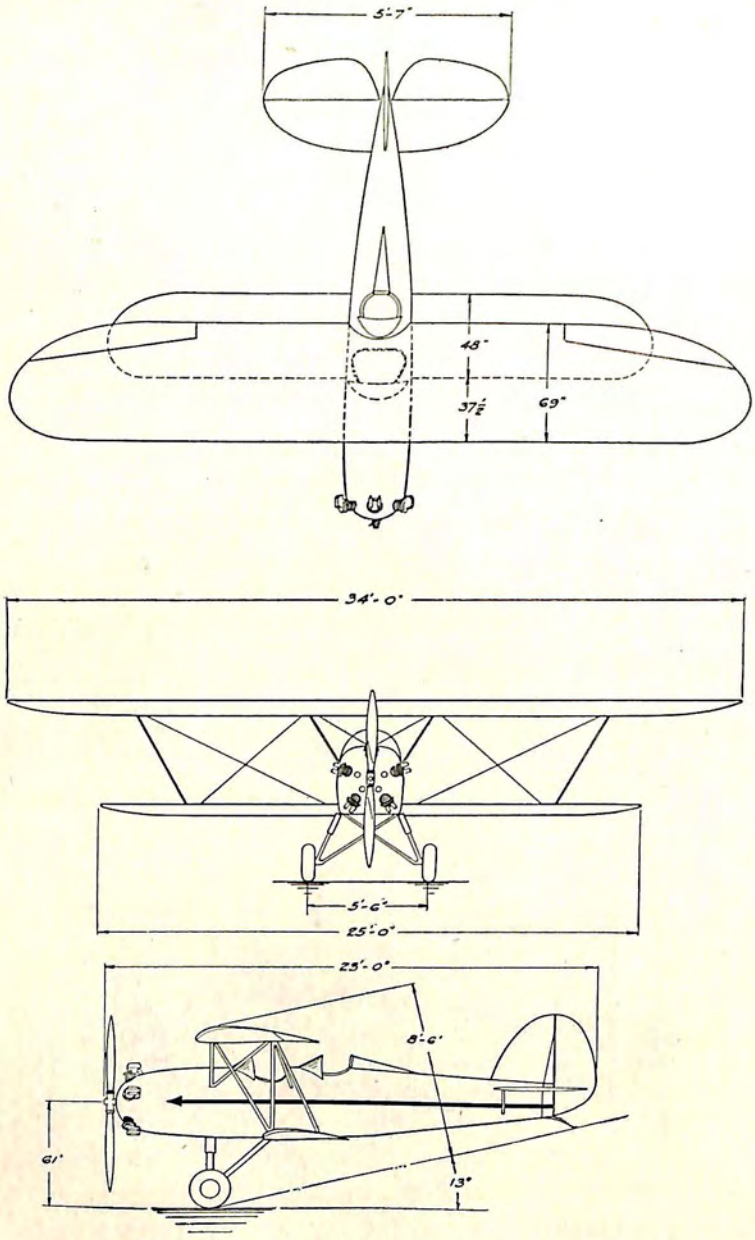
AMERICAN EAGLE AIRCRAFT CORPORATION
Kansas City, Kan.
MODEL A–129 — 3 PLACE
ENGINE: CURTISS OX5
KINNER



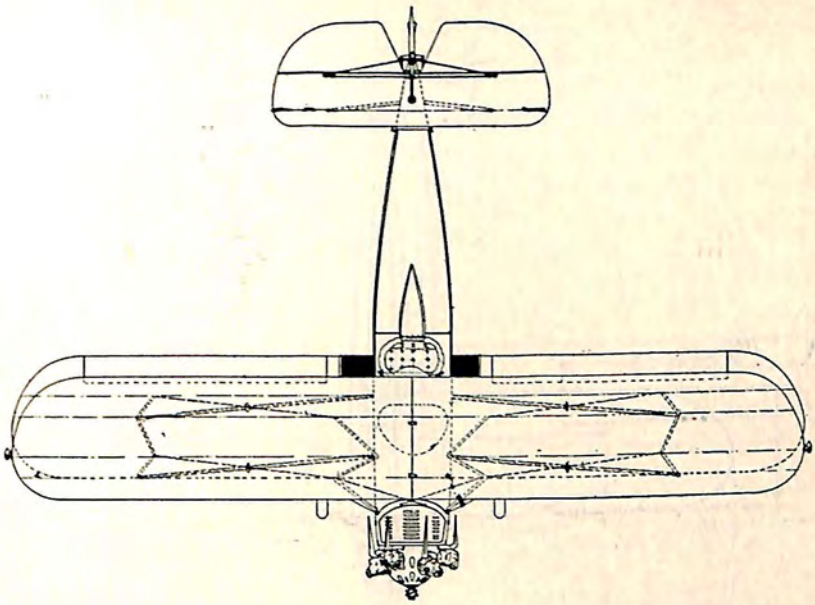
AMERICAN EAGLE AIRCRAFT CORPORATION
Kansas City, Kan.

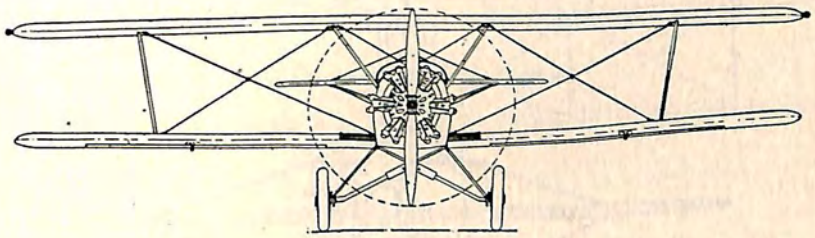
WALLACE TOUROPLANE — 3–4 PLACE

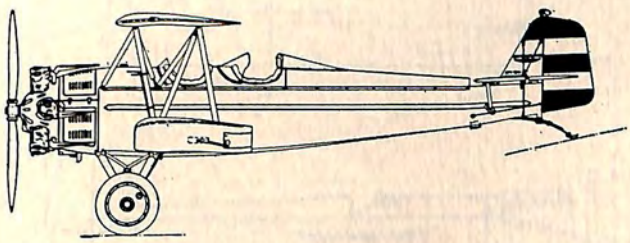
ENGINE: KINNER
WRIGHT WHIRLWIND 165



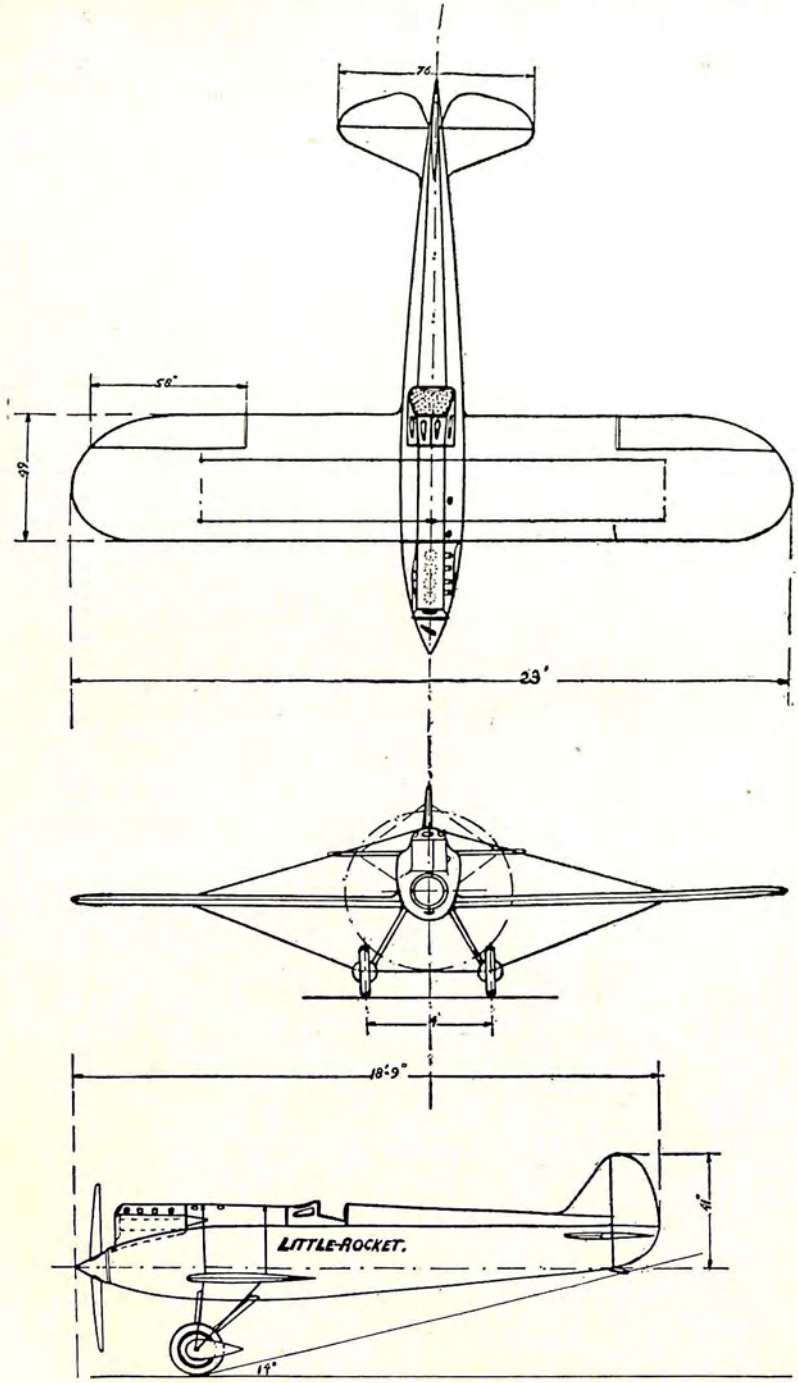
BIRD AIRCRAFT CORPORATION
Brooklyn, N. Y.
MODEL "B" — 3 PLACE
ENGINE: KINNER K5



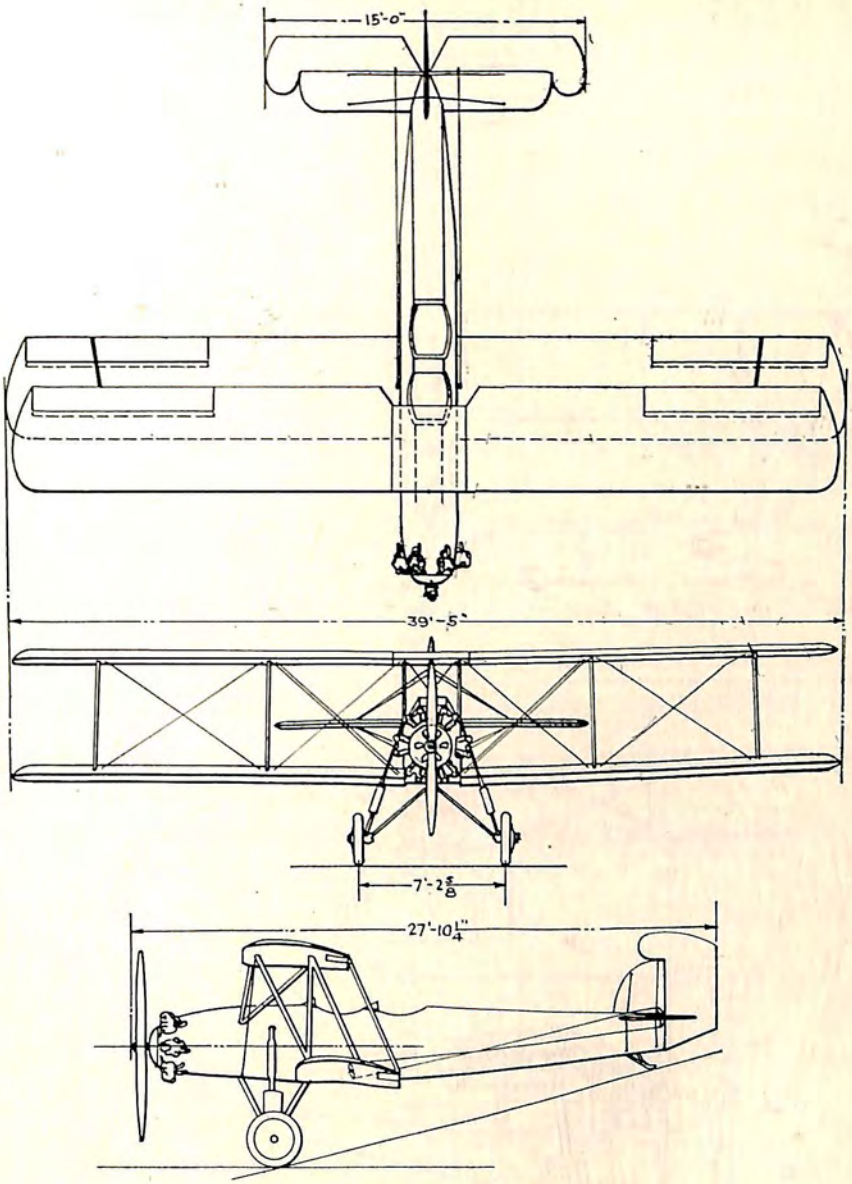




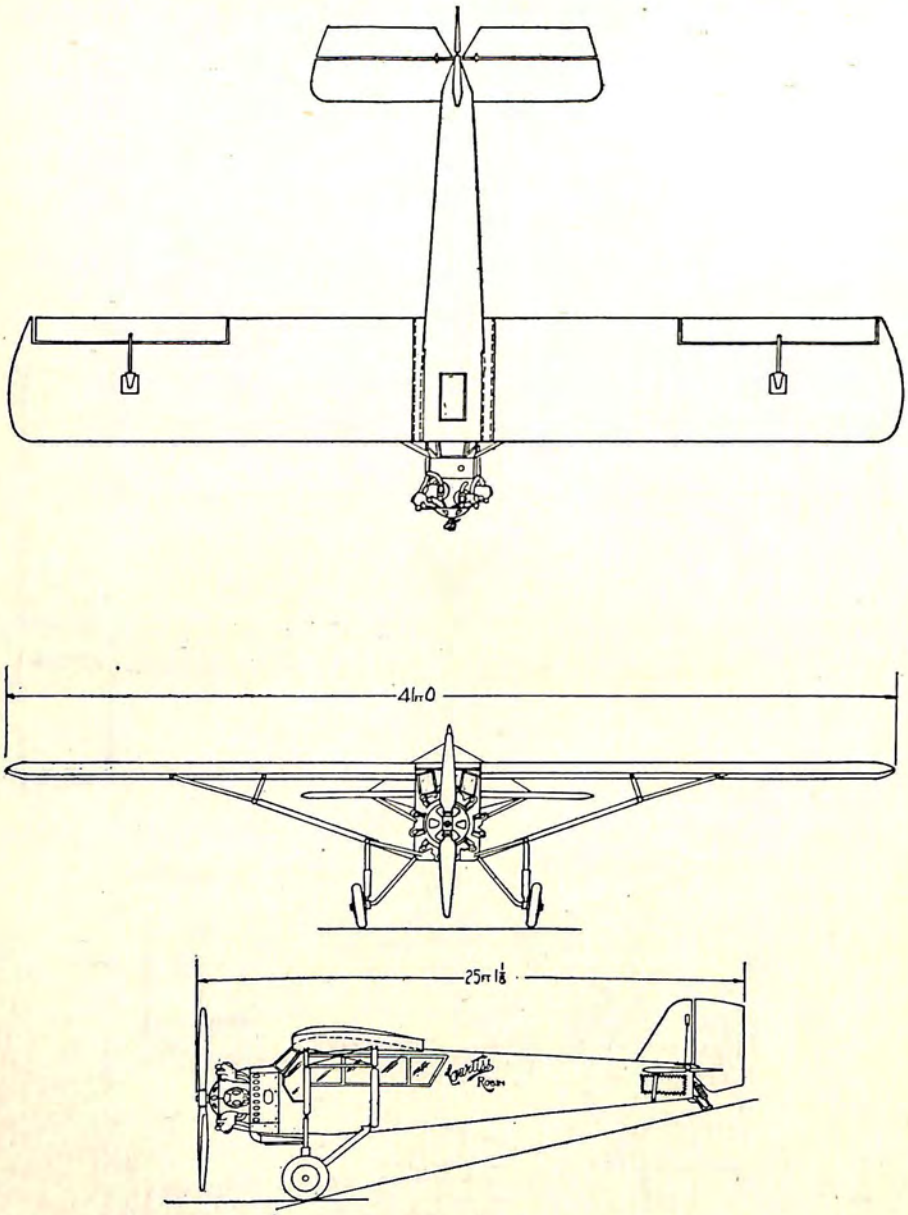
COMMANDAIRE, INC.
Little Rock, Ark.
MODEL 5 C 3 — 3 PLACE
ENGINE: CURTISS CHALLENGER



COMMANDAIRE, Inc.
Little Rock, Ark.
Little Rocket — 1 Place
Engine: American Cirrus



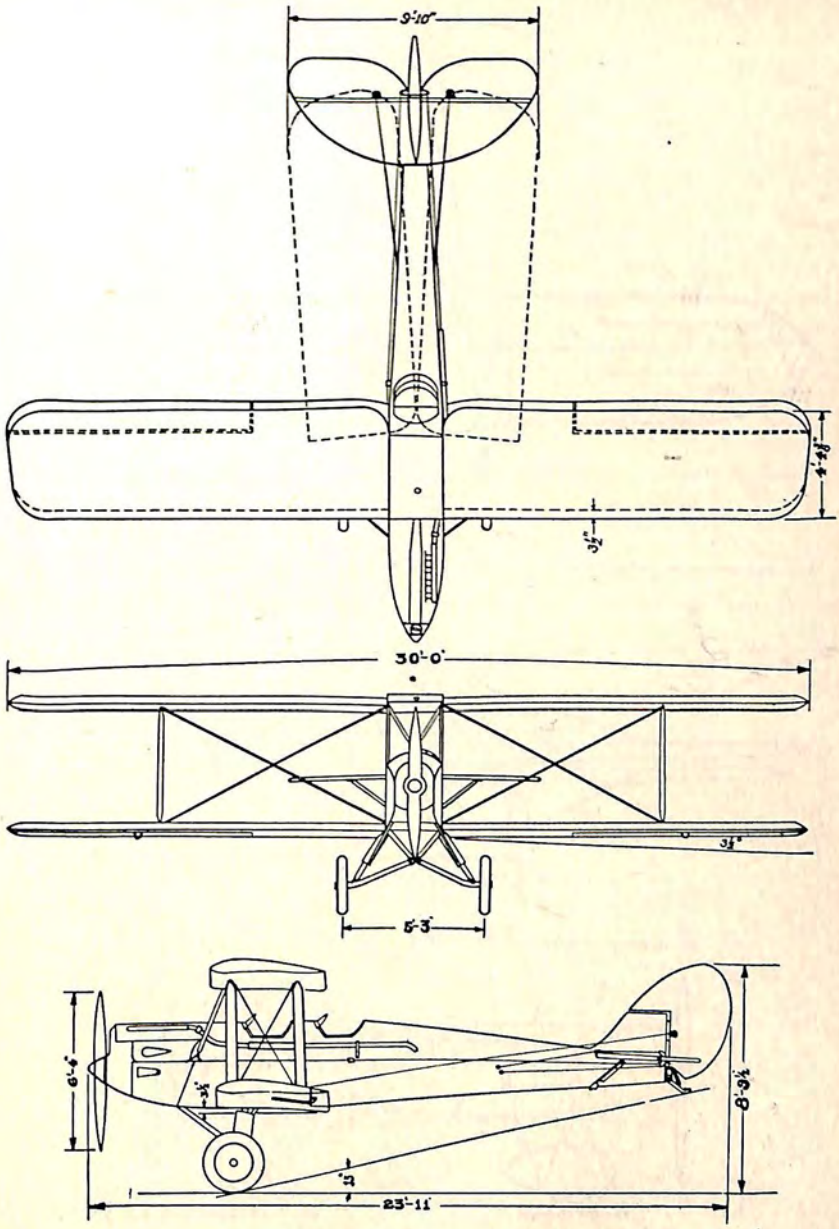
CURTISS AEROPLANE & MOTOR COMPANY
Garden City, L. I., N. Y.
FLEDGLING — 2 PLACE
ENGINE: CURTISS CHALLENGER



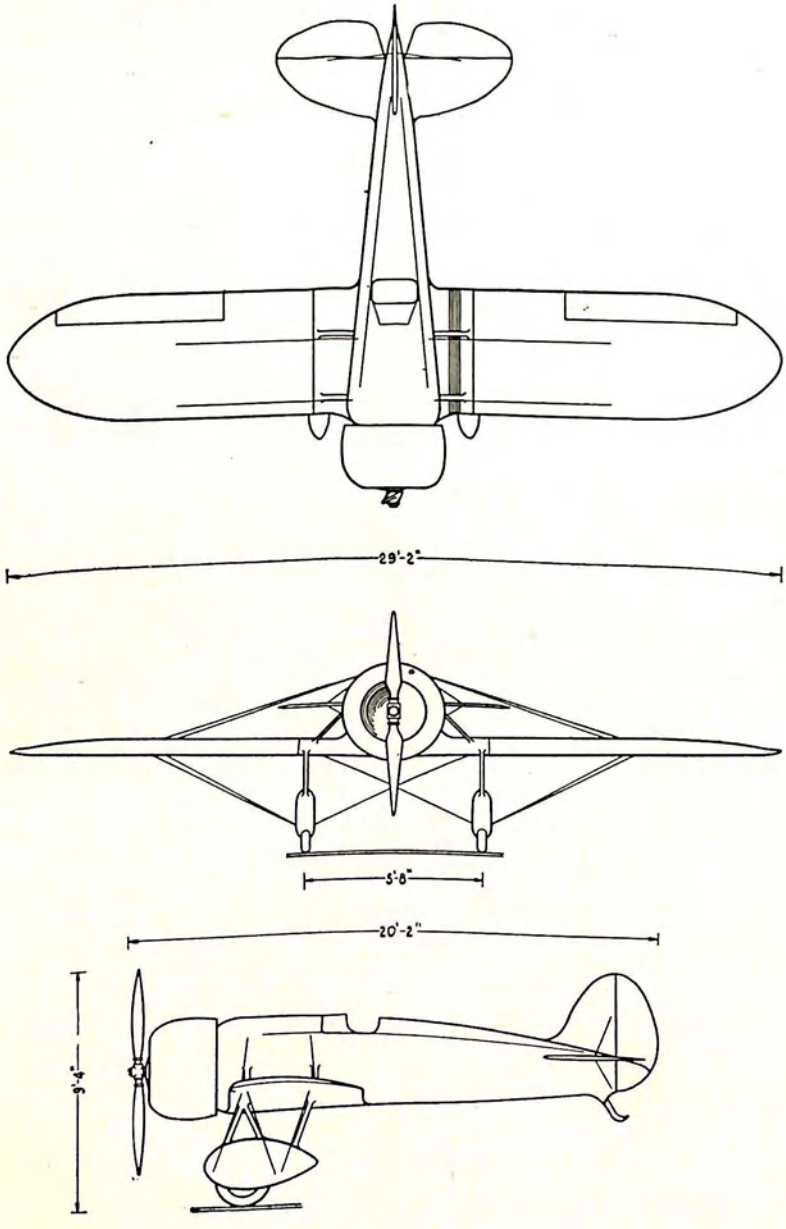
CURTISS-WRIGHT AIRPLANE COMPANY
St. Louis, Mo.

ROBIN C 1-C 2 — 3 PLACE

ENGINE: CURTISS CHALLENGER
WRIGHT WHIRLWIND 165



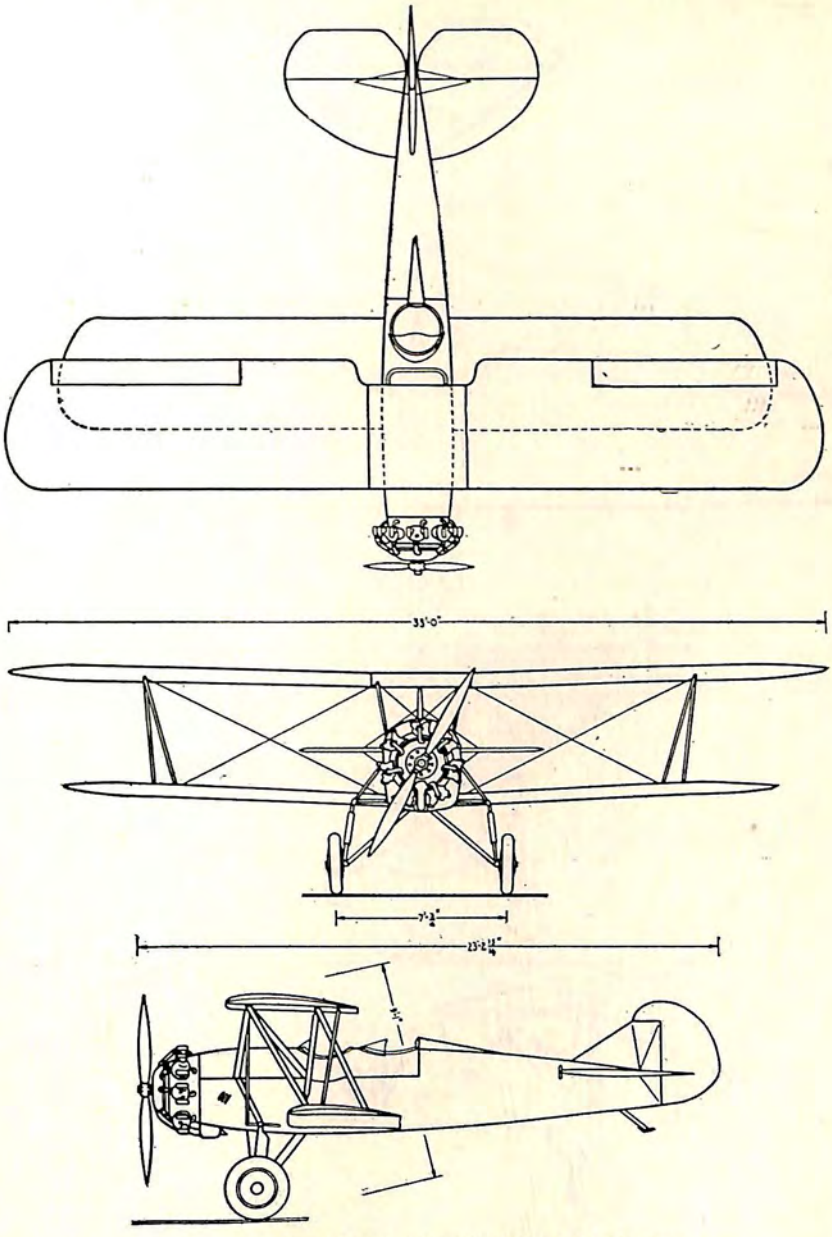
CURTISS-WRIGHT AIRPLANE COMPANY
St. Louis, Mo.
MOTH — 2 PLACE
ENGINE: WRIGHT GIPSY



CURTISS-WRIGHT AIRPLANE COMPANY
Wichita, Kan.

MODEL M — 1 PLACE

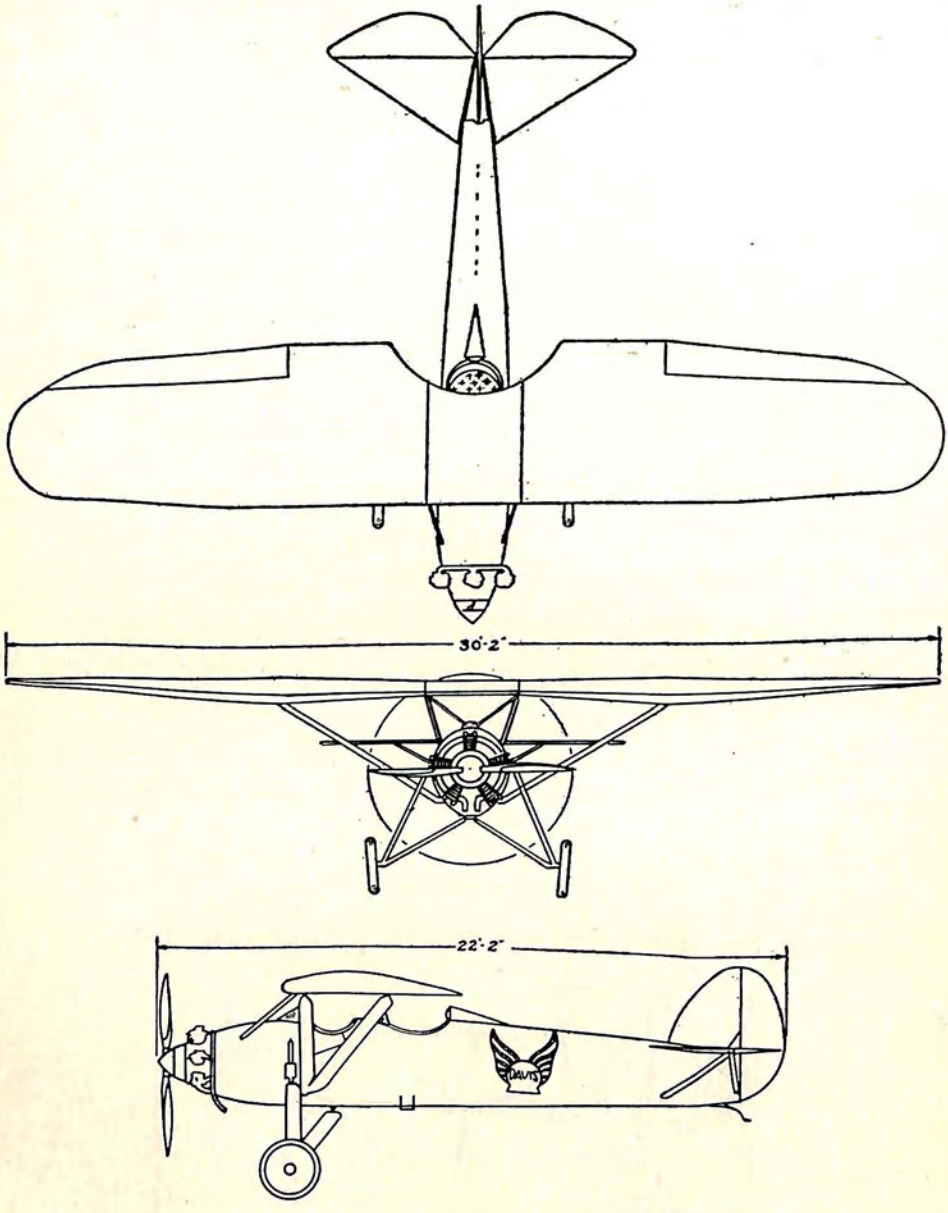
ENGINE: SUPER CHARGED WRIGHT WHIRLWIND 300



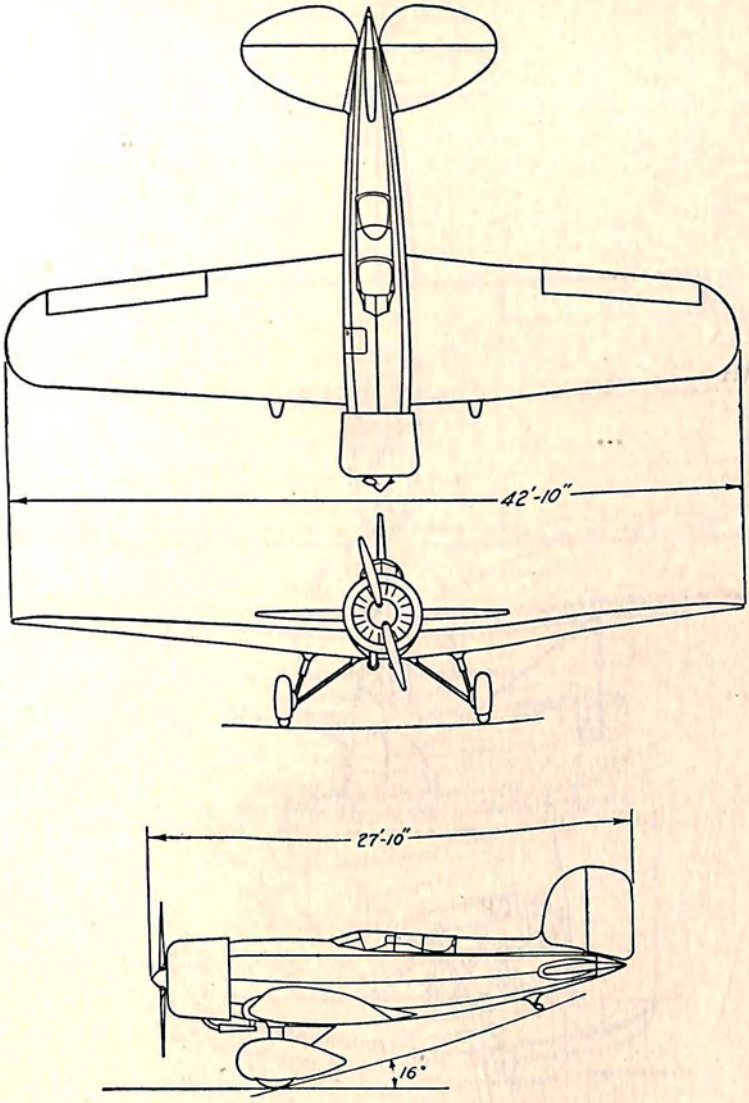
CURTISS-WRIGHT AIRPLANE COMPANY
Wichita, Kan.

MODEL 4 D — 3 PLACE

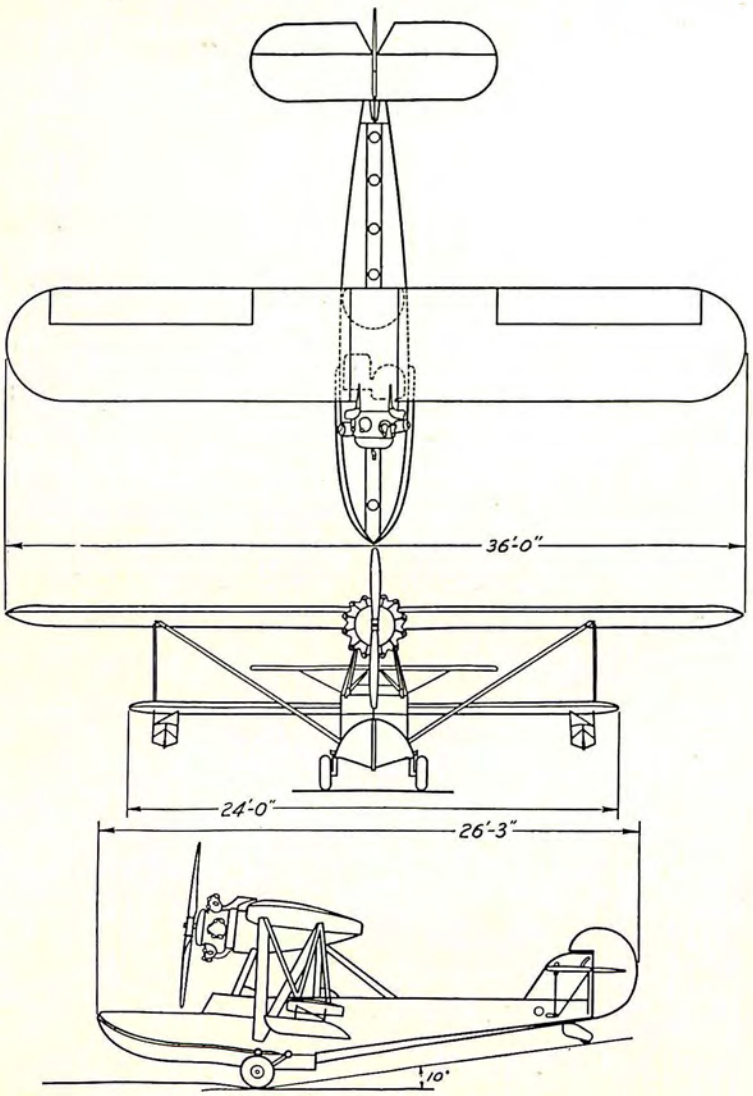
ENGINE: WRIGHT WHIRLWIND 240
WRIGHT WHIRLWIND 165



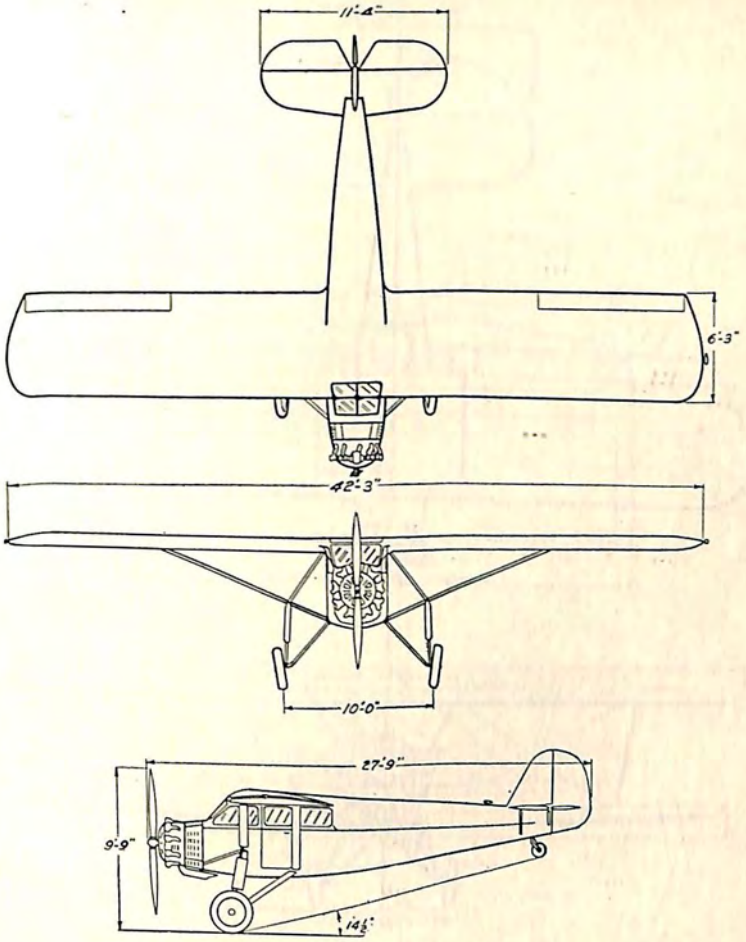
DAVIS AIRCRAFT CORPORATION
Richmond, Ind.
MODEL D — 2 PLACE
ENGINE: KINNER
LE BLOND



DETROIT AIRCRAFT CORPORATION
Detroit, Mich.
DETROIT LOCKHEED "SIRIUS" — 2 PLACE
ENGINE: PRATT & WHITNEY WASP



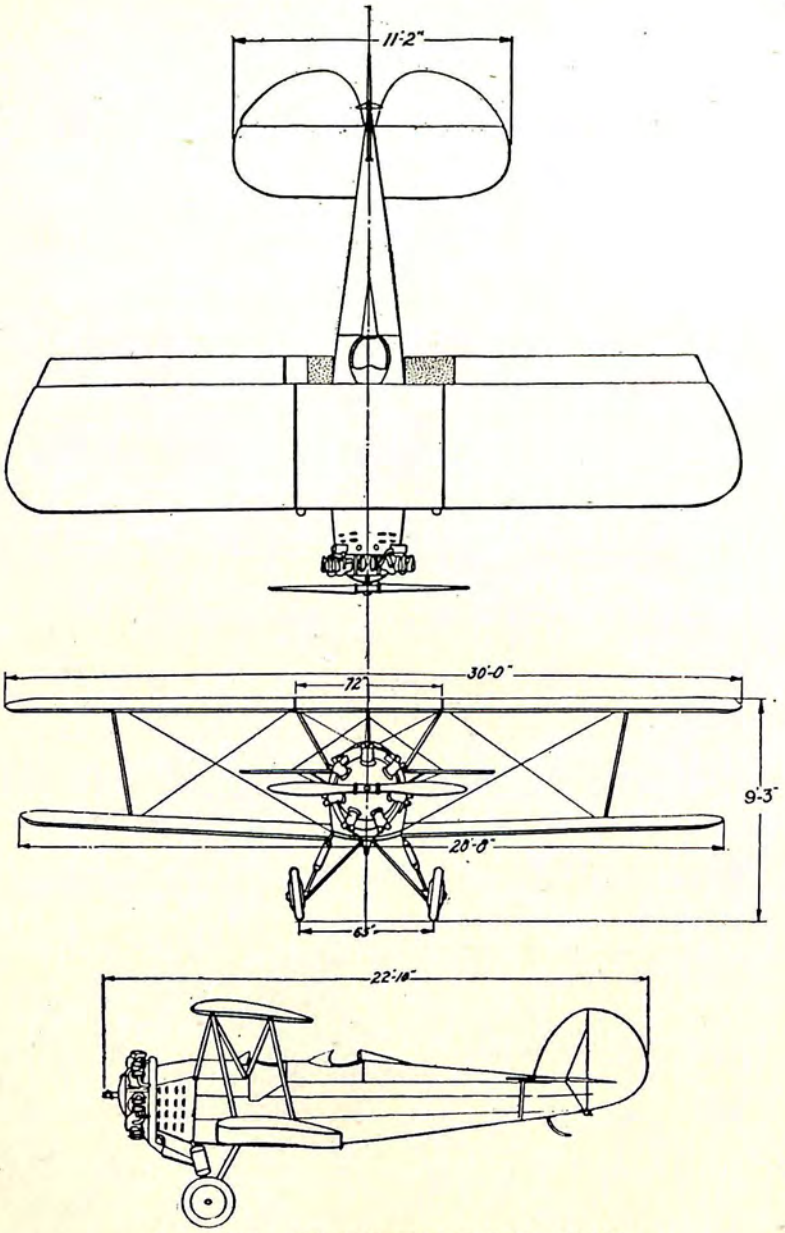
DETROIT AIRCRAFT CORPORATION
Detroit, Mich.
DETROIT EASTMAN AMPHIBIAN — 3 PLACE
ENGINE: CURTISS CHALLENGER



DETROIT AIRCRAFT CORPORATION
Detroit, Mich.

DETROIT RYAN C–1 — 4 PLACE

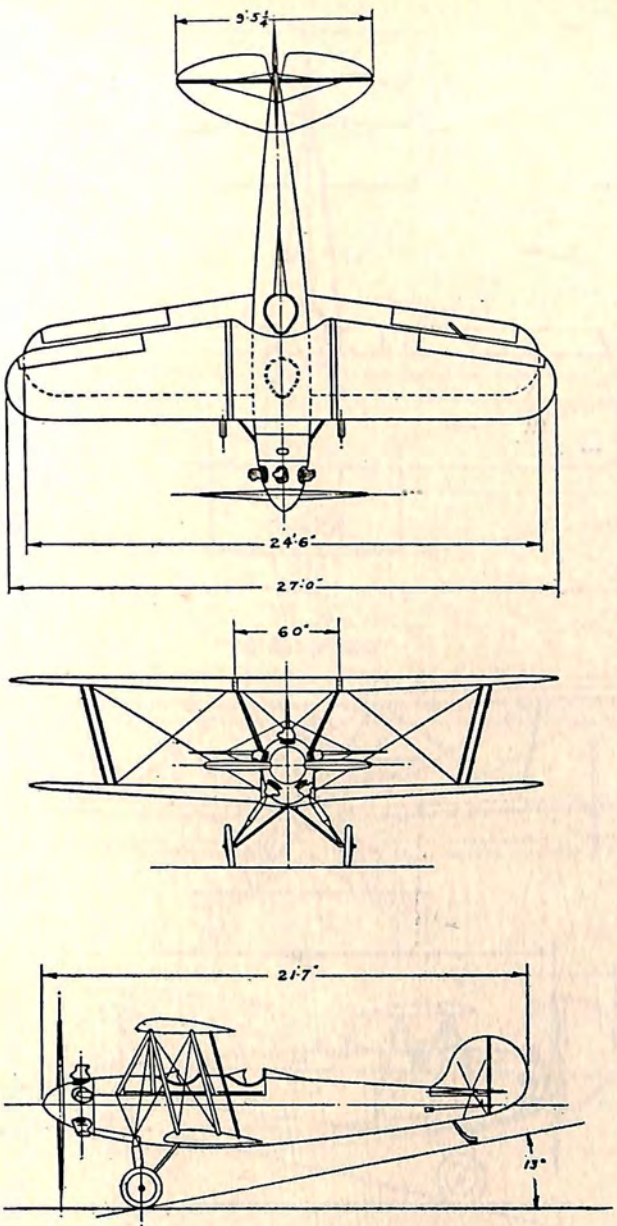
ENGINE: PACKARD DIESEL
PRATT & WHITNEY WASP, JR.
WRIGHT WHIRLWIND 240



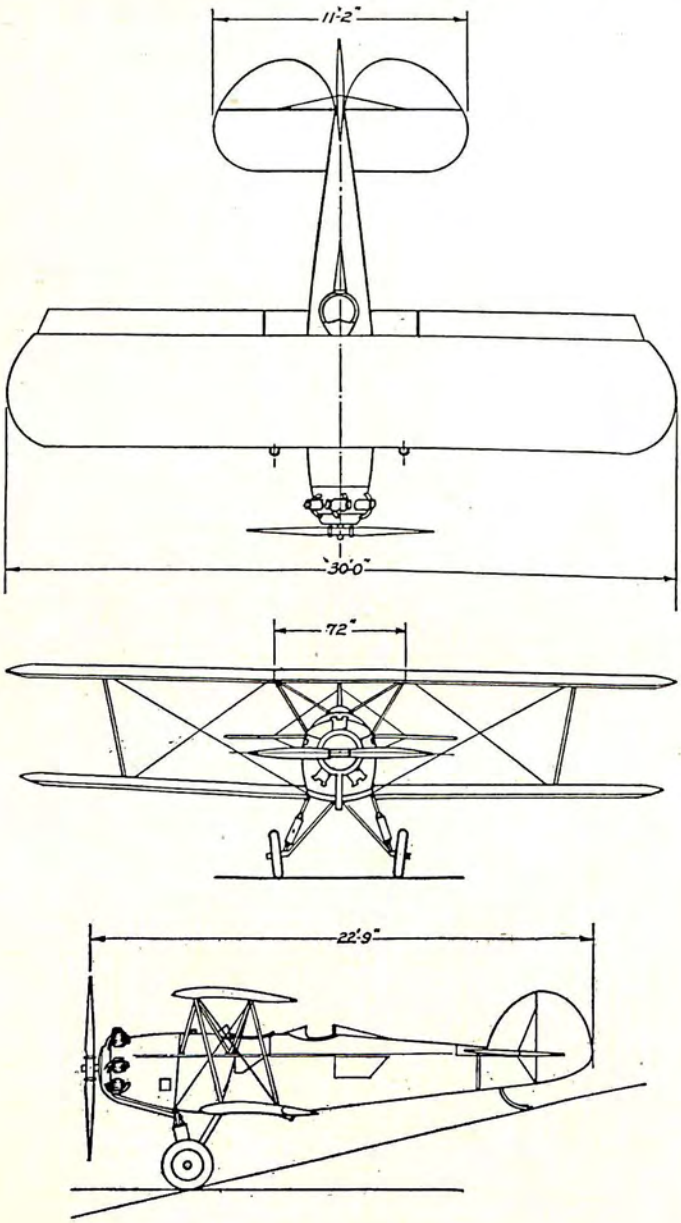
DETROIT AIRCRAFT CORPORATION
Detroit, Mich.

MODEL P 1–SPEEDSTER — 3 PLACE

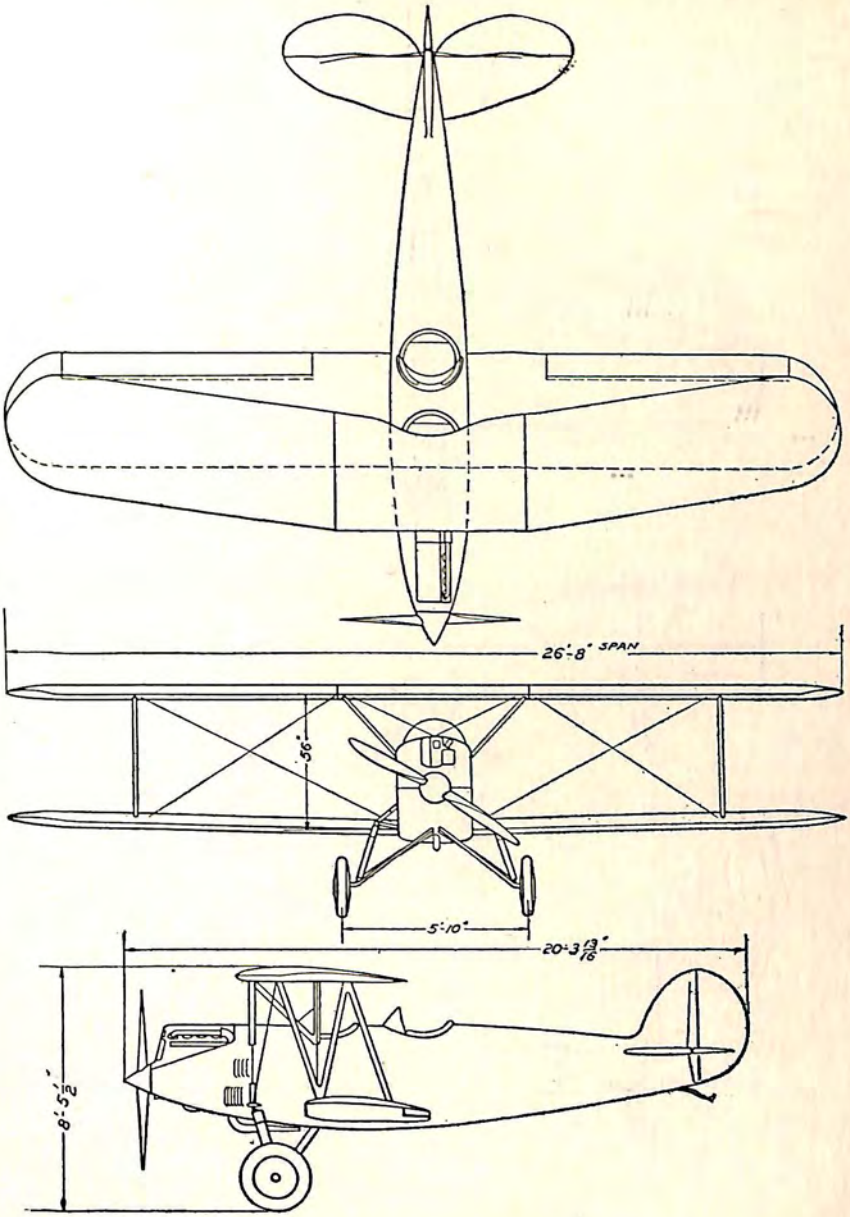
ENGINE: AXELSON
CURTISS OX 5
WRIGHT WHIRLWIND 165



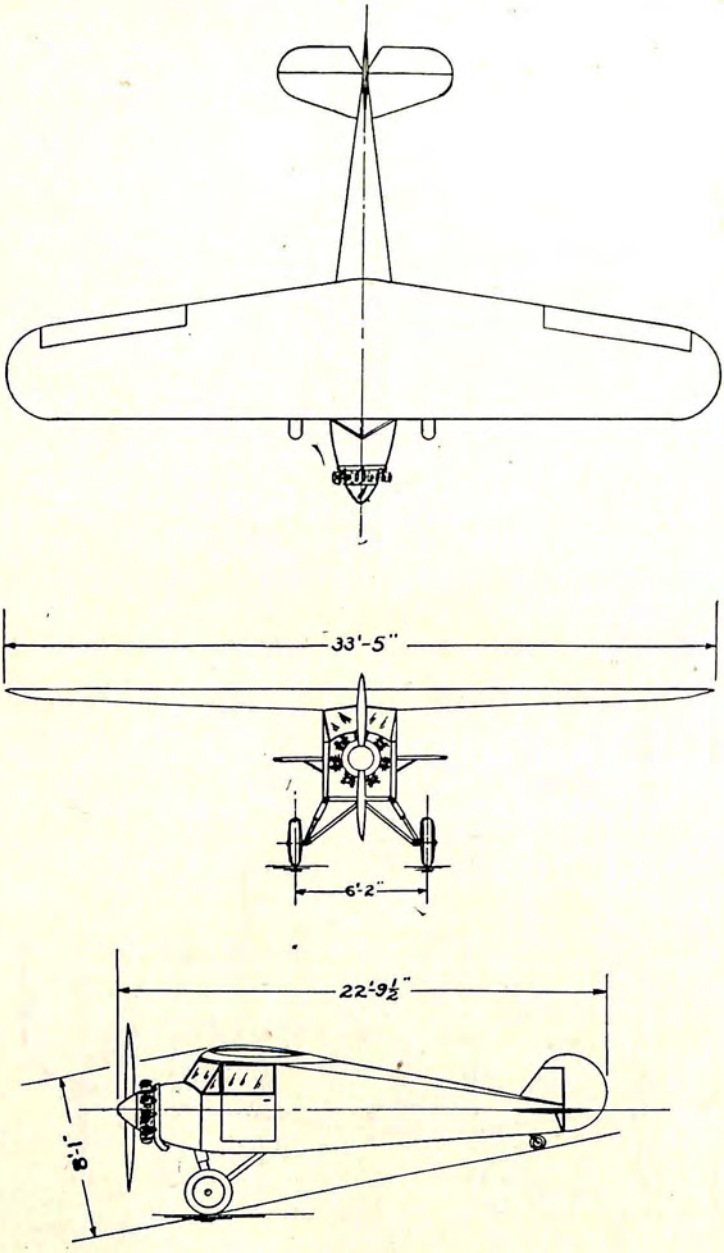
FAIRCHILD AVIATION CORPORATION
Farmingdale, L. I., N. Y.
MODEL KR 21 — 2 PLACE
ENGINE: KINNER



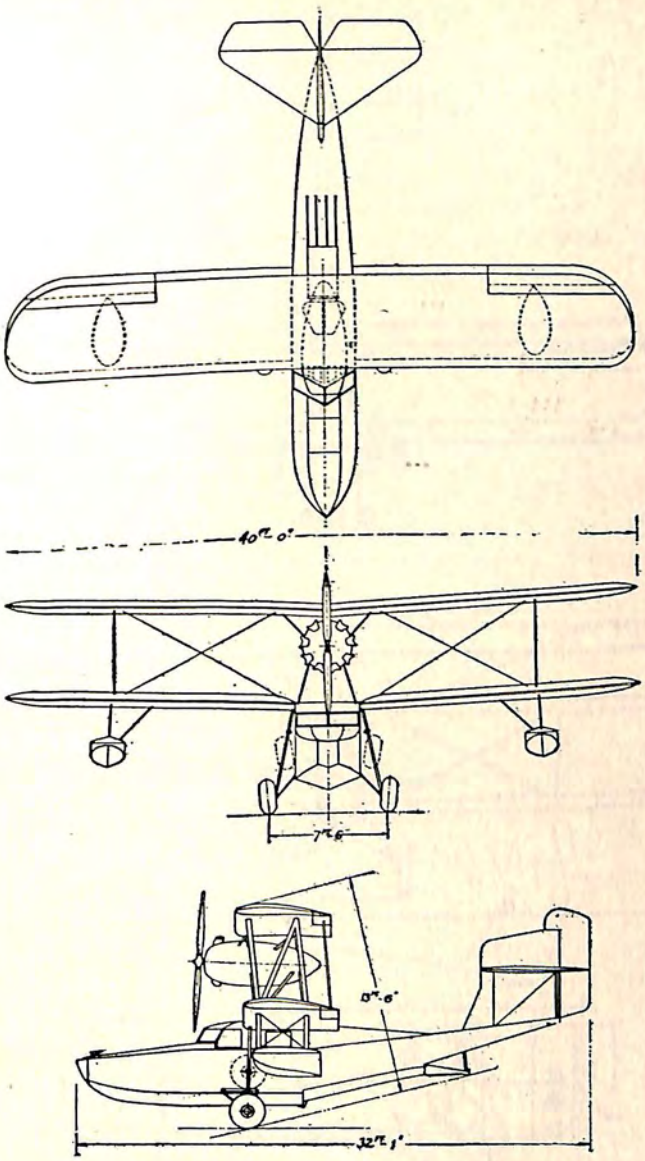
FAIRCHILD AVIATION CORPORATION
Farmingdale, L. I. N. Y.
MODEL KR 34 — 3 PLACE
ENGINE: WRIGHT WHIRLWIND 165



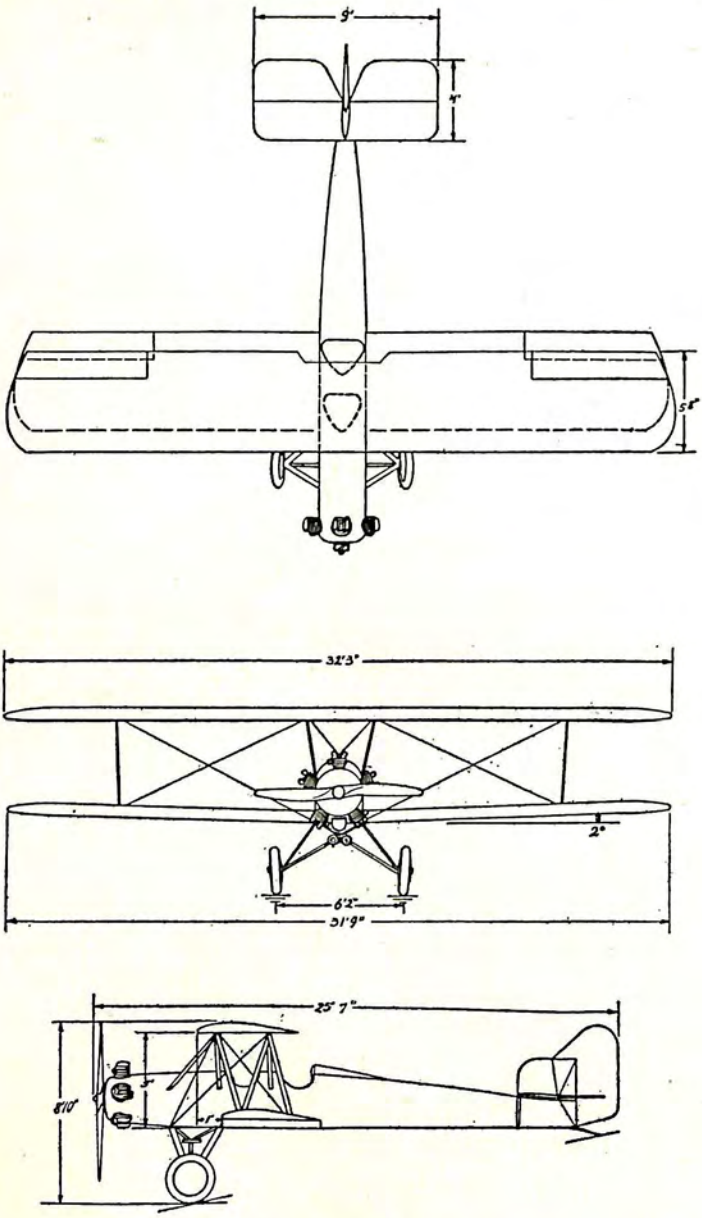
GREAT LAKES AIRCRAFT CORPORATION
Cleveland, Ohio
MODEL 2 T 1–A — 2 PLACE
ENGINE: AMERICAN CIRRUS



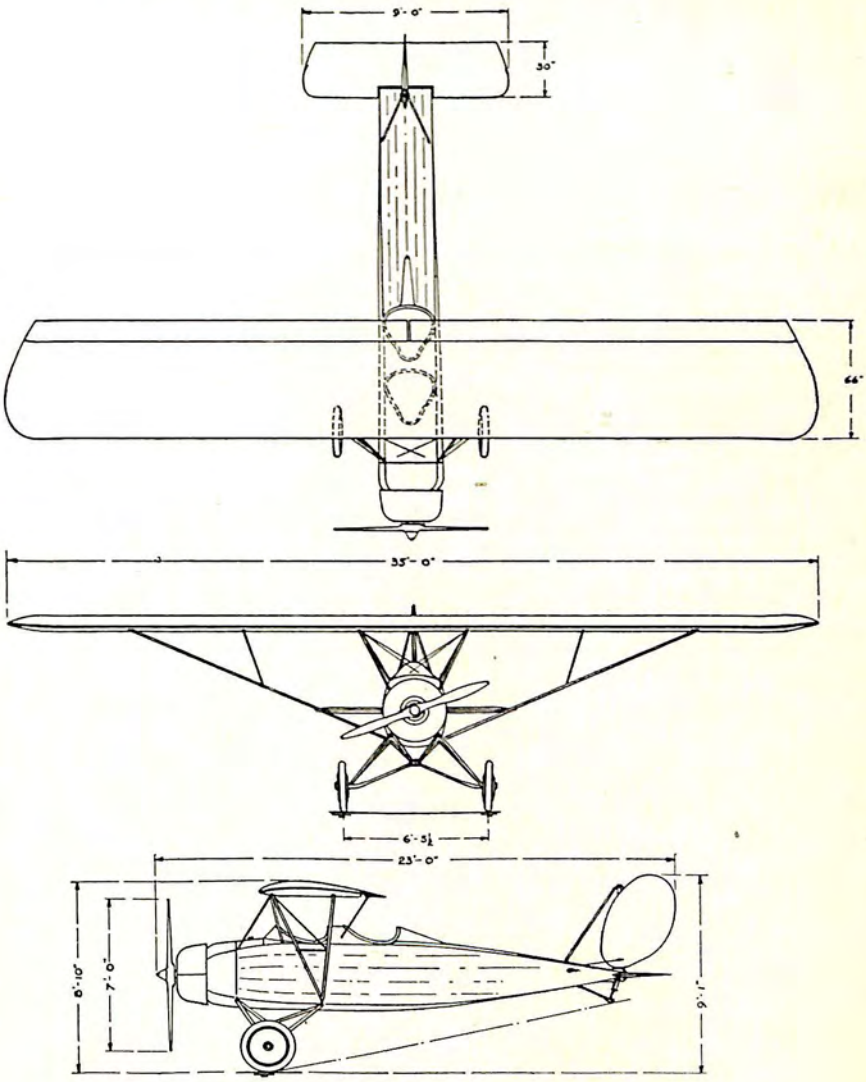
HUNTINGTON AIRCRAFT CORPORATION
Bridgeport, Conn.
MODEL 11 — 2 PLACE
ENGINE: WARNER SCARAB



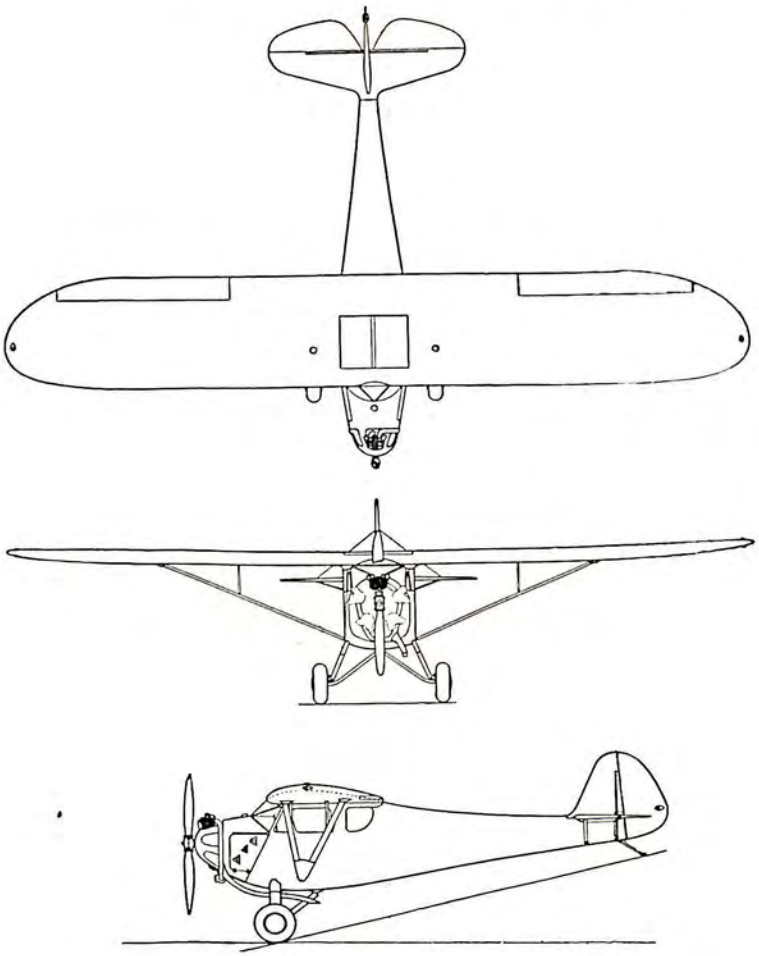
KEYSTONE AIRCRAFT CORPORATION
Bristol, Pa.
COMMUTER — 4 PLACE
ENGINE: WRIGHT WHIRLWIND 300



LINCOLN AIRCRAFT COMPANY, INC.
Lincoln, Neb.
MODEL PT 1 — 2 PLACE
ENGINE: CURTISS OX 5
KINNER



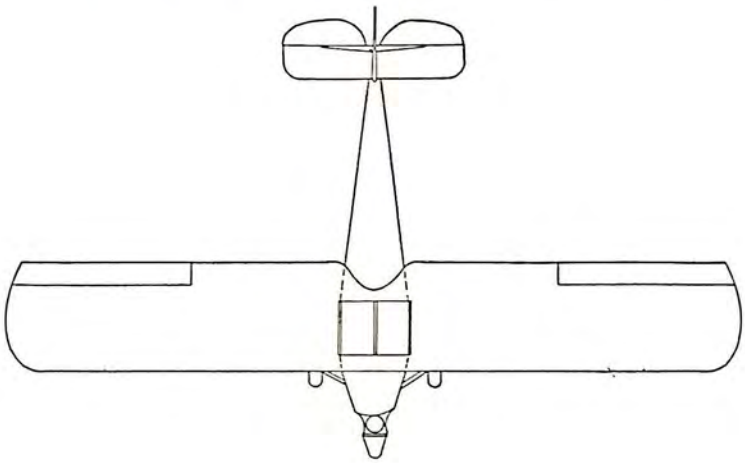
MERCURY AIRCRAFT, INCORPORATED
Hammondsport, N. Y.
MODEL T 2 — 2 PLACE
ENGINE: LE BLOND

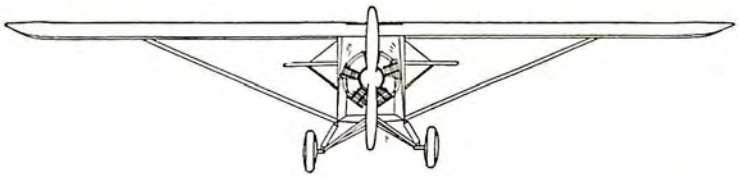


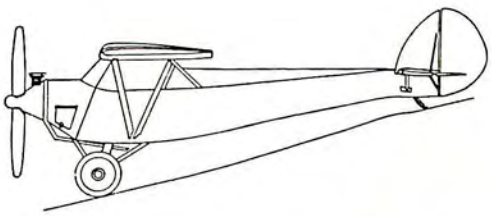
MONO AIRCRAFT, INCORPORATED
Moline, Ill.

MONOCOUPE 90–90J–100–125 — 2 PLACE

ENGINE: KINNER B 5
LAMBERT
WARNER SCARAB, JR.
WARNER SCARAB

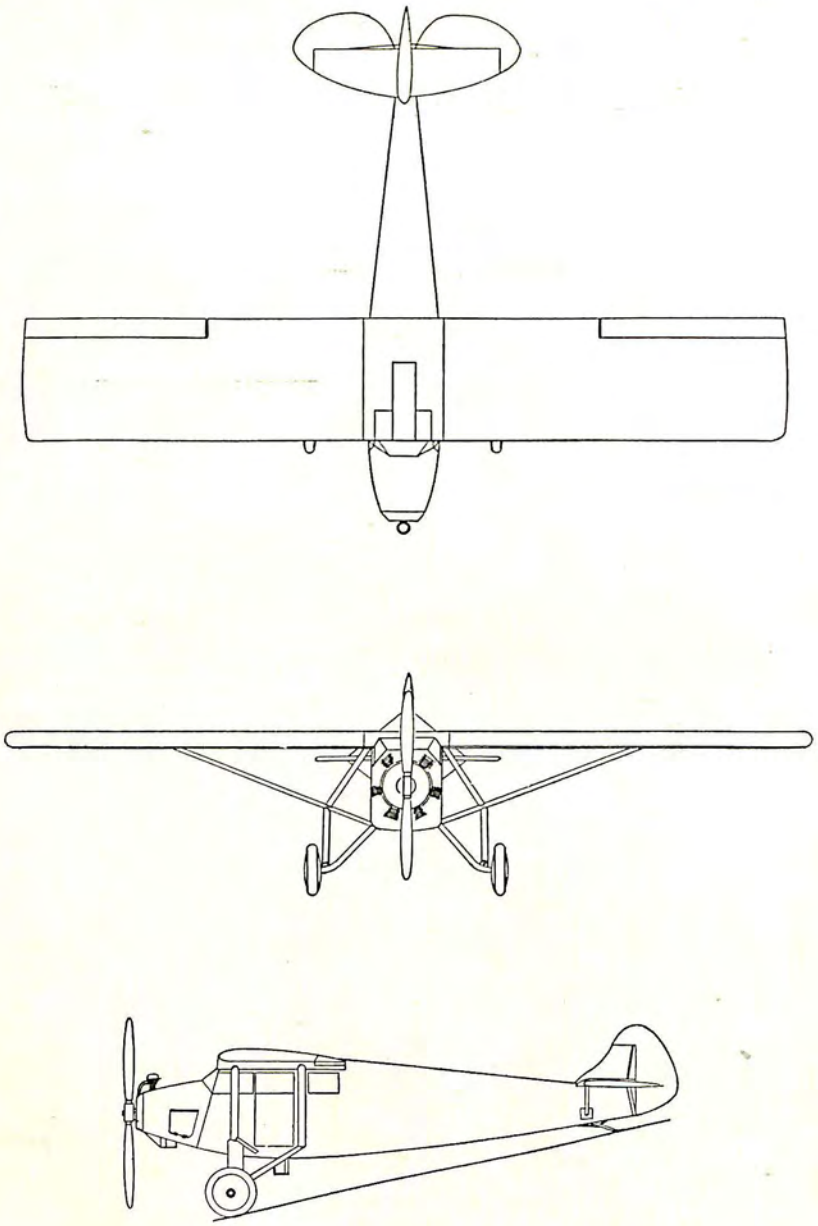






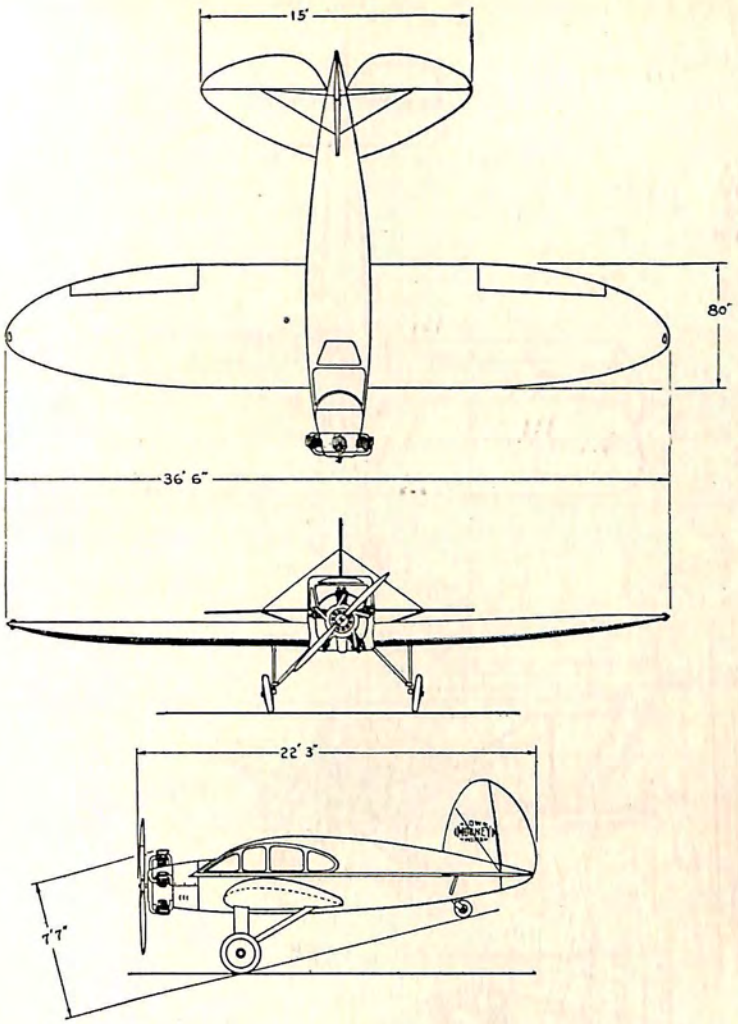
MONO AIRCRAFT, INCORPORATED
Moline, Ill.

MONOPREP — 2 PLACE
ENGINE: VELIE

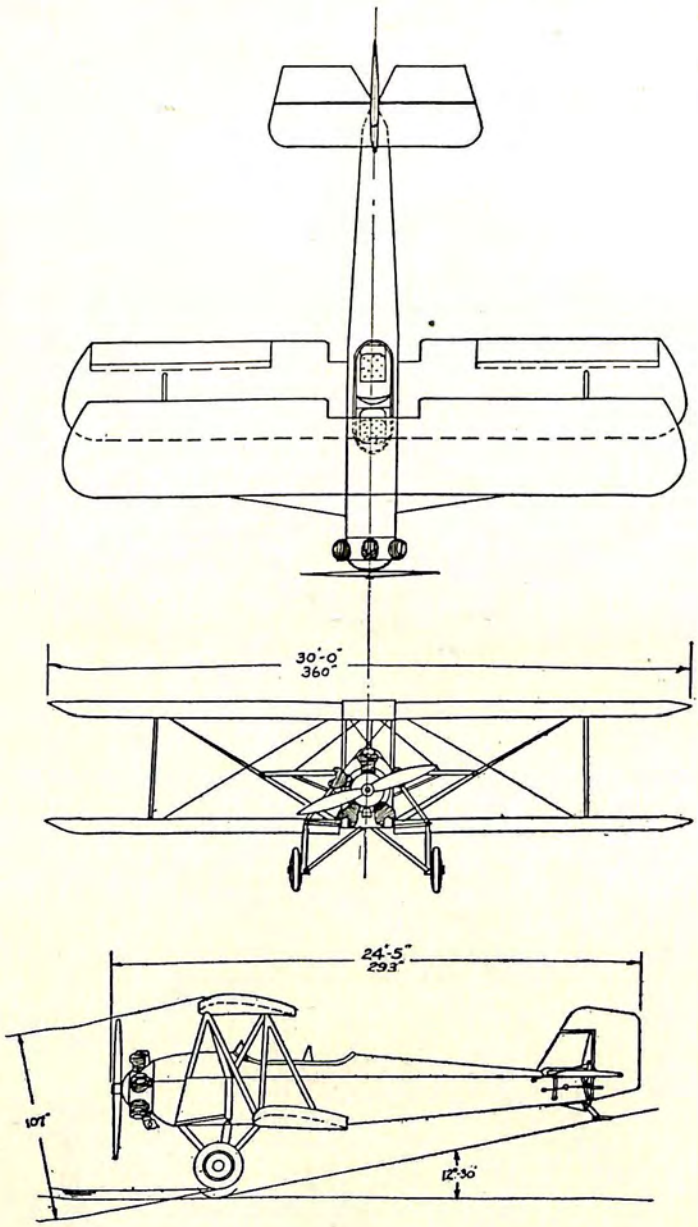


MONO AIRCRAFT INCORPORATED
Moline, Ill.

MONOCOACH — 4 PLACE
ENGINE: WRIGHT WHIRLWIND 240



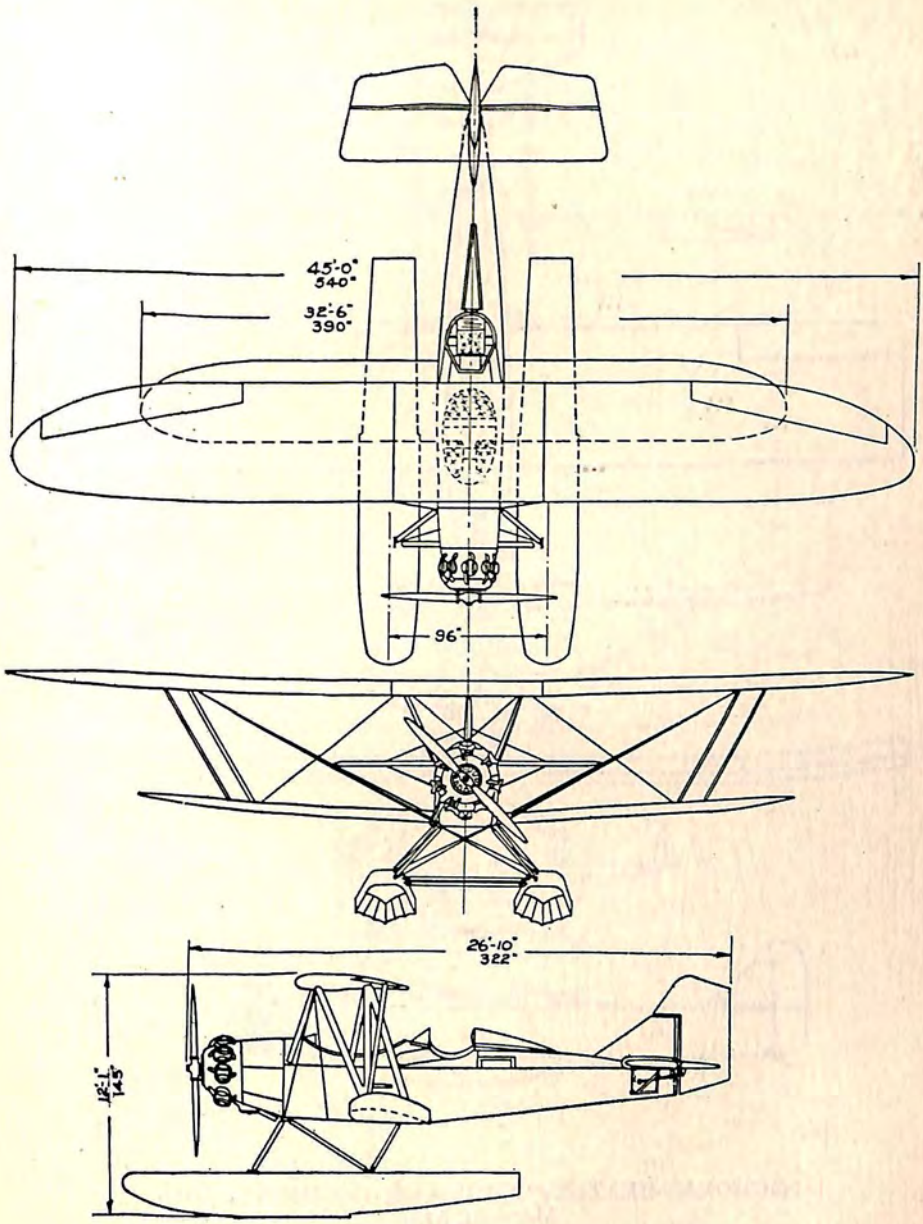
MOONEY AIRCRAFT CORPORATION
Wichita, Kan.
MODEL A–1, A–2
ENGINE: KINNER K–5
KINNER B–5



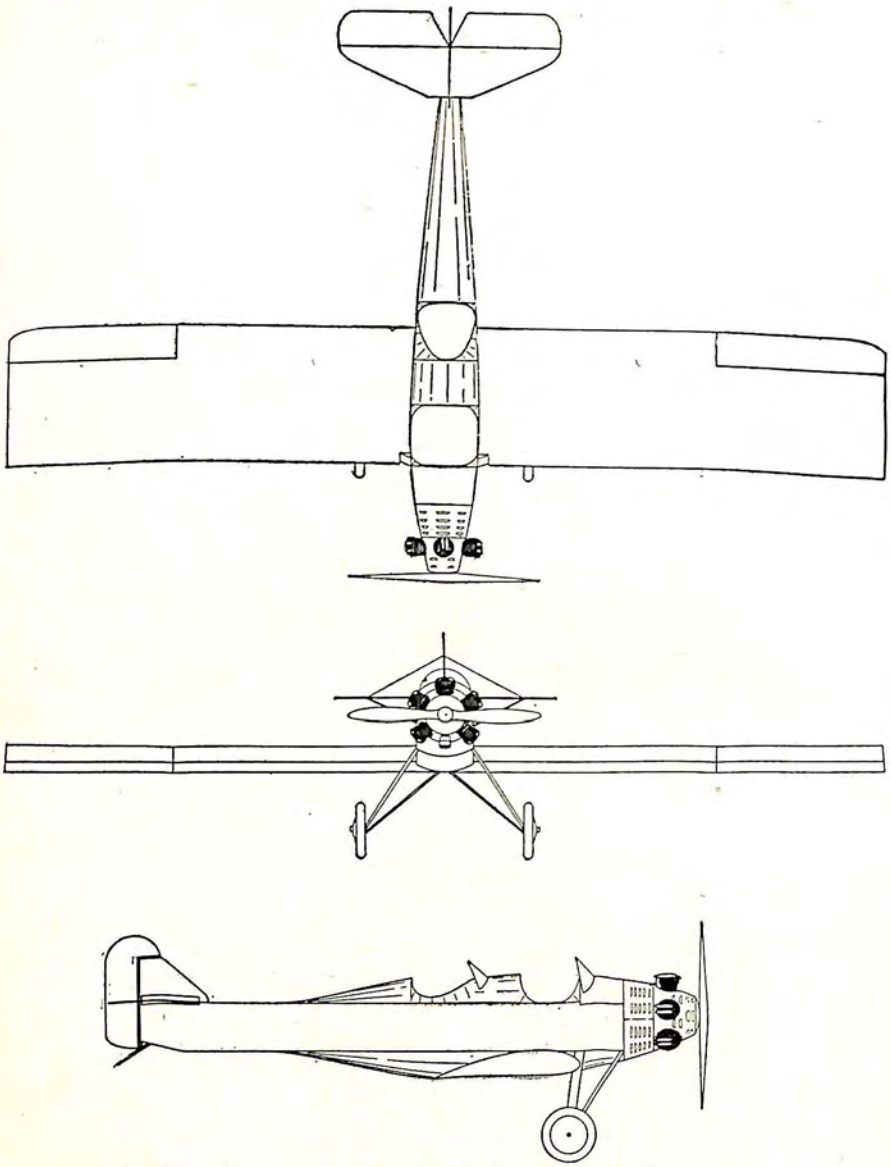
NEW STANDARD AIRCRAFT CORPORATION
Paterson, N. J.

MODEL D29A–D29B–D31–D32 — 2 PLACE

ENGINE: KINNER B 5
WRIGHT WHIRLWIND 165

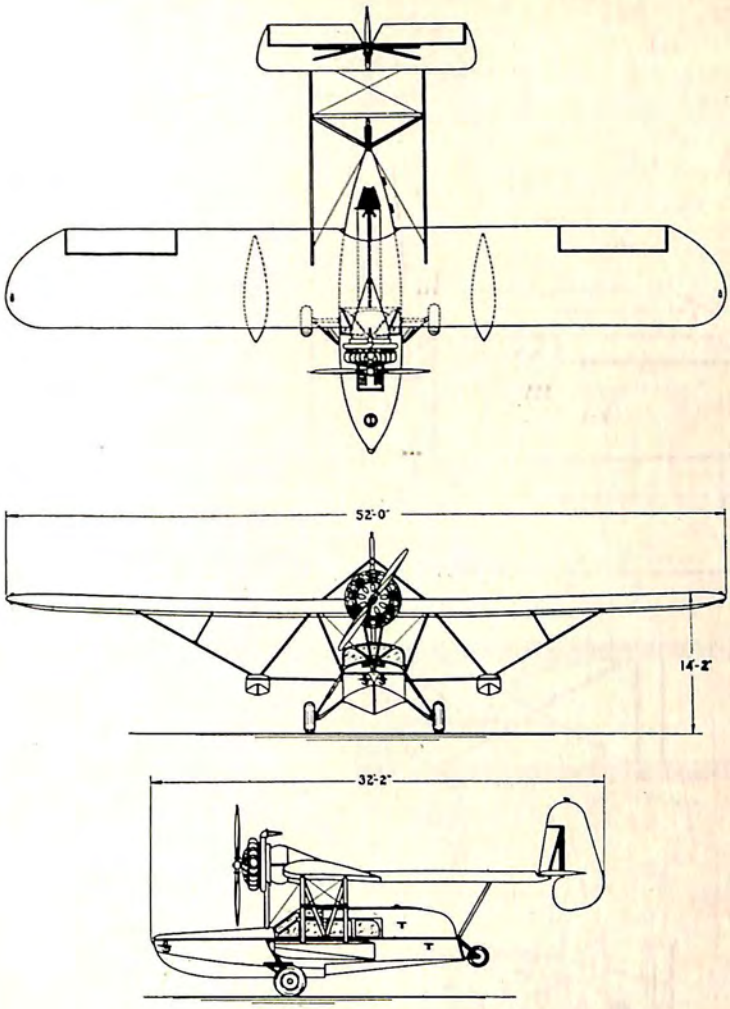


NEW STANDARD AIRCRAFT CORPORATION
Paterson, N. J.
MODEL D28A–D25A–D25B — 5 PLACE
ENGINE: WRIGHT WHIRLWIND 240
WRIGHT WHIRLWIND 300

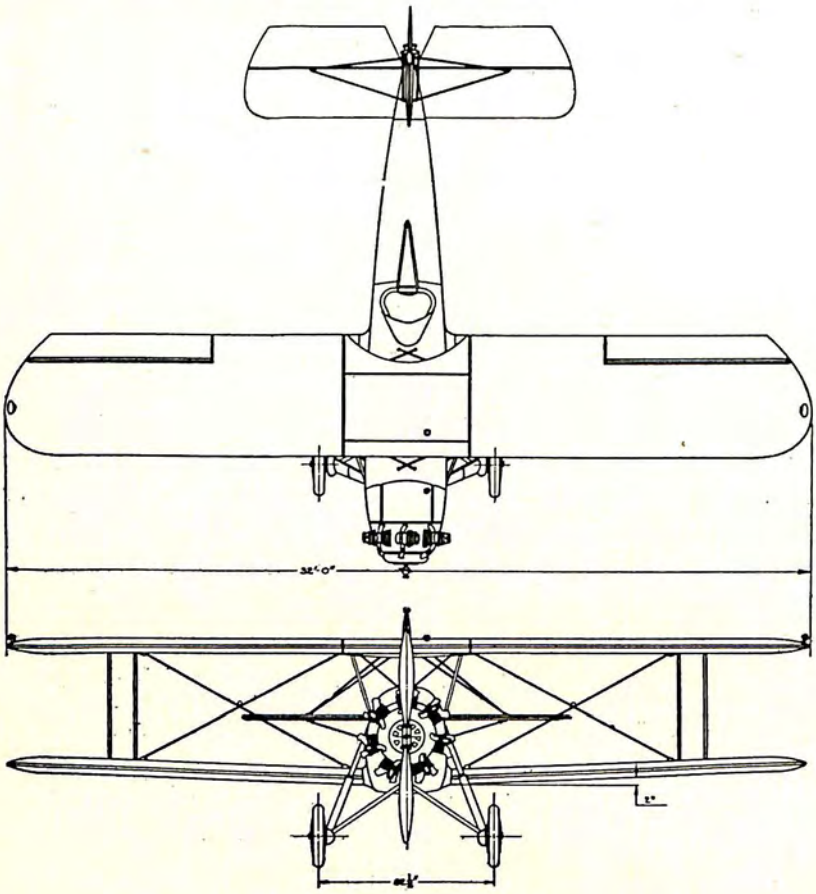


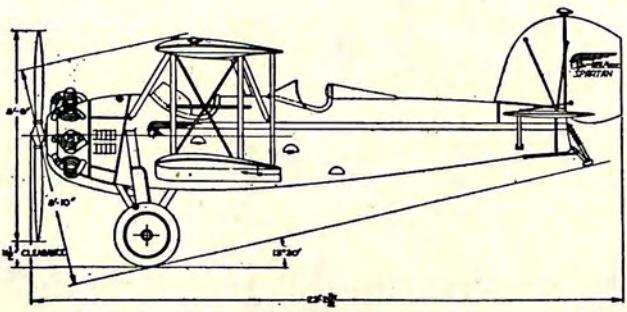
NICHOLAS-BEAZLEY AIRPLANE COMPANY, INC.
Marshall, Mo.

BARLING NB3–NB4 — 3 PLACE
ENGINE: GENET
LAMBERT
LE BLOND
VELIE M 5
WARNER SCARAB, JR.



SIKORSKY AVIATION CORPORATION
Bridgeport, Conn.
AMPHIBION S-39 — 5 PLACE
ENGINE: PRATT & WHITNEY WASP, JR.

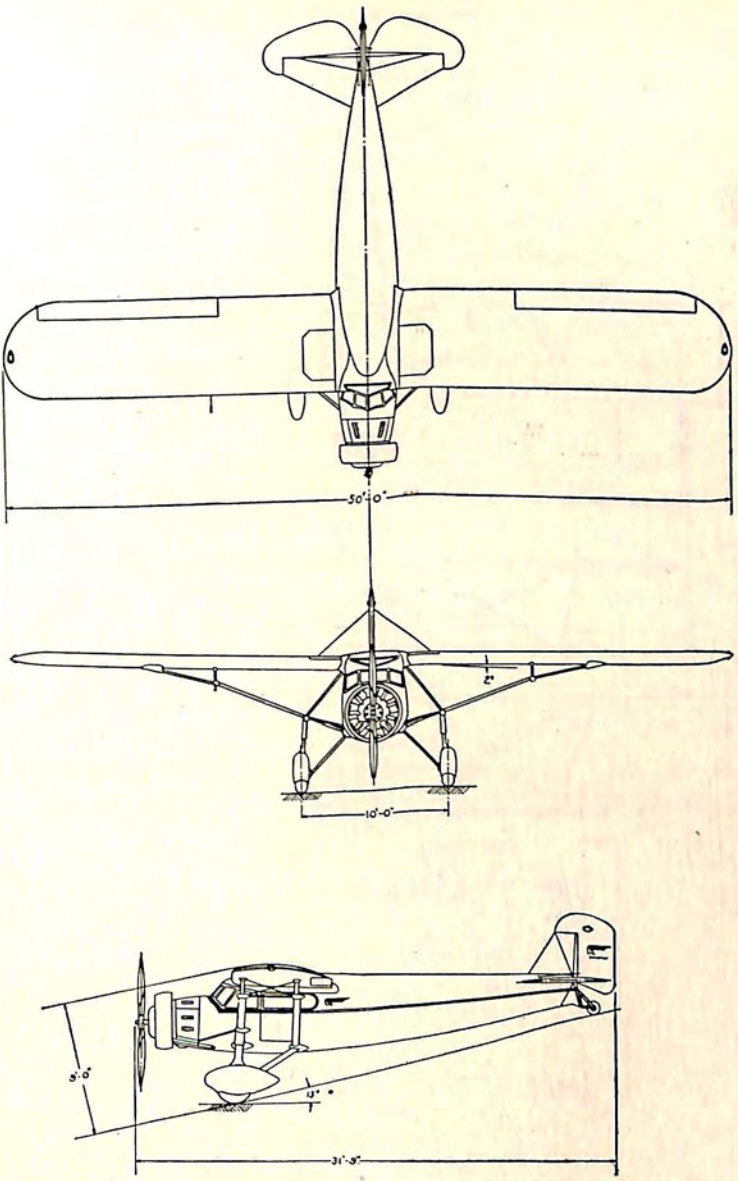




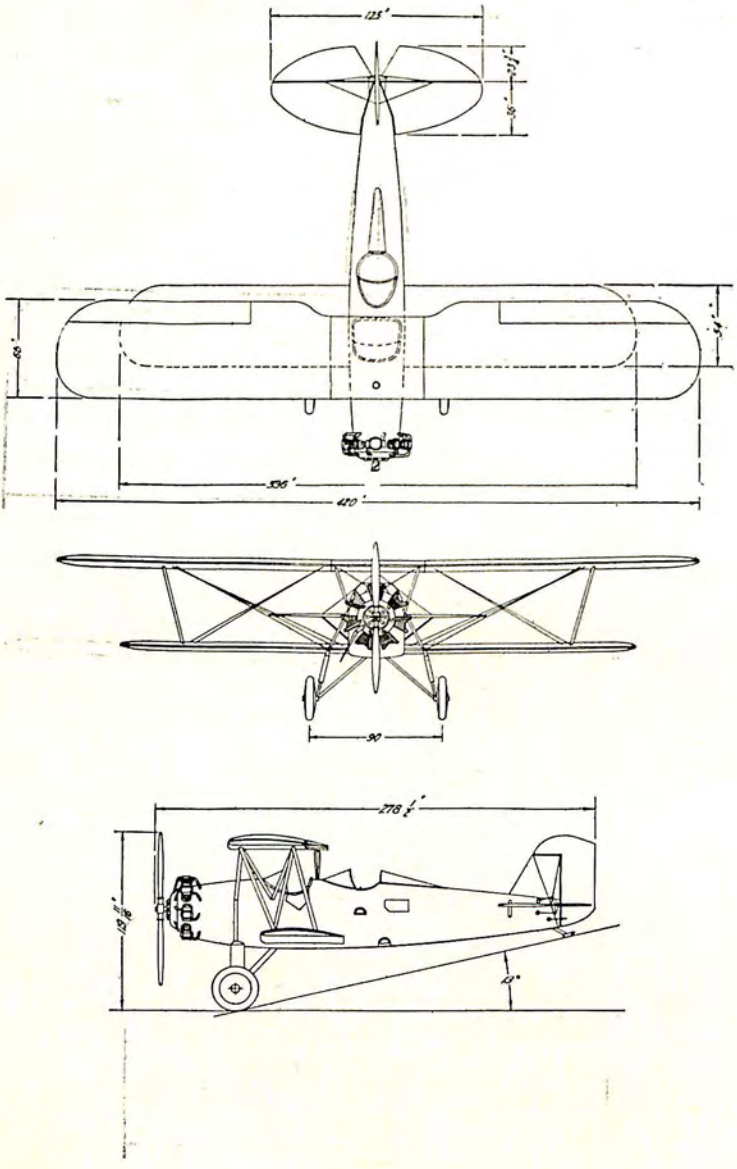
SPARTAN AIRCRAFT COMPANY, INC.
Tulsa, Okla.

MODEL C 3 — 3 PLACE

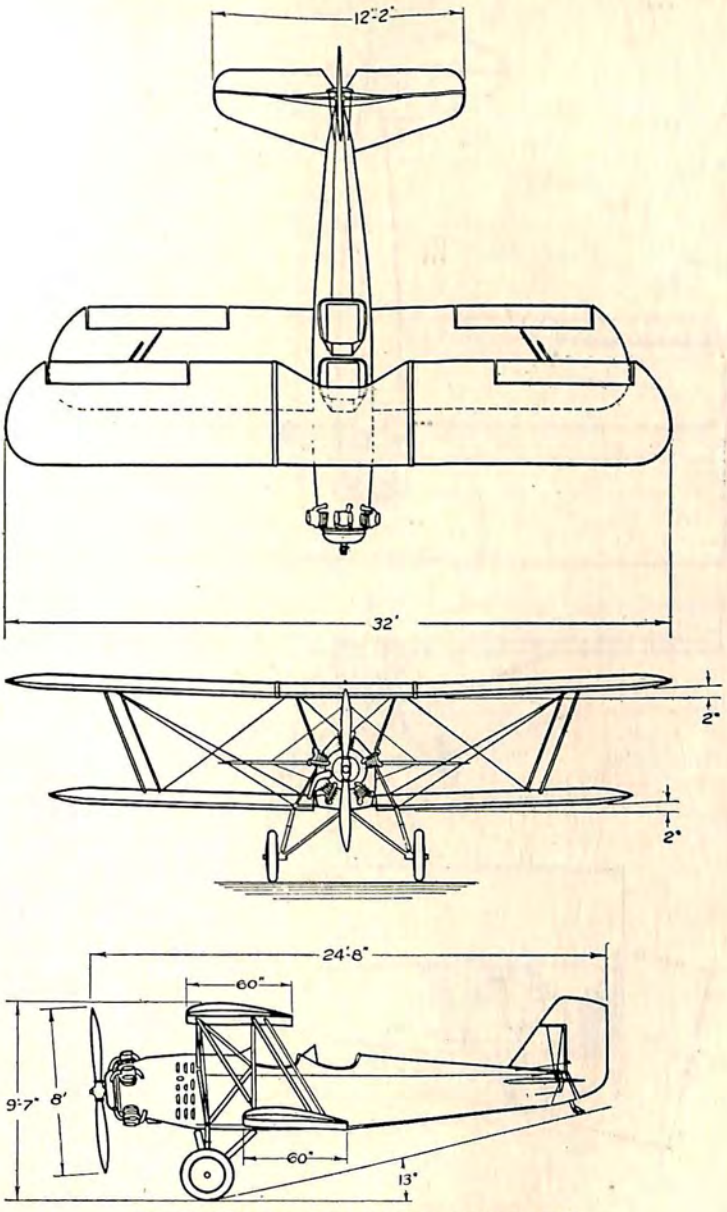
ENGINE: WRIGHT WHIRLWIND 165
WRIGHT WHIRLWIND 240



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



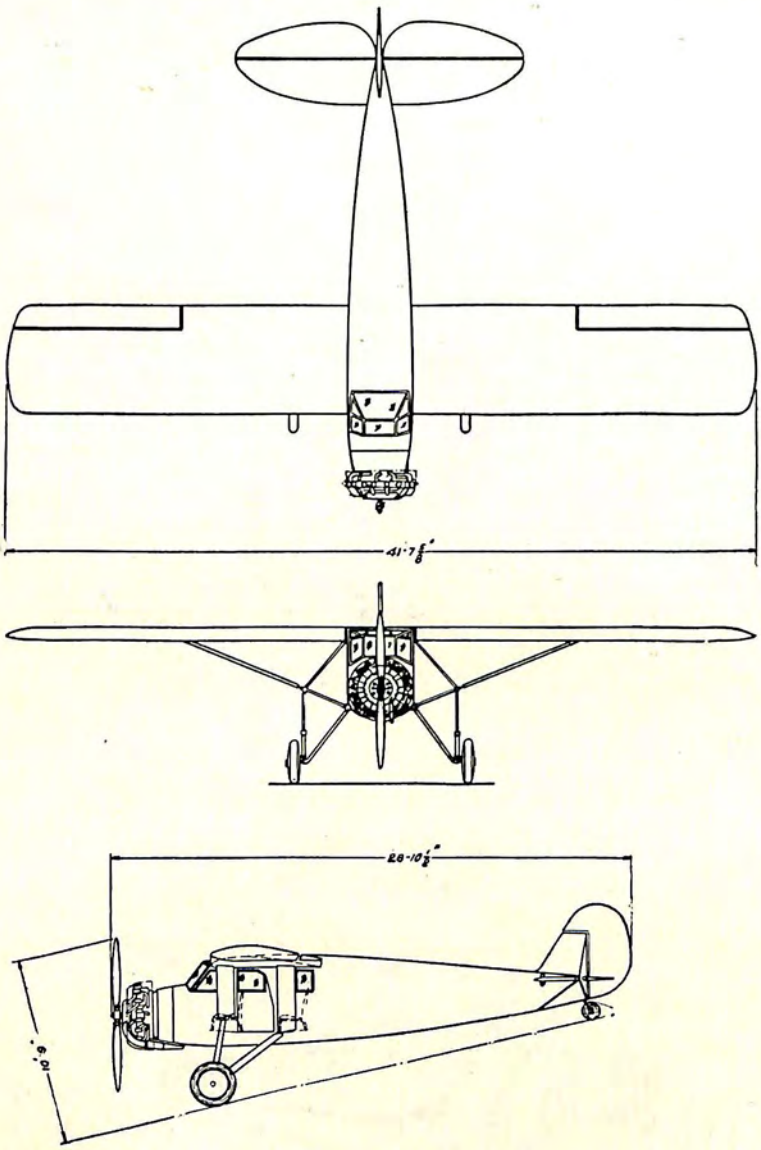
STEARMAN AIRCRAFT COMPANY
Wichita, Kan.
MODEL C 3R — 3 PLACE
ENGINE: WRIGHT WHIRLWIND 240



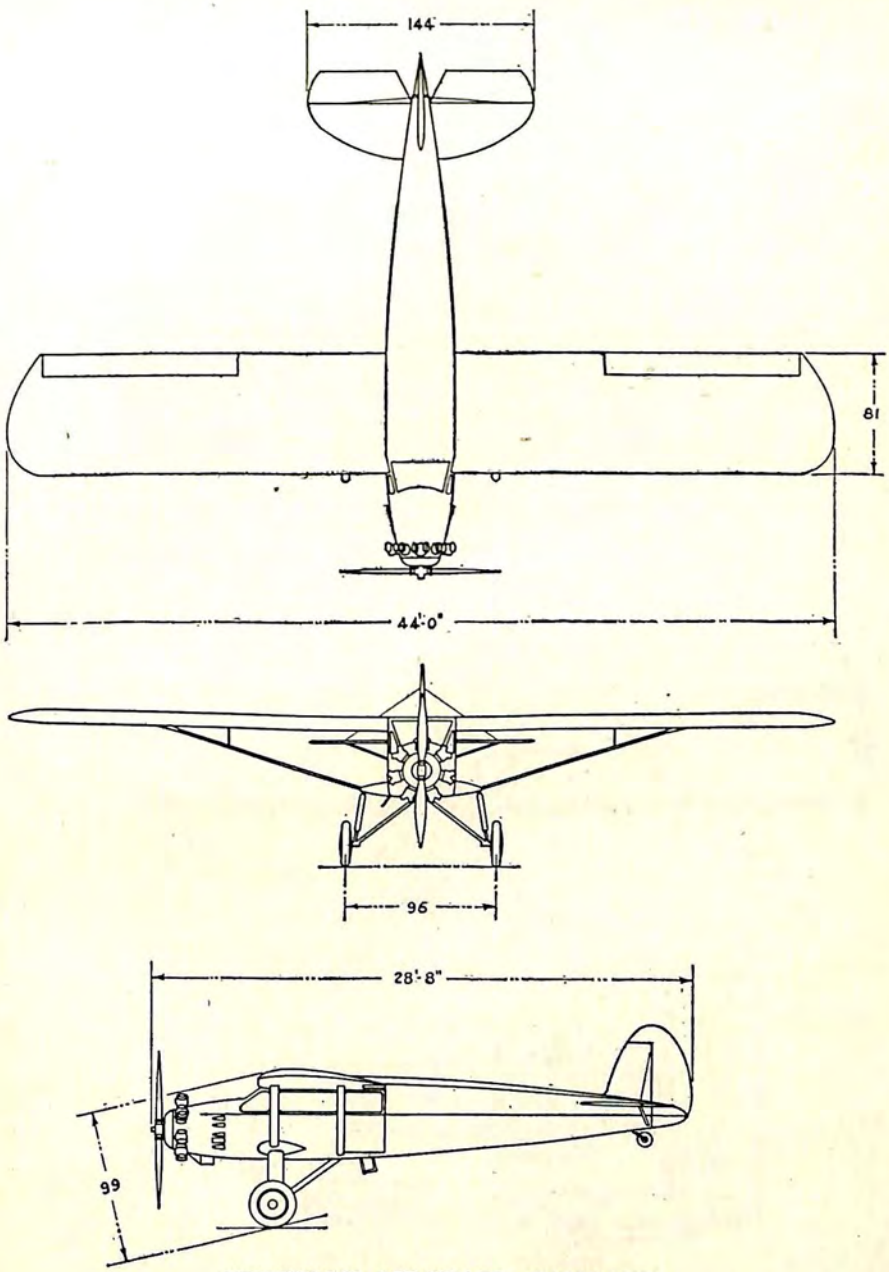
STEARMAN AIRCRAFT COMPANY
Wichita, Kan.

CLOUDBOY — 2 PLACE

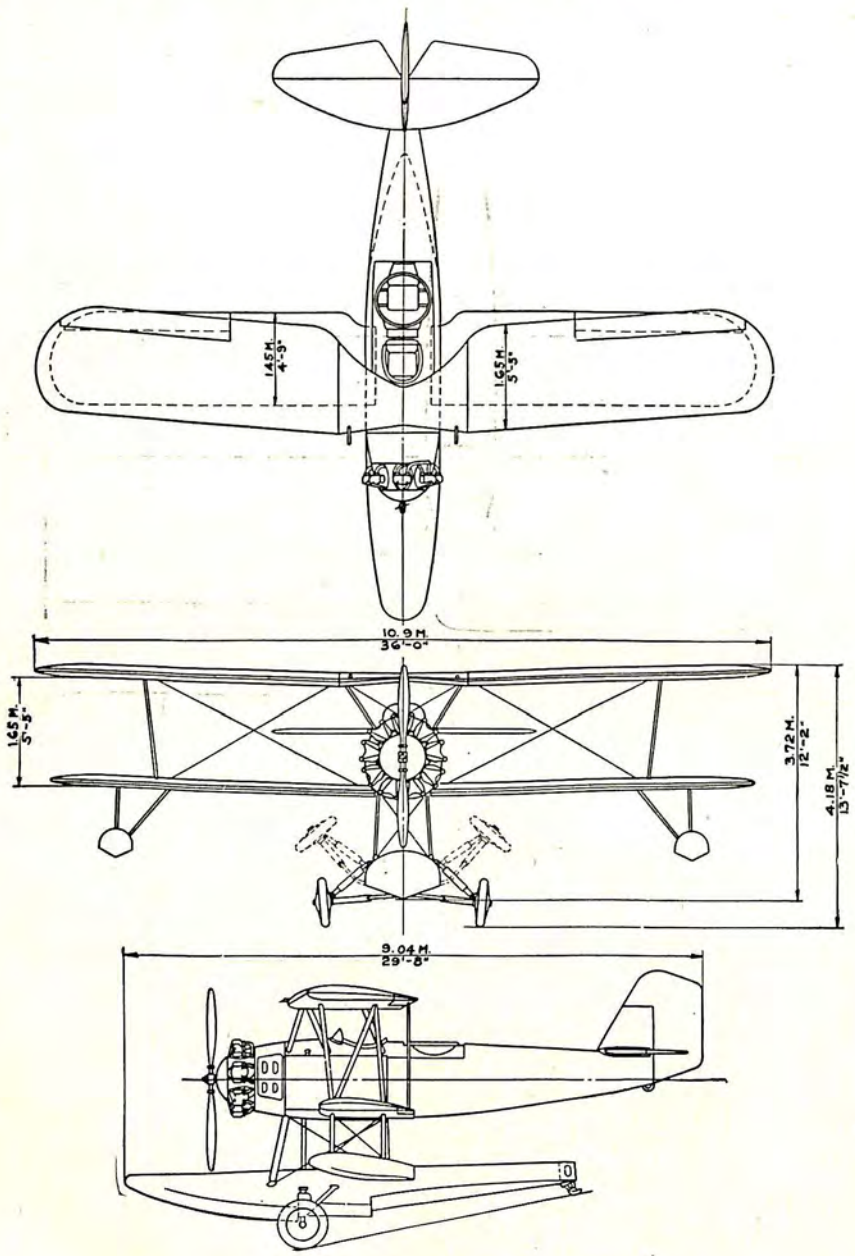
ENGINE: CONTINENTAL
PRATT & WHITNEY WASP, JR.
WRIGHT WHIRLWIND 165



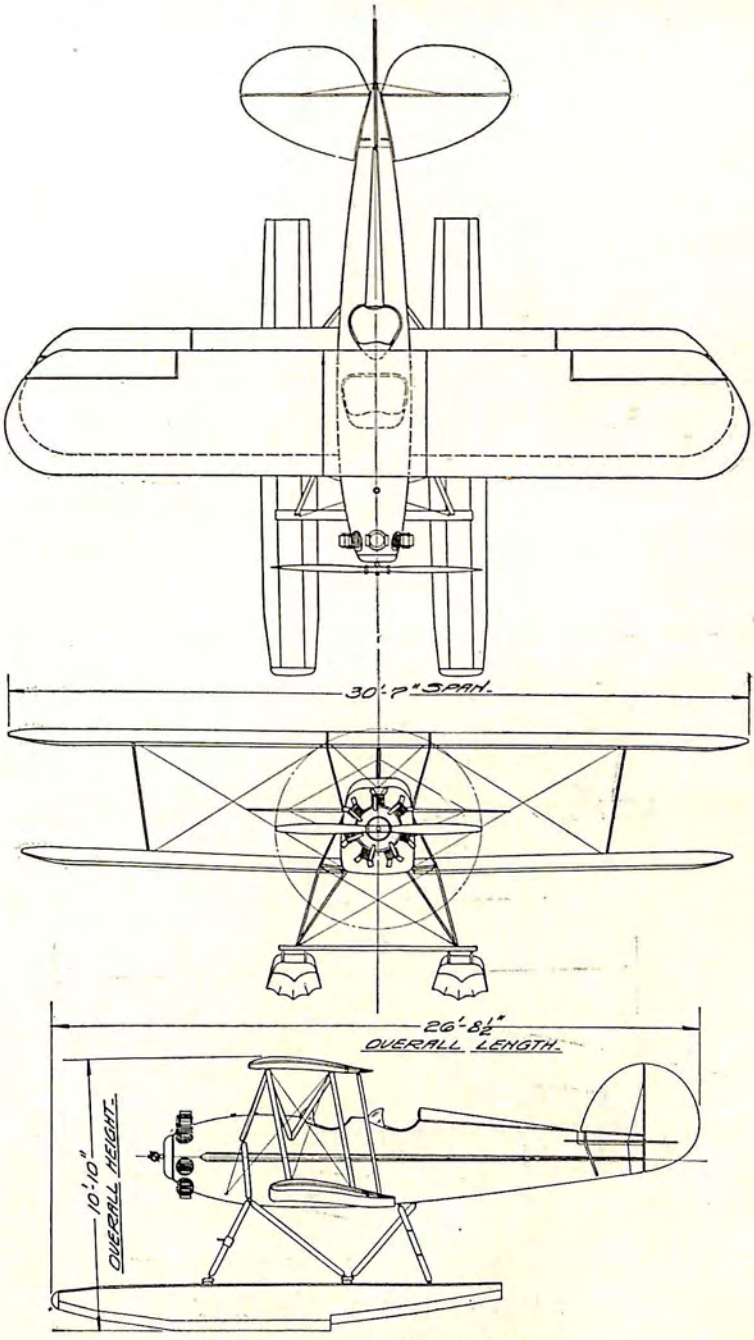
STINSON AIRCRAFT CORPORATION
Wayne, Mich.
MODEL SM 8A — 4 PLACE
ENGINE: LYCOMING



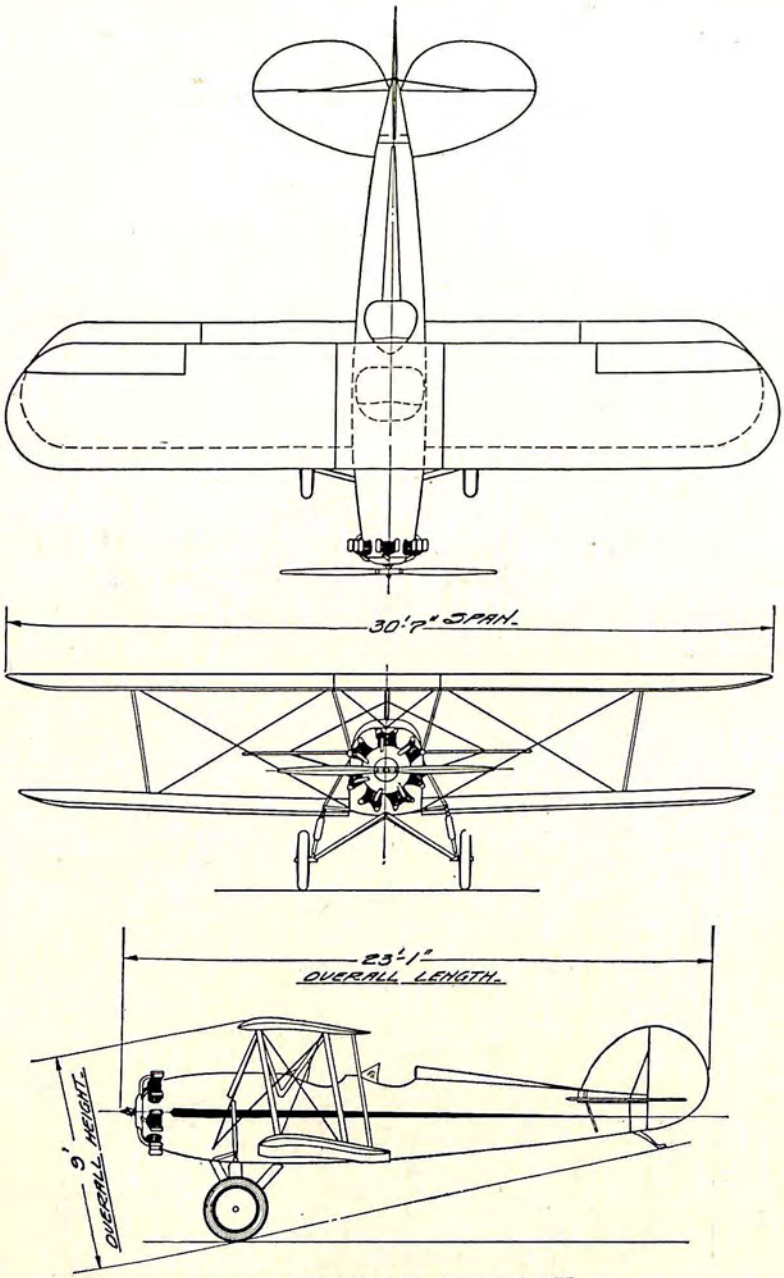
VERVILLE AIRCRAFT COMPANY
Detroit, Mich.
MODEL 104 — 4 PLACE
ENGINE: PACKARD DIESEL
WRIGHT WHIRLWIND 240



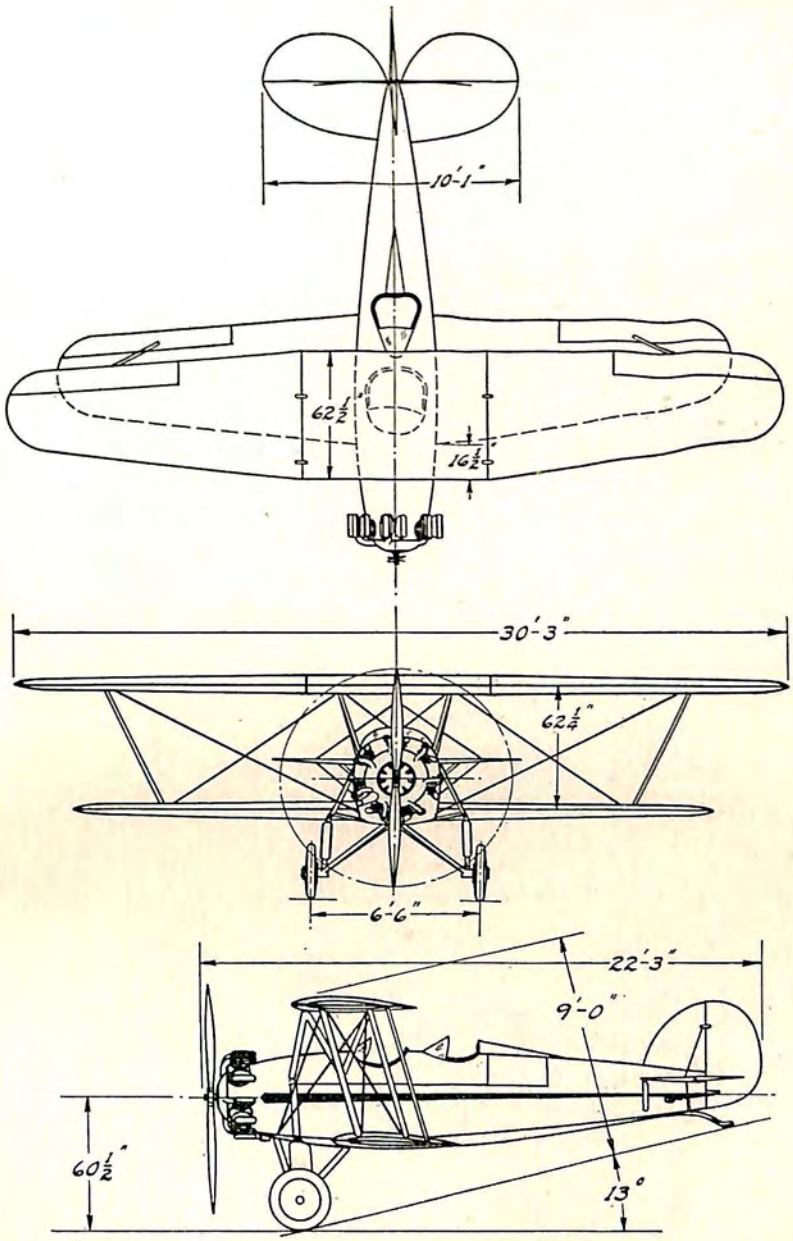
CHANCE VOUGHT CORPORATION
Hartford, Conn.
MODEL O 2U–4 — 2 PLACE
ENGINE: PRATT & WHITNEY WASP



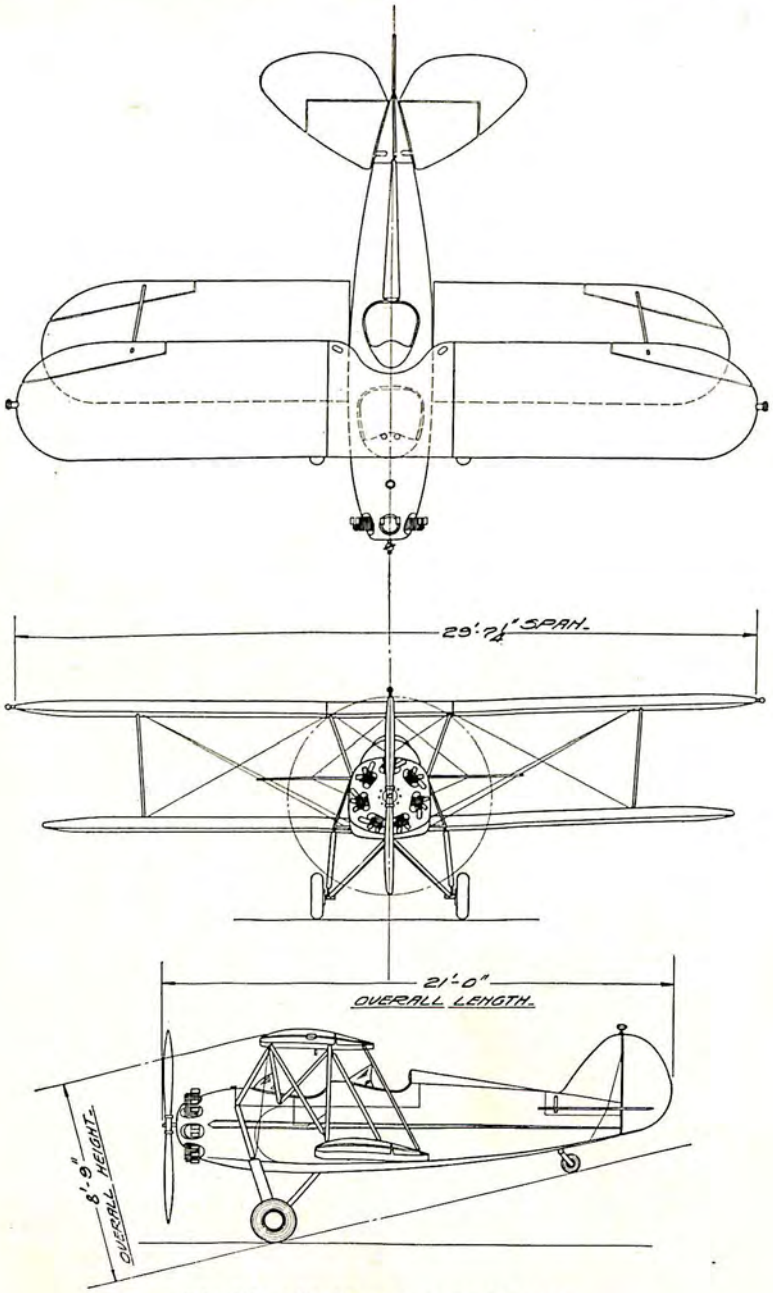
WACO AIRCRAFT COMPANY
Troy, Ohio
MODEL CS 0 — 3 PLACE
ENGINE: WRIGHT WHIRLWIND 165
WRIGHT WHIRLWIND 240



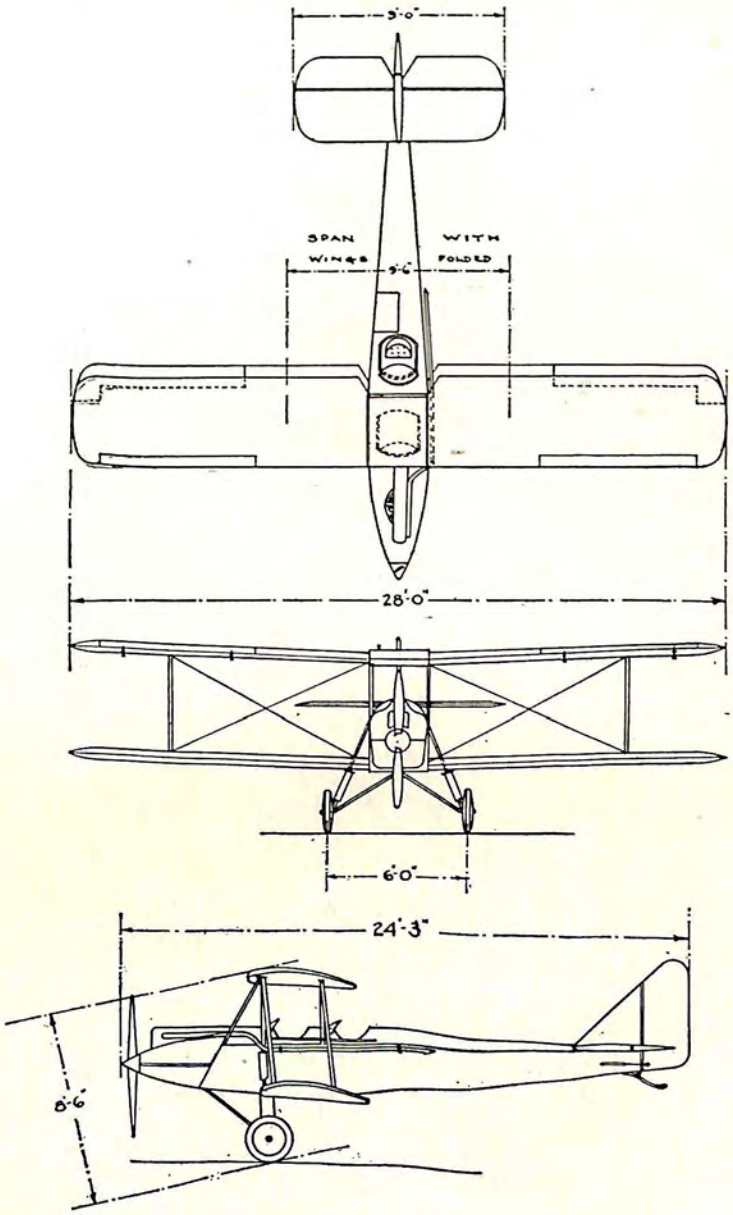
WACO AIRCRAFT COMPANY
Troy, Ohio
MODEL QS 0 — 3 PLACE
ENGINE: CONTINENTAL A 70



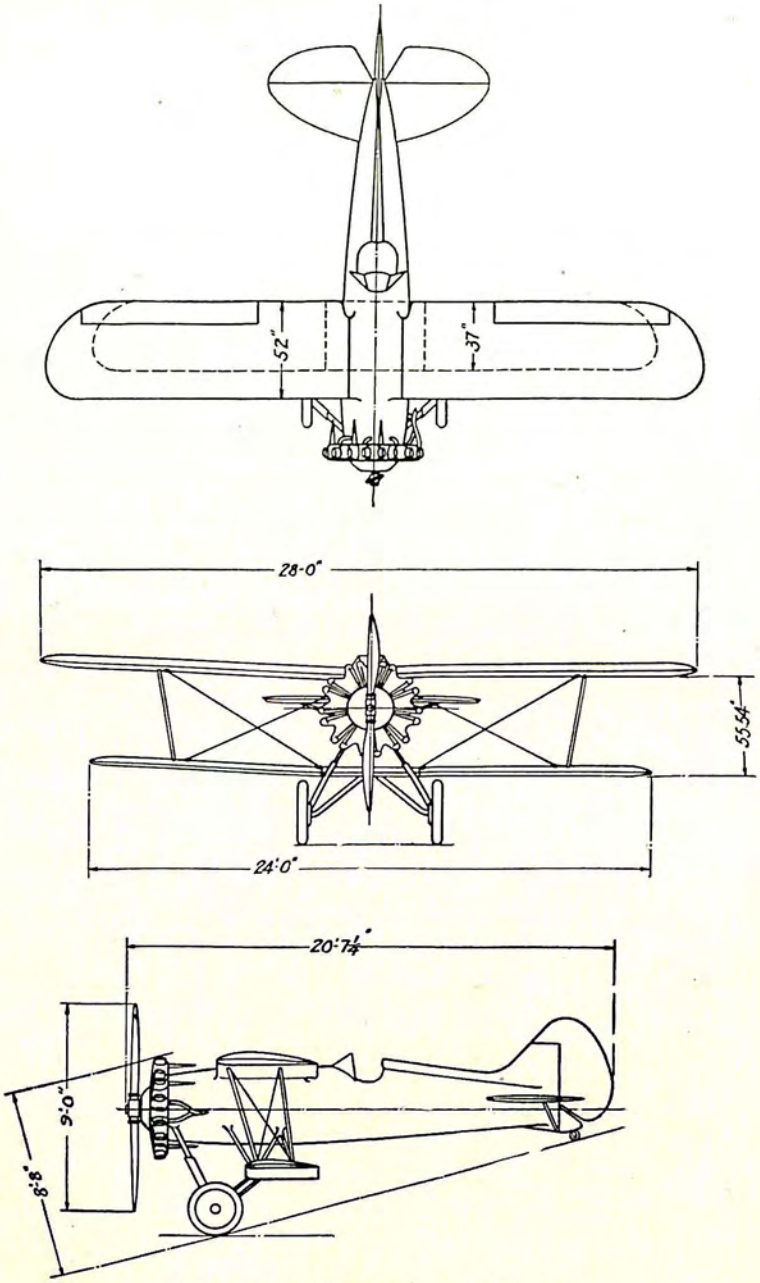
WACO AIRCRAFT COMPANY
Troy, Ohio
MODEL 225 TAPER WING — 3 PLACE
ENGINE: PACKARD DIESEL
WRIGHT WHIRLWIND 240



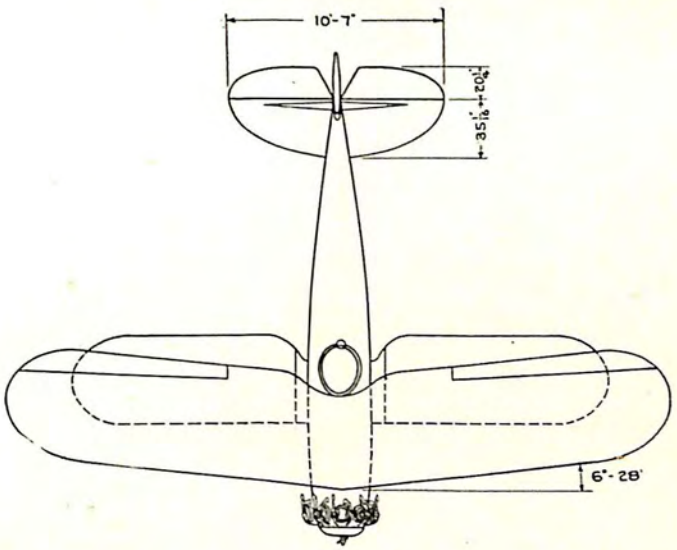
WACO AIRCRAFT COMPANY
Troy, Ohio
MODEL F — 3 PLACE
ENGINE: KINNER K 5
KINNER B 5
WARNER SCARAB

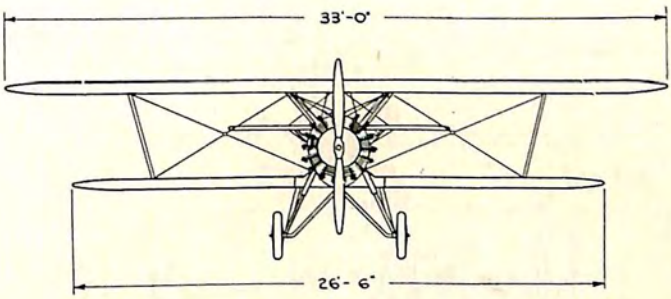


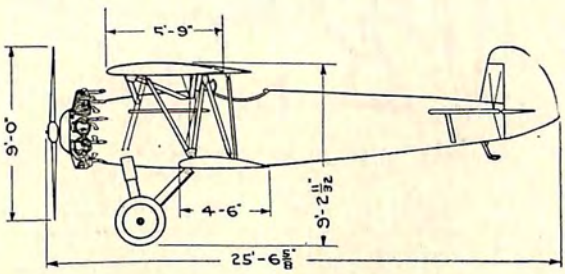
WHITTELSEY MANUFACTURING COMPANY
Bridgeport, Conn.
WHITTELSEY AVIAN — 2 PLACE
ENGINE: CIRRUS



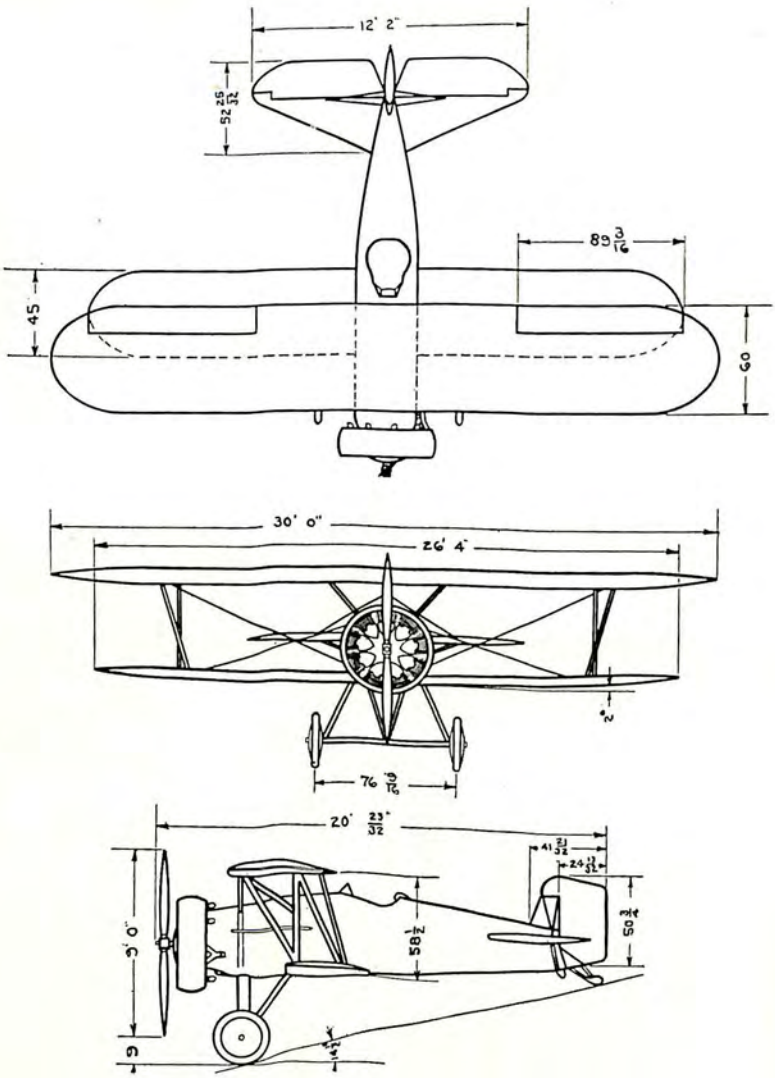
B/J AIRCRAFT CORPORATION
Baltimore, Md.
FIGHTER XFJ–1 — 1 PLACE
ENGINE: PRATT & WHITNEY WASP



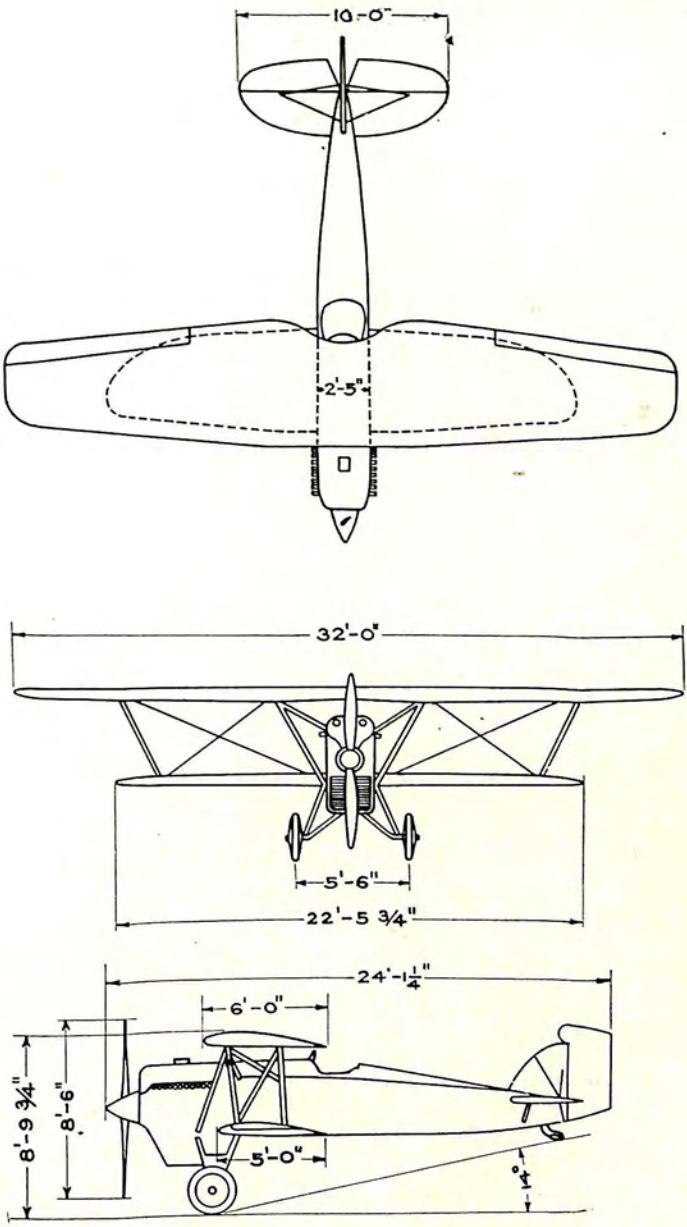




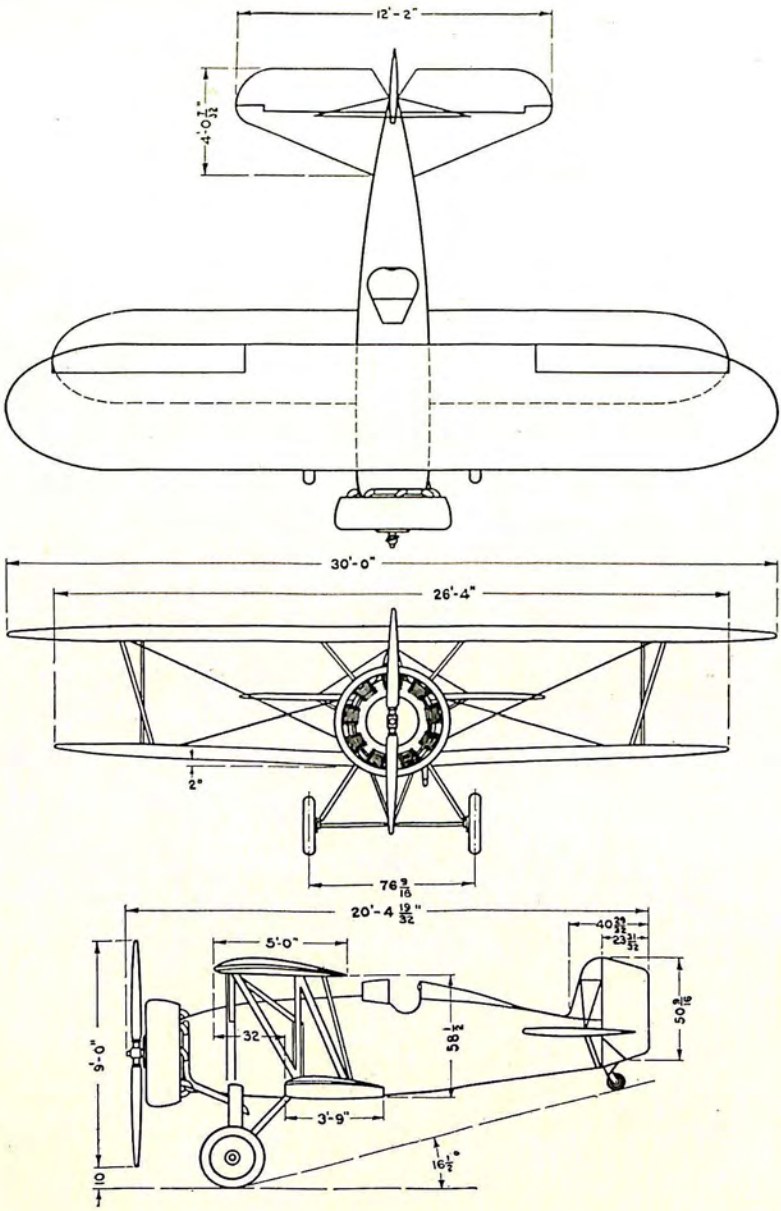
BOEING AIRPLANE COMPANY
Seattle, Wash.
FIGHTER F–3—B–1
ENGINE: PRATT & WHITNEY WASP



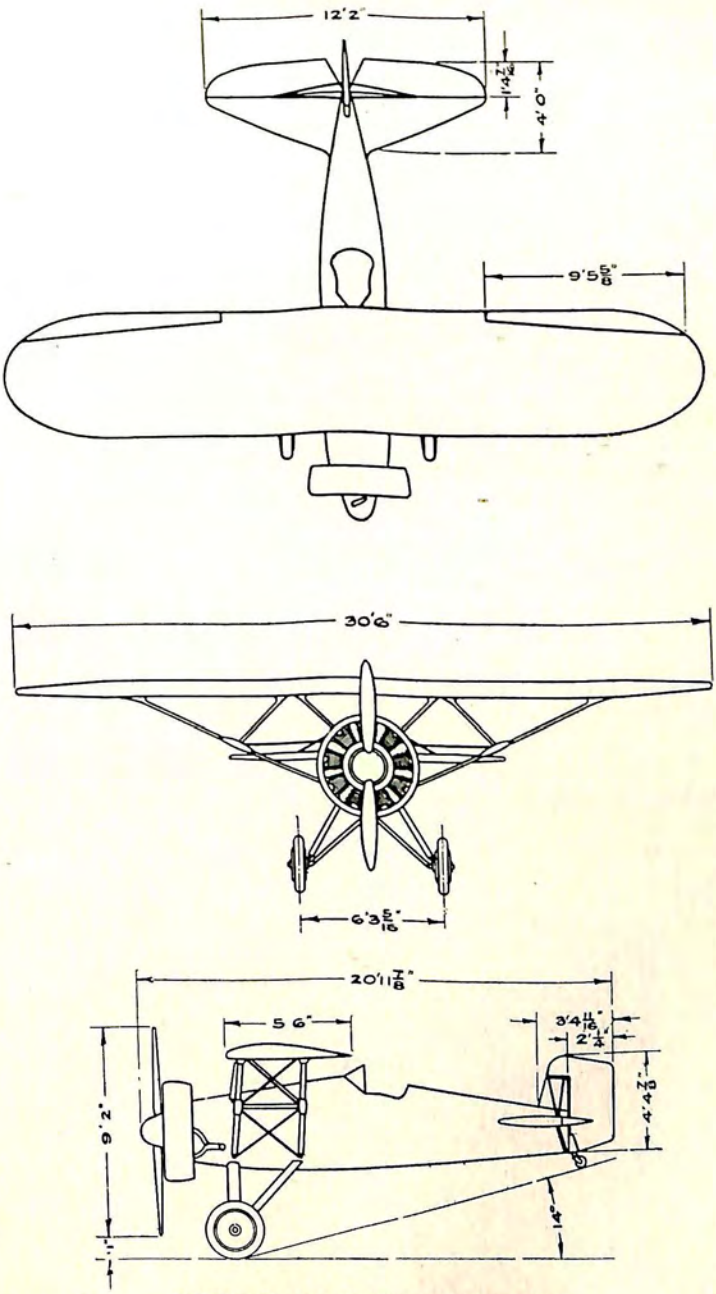
BOEING AIRPLANE COMPANY
Seattle, Wash.
MODEL P 12 C—F 4 B 2
ENGINE: PRATT & WHITNEY WASP



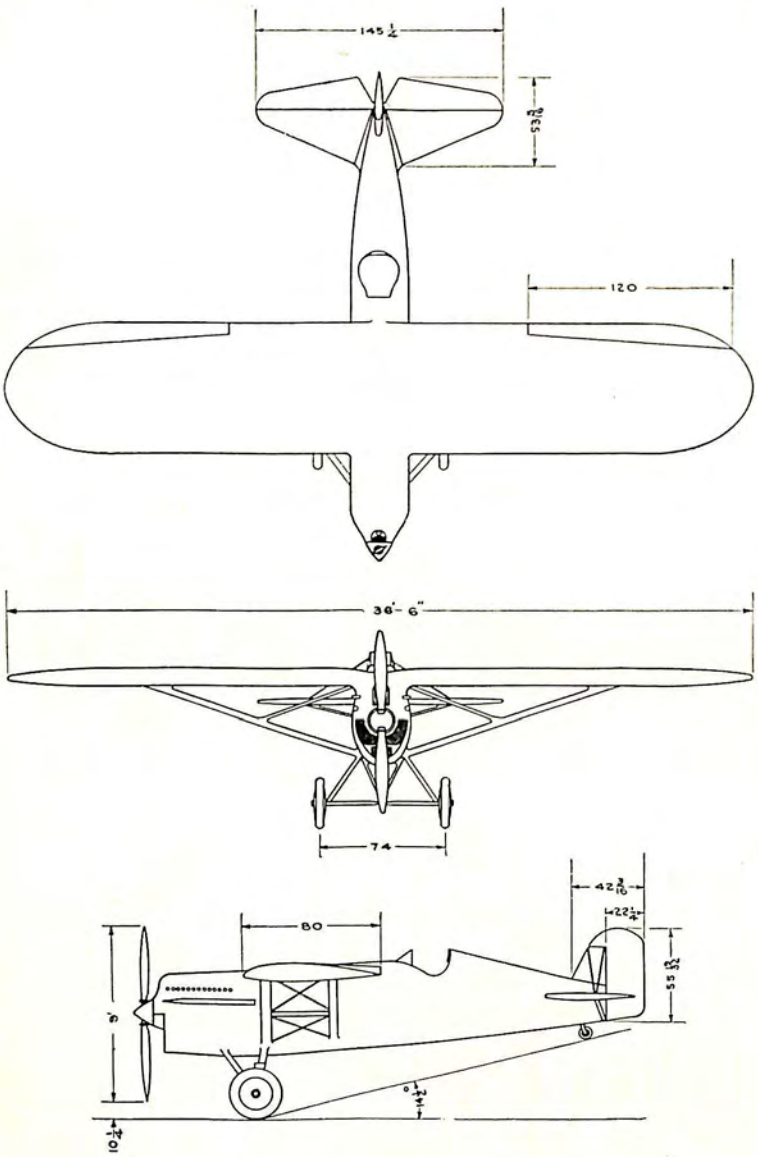
BOEING AIRPLANE COMPANY
Seattle, Wash.
PURSUIT X P–7
ENGINE: CURTISS V–1570



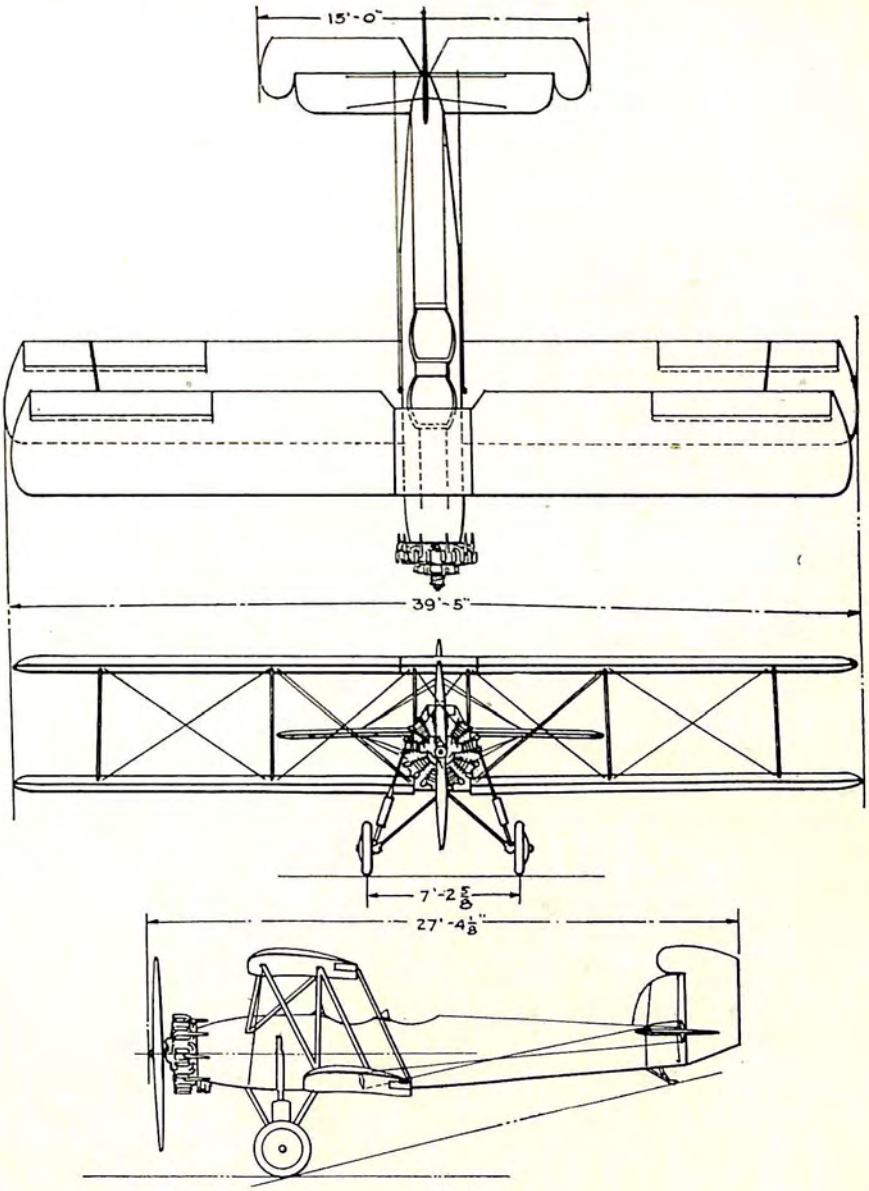
BOEING AIRPLANE COMPANY
Seattle, Wash.
MODEL 218
ENGINE: PRATT & WHITNEY WASP



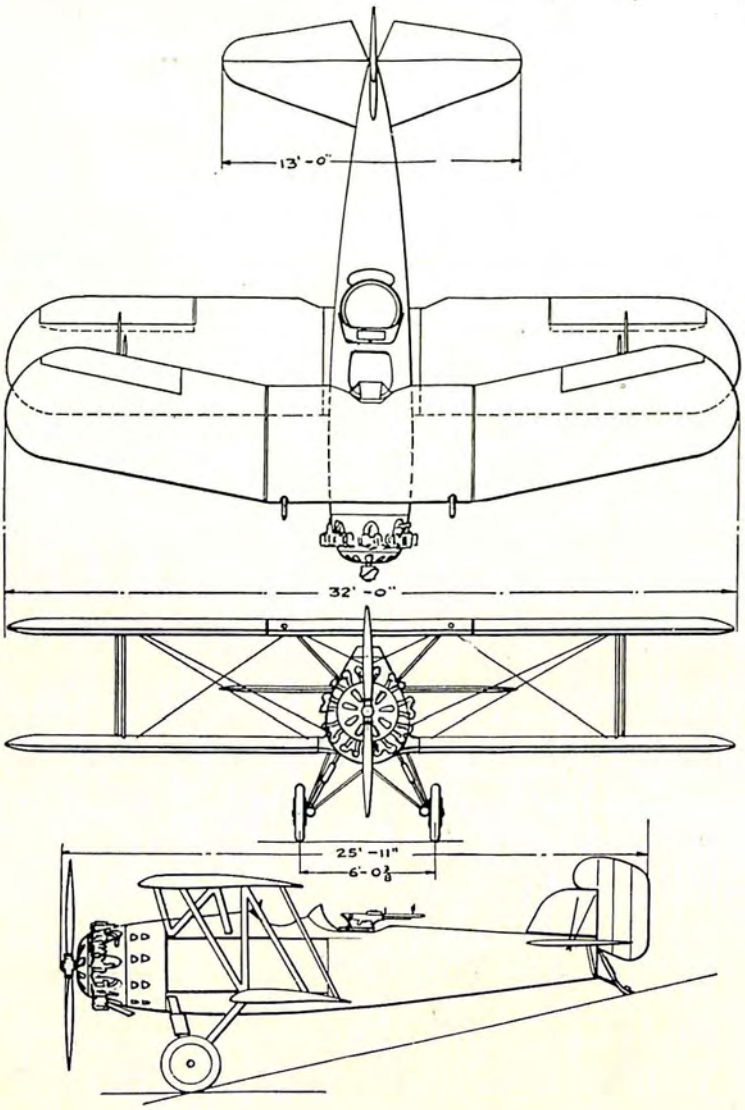
BOEING AIRPLANE COMPANY
Seattle, Wash.
MODEL 202
ENGINE: PRATT & WHITNEY WASP



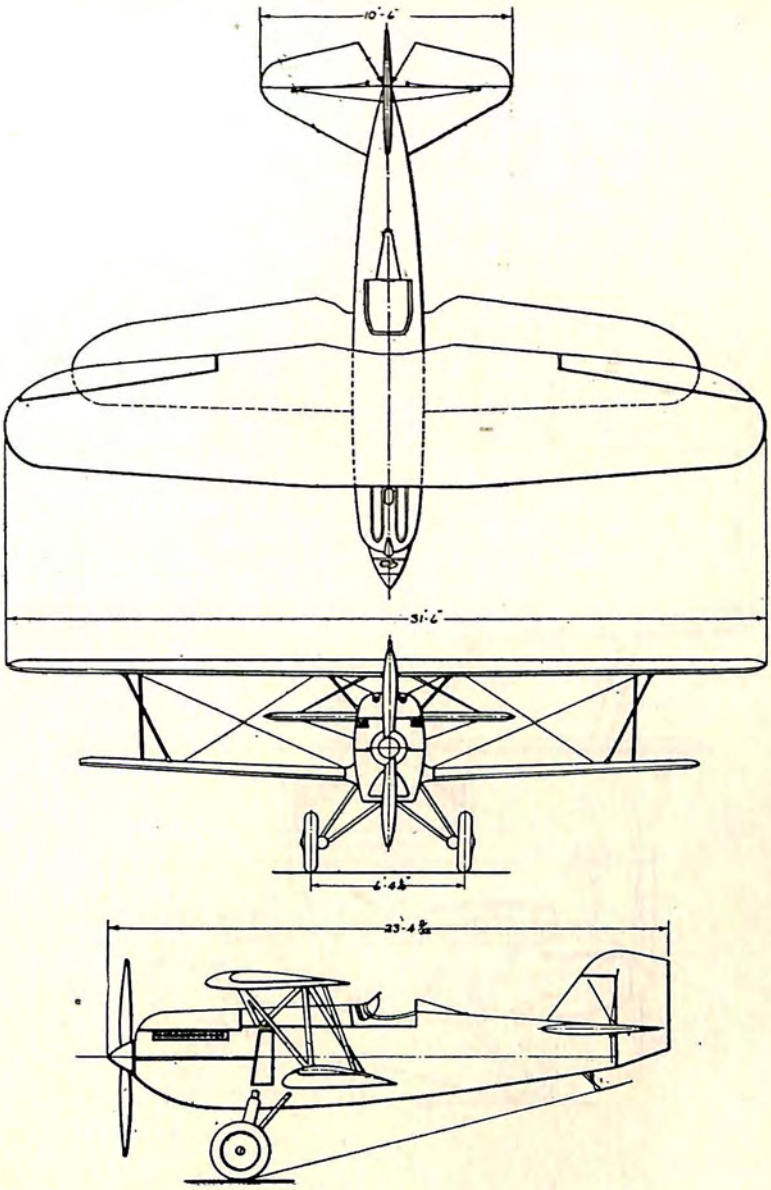
BOEING AIRPLANE COMPANY
Seattle, Wash.
MODEL XP-9
ENGINE: CURTISS SUPER CONQUEROR



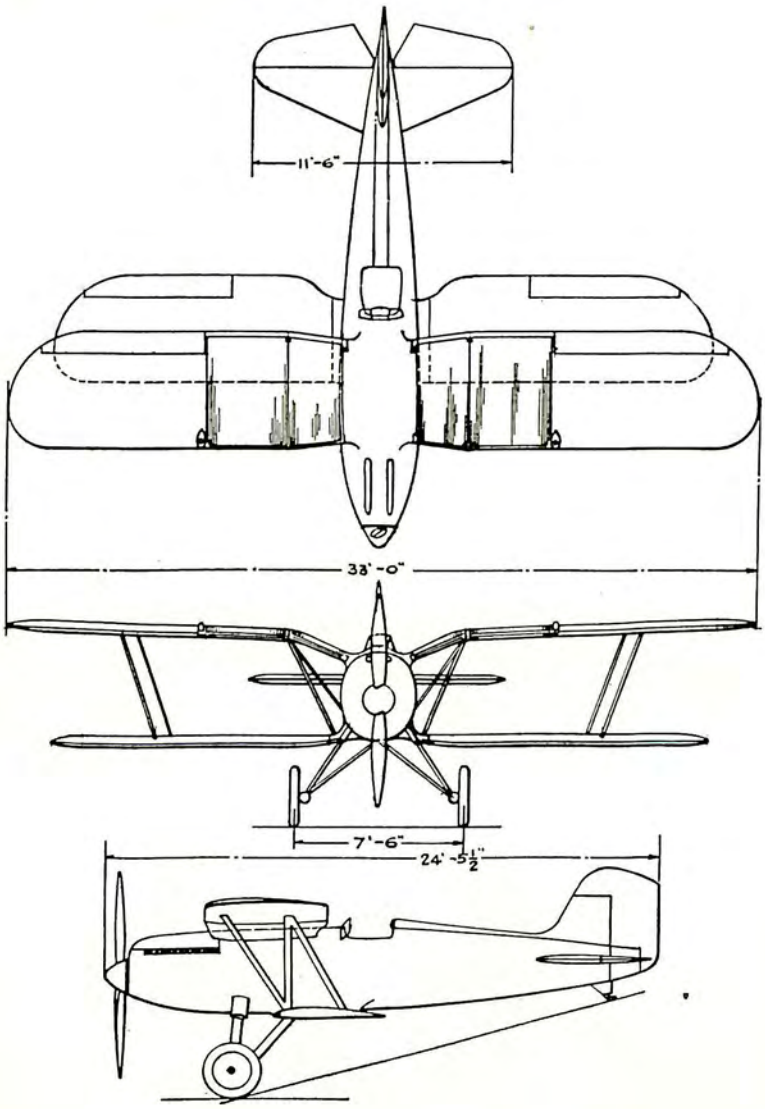
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Garden City, L. I., N. Y.
TRAINER N 2 C 2
ENGINE: WRIGHT WHIRLWIND 240



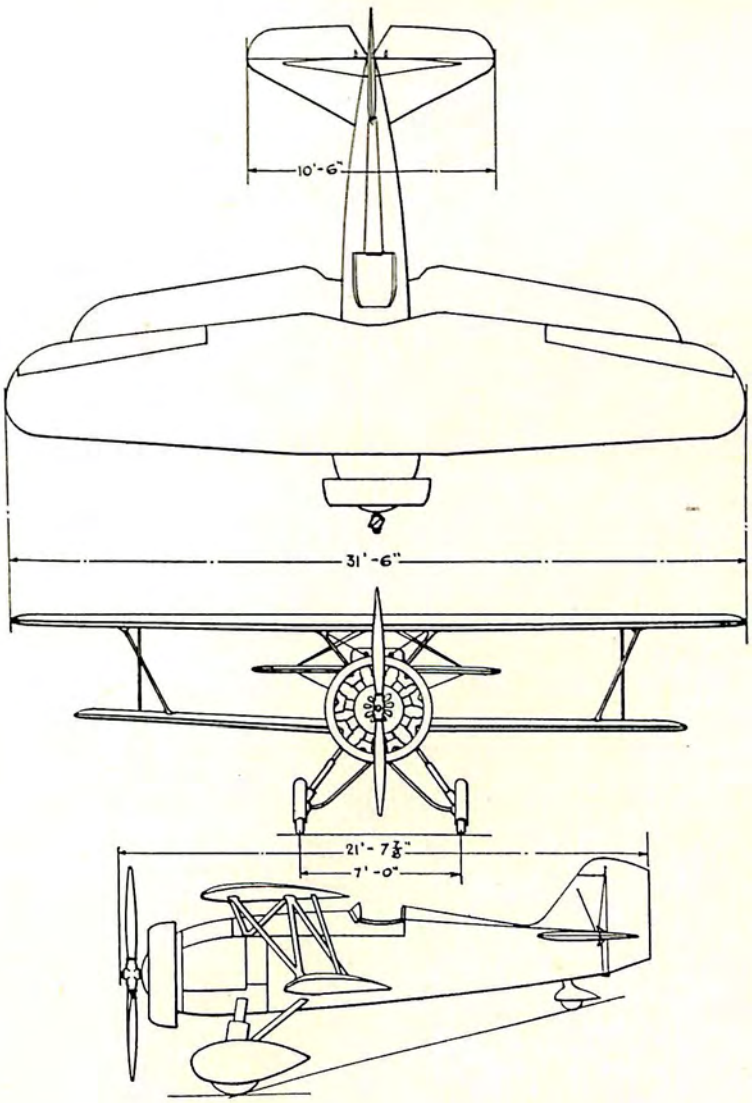
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Garden City, L. I., N. Y.
FIGHTER F 8 C 4—F 8 C 5
ENGINE: PRATT & WHITNEY WASP



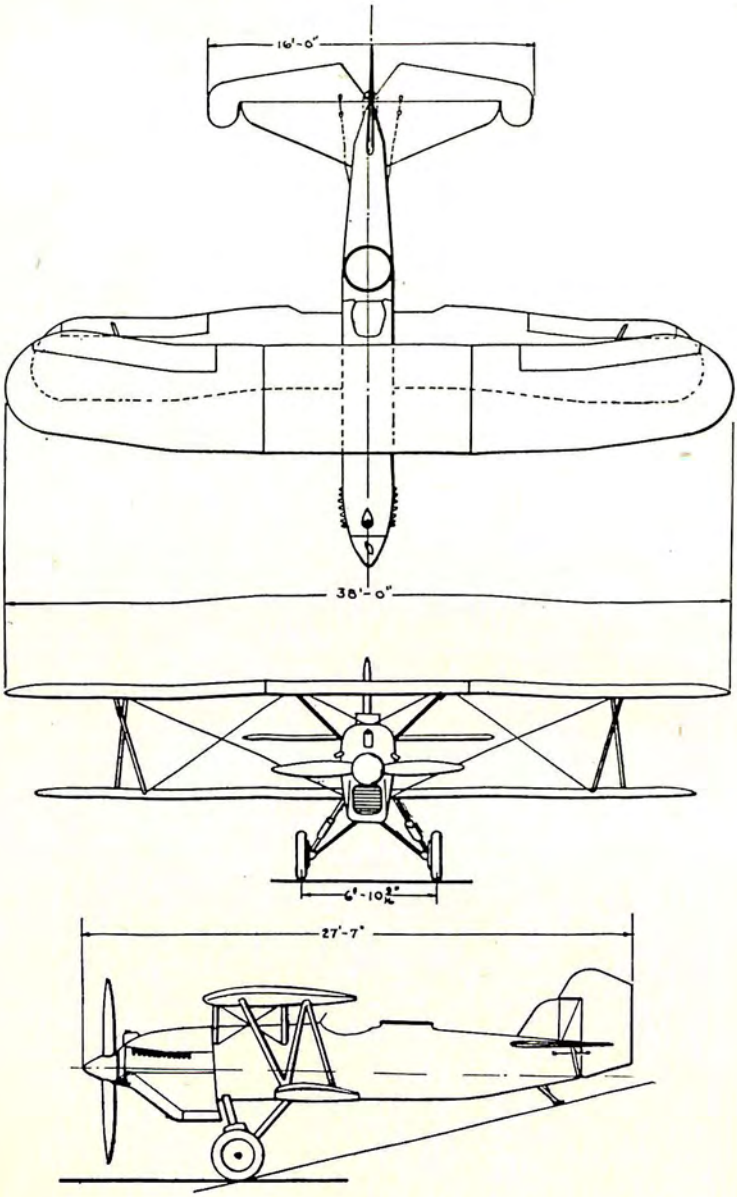
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Garden City, L. I., N. Y.
PURSUIT P 6
ENGINE: CURTISS CONQUEROR



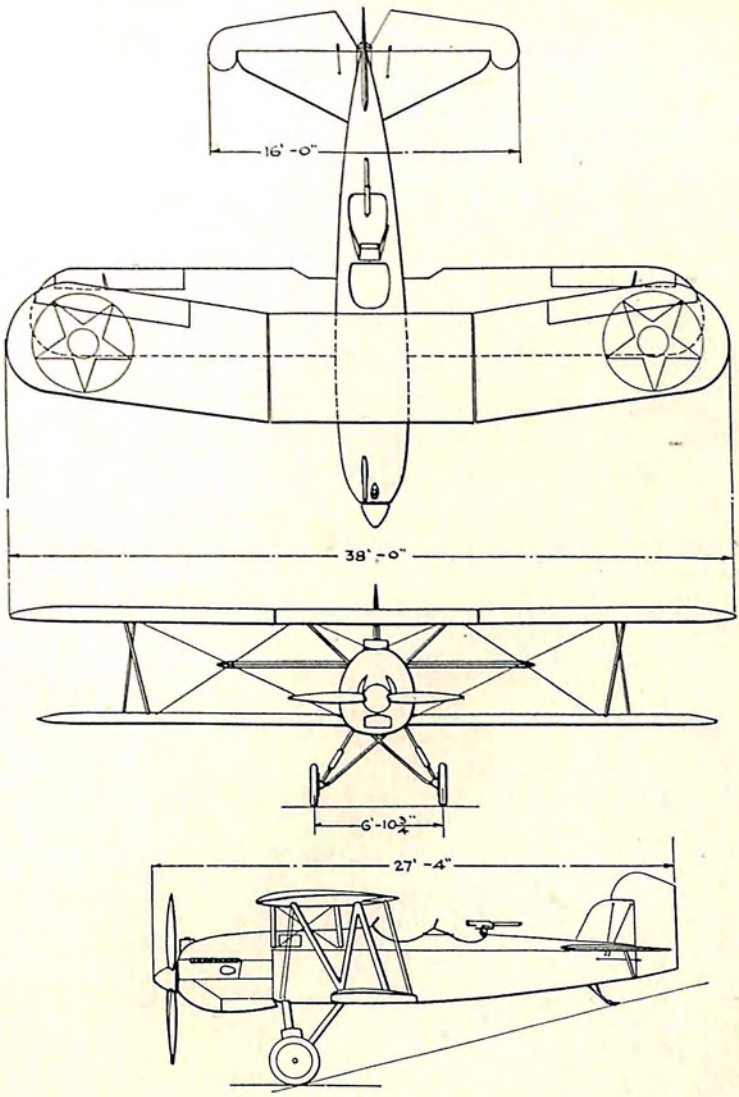
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Garden City, L. I., N. Y.
PURSUIT XP–10
ENGINE: CURTISS CONQUEROR, PRESTONE COOLED



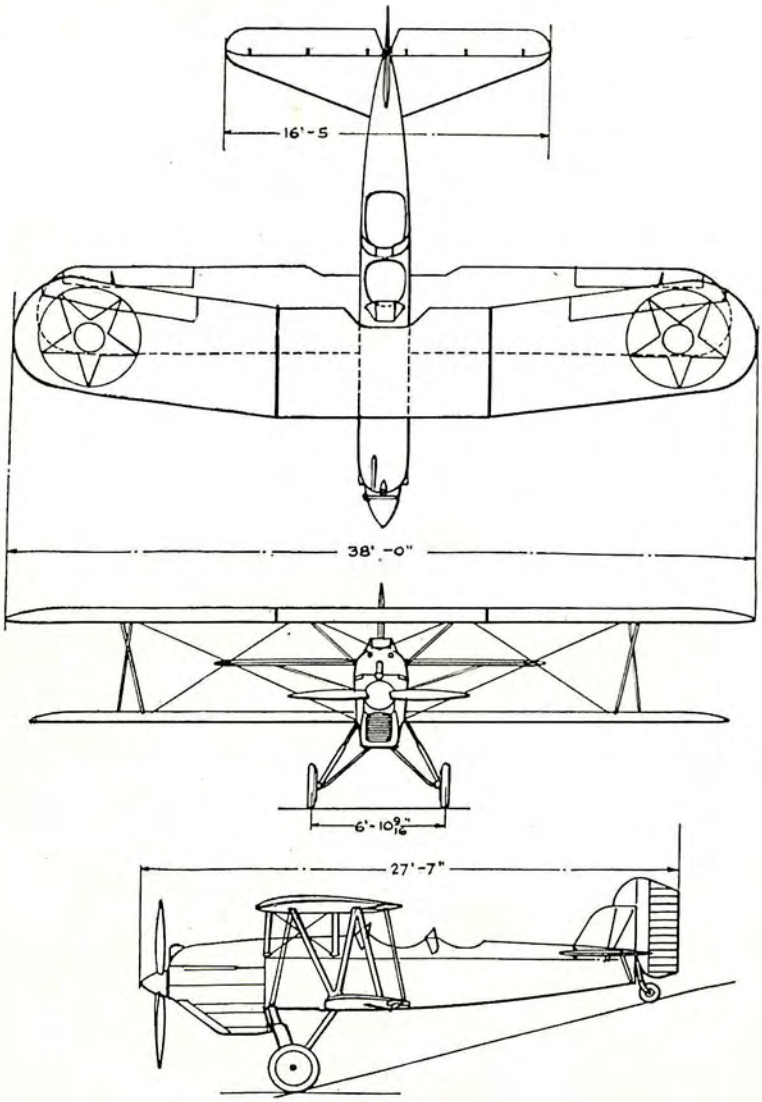
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Garden City, L. I., N. Y.
PURSUIT YP–20
ENGINE: WRIGHT CYCLONE



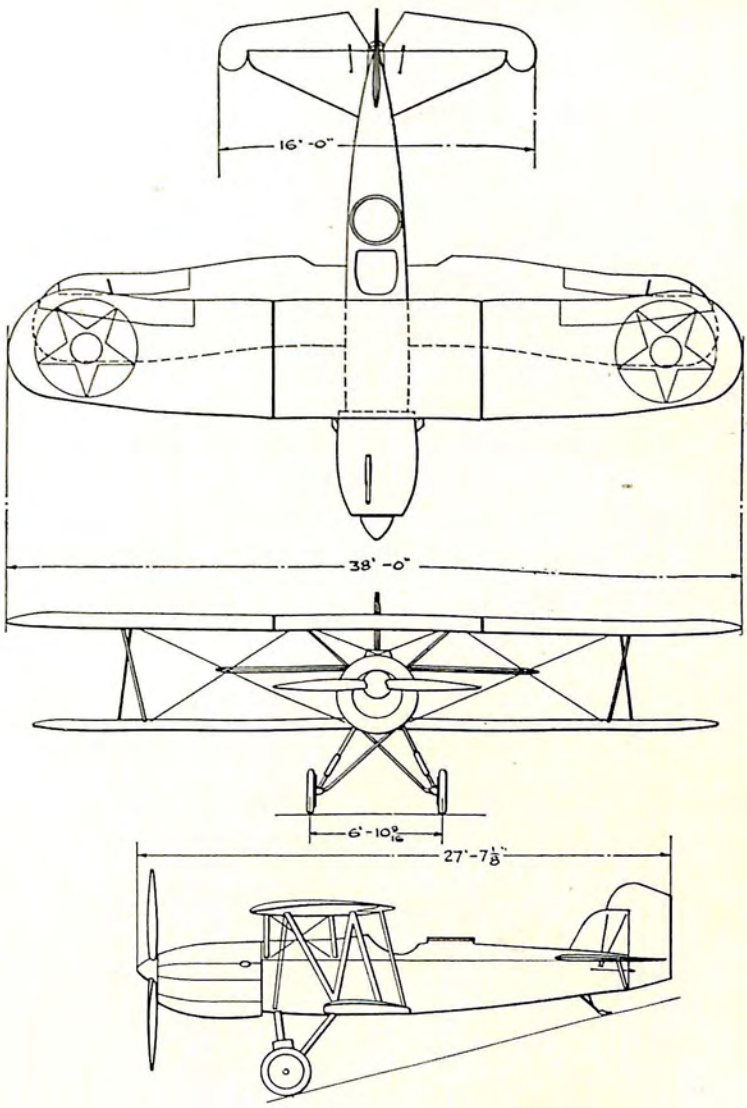
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Garden City, L. I. N. Y.
OBSERVATION O-1E
ENGINE: CURTISS D-12-E



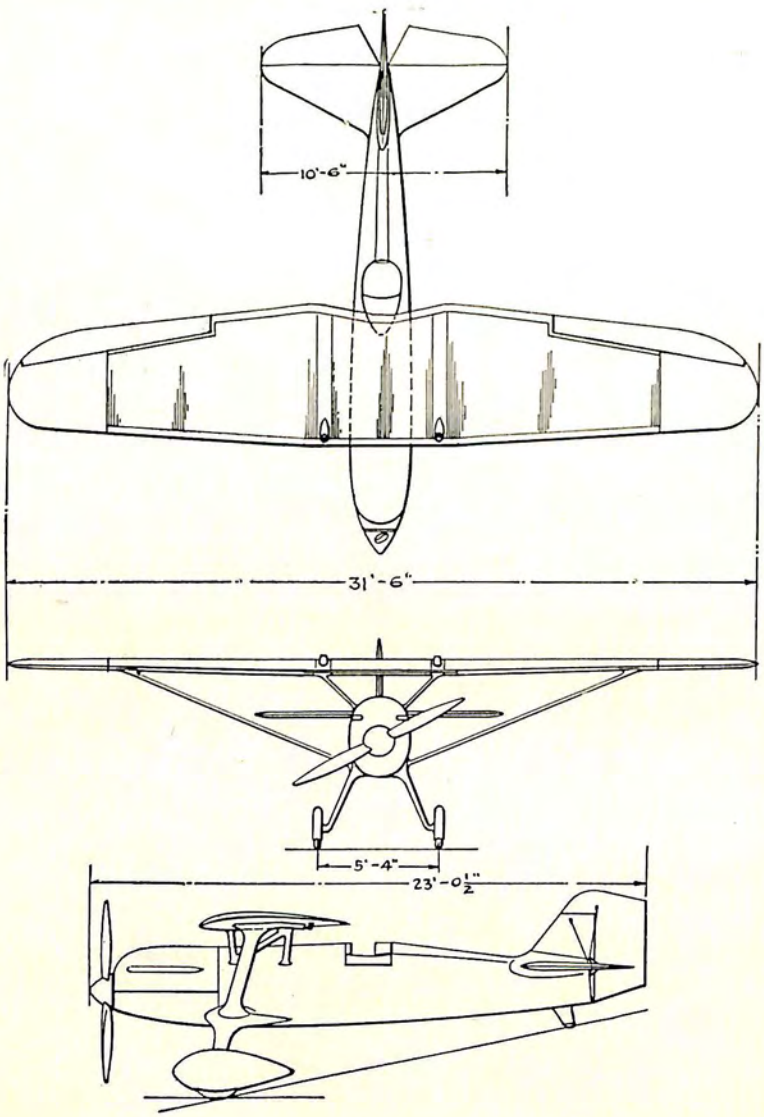
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Garden City, L. I., N. Y.
OBSERVATION XO–16
ENGINE: CURTISS CONQUEROR



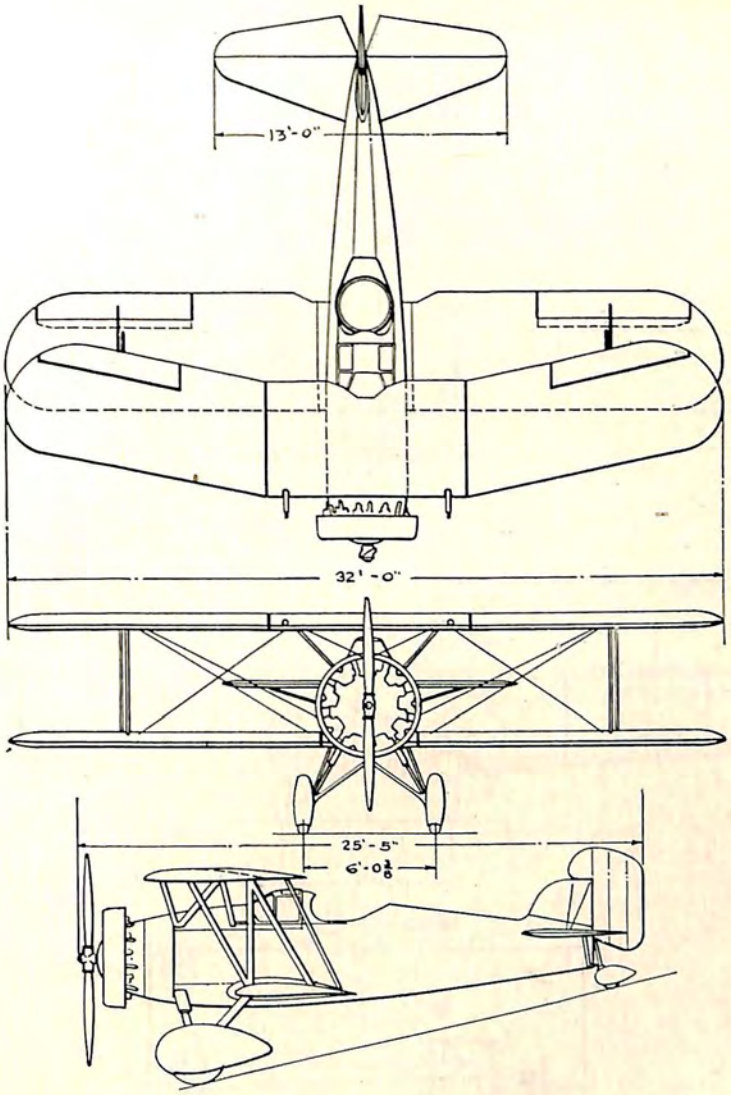
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Garden City, L. I., N. Y.
OBSERVATION Y 10–1 C
ENGINE: CURTISS D–12–E



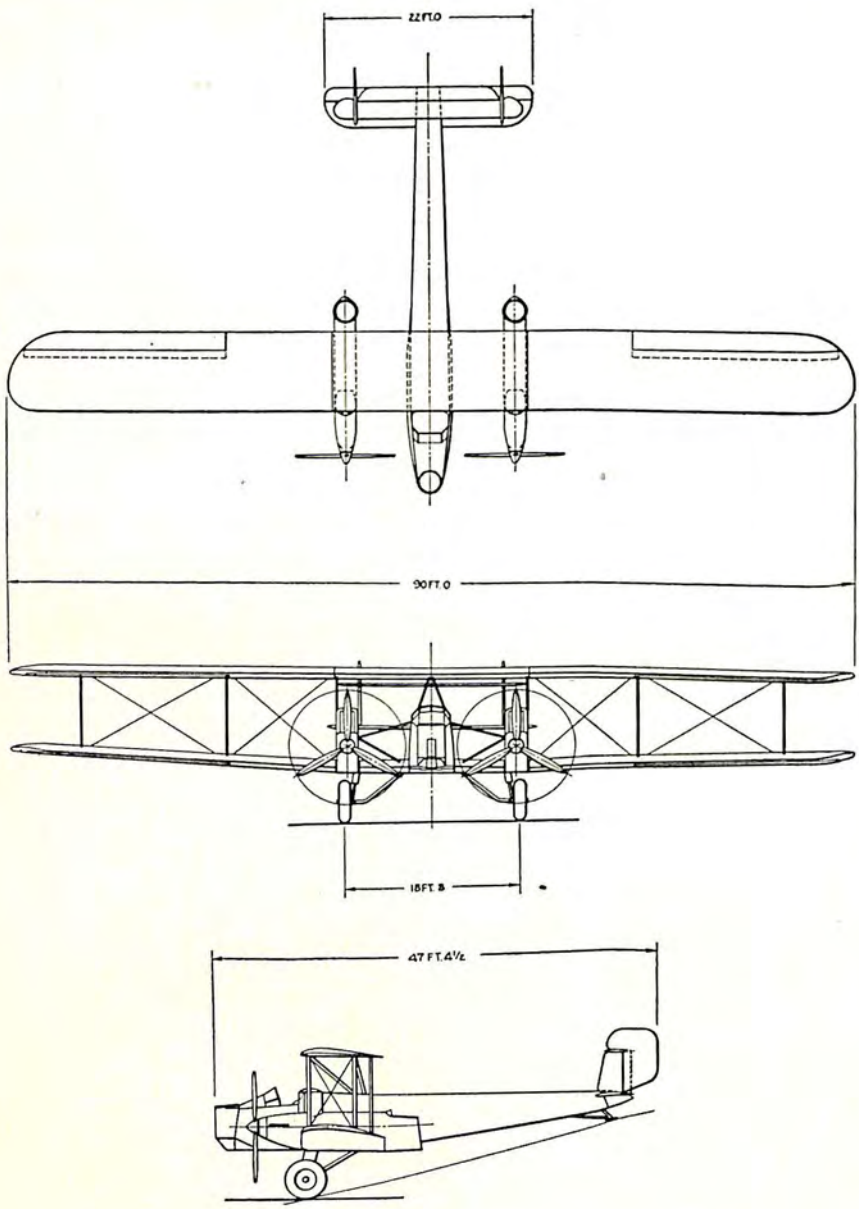
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Garden City, L. I., N. Y.
OBSERVATION 026
ENGINE: CURTISS GEARED CONQUEROR, PRESTONE COOLED



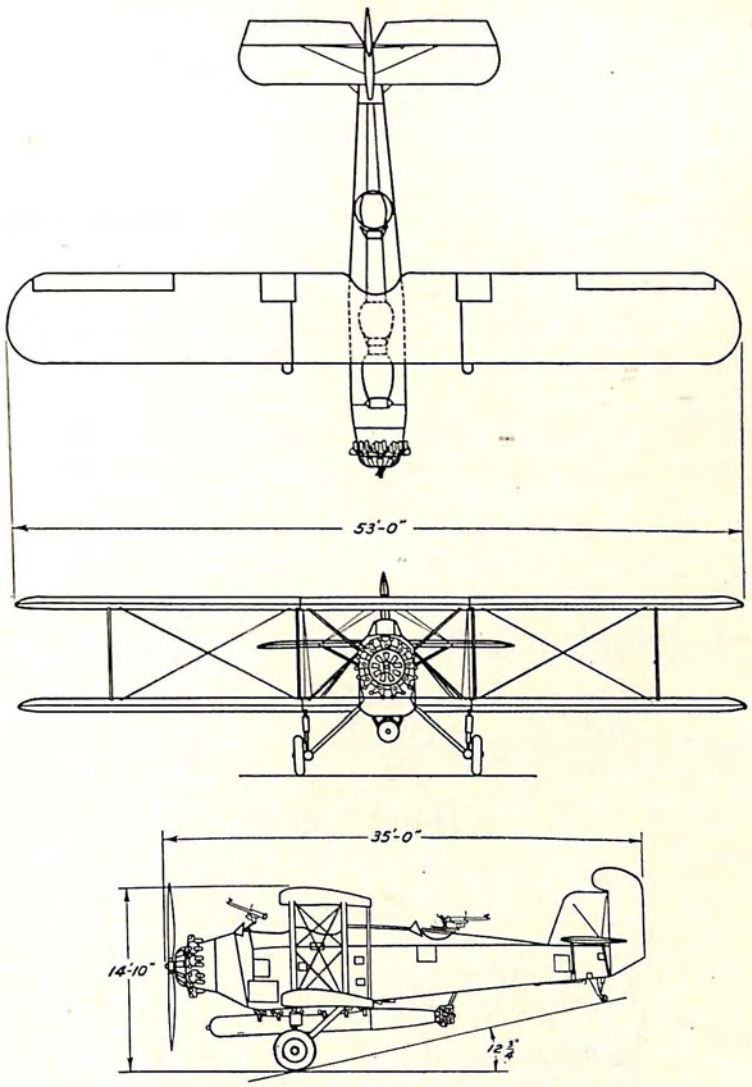
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Garden City, L. I., N. Y.
RACER XF6C-6
ENGINE CURTISS CONQUEROR, PRESTONE COOLED



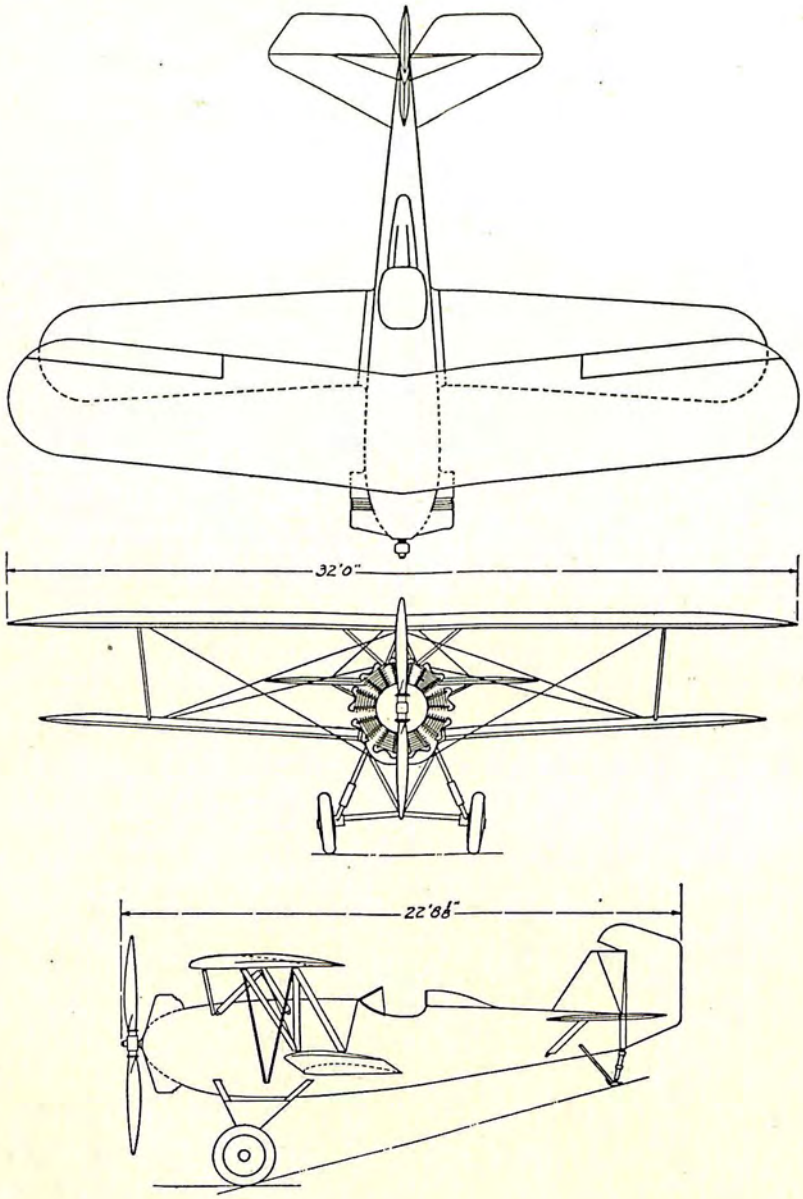
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Garden City, L. I., N. Y.
FIGHTER F8C–7
ENGINE: WRIGHT CYCLONE



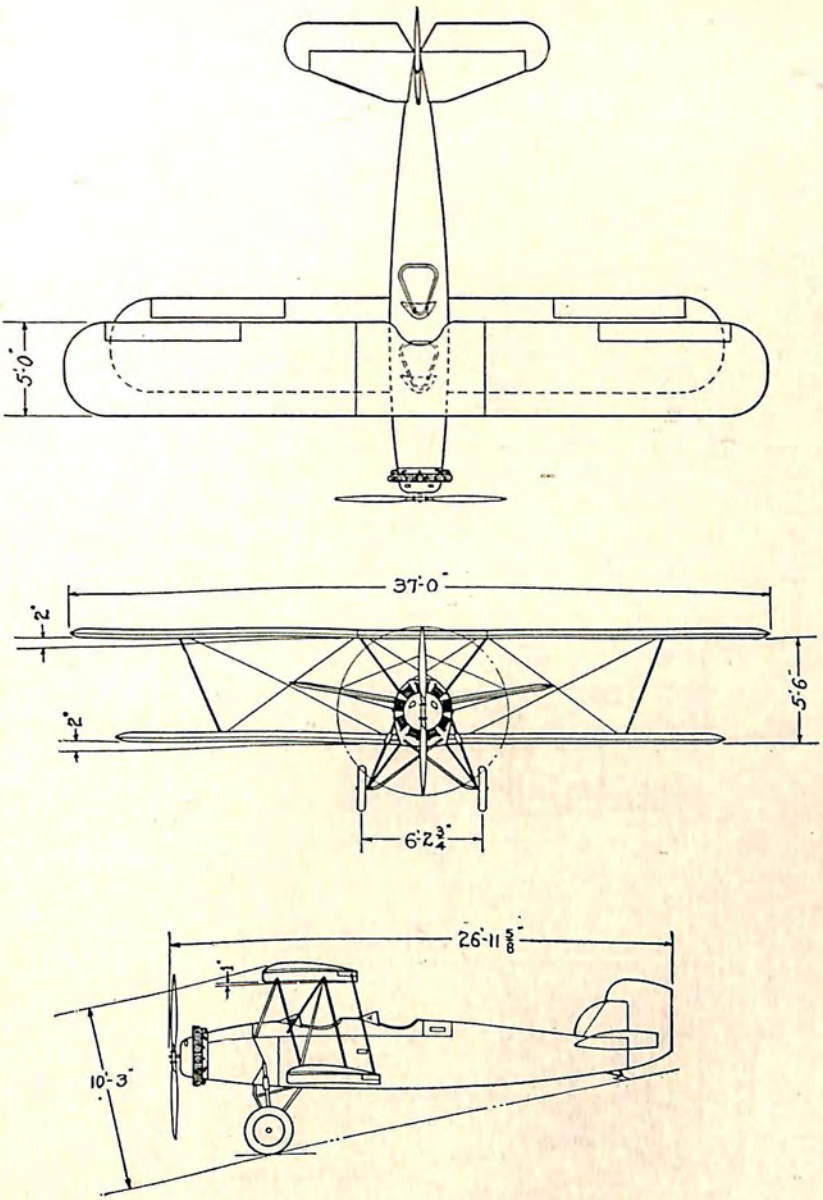
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Garden City, L. I., N. Y.
BOMBER B–2
ENGINE: TWO CURTISS GEARED CONQUERORS



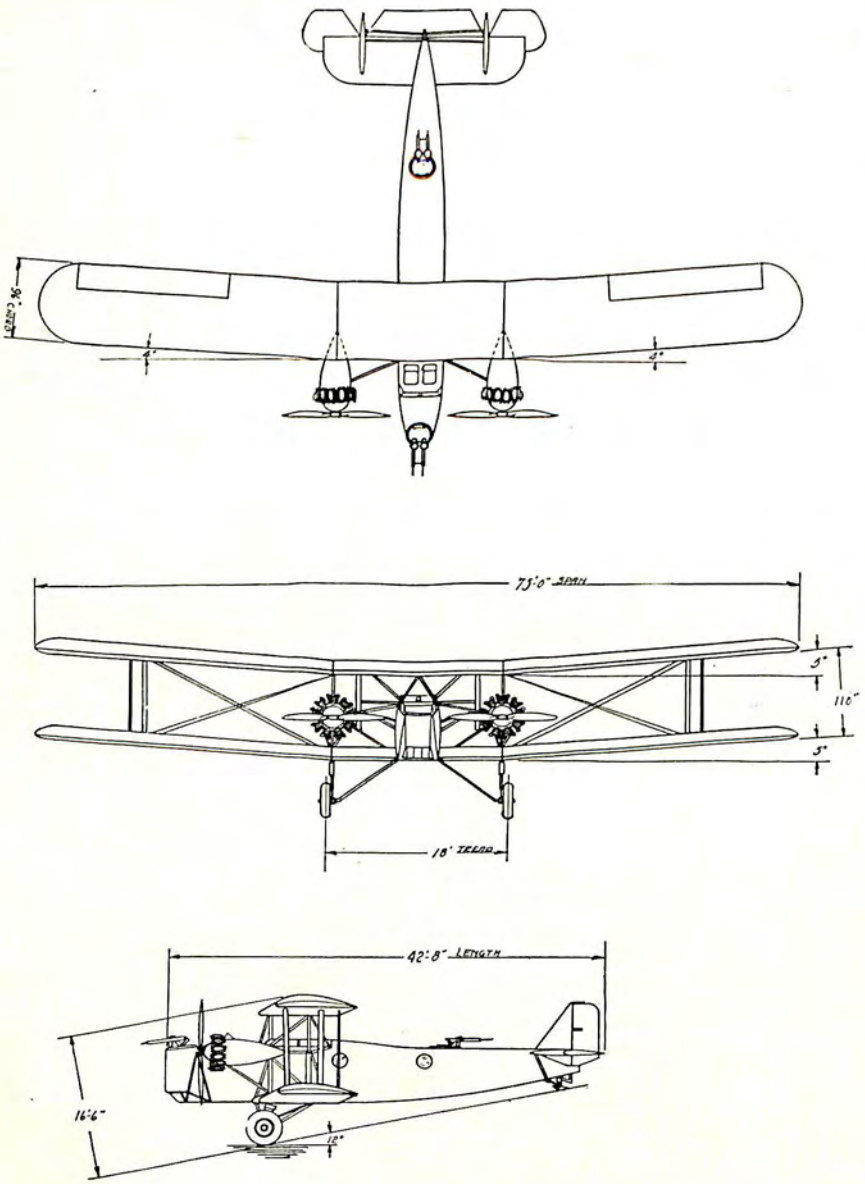
DETROIT AIRCRAFT CORPORATION
Detroit, Mich.
BOMBER TE-1
ENGINE: WRIGHT CYCLONE



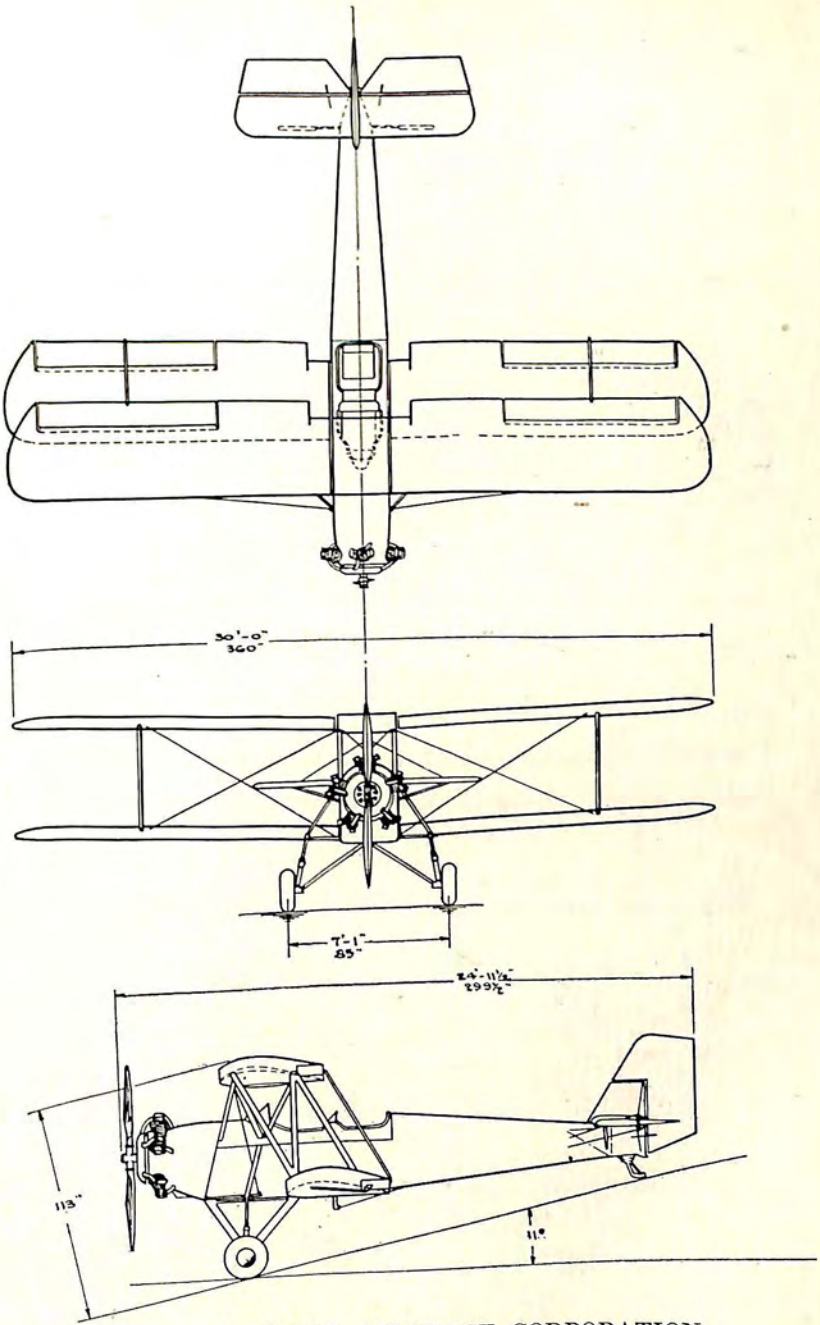
HALL ALUMINUM AIRCRAFT CORPORATION
Buffalo, N. Y.
FIGHTER XFH–1
ENGINE: PRATT & WHITNEY WASP



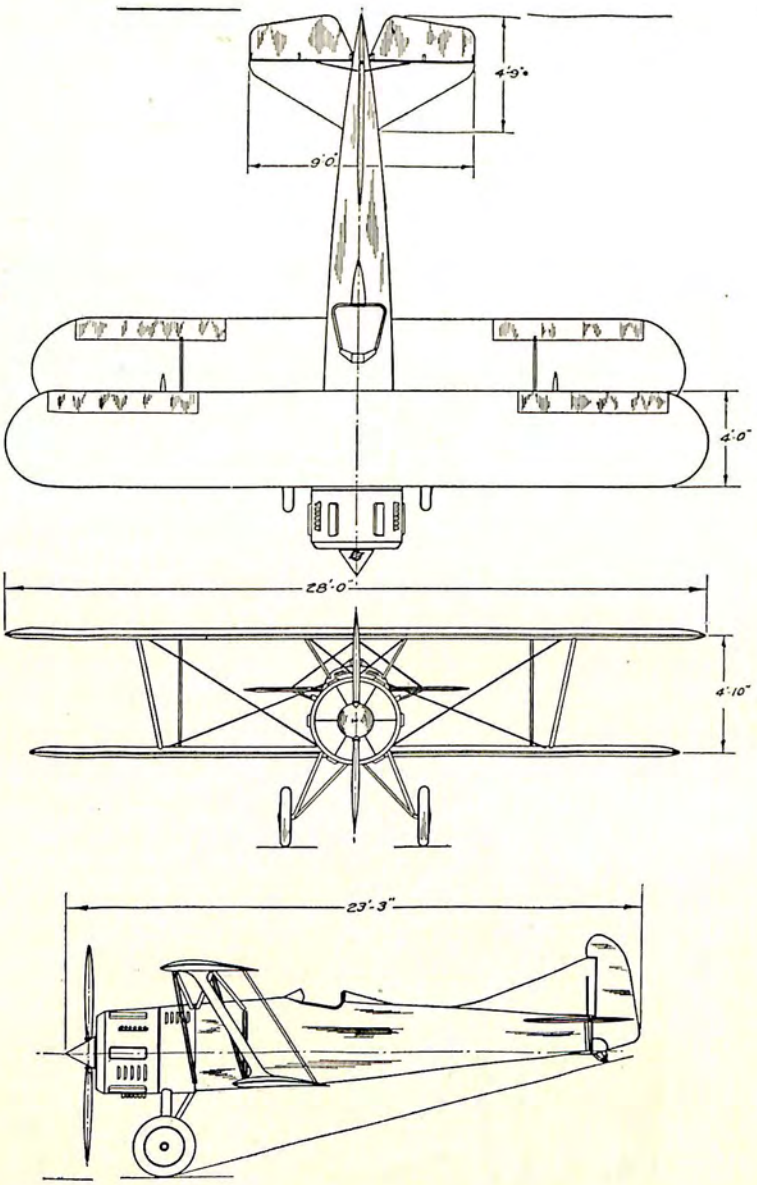
KEYSTONE AIRCRAFT CORPORATION
Bristol, Pa.
TRAINER NK–1
ENGINE: WRIGHT WHIRLWIND 240



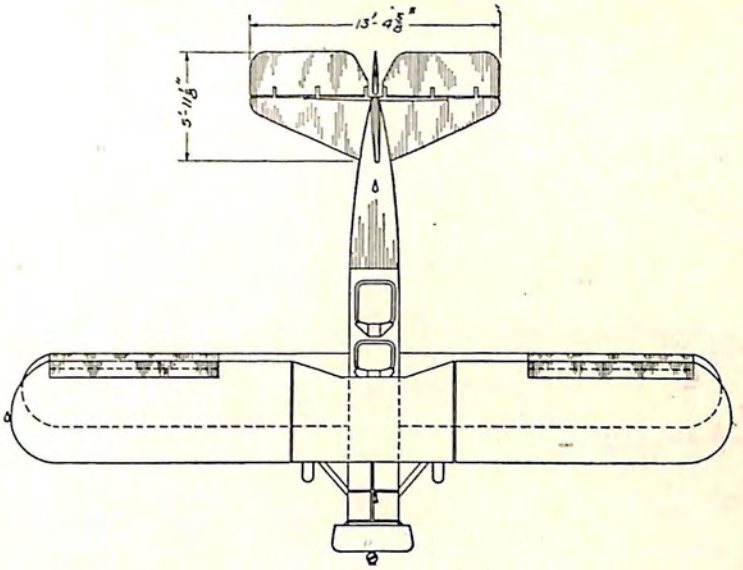
KEYSTONE AIRCRAFT CORPORATION
Bristol, Pa.
BOMBER B 3 A
ENGINE: TWO WRIGHT CYCLONES

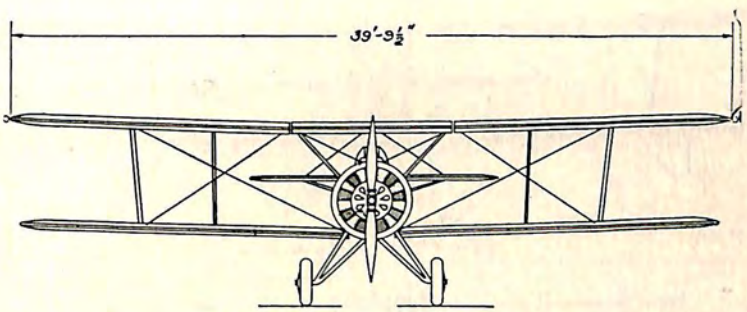


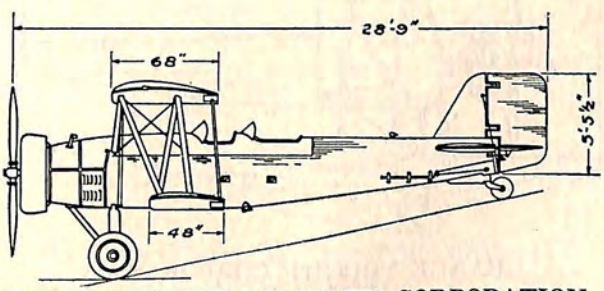
NEW STANDARD AIRCRAFT CORPORATION
Paterson, N. J.
MODEL NT–1
ENGINE: KINNER B 5—WRIGHT WHIRLWIND 165



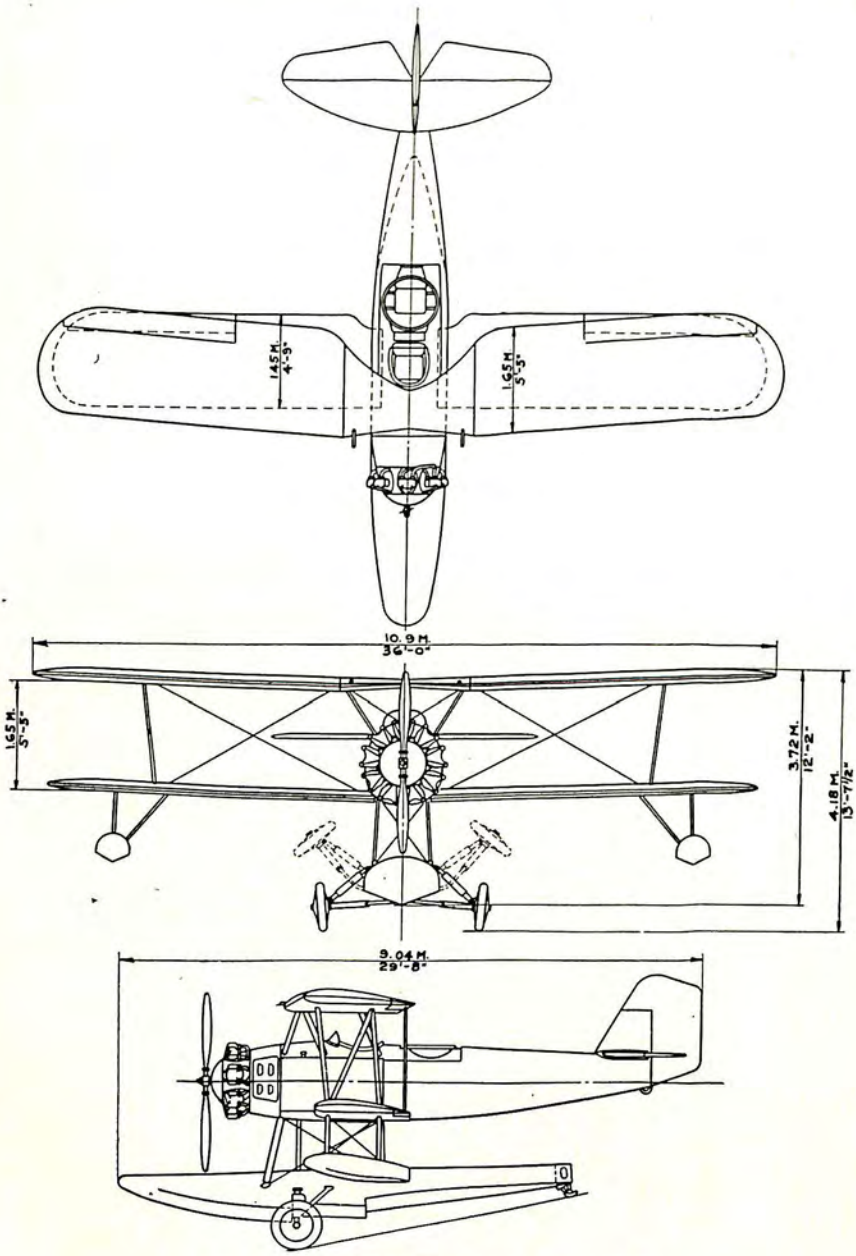
THOMAS MORSE AIRCRAFT CORPORATION
Buffalo, N. Y.
VIPER PURSUIT
ENGINE: CURTISS CHIEFTAIN



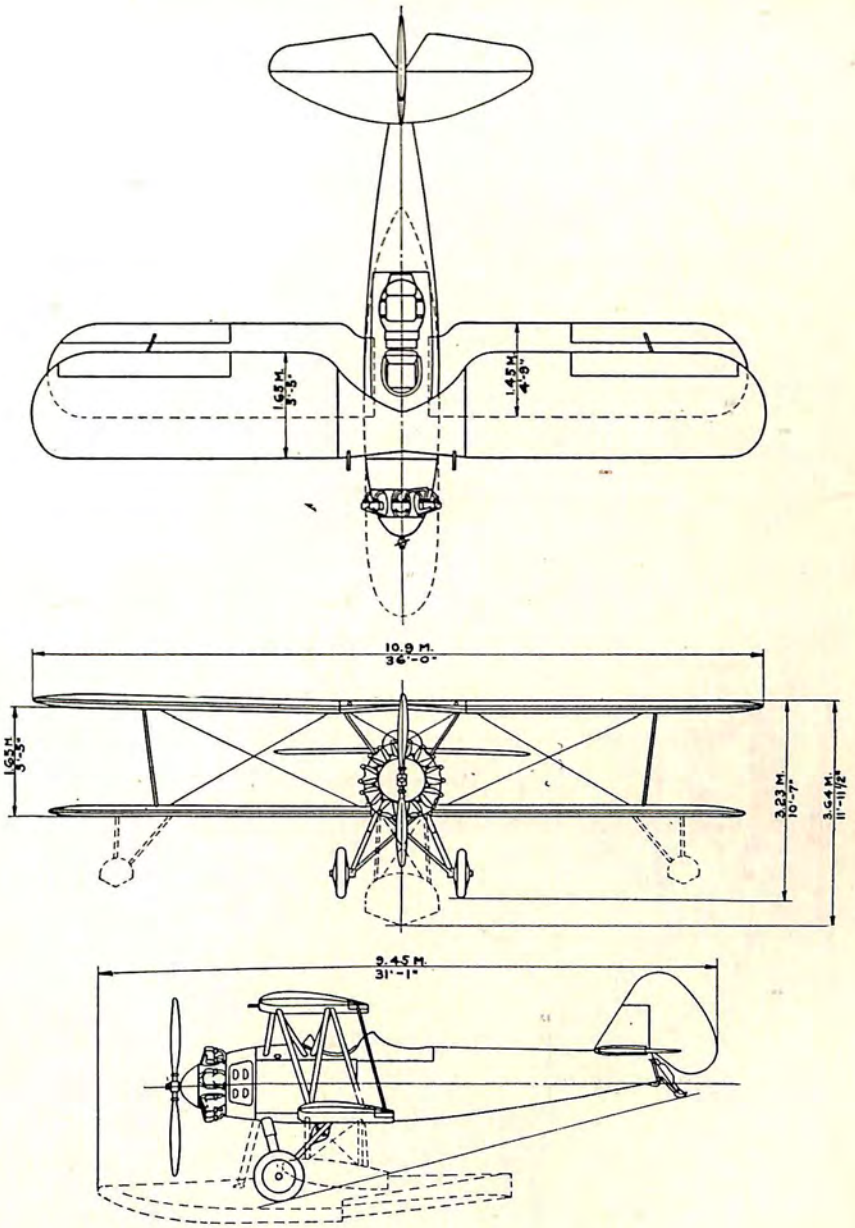




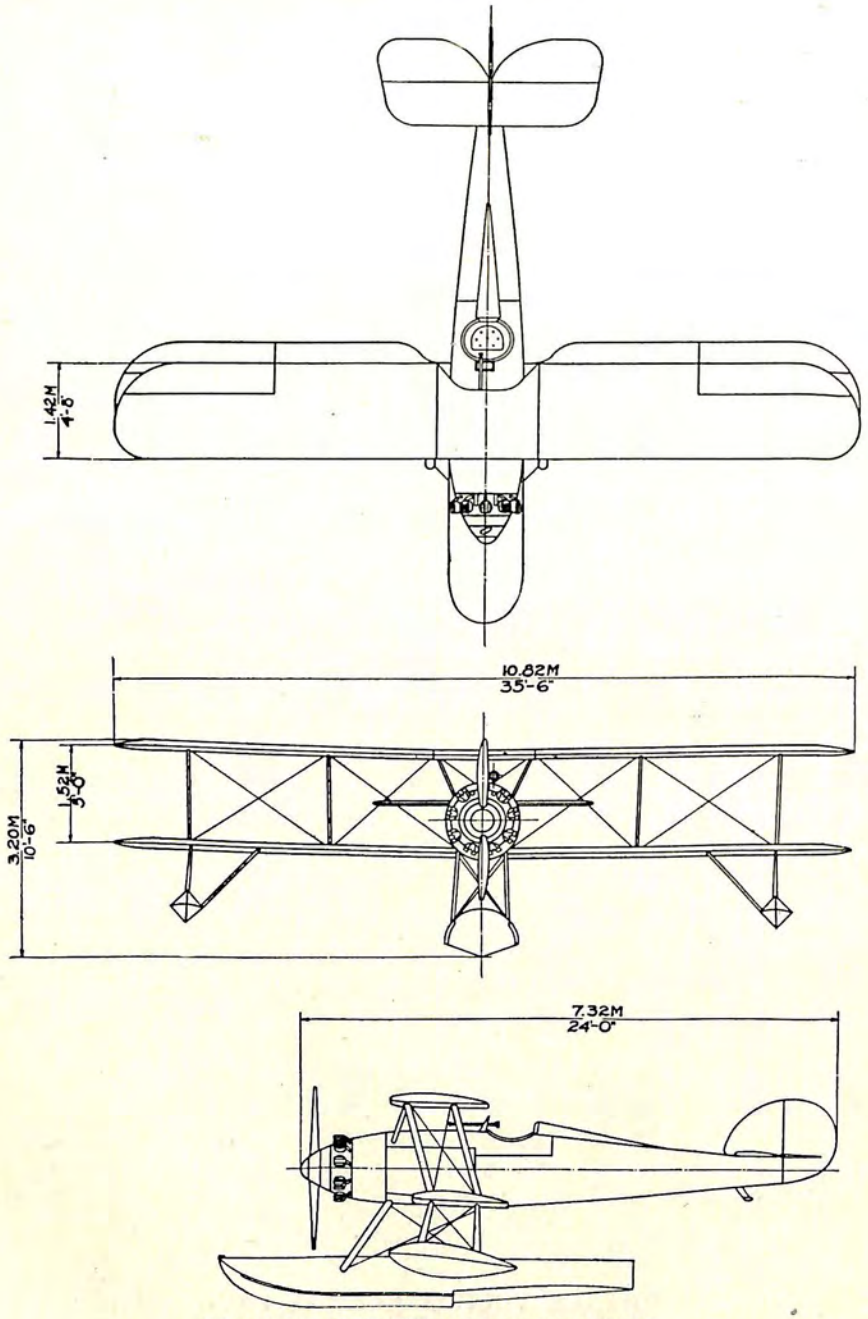
THOMAS MORSE AIRCRAFT CORPORATION
Buffalo, N. Y.
MODEL O-19 C
ENGINE: PRATT & WHITNEY WASP



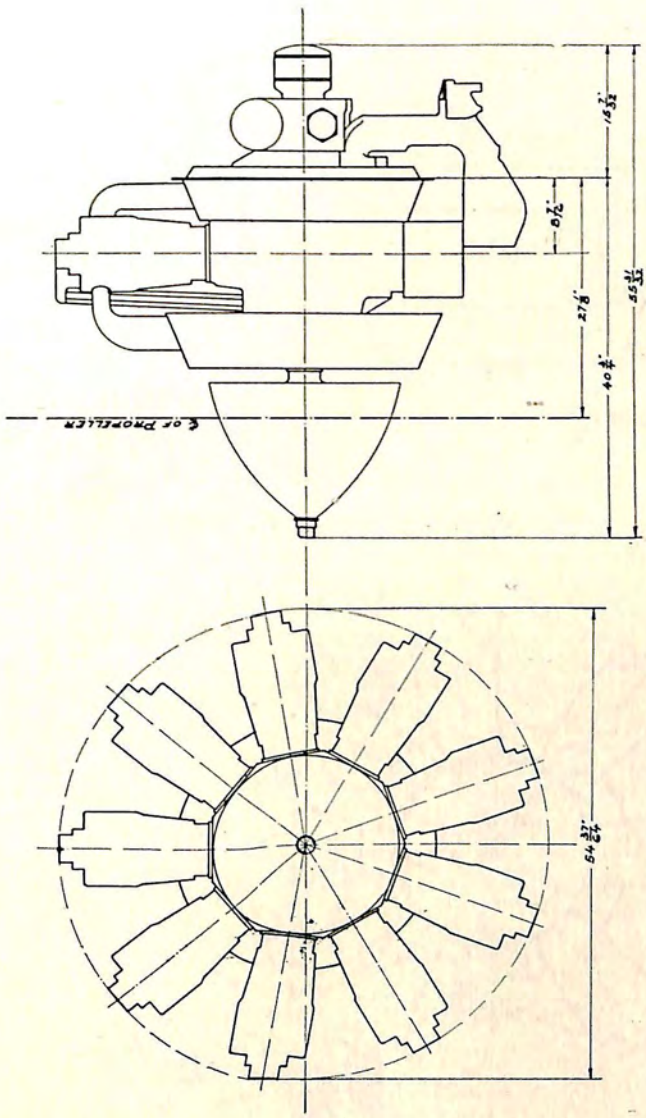
CHANCE VOUGHT CORPORATION
Hartford, Conn.
OBSERVATION O2U–4
ENGINE: PRATT & WHITNEY WASP



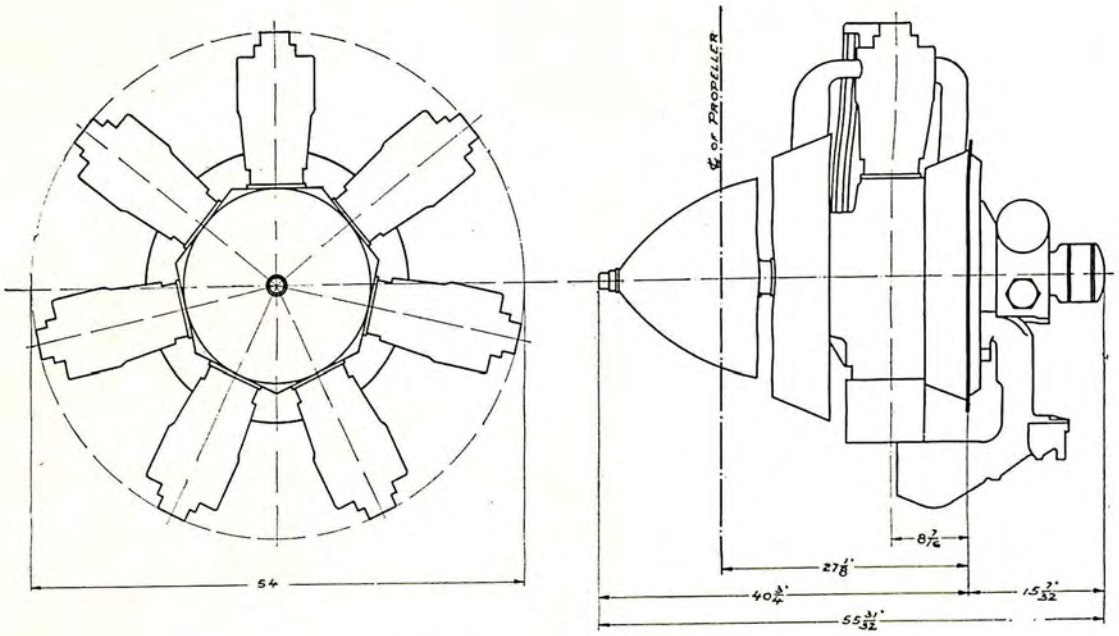
CHANCE VOUGHT CORPORATION
Hartford, Conn.
FIGHTER XF20–1
ENGINE: PRATT & WHITNEY WASP



CHANCE VOUGHT CORPORATION
Hartford, Conn.
FIGHTER FU-1
ENGINE: WRIGHT WHIRLWIND 240

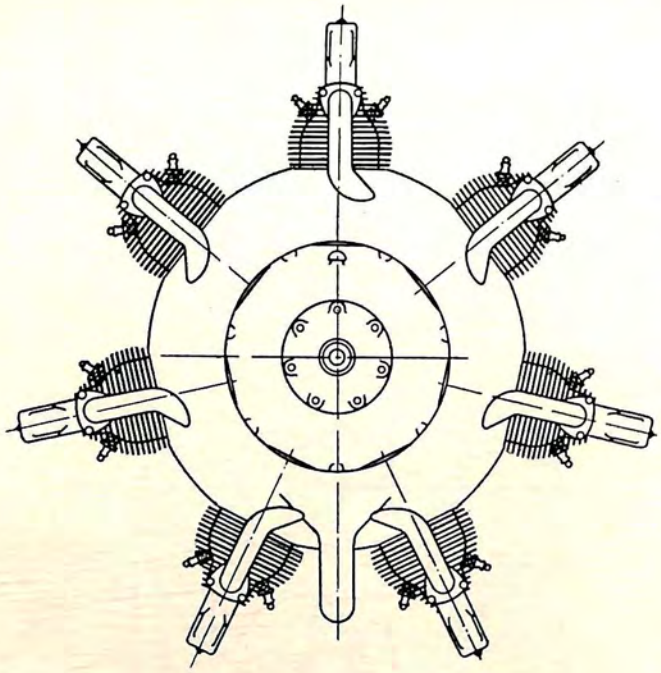


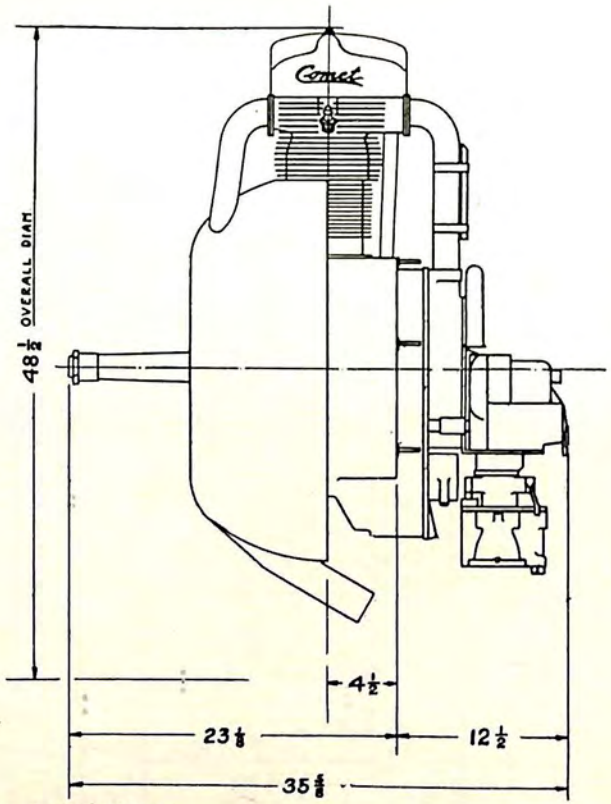
E. W. BLISS COMPANY
Brooklyn, N. Y.
BLISS–JUPITER — 550 H.P.
9 CYLINDER RADIAL AIRCOOLED



E. W. BLISS COMPANY
Brooklyn, N. Y.

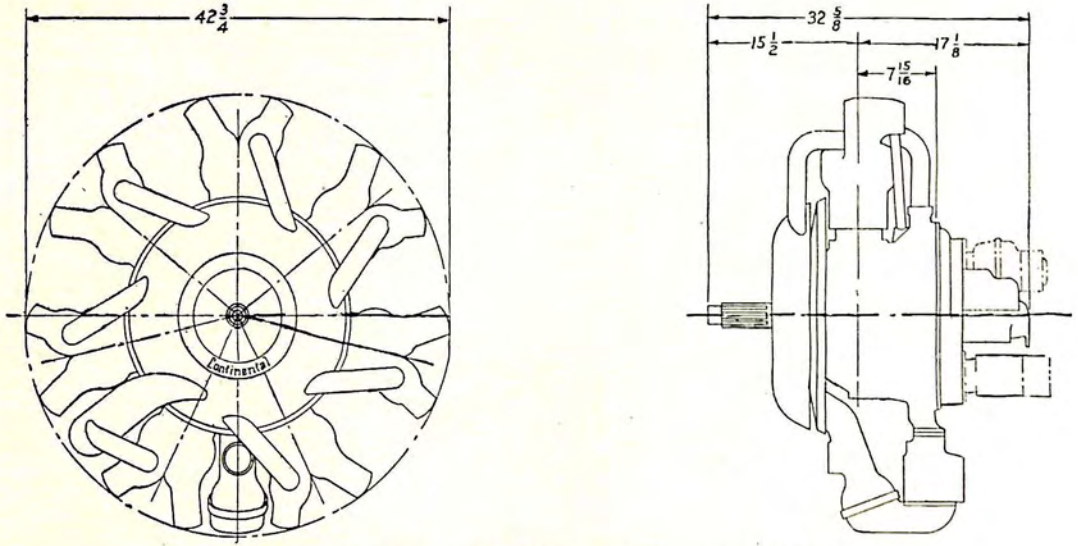
BLISS–NEPTUNE — 400 H.P.
7 CYLINDER RADIAL AIRCOOLED





COMET ENGINE CORPORATION
Madison, Wis.

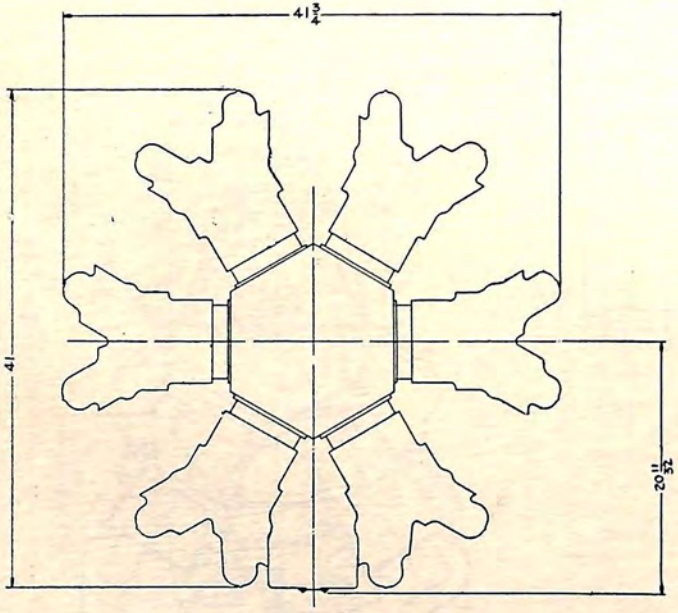
COMET — 150 H.P.
7 CYLINDER RADIAL AIRCOOLED

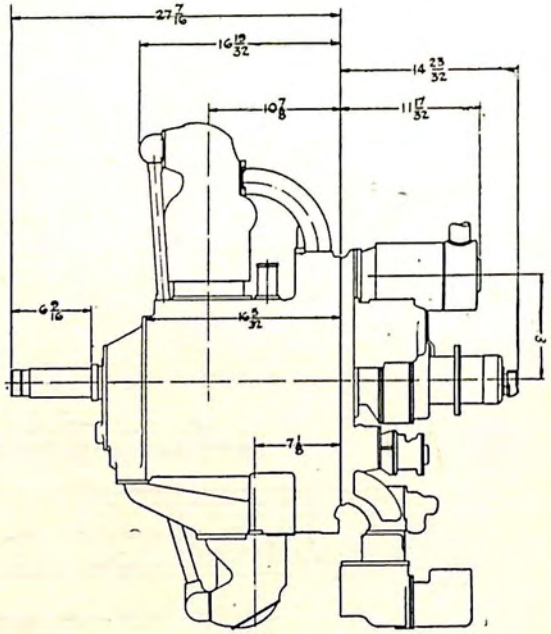


CONTINENTAL AIRCRAFT ENGINE COMPANY
Detroit, Mich.

MODEL A70-2 — 165 H.P.

7 CYLINDER RADIAL AIRCOOLED

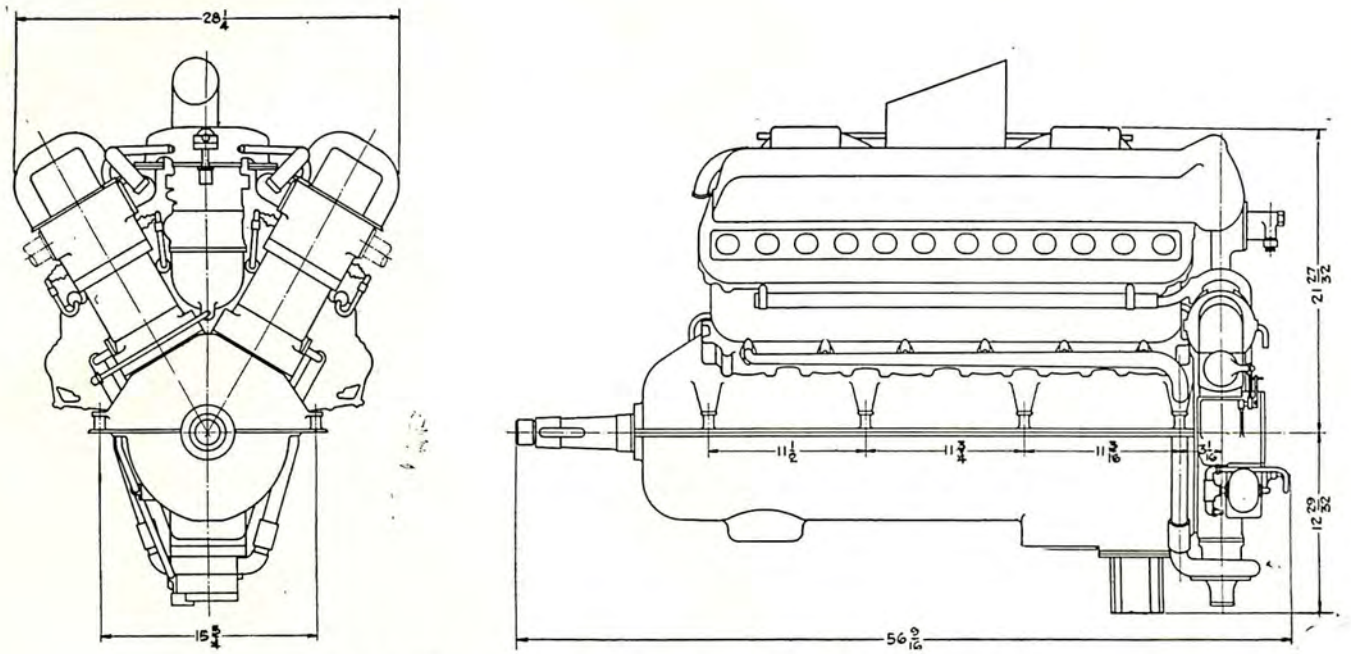




CURTISS AEROPLANE & MOTOR COMPANY, INC.
Buffalo, N. Y.

CHALLENGER — 185 H.P.

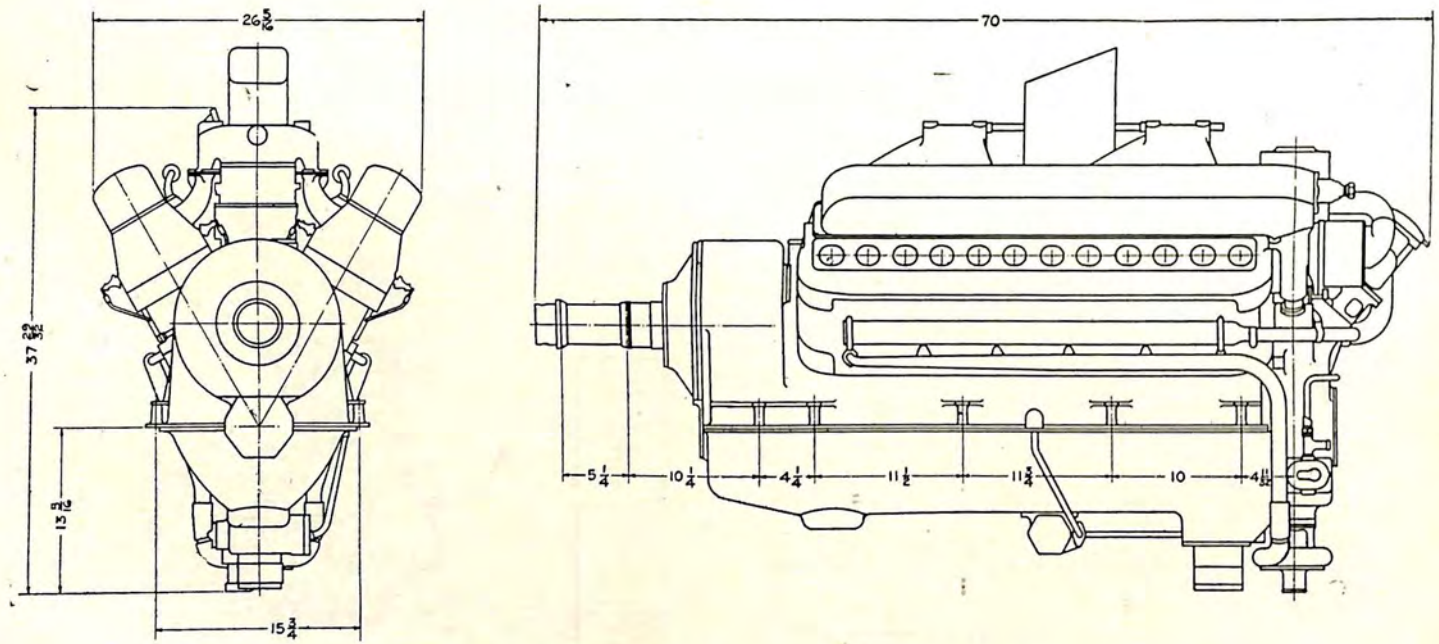
6 CYLINDER RADIAL AIRCOOLED



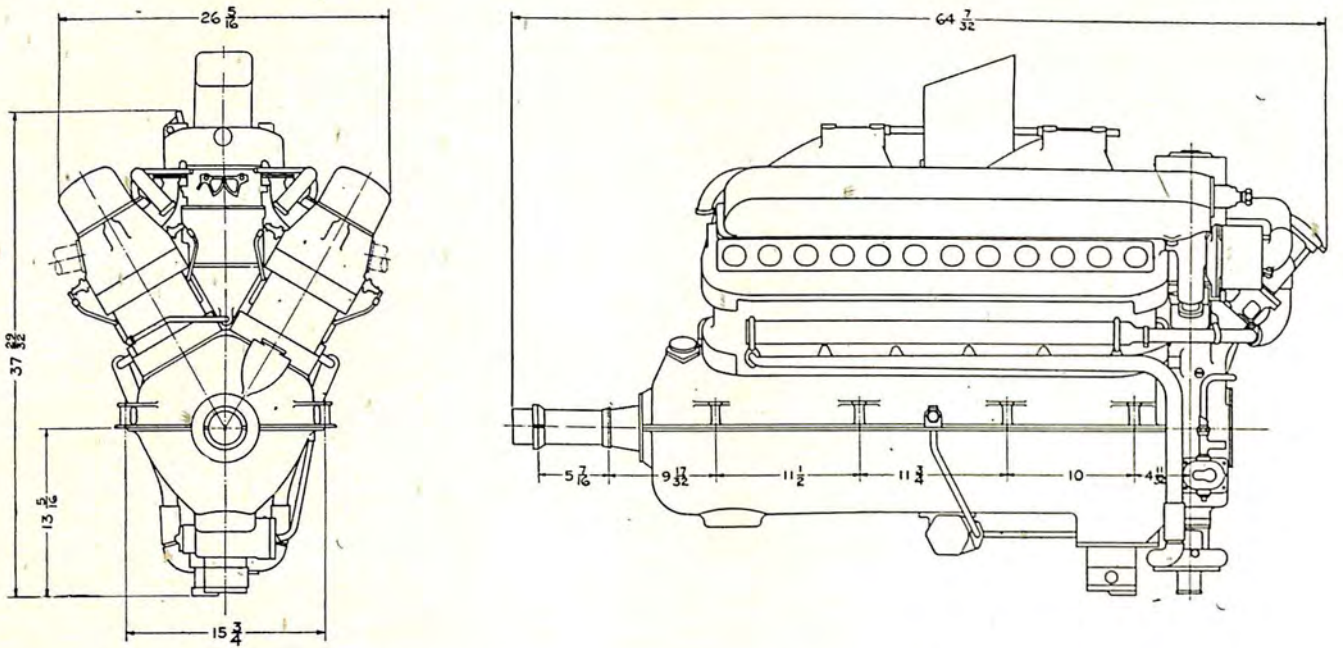
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Buffalo, N. Y.

MODEL D-12 — 435 H.P.

12 CYLINDER V TYPE WATERCOOLED



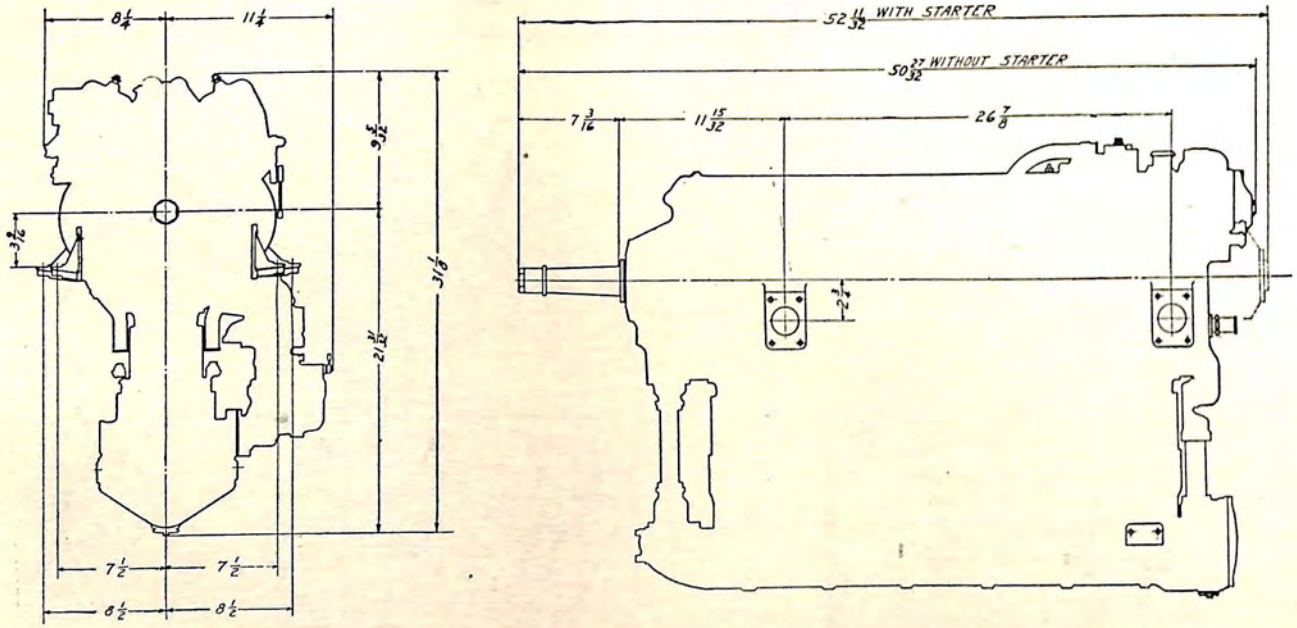
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Buffalo, N. Y.
CONQUEROR (GEARED) — 600 H.P.
12 CYLINDER V TYPE WATERCOOLED



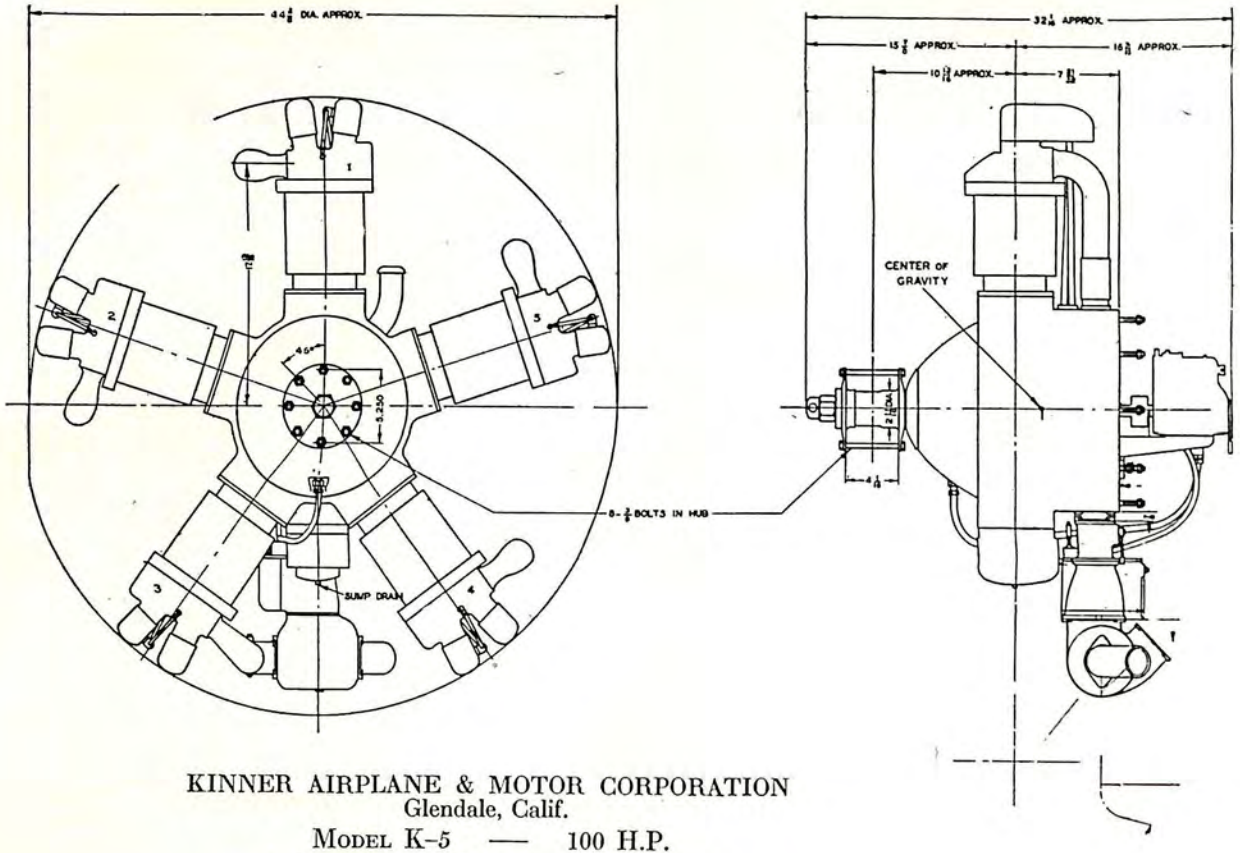
CURTISS AEROPLANE & MOTOR COMPANY, INC.
Buffalo, N. Y.

CONQUEROR — 625 H.P.

12 CYLINDER V TYPE WATERCOOLED



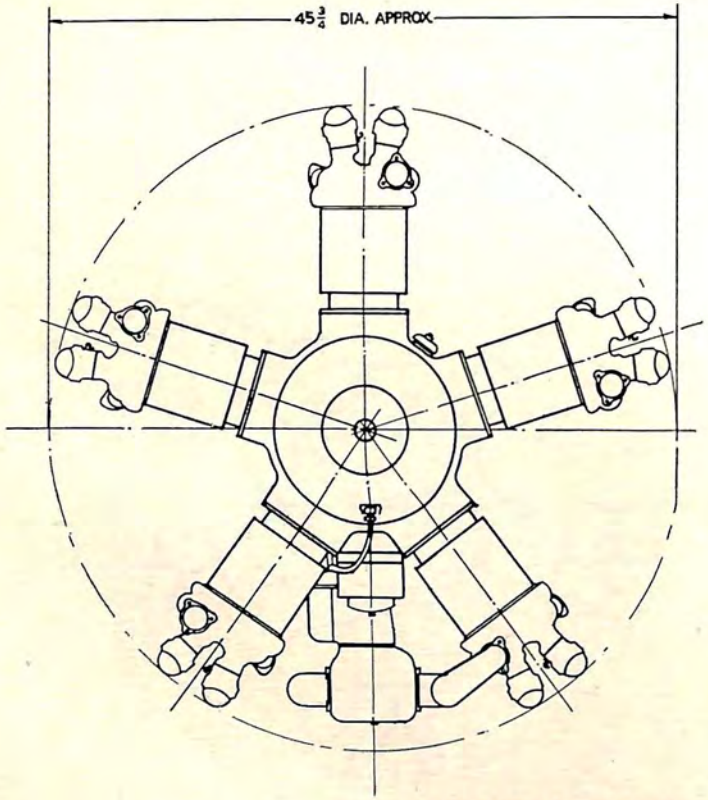
FAIRCHILD ENGINE CORPORATION
Farmingdale, N. Y.
MODEL 6-390 — 120 H.P.
6 CYLINDER INVERTED IN LINE AIRCOOLED

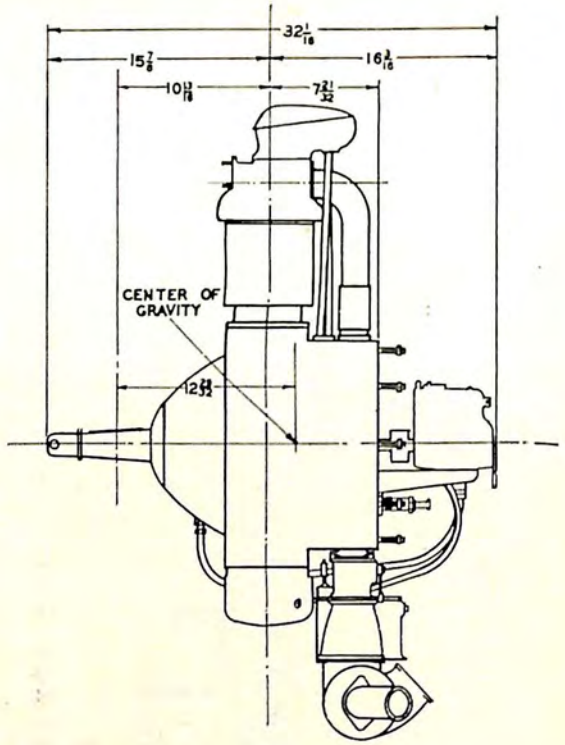


KINNER AIRPLANE & MOTOR CORPORATION
Glendale, Calif.

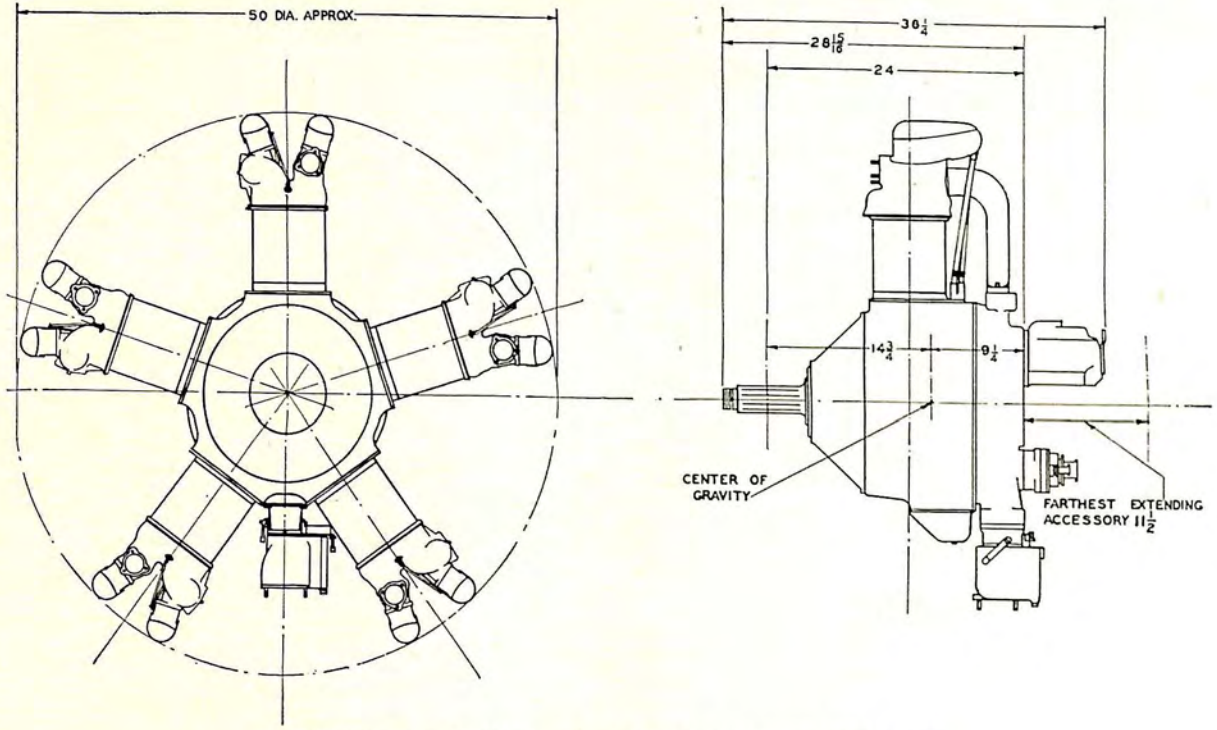
MODEL K-5 — 100 H.P.

5 CYLINDER RADIAL AIRCOOLED





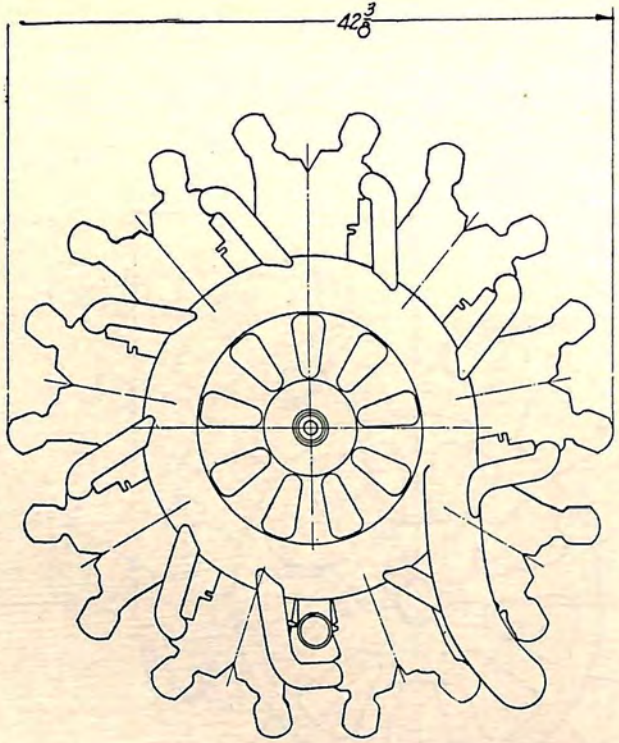
KINNER AIRPLANE & MOTOR CORPORATION
Glendale, Calif.
MODEL B-5 — 125 H.P.
5 CYLINDER RADIAL AIRCOOLED

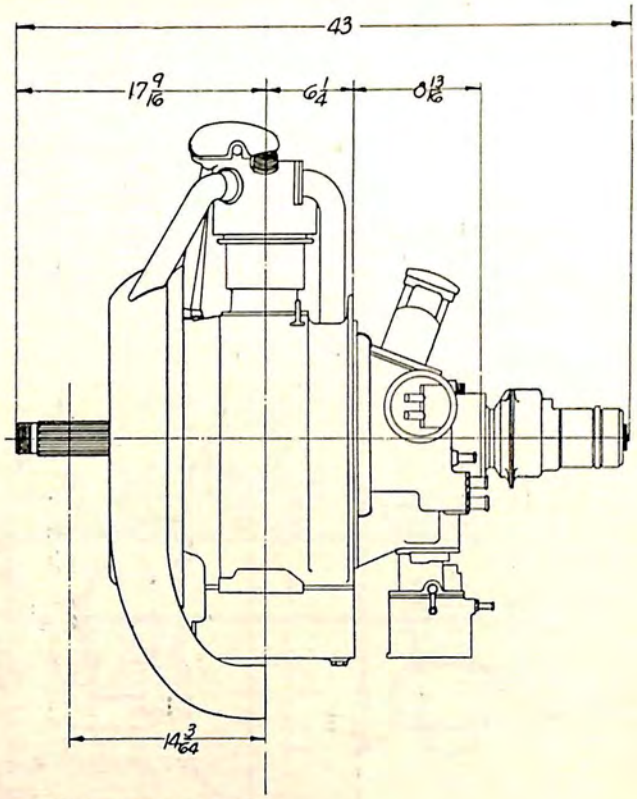


KINNER AIRPLANE & MOTOR CORPORATION
Glendale, Calif.

MODEL C-5 — 210 H.P.

5 CYLINDER RADIAL AIRCOOLED

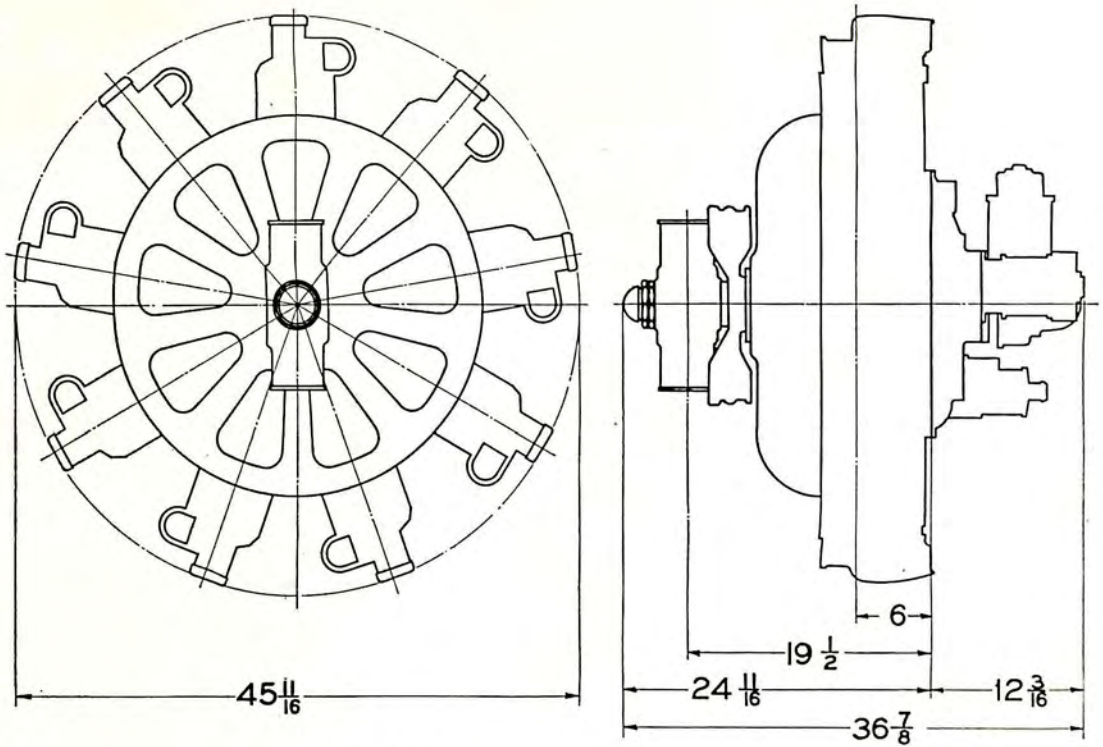




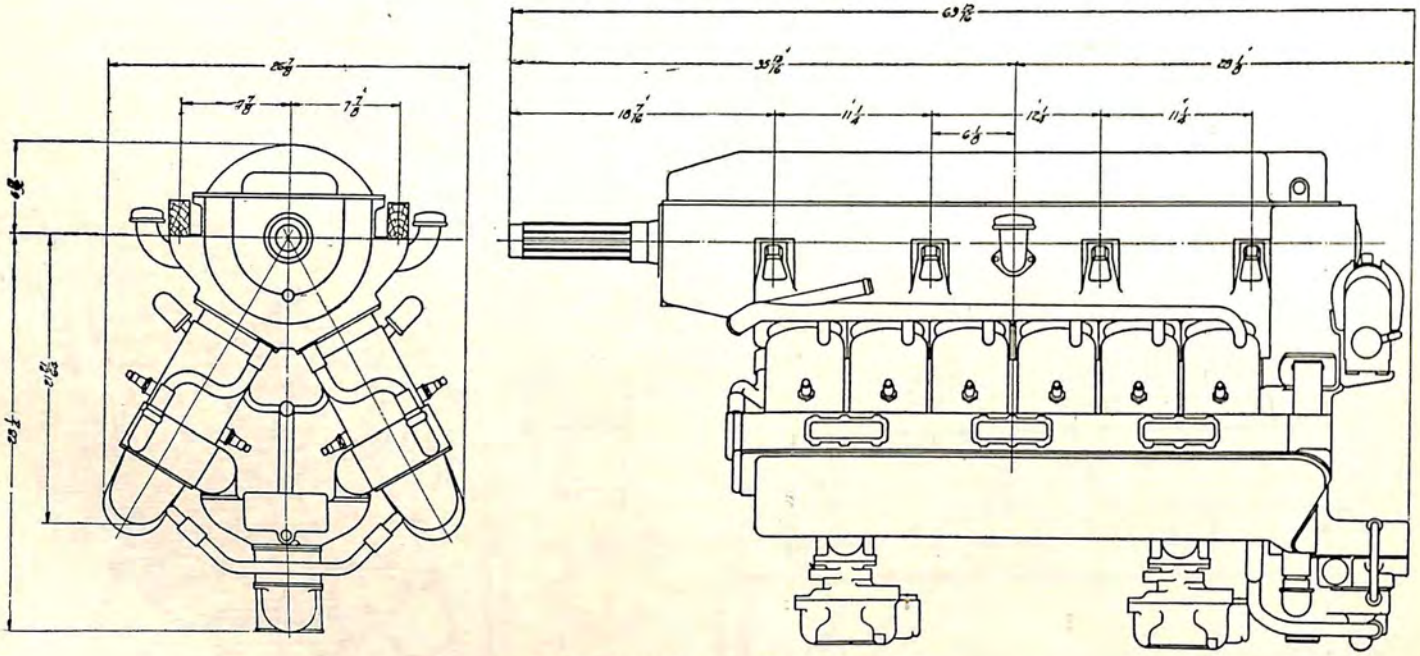
LYCOMING MANUFACTURING COMPANY
Williamsport, Pa.

MODEL R-680 — 210 H.P.

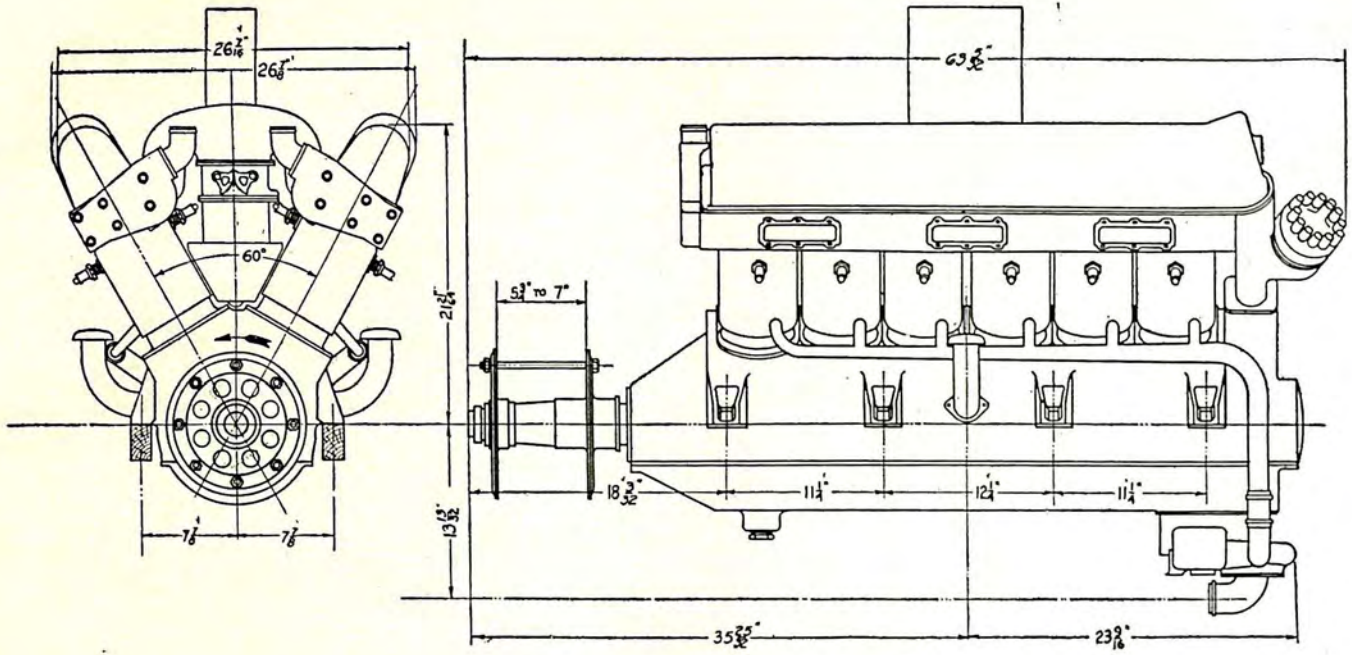
9 CYLINDER RADIAL AIRCOOLED



PACKARD MOTOR CAR COMPANY
Detroit, Mich.
MODEL DR-980 — 225 H.P.
9 CYLINDER RADIAL AIRCOOLED

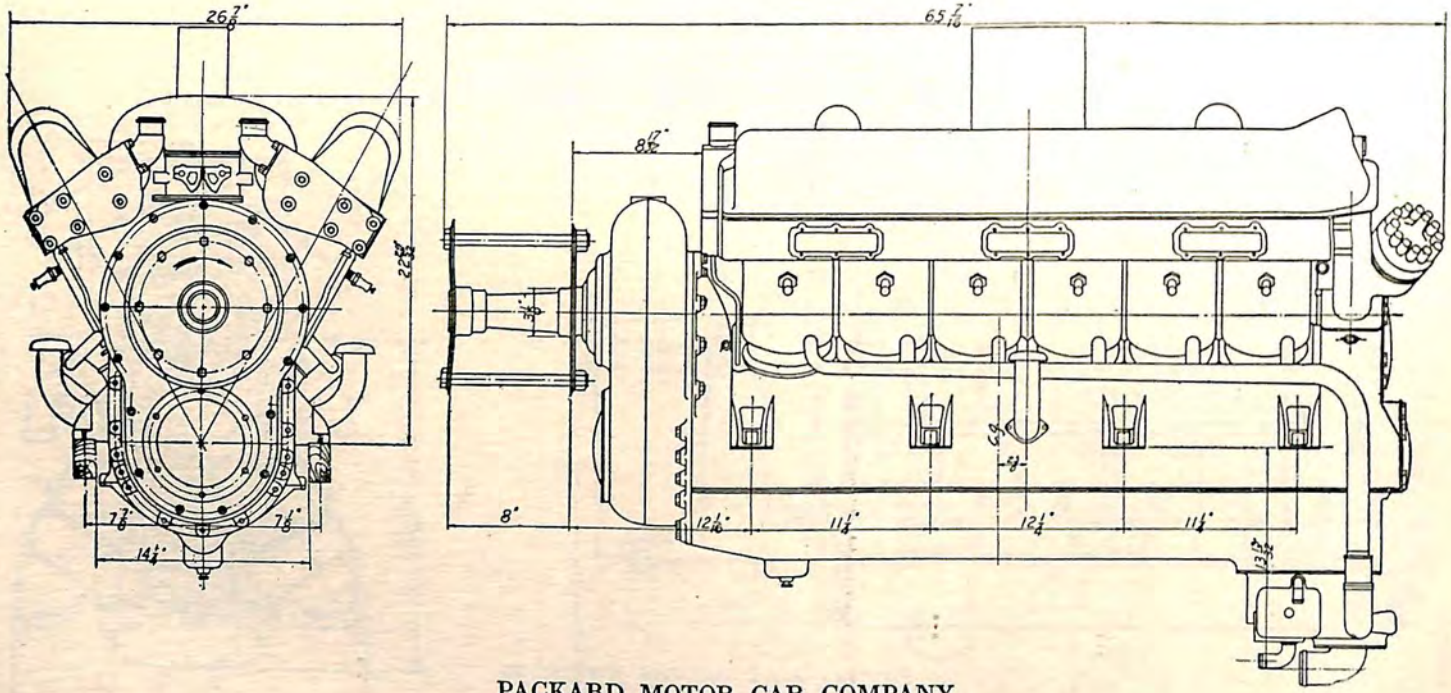


PACKARD MOTOR CAR COMPANY
Detroit, Mich.
MODEL 2A–1500 — 600 H.P.
12 CYLINDER INVERTED V TYPE WATERCOOLED

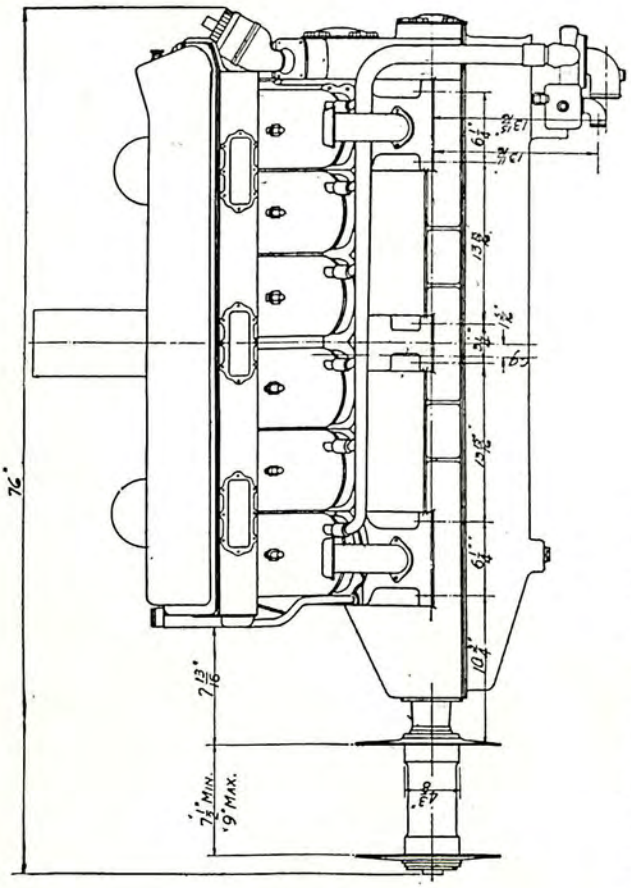


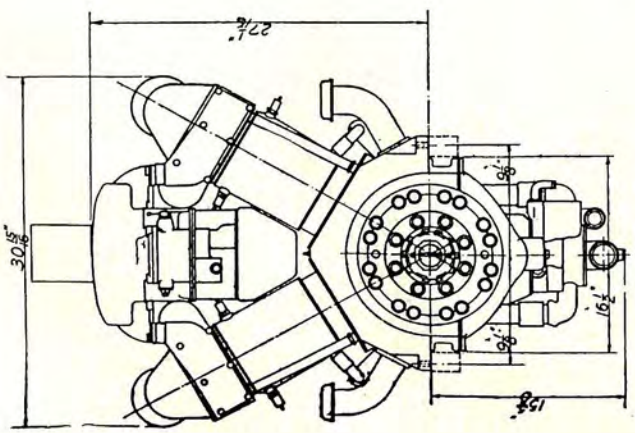
PACKARD MOTOR CAR COMPANY
Detroit, Mich.

MODEL 2A–1500 — 600 H.P.
12 CYLINDER V TYPE WATERCOOLED



PACKARD MOTOR CAR COMPANY
Detroit, Mich.
MODEL 2A–1500 (GEARED) — 600 H.P.
12 CYLINDER V TYPE WATERCOOLED

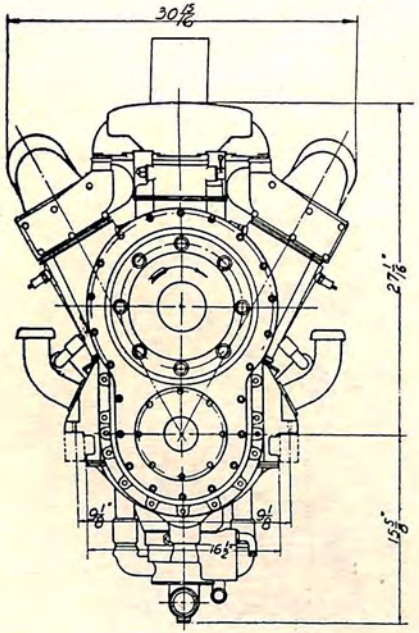


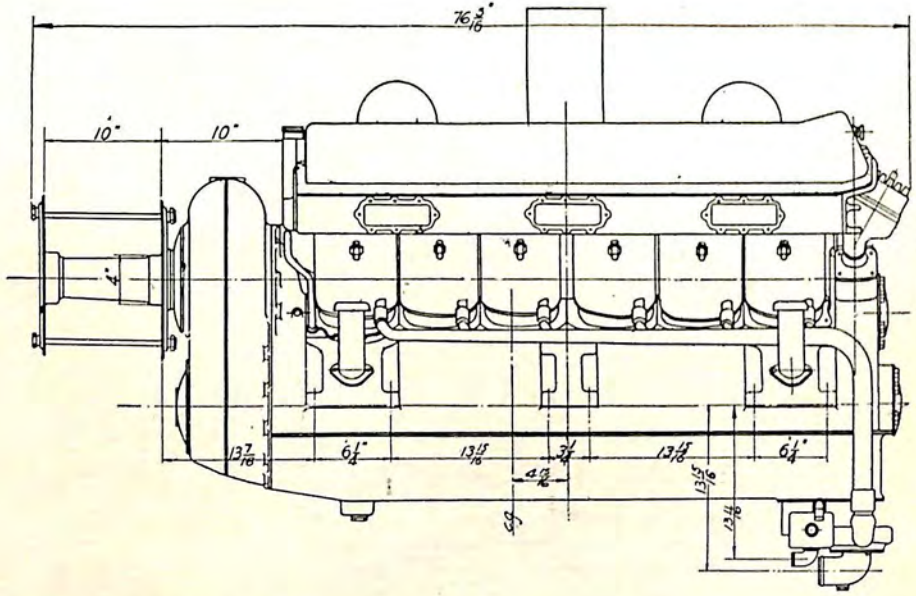


PACKARD MOTOR CAR COMPANY
Detroit, Mich.

MODEL 2A–2500 — 800 H.P.

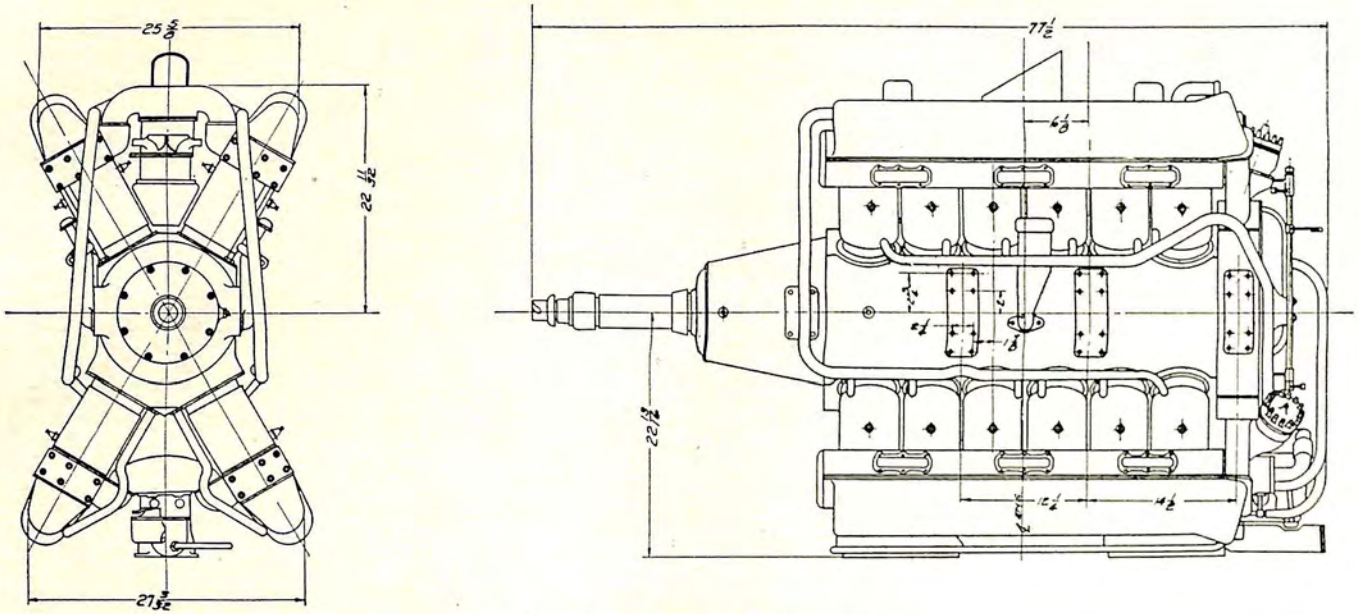
12 CYLINDER V TYPE WATERCOOLED





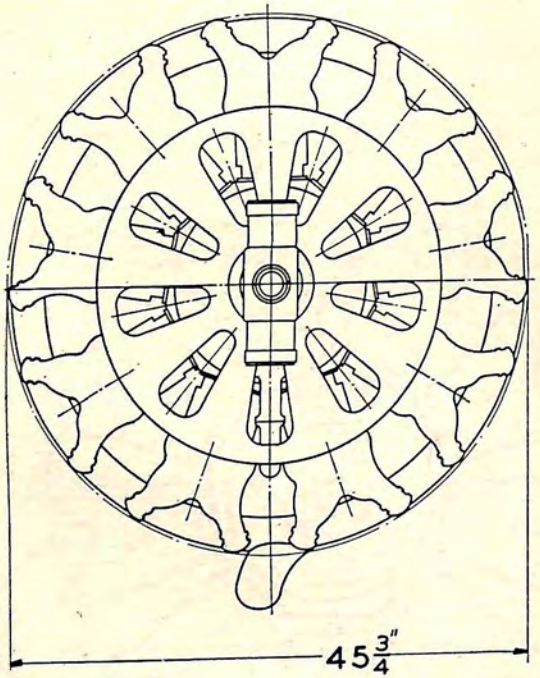
PACKARD MOTOR CAR COMPANY
Detroit, Mich.

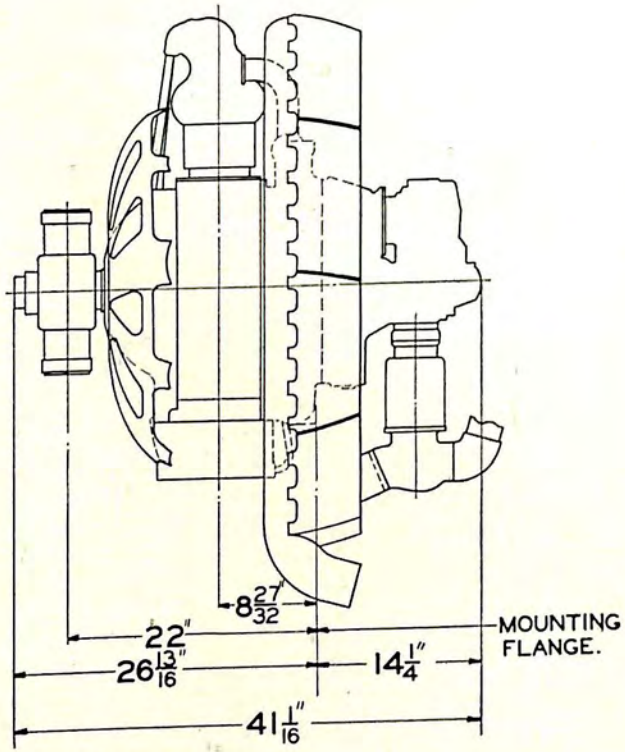
MODEL 2A–2500 (GEARED) — 800 H.P.
12 CYLINDER V TYPE WATERCOOLED



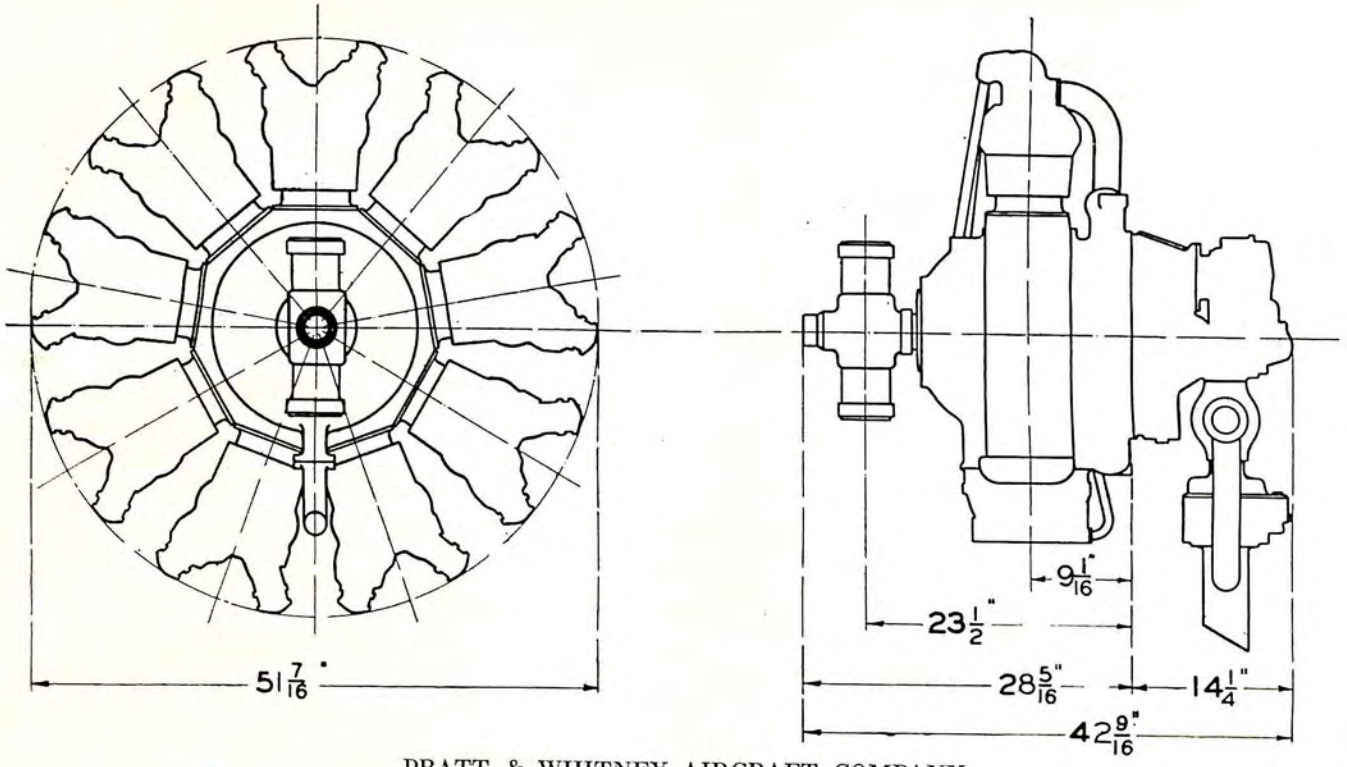
PACKARD MOTOR CAR COMPANY
Detroit, Mich.

MODEL 1A–2775 — 1250 H.P.
24 CYLINDER X TYPE WATERCOOLED

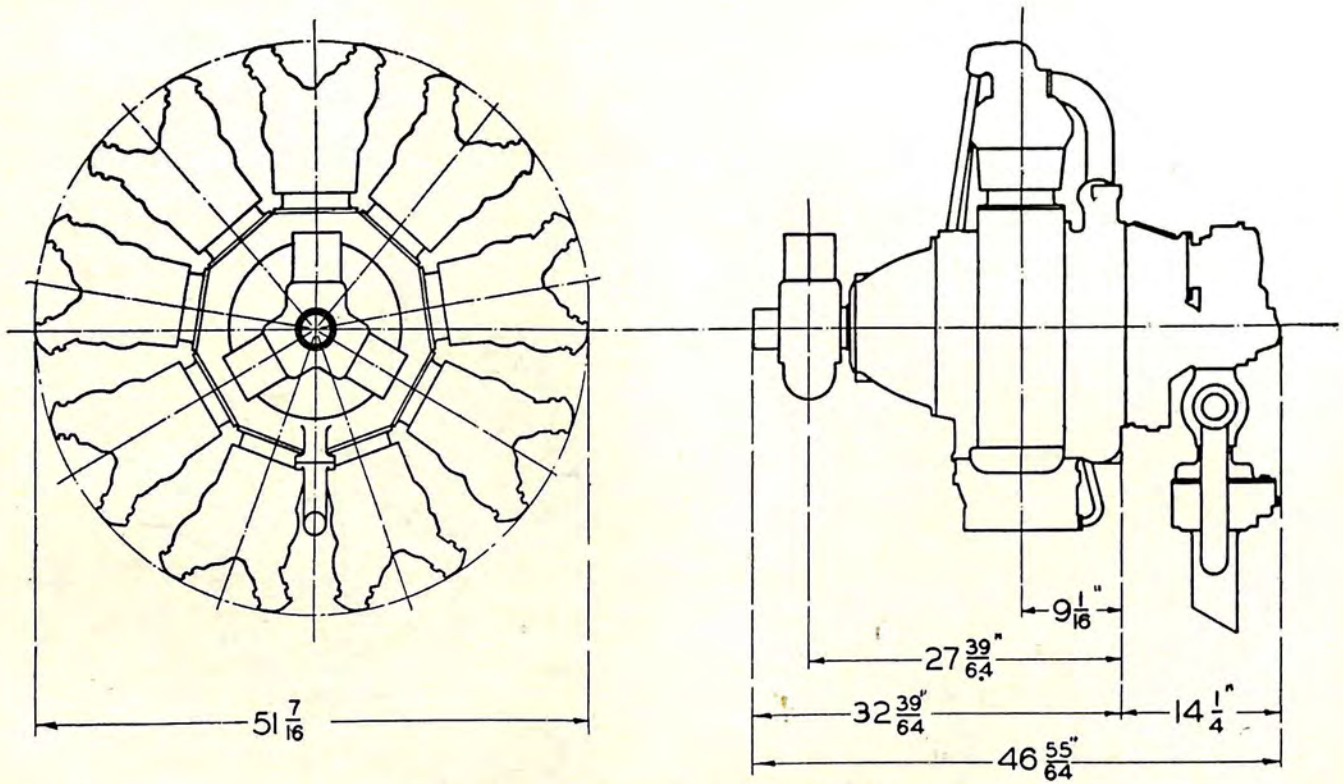




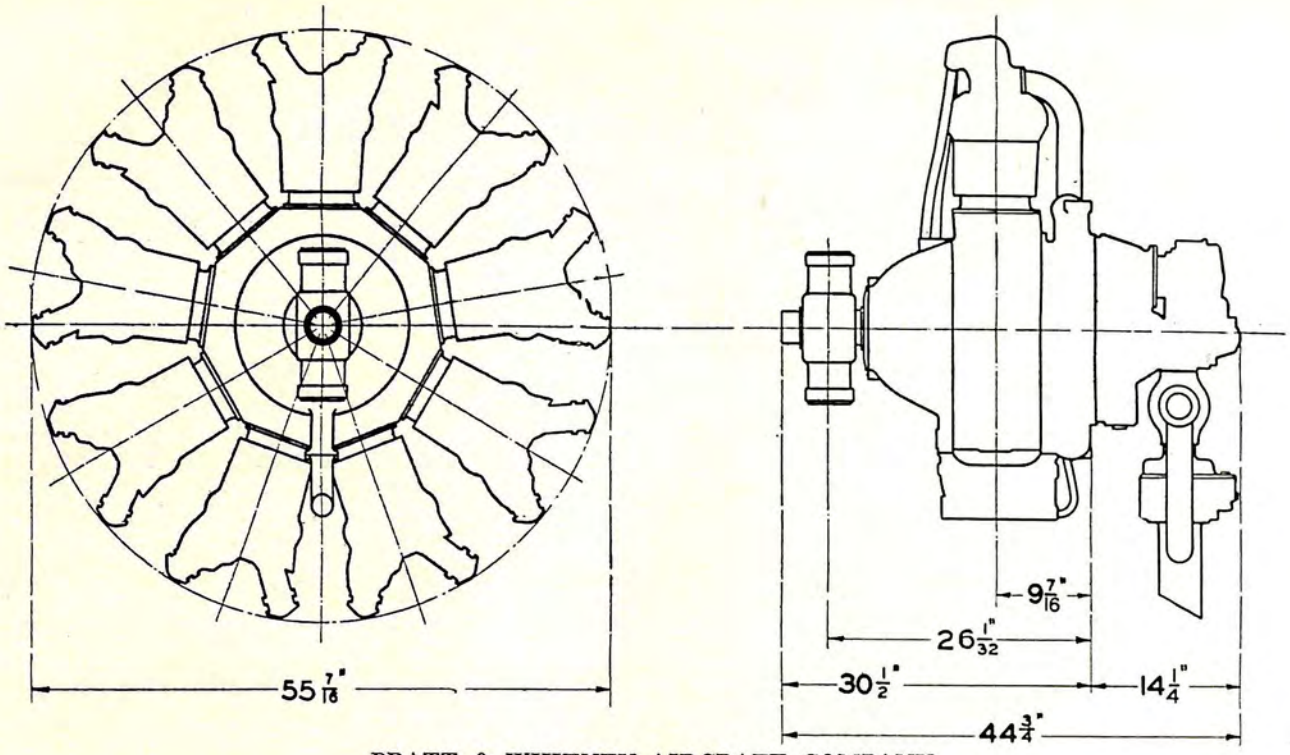
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
WASP, JR. — 300 H.P.
9 CYLINDER RADIAL AIRCOOLED



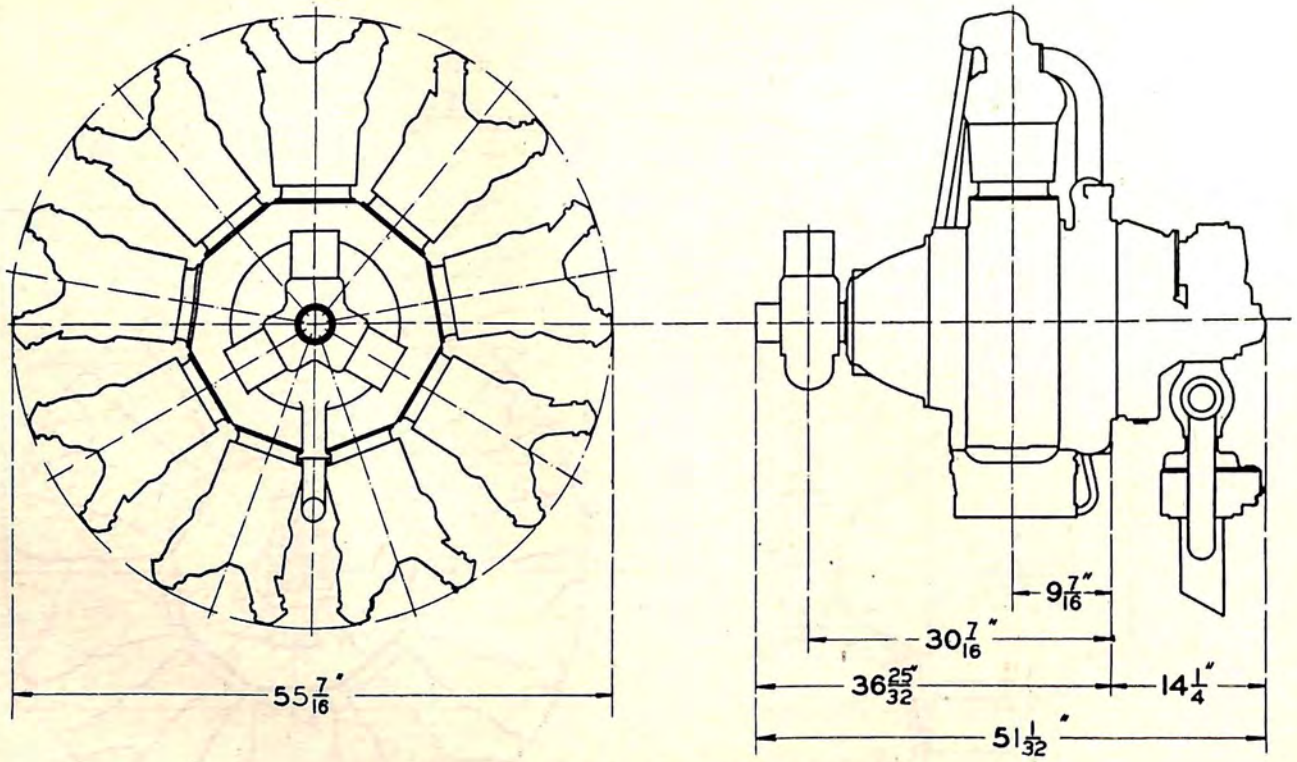
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
WASP C — 420 H.P.
9 CYLINDER RADIAL AIRCOOLED



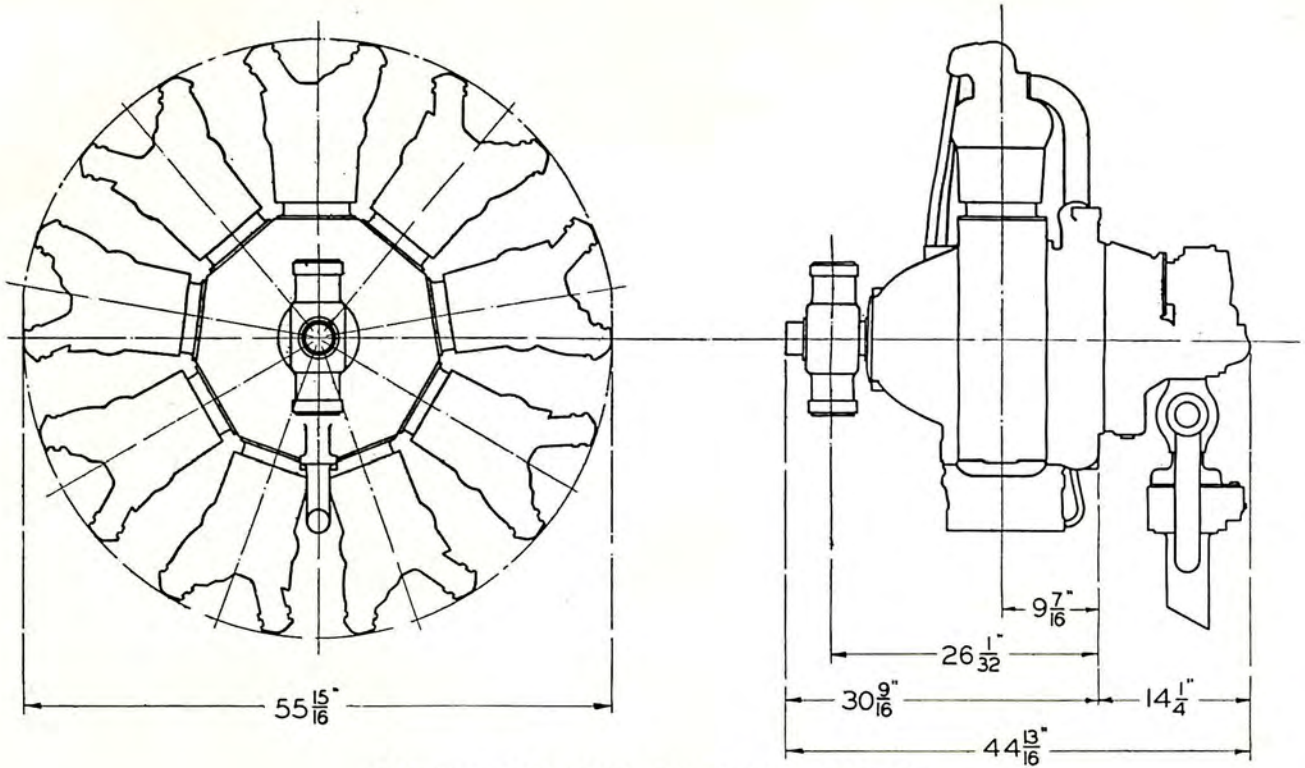
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
WASP C (GEARED) — 420 H.P.
9 CYLINDER RADIAL AIRCOOLED



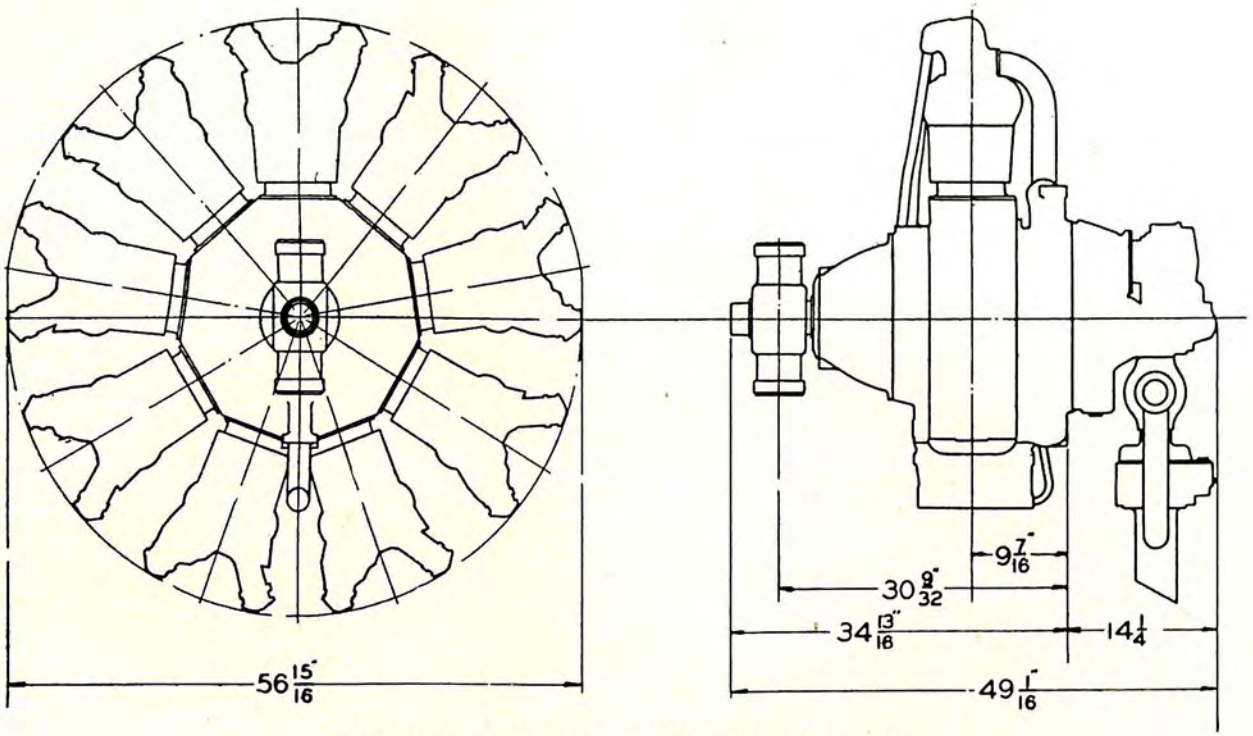
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
HORNET A-1 — 525 H.P.
9 CYLINDER RADIAL AIRCOOLED



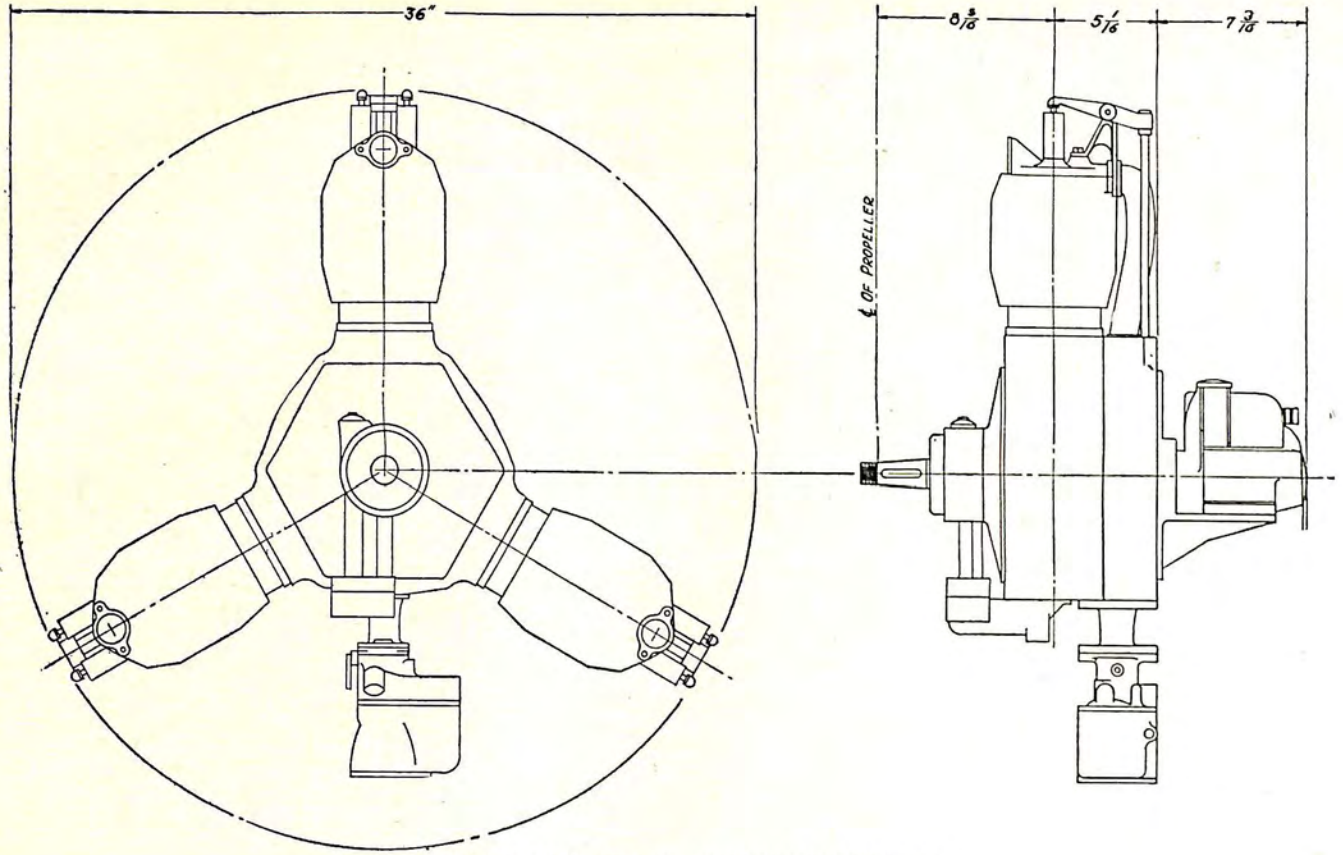
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
HORNET (GEARED) — 525 H.P.
9 CYLINDER RADIAL AIRCOOLED



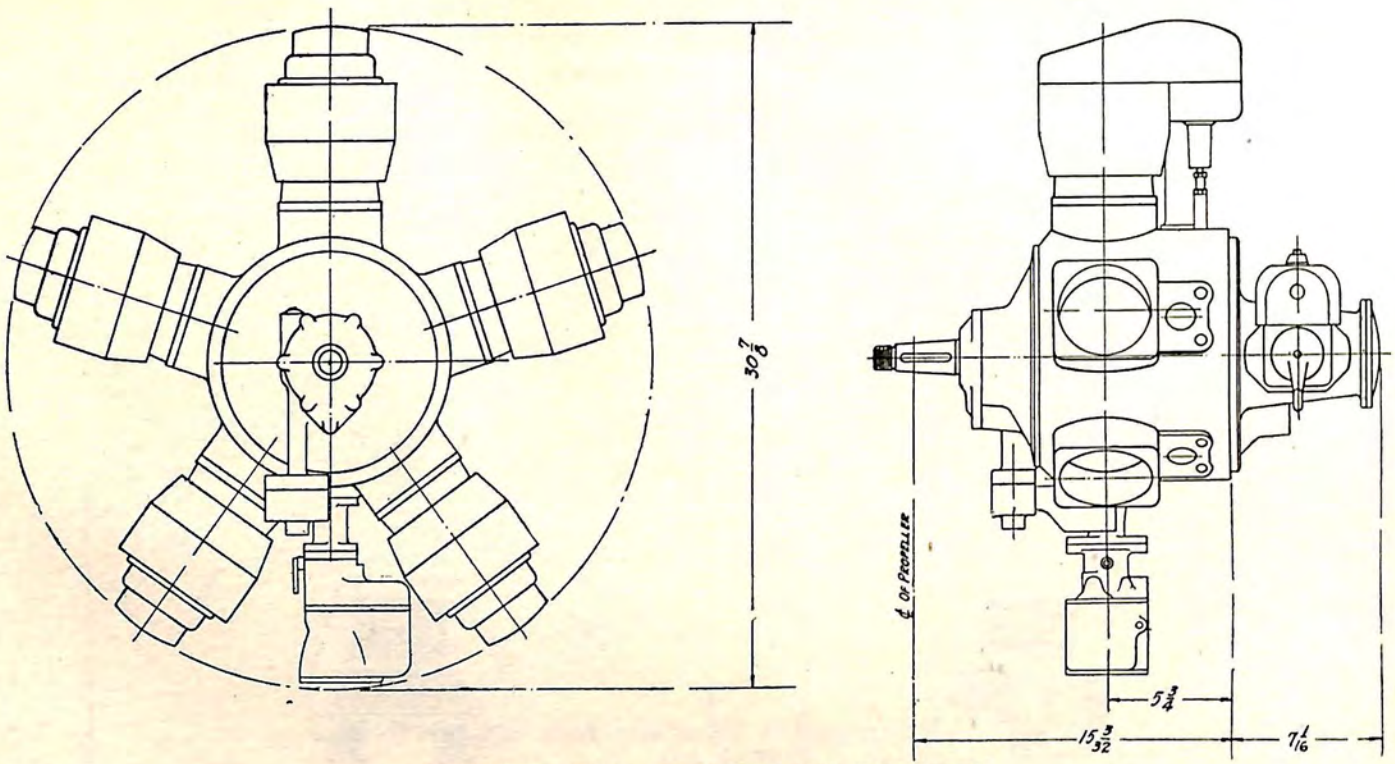
PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
HORNET 1860 — 575 H.P.
9 CYLINDER RADIAL AIRCOOLED



PRATT & WHITNEY AIRCRAFT COMPANY
East Hartford, Conn.
HORNET B (GEARED) — 550 H.P.
9 CYLINDER RADIAL AIRCOOLED



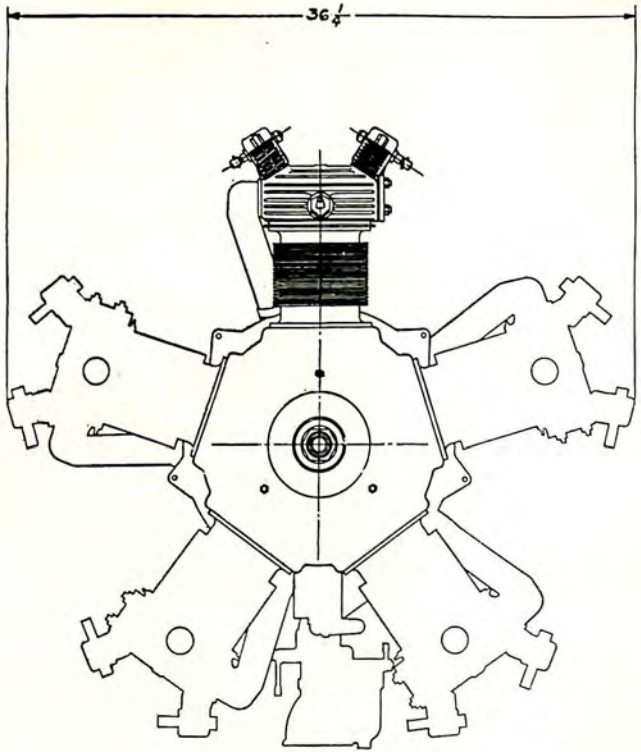
SZEKELY AIRCRAFT & ENGINE COMPANY
Holland, Mich.
MODEL SR3–B — 40 H.P.
3 CYLINDER RADIAL AIRCOOLED

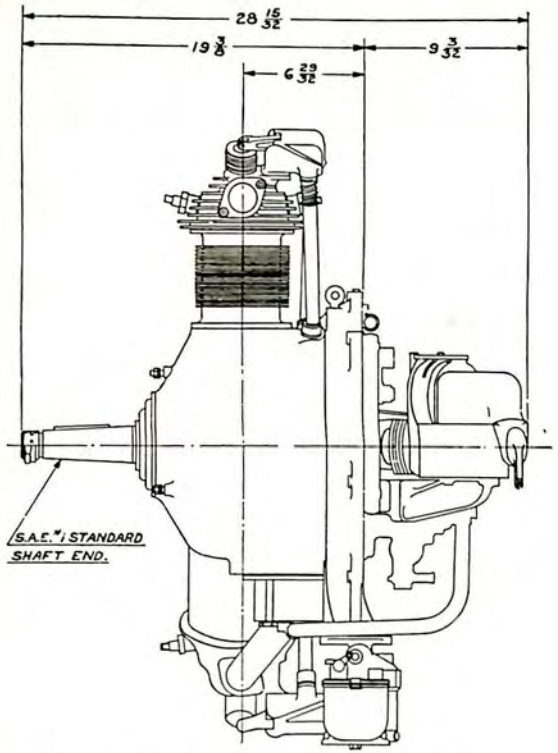


SZEKELY AIRCRAFT & ENGINE COMPANY
Holland, Mich.

MODEL SR5-L — 70 H.P.

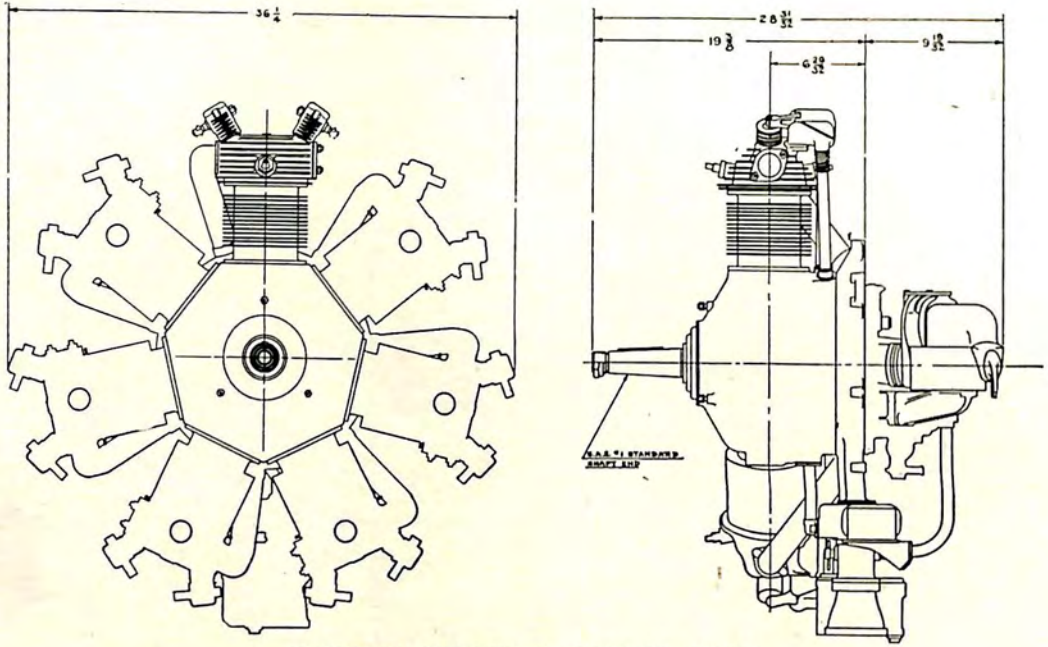
5 CYLINDER RADIAL AIRCOOLED





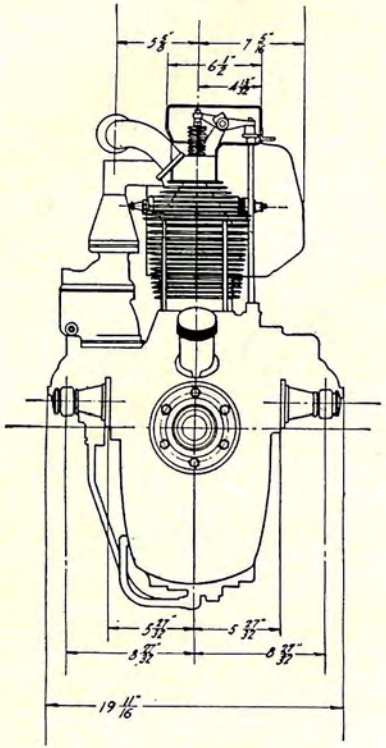
WARNER AIRCRAFT CORPORATION
Detroit, Mich

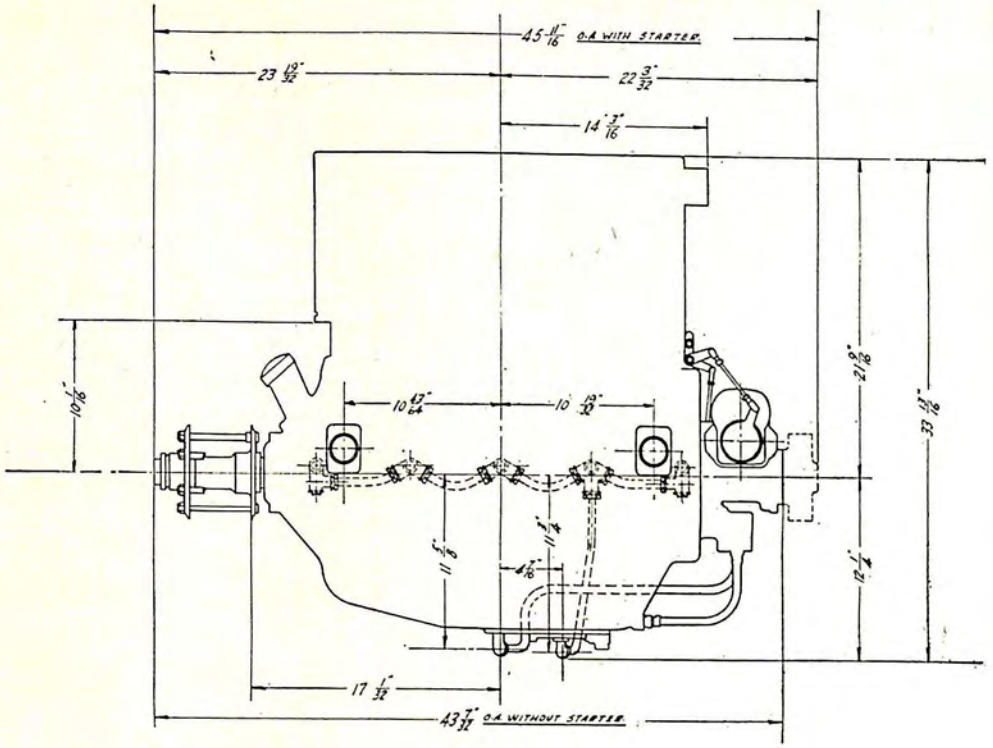
SCARAB, JR. — 90 H.P.
5 CYLINDER RADIAL AIRCOOLED



WARNER AIRCRAFT CORPORATION
Detroit, Mich.

SCARAB — 110 H.P.
7 CYLINDER RADIAL AIRCOOLED



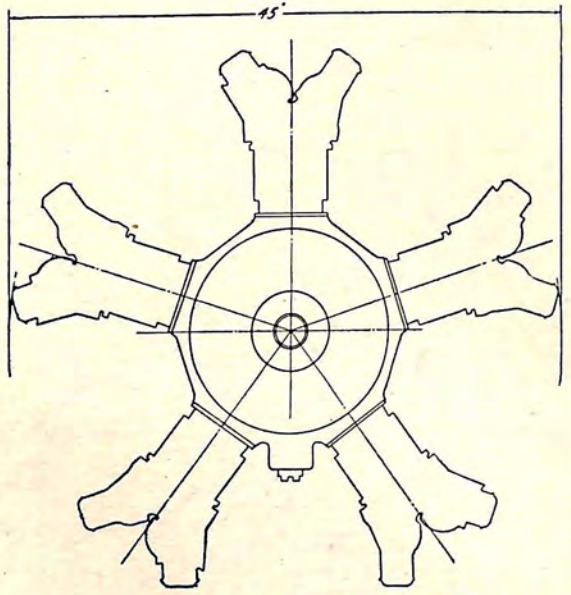


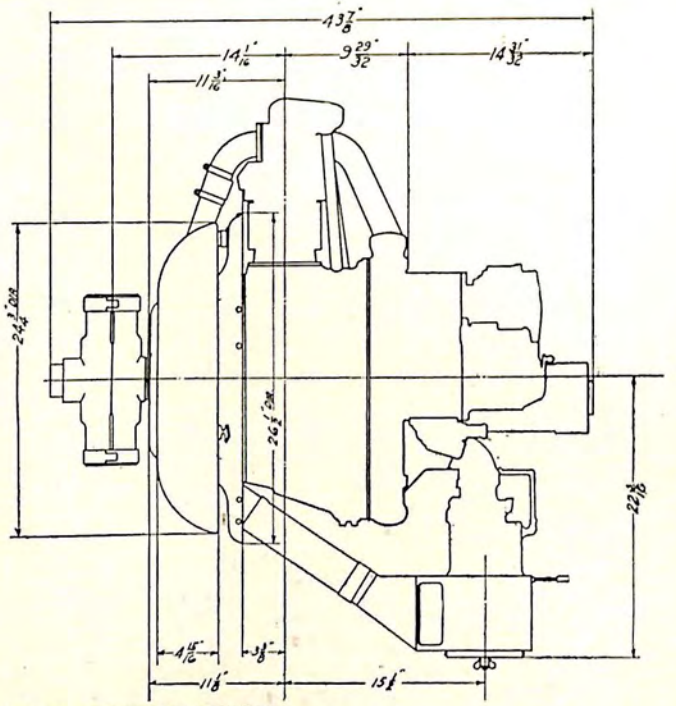
WRIGHT AERONAUTICAL CORPORATION

Paterson, N. J.

WRIGHT GIPSY — 85 H.P.

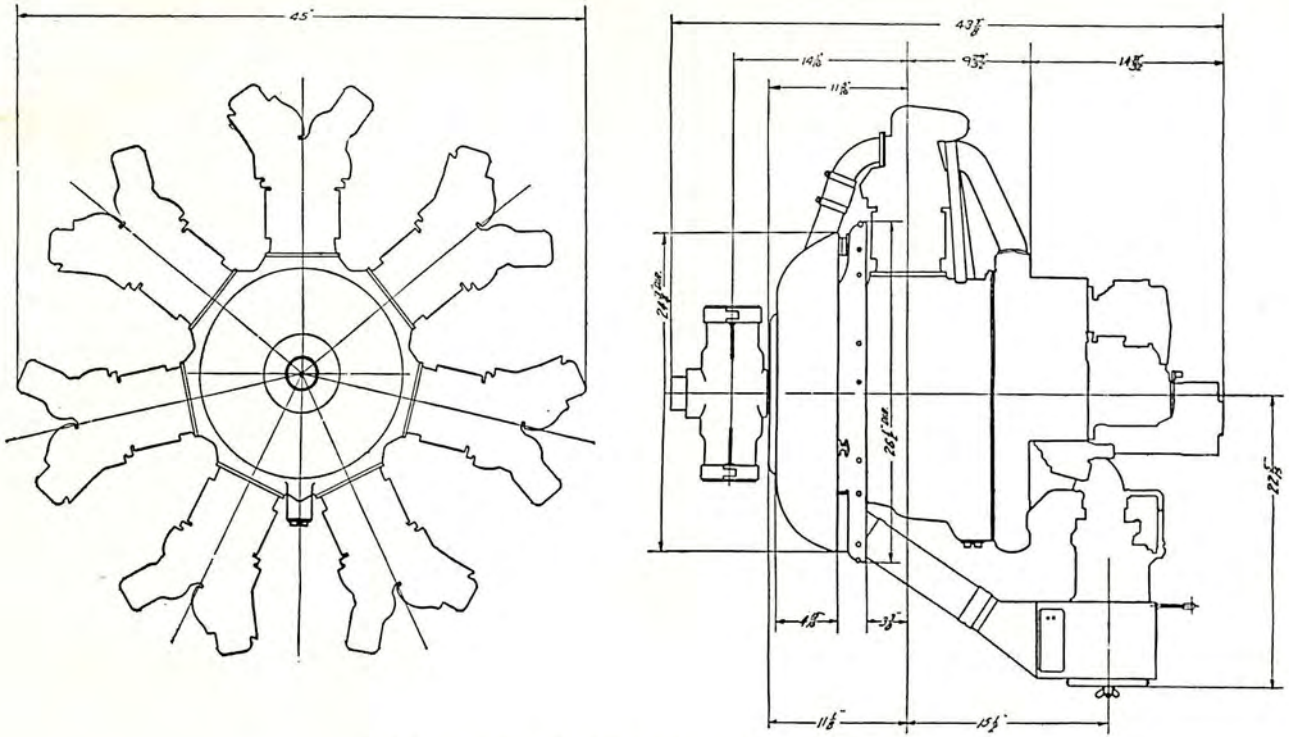
4 CYLINDER IN LINE AIRCOOLED





WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.

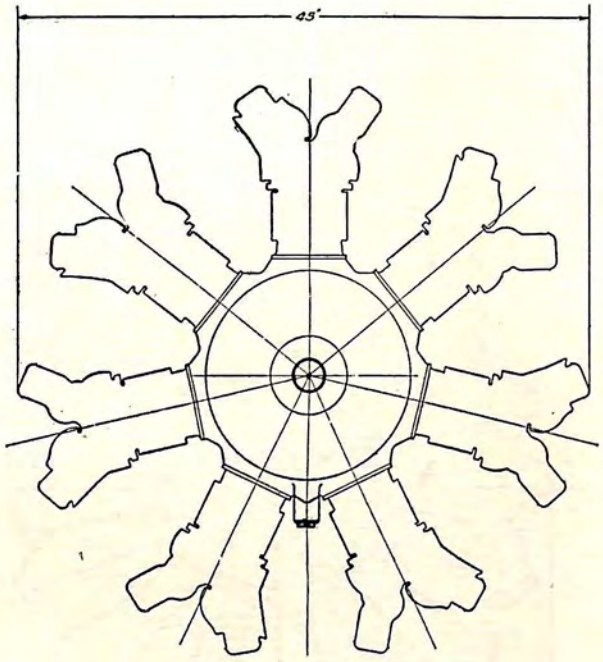
WHIRLWIND — 165 H.P.
5 CYLINDER RADIAL AIRCOOLED

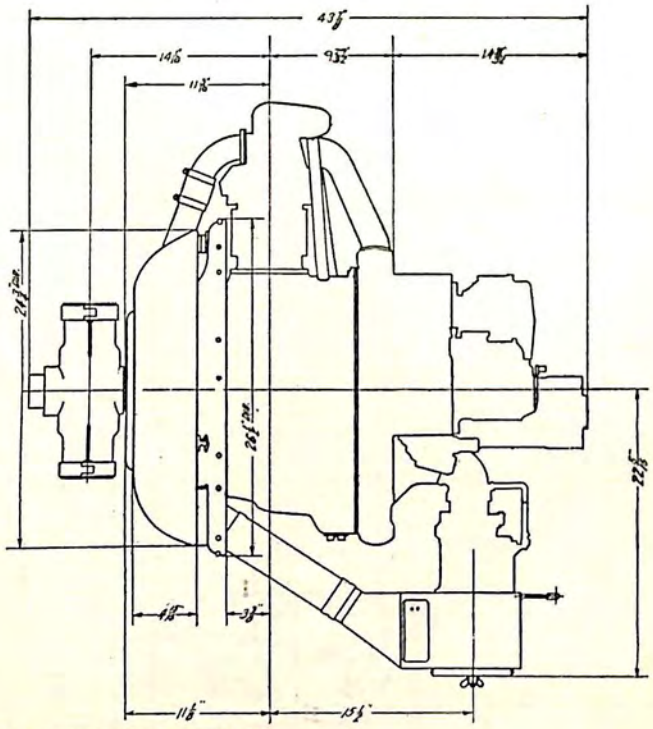


WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.

WHIRLWIND — 240 H.P.

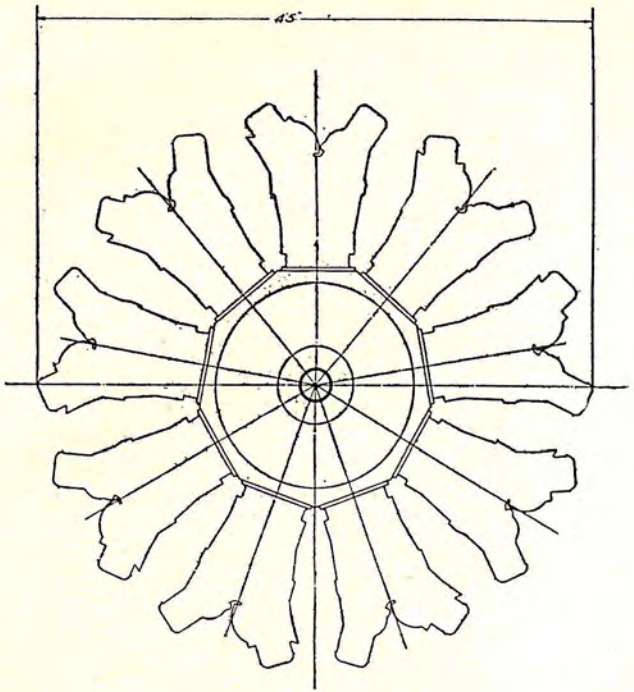
7 CYLINDER RADIAL AIRCOOLED

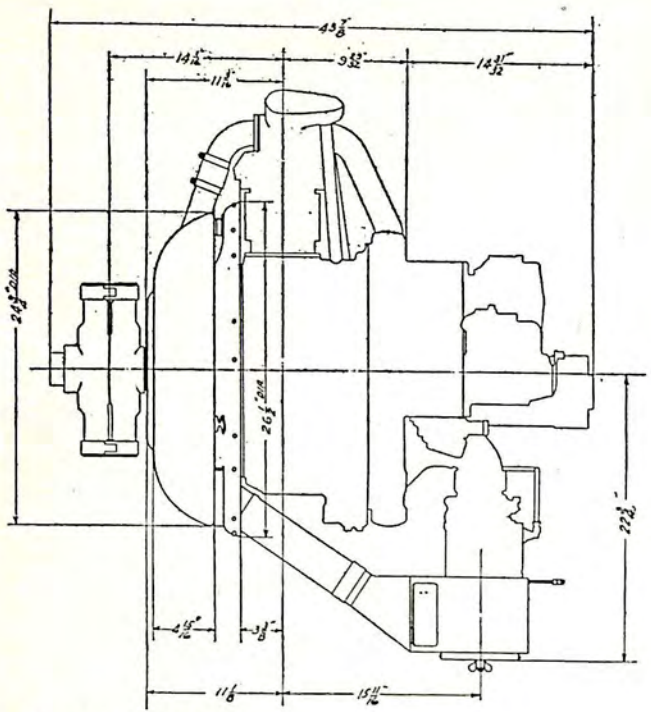




WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.

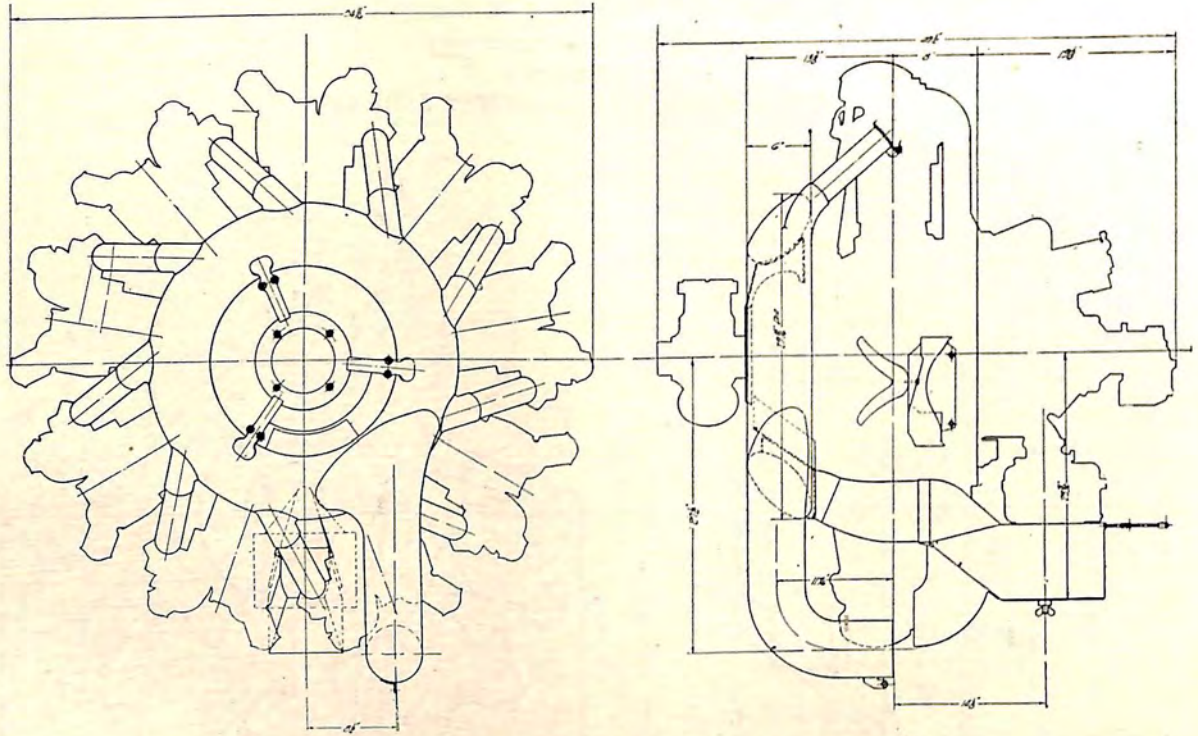
WHIRLWIND — 300 H.P.
9 CYLINDER RADIAL AIRCOOLED



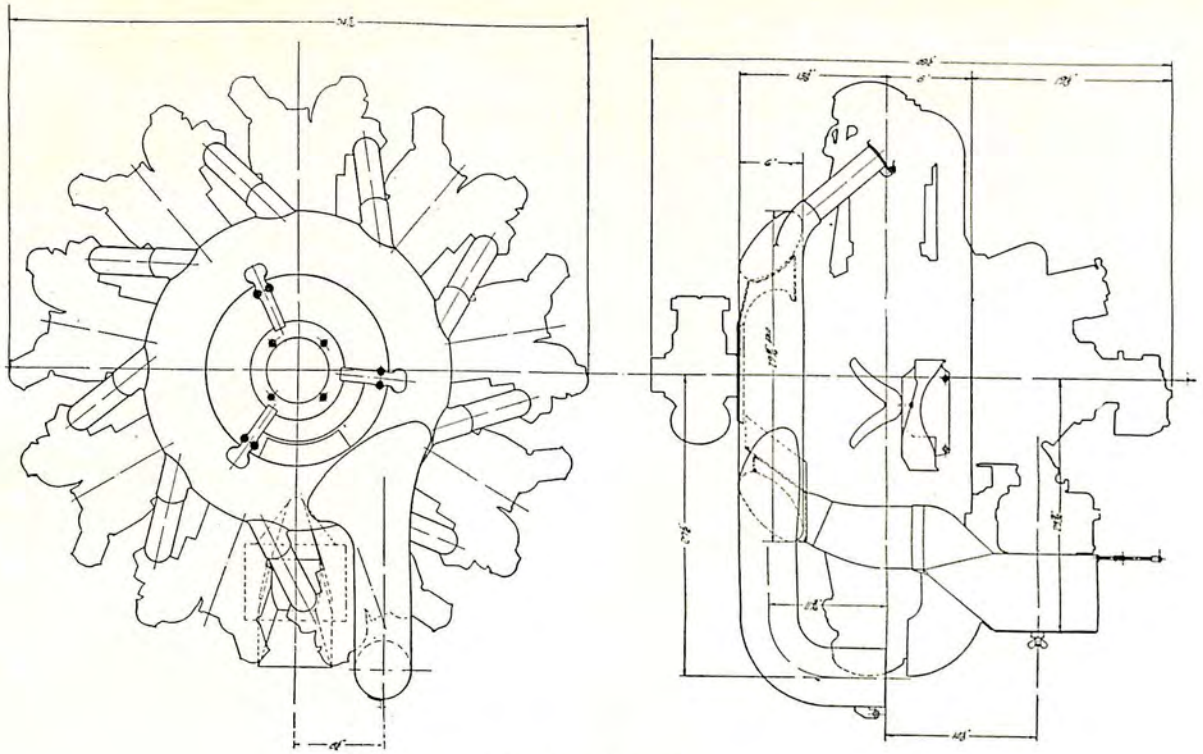


WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.

WHIRLWIND — 400 H.P.
9 CYLINDER RADIAL AIRCOOLED



WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.
CYCLONE — 525 H.P.
9 CYLINDERS RADIAL AIRCOOLED



WRIGHT AERONAUTICAL CORPORATION
Paterson, N. J.

CYCLONE — 575 H.P.

9 CYLINDER RADIAL AIRCOOLED

CHRONOLOGY FOR 1930

CHRONOLOGY FOR 1930

Jan. 6	Curtiss "Tanager" awarded $100,000 prize in the Guggenheim Safe Aircraft Competition.
Jan. 13	W. H. Bowlus establishes American glider record of 6 hrs. 19 min. 3 sec. at San Diego, Calif.
Feb. 11	Pontiac, Mich., Municipal Airport receives first A-1-A rating from Department of Commerce.
Feb. 14–19	Lieuts. W. W. White and Clement McMullen fly from New York to Buenos Aires in 52 hrs. 15 min. flying time, establishing unofficial record. (Lockheed Vega, Pratt and Whitney Wasp motored.)
Feb. 15–16	Capt. Dieudonné Coste and Jacques Codos establish distance record on a closed circuit with pay load of 1,000 kilograms of 2,056.672 miles at Istres, France. (Breguet 19, Hispano-Suiza motored.)
Feb. 15–16	Capt. Dieudonné Coste and Jacques Codos establish duration record on a closed circuit with pay load of 1,000 kilograms of 18 hrs. 1 min. at Istres, France. (Breguet 19, Hispano-Suiza motored.)
Feb. 15–23	Second Annual International Aircraft Exposition held at St. Louis under auspices of Aeronautical Chamber of Commerce.
Feb. 16	D. S. Zimmerly establishes American altitude record for light airplanes of the third category of 24,074 ft. at St. Louis, Mo. (Nicholas Beazley Barling, Lambert R 266 motored.)
Feb. 17–19	First National Conference on Aeronautical Education held at St. Louis, Mo.
Feb. 18	L. F. Shoenhair establishes speed record for 100 kilometers with pay load of 500 kilograms of 185.49 m.p.h. at Jacksonville, Fla. (Lockheed Vega, Pratt and Whitney Wasp motored.)
Feb. 18	L. F. Shoenhair establishes speed record for 500 kilometers with pay load of 500 kilograms of 171.24 m.p.h. at Jacksonville, Fla. (Lockheed Vega, Pratt and Whitney Wasp motored.)
Feb. 18	Air mail through service inaugurated by New York, Rio and Buenos Aires Line, Inc., between Santiago, Chile, and Miami, Fla.
Feb. 20	L. F. Shoenhair establishes speed record for 100 kilometers with pay load of 1,000 kilograms on a closed circuit of 176 m.p.h. at Jacksonville, Fla. (Lockheed Vega, Pratt and Whitney Wasp motored.)
Feb. 20	L. F. Shoenhair establishes speed record for 500 kilometers with pay load of 1,000 kilograms on a closed circuit of 168.27 m.p.h. at Jacksonville, Fla. (Lockheed Vega, Pratt and Whitney Wasp motored.)
Feb. 20	L. F. Shoenhair establishes speed record for 1,000 kilometers with pay load of 1,000 kilograms on a closed circuit of 152.70 m.p.h. at Jacksonville, Fla. (Lockheed Vega, Pratt and Whitney Wasp motored.)
Feb. 23–24	W. H. Bowlus establishes American glider record of 9 hrs. 5 min. 27 sec. at San Diego, Calif.
Feb. 24–25	Mid-West Legislative Aviation Conference held at Milwaukee, Wis., under auspices of Milwaukee Chapter of N. A. A.
Feb. 28	George W. Haldeman establishes altitude record for commercial planes of 30,453 ft. at Wilmington, Del. (Bellanca Pacemaker, Wright Whirlwind motored.)
Mar. 4	Capt. Boris Sergievsky establishes seaplane altitude record with pay load of 2,000 kilograms of 19,065 ft. at North Beach, N. Y. Sikorsky S-38, 2 Pratt and Whitney Hornets.)
Mar. 6–15	Second Annual Pittsburgh Aircraft Show held at Pittsburgh, Pa.
Mar. 10	Elinor Smith establishes women's altitude record of 27,418 ft. at Valley Stream, Long Island, N. Y. (Bellanca Pacemaker, Wright Whirlwind motored.)
Mar. 13	Capt. Boris Sergievsky establishes seaplane altitude record with pay load of 500 kilograms and of 1,000 kilograms of 23,222 ft. at North Beach, N. Y. (Sikorsky S-38, 2 Pratt and Whitney Hornets.)

Mar. 13	Capt. Boris Sergievsky establishes seaplane speed record for 100 kilometers with pay load of 1,000 kilograms of 165.73 m.p.h. at North Beach, N. Y. (Sikorsky S-38, 2 Pratt and Whitney Hornets.)
Mar. 13	Capt. Boris Sergievsky establishes seaplane speed record for 100 kilometers with pay load of 2,000 kilograms of 143.77 m.p.h. at North Beach, N. Y. (Sikorsky S-38, 2 Pratt and Whitney Hornets.)
Mar. 22–30	Second Annual Buffalo Aviation Show held at Buffalo, N. Y.
Mar. 26	W. J. Fleming establishes speed record for 100 kilometers with pay load of 2,000 kilograms on a closed circuit of 142.66 m.p.h. at Los Angeles, Calif. (Bach, Pratt and Whitney Wasp and 2 Wright J-6 motors.)
Mar. 26–Apr. 1	Cincinnati Aircraft Show held at Cincinnati, Ohio.
Mar. 30–Apr. 6	Capt. Frank M. Hawks is towed in a glider by a Waco plane from San Diego, Calif., to New York, 2,860 miles in 36 hrs. 47 min. flying time.
Apr. 1–2	William Alexander, pilot, Capt. L. A. Yancey, navigator, and Zeh Bouck, radio operator, reach Bermuda from New York, after spending the night on the sea sixty miles from Bermuda. (Stinson, Wright Whirlwind motored.)
Apr. 5–13	Third Annual All-American Aircraft Show held at Detroit, Mich.
Apr. 8	Orville Wright receives first Daniel Guggenheim Medal for aeronautics.
Apr. 11–12	Jean Mermoz establishes seaplane distance record on a closed circuit of 2,677 miles at Marignane, France. (Latécoère 28, Hispano-Suiza motored.)
Apr. 16	Election of officers of Aeronautical Chamber of Commerce.
Apr. 18–26	Tri-State Aircraft Show held at Camden, N. J.
Apr. 20	Colonel and Mrs. Charles A. Lindbergh make one-stop flight from Los Angeles to New York in 14 hrs. 45 min. 32 sec. elapsed time, or 14 hrs. 23 min. 27 sec. flying time, establishing unofficial transcontinental record. (Lockheed Sirius, Pratt and Whitney Wasp motored.)
Apr. 26	Direct air mail service inaugurated by Pan American Airways, Inc., between Miami, Fla., and Cristobal, C. Z.
Apr. 28–30	First International Conference on Aviation Lighting held in Berlin, Germany.
Apr. 29	McNary-Watres Act signed by President Hoover.
Apr. 30	Jack Barstow establishes unofficial gliding record of 15 hrs. 13 min. at San Diego, Calif.
May 1–2	New York Glider Carnival held at Bayside, Long Island, N. Y., under auspices of National Glider Association and Aeronautical Chamber of Commerce.
May 2	Lena Bernstein establishes duration record for women of 35 hrs. 46 min. at Le Bourget, France. (Farman 192, Salmson motored.)
May 3–11	New York Aircraft Salon held at Madison Square Garden under auspices of Aeronautical Chamber of Commerce.
May 5	Air mail service extended from Cristobal, C. Z., to Puerto Cabella, Venezuela, by Pan American Airways, Inc.
May 9	Dr. Ludwig Prandtl receives second Daniel Guggenheim Medal for work in aerodynamics.
May 12–13	Jean Mermoz, with Jean d'Abry and Leopold Gimie fly from Senegal to Natal, Brazil, establishing distance record for seaplanes of 1,971.7310 miles. (Latécoère 28, Hispano-Suiza motored.)
May 13	N. A. C. A. conference held at Langley Field, Va.
May 14–16	Second National Airport Conference held at Buffalo, N. Y., under auspices of Aeronautical Chamber of Commerce.
May 24	Amy Johnson completes solo flight of 9,900 miles from England to Australia. (DeHavilland Moth, DeHavilland Gipsy motored.)
May 26	Cheney award for valor presented to Second Lieut. W. A. Matheny of the Army Air Corps.
May 27	Col. Roscoe Turner flies from New York to Los Angeles in total elapsed time of 18 hrs. 43 min. 34 sec., setting new record for east-west flight. (Lockheed Vega, Pratt and Whitney Wasp motored.)

May 28	Clarence O. Prest establishes speed record for light airplanes of the fourth category for 100 kilometers of 100.79 m.p.h., San Bernardino Co., Calif. (Prest Baby Pursuit, Szekely motored.)
May 30	Glenn H. Curtiss flies from Albany to New York in commemoration of 1910 flight.
May 30–June 2	Maj. U. Maddalena and Lieut F. Cecconi establish world duration record on a closed circuit of 67 hrs. 13 min. at Montecelio, Rome, Italy. (Savoia-Marchetti S-64, Fiat A 22 T motored.)
May 30–June 2	Maj. U. Maddalena and Lieut. F. Cecconi establish world distance record on a closed circuit of 5,088.27 miles at Montecelio, Rome, Italy. (Savoia-Marchetti S-64, Fiat A 22 T motored.)
May 31	Curtiss Marine Trophy Race won by Capt. Arthur H. Page at 164.1 m.p.h. at Anacostia, D. C. (Curtiss Hawk, Curtiss D-12 motored.)
June 3	Collier Trophy for 1929 awarded to N. A. C. A. for development of cowling.
June 4	Apollo Soucek establishes world altitude record of 43,166 ft., at Anacostia, D. C. (Wright Apache, Pratt and Whitney Wasp motored.)
June 6	Graf Zeppelin ends 18,000 mile voyage of 19 days from Friedrichshafen, Germany, including Rio de Janeiro and New York.
June 8–13	Annual F. A. I. conference held at Paris, France.
June 11	F. A. I. medal for 1929 awarded to Capt. Dieudonné Coste for record flights.
June 11–July 4	John and Kenneth Hunter establish refueling duration record of 553 hrs. 41 min. 30 sec. at Chicago. (Stinson, Wright Whirlwind motored.)
June 15	Capt. Boris Sergievsky establishes seaplane altitude record with pay load of 500 kilograms of 26,368 ft. at North Beach, N. Y. (Sikorsky S-38, 2 Pratt and Whitney Wasps.)
June 16	Elmer A. Sperry, inventor and founder of Sperry Gyroscope Company, dies at Brooklyn, N. Y.
June 17–18	W. S. Brock and E. F. Schlee fly from Jacksonville to San Diego in 13 hrs. 56 min. and from San Diego to Jacksonville in 16 hrs. 50 min. Round trip elapsed time 31 hrs. 57 min. (Lockheed Vega, Pratt and Whitney Wasp motored.)
June 19	Rear Admiral Richard E. Byrd arrives in New York from antarctic expedition.
June 20–21	Dedication of Randolph Field, Army Air Corps field at San Antonio, Texas.
June 21	Col. R. Fierro flies from New York to Mexico City in approximately 16½ hrs. (Lockheed Sirius, Pratt and Whitney Wasp motored.)
June 22	Son is born to Col. and Mrs. Charles A. Lindbergh.
June 23–26	Maj. Charles Kingsford-Smith, with Evert Van Dyke, John W. Stannage, and Capt. J. P. Saul, in Southern Cross flies from Ireland to New York with stop at Newfoundland for refueling. (Fokker, 3 Wright Whirlwinds.)
June 25	Aeronautical Chamber of Commerce gives dinner in honor of Rear Admiral Richard E. Byrd.
June 25	Amelia Earhart sets speed record for women over 100 kilometer course of 174.9 m.p.h. at Detroit, Mich. (Lockheed Vega, Pratt and Whitney Wasp motored.)
June 28–July 6	Pacific Coast Aeronautical Exposition held at Oakland, Calif.
June 29	Roger Q. Williams, with Capt. Errol Boyd and Lieut. H. P. Connor, flies from New York to Bermuda and return without stopping in 17 hrs. 1 min. (Bellanca, Wright Whirlwind motored.)
July 2–4	Major Charles Kingsford-Smith in Southern Cross flies from New York to Oakland, Calif., completing world flight begun May 31, 1928.
July 4–6	National Elimination Balloon Race won by Goodyear VII, flying 768 miles, and piloted by R. J. Blair and F. A. Trotter.
July 5	King's Cup Race won by Winifred Brown at Hanworth, England, at 102 m.p.h. (Avro Avian, Cirrus Mark III motored.)

July 6	Amelia Earhart sets speed record for women over 3 kilometer course of 181.18 m.p.h. at Detroit, Mich. (Lockheed Vega, Pratt and Whitney Wasp motored.)
July 9–12	Meeting of Committee on Cooperation between Civil Aviation Undertakings of League of Nations held at Geneva.
July 11	Ruth Alexander sets altitude record for light planes at San Diego of 21,598 ft. (Nicholas Beazley Barling, Warner motored.)
July 20–Aug. 7	Fritz Morzik wins International Light Plane Tour. (B. F. W., Argus motored.)
July 21	Capt. Boris Sergievsky establishes seaplane altitude record with pay load of 1,000 kilograms of 26,929 ft. at Bridgeport, Conn. (Sikorsky S-38, 2 Pratt and Whitney Wasps.)
July 21–Aug. 1	Cirrus All-America Flying Derby won by Lieut. Lee Gehlback. (Command-Aire, Cirrus motored.)
July 21–Aug. 17	Dale Jackson and Forest O'Brine establish refueling duration record of 647 hrs. 28 min. 30 sec. (Curtiss Robin, Curtiss Challenger motored.)
July 23	Glenn H. Curtiss dies at Buffalo, N. Y.
July 25	Chance M. Vought dies at Southampton, Long Island, N. Y.
July 28–Aug. 1	R-100 flies from Cardington, England, to Montreal, Canada, in 78 hrs. 49 min.
Aug. 5	Florence Barnes establishes speed record for women of 196.19 m.p.h. at Los Angeles, Calif. (Travel Air, Wright motored.)
Aug. 6	Capt. Frank M. Hawks flies from New York to Los Angeles in 14 hrs. 50 min. 43 sec. elapsed time, setting new record for east-west flight. (Travel Air Mystery S, Wright Whirlwind motored.)
Aug. 9–10	W. B. Atwater establishes solo duration record for light seaplanes of 22 hrs. 18 min. 32 sec. at Manhassett Bay, N. Y. (Savoia-Marchetti, Kinner motored.)
Aug. 9–24	International Gliding Meet held under auspices of Rhoen-Rossiten Gesellschaft at Wasserkuppe, Germany.
Aug. 11	Capt. Boris Sergievsky establishes seaplane altitude record with pay load of 2,000 kilograms of 19,928 ft. at Bridgeport, Conn. (Sikorsky S-38, 2 Pratt and Whitney Wasps.)
Aug. 13	Capt. Frank M. Hawks flies from Los Angeles to New York in 12 hrs. 25 min. 3 sec. elapsed time or 11 hrs. 40 min. 30 sec. flying time, setting new record for west-east flight. (Travel Air Mystery S. Wright Whirlwind motored.)
Aug. 13–16	R-100 flies from Montreal, Canada, to Cardington, England, in 57 hrs. 5 min.
Aug. 18–20	First National Legislative Air Conference held at Chicago, Ill.
Aug. 23–Sept. 1	National Air Races held at Chicago, Ill.
Aug. 24	Robert Kronfeld establishes glider distance record of 101 miles at Wasserkuppe, Germany.
Aug. 26	Capt. Wolfgang von Gronau, with Fritz Albrecht, Franz Hack and Edward Zimmer, arrives at New York, having left the Isle of Sylt, North Sea, on Aug. 18, with stops at Faroe Islands, Iceland, Greenland, Labrador, and Nova Scotia. (Dornier Wal, B. M. W. motored.)
Sept. 1–2	Capt. Dieudonné Coste and Maurice Bellonte complete first non-stop flight from Paris to New York, covering 4,030 miles in 37 hrs. 18 min. 30 sec. (Breguet 19, Hispano-Suiza motored.)
Sept. 1–6	Fifth International Air Congress meets at The Hague, Holland.
Sept. 2	Gordon Bennett Balloon Race won by W. T. Van Orman in Goodyear VIII, flying 542 miles from Cleveland to Norfolk County, Mass.
Sept. 2–4	Maryse Bastie establishes duration record for women of 37 hrs. 55 min. 43 sec. at Le Bourget, France. (Klemm, Salmson motored.)
Sept. 6–7	American Legion Air Meet held at Philadelphia, Pa.
Sept. 11–27	Sixth Annual National Air Tour won by H. L. Russell. (Ford, Wright and Pratt and Whitney motored.)
Sept. 15–Oct. 10	Capt. Dieudonné Coste and Maurice Bellonte make 15,000 mile goodwill tour of the United States.

Sept. 21–Oct. 5	National soaring contest held at Elmira, N. Y., under auspices of National Glider Association.
Sept. 23–24	Middle Atlantic States Traffic and Aviation Conference held at Philadelphia, Pa., under auspices of Chamber of Commerce of the United States and Aeronautical Chamber of Commerce.
Sept. 25–26	New England States Traffic and Aviation Conference held at Boston, Mass., under auspices of Chamber of Commerce of the United States and Aeronautical Chamber of Commerce.
Sept. 28	Daniel Guggenheim dies at Port Washington, Long Island, N. Y.
Sept. 29	Leroy Manning establishes speed record for 100 kilometers with pay load of 2,000 kilograms of 164.43 m.p.h. at Dearborn, Mich. (Ford, 3 Pratt and Whitney Wasps.)
Sept. 30	J. K. O'Meara establishes American glider duration record of 6 hrs. 48 min. at Elmira, N. Y.
Sept. 30	Willfred G. Moore establishes altitude record for light airplanes of first category of 18,543 ft. at Kansas City, Mo. (Inland Sport, Warner motored.)
Oct. 2	Air mail service from Cristobal, C. Z., extended to La Guaira, Venezuela, by Pan American Airways.
Oct. 5	British airship R-101 destroyed at Beauvais, France, causing death to 48 persons.
Oct. 5–9	Laura Ingalls flies from New York to Los Angeles in 30 hrs. 27 min. flying time. (DeHavilland Moth, DeHavilland Gipsy motored.)
Oct. 9–11	Capt. Errol Boyd and Lieut. H. P. Connor fly from Harbor Grace, Newfoundland, to Croydon, England, after being forced down on Scilly Islands. (Bellanca, Wright Whirlwind motored.)
Oct. 9–19	Comdr. Charles Kingsford-Smith flies from Heston, England, to Port Darwin, Australia, in 9 days, 23 hrs. 30 min., establishing new record. (Avro Avian, DeHavilland Gipsy motored.)
Oct. 10	Warren Eaton establishes American glider altitude record of 2,409 ft. at Elmira, N. Y.
Oct. 11–18	Laura Ingalls flies from Los Angeles to New York in 25 hrs. 35 min. flying time. (DeHavilland Moth, DeHavilland Gipsy motored.)
Oct. 13–16	Mrs. Keith Miller flies from New York to Los Angeles in 25 hrs. 44 min. flying time. (Alexander Bullet, Wright Whirlwind motored.)
Oct. 15	Southern Air Fast Express inaugurates southern transcontinental air mail route from Atlanta to Los Angeles, connecting with Eastern Air Transport at Atlanta.
Oct. 18–19	All-Eastern States Air Races held at Trenton, N. J., under auspices of American Legion.
Oct. 19–26	Mrs. Keith Miller flies from Los Angeles to New York in 21 hrs. 47 min. flying time. (Alexander Bullet, Wright Whirlwind motored.)
Oct. 25	Transcontinental and Western Air, Inc., inaugurates transcontinental air mail and passenger line between New York and Los Angeles.
Oct. 27	L. F. Shoenhair establishes speed record for 1,000 kilometers of 164.26 m.p.h. at Akron, Ohio. (Lockheed Vega, Pratt and Whitney Wasp motored.)
Nov. 1	McNary-Watres Act, changing payment to air mail contractors from a poundage to a mileage-space basis, goes into effect.
Nov. 5–6	Midwestern States Traffic and Aviation Conference held at Chicago under auspices of Chamber of Commerce of the United States and Aeronautical Chamber of Commerce.
Nov. 6	Capt. Edward V. Rickenbacker receives Congressional Medal of Honor in recognition of service during World War.
Nov. 6	Capt. Frank M. Hawks flies from New York to Havana, Cuba, in 9 hrs. 21 min. elapsed time. (Travel Air Mystery S, Wright Whirlwind motored.)
Nov. 7–8	North Central States Traffic and Aviation Conference held at Minneapolis, Minn., under auspices of Chamber of Commerce of the United States and Aeronautical Chamber of Commerce.
Nov. 8–13	Capt. Goulette and M. Lalouette fly from Paris to Saigon, French Indo-China, in 5 days, 3 hrs. 50 min., establishing new record. (Farman, Lorraine motored.)

Nov. 9	Capt. Frank M. Hawks flies from Havana, Cuba, to New York in 8 hrs. 44 min. elapsed time. (Travel Air Mystery S, Wright Whirlwind motored.)
Nov. 9–10	Capt. Roy W. Ammel flies non-stop from New York to France Field, Panama Canal Zone, in 24 hrs. 35 min. (Lockheed Sirius, Pratt and Whitney Wasp motored.)
Nov. 19–20	Southern States Traffic and Aviation Conference held at Atlanta, Ga., under auspices of Chamber of Commerce of the United States and Aeronautical Chamber of Commerce.
Nov. 24–25	Southwestern States Traffic and Aviation Conference held at Dallas, Tex., under auspices of Chamber of Commerce of the United States and Aeronautical Chamber of Commerce.
Nov. 24–Dec. 1	Ruth Nichols flies from New York to Los Angeles in 16 hrs. 59 min. 30 sec. flying time. (Lockheed Vega, Pratt and Whitney Wasp motored.)
Nov. 27	Air mail service inaugurated by Pan American Airways, Inc., between Paramaribo, Dutch Guiana, and Santos, Brazil.
Nov. 28–Dec. 14	International Aeronautical Exposition held at Paris, France.
Dec. 2	Pan American Airways Miami-Cristobal mail rerouted to include Cienfuegos, Cuba, and Kingston, Jamaica, inaugurating longest regular service over water.
Dec. 5	Herbert Schiff Trophy for Naval Aviation awarded to Fighting Plane Squadron 3-B.
Dec. 5–6	Western States Traffic and Aviation Conference held at Portland, Ore., under auspices of Chamber of Commerce of the United States and Aeronautical Chamber of Commerce.
Dec. 9–10	Ruth Nichols flies from Los Angeles to New York in 13 hrs. 21 min. flying time, or 29 hrs. 1 min. 43 sec. elapsed time. (Lockheed Vega, Pratt and Whitney Wasp motored.)
Dec. 10–23	First International Congress for Aerial Safety held at Paris, France.
Dec. 16–17	National Conference on Uniform Aeronautic Regulatory Laws held in Washington, D. C., under auspices of Aeronautics Branch of Department of Commerce.

APPENDIX

AERONAUTICAL CHAMBER OF COMMERCE OF AMERICA, INC.

10 East Fortieth Street, New York

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Vice President, Northwest Division.....Louis H. Mueller
Vice President, Southwest Division.....H. M. Hanshue
Vice President, North Central Division.....Paul Henderson
Vice President, South Central Division.....L. V. Kerber
Vice President, East Central Division.....Edward S. Evans
Vice President, Northeast Division.....G. B. Grosvenor
Vice President, Southeast Division.....J. T. Trippe
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Treasurer.....B. F. Castle

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John R. Cautley
Clyde V. Cessna
Reed M. Chambers
Charles H. Colvin
E. L. Cord
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Sherman M. Fairchild
James R. Fitzpatrick
Carl B. Fritsche
S. L. Gabel
Graham B. Grosvenor
Harris M. Hanshue
Paul Henderson
J. C. Hunsaker
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W. B. Metzger
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Paul Henderson
C. L. Lawrance
Grover Loening
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Washington Service.....Homer C. Bennett
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Major Enrique de Paramo, Jefe de la Seccion de Aviacion, Ministerio de Guerra, Bogota, Colombia.
Mr. M. M. Buckley, Manager, Andian Natuibak Corporation, Cartagena, Colombia.
Count Paul Van Bauer, General Manager, Sociedad Colomba-Alemana de Transportes Areos, Barranquilla, Colombia.

COSTA RICA

Secretary, Department of State and Public Security, San José, Costa Rica.

CUBA

Brig. José Semidey Suarez y Diaria, Secretaria de la Guerra y Marina, Habana, Cuba.
Gen. Alberto Herrera, Chief of Staff, Ministry of War and Marine, Habana, Cuba.
Colonel Julio Saaguily, Chief of Air Corps, Secretaria de la Guerra y Marina, Habana, Cuba.
Commandante Ovisio Ortega, Secretaria de la Guerra y Marina, Habana, Cuba.
Captain Manuel Arozarena y Reyes, Secretaria de la Guerra y Marina, Habana, Cuba.

Captain Rosenham Beam, Instructor in Aviation, Ministry of War and Marine, Habana, Cuba.
Dr. José Antonio Montalvo, Chief of Communications, Habana, Cuba.

CZECHOSLOVAKIA

Frantisek Udrzal, Minister of National Defense.
Lt. Col. Zdenek Kittler, Chief Administrative Section.
Major Eng. Julius Philip, Chief Technical Section.
Major Karel Kulin, Chief Supervisory Section.
Ministry of National Defense.
Ul Narodni Olrany, Prague-Bubenec, Czechoslovakia.
Dr. Frantisek Spina, Minister of Public Works.
Chief, Ing. V. Roubic, Chief of Transportation Division.
Ing. Zdanko Janak, Chief of Aviation Section.
Ing. J. Najbrt, Administrative Section.
Ing. H. Berounsky, Administrative Section.
Dr. Ing. Gustav Sticha, Technical Section.
Ing. F. Stones, Technical Section.
Ministry of Public Works, Prague-Smichov, Czechoslovakia.

DENMARK

Col. J. P. Koch, Aviation Corps, Krigsministeriet, Copenhagen, Denmark.
Captain A. E. V. Grandjean, Chief Aviation Corps, Marineministeriet, Copenhagen, Denmark.
Mr. Knud Gregersen, Trafikministeriet, Copenhagen, Denmark.

DOMINICAN REPUBLIC

Sr. Alfredo Ginebra, Director General of Public Works, Santo Domingo, Dominican Republic.
Sr. Alfredo Ricart Olives, Secretary of State for National Defense, Santo Domingo, Dominican Republic.

ECUADOR

Major Guillermo Freile, Chief of Aviacion Section, Ministry of War, Guayaquil, Ecuador.
Messrs. Mona y Meta, Ecuadorean Government purchasing agents, 1005 North American Building, Philadelphia, Pa.

EGYPT

Minister of War and Marine, Cairo, Egypt.
Under-Secretary of State, Cairo, Egypt.
D. D. Long, Air Consultant, Ministry of Communication, Cairo, Egypt.

EL SALVADOR

Gen. Antonio Claremont, Chief of Aviation, San Salvador, El Salvador.
Pio Romero Bosque, Secretary of War, Minister of War, Marine and Aviation, San Salvador, El Salvador.

ESTONIA

Lieut. Col. A. Steinberg is in command of the Air Force, Tallinn, Estonia.

FINLAND

Pouhustusministerion Insinooriosasto, Teknillisen Toimiston Paallikko, Korkeavnorenkatu 21, Helsingfors, Finland.
Lieut. Col. W. Vouri, Chief of Air Force. (Purchases of flying equipment are made by Col. Knut Solin, Chief, Engineering Department, Ministry of Defense, Mr. K. R. Salovins, Referee at Ministry of Communications, and Public Works, in charge proposed Civil Aviation Department.)

FRANCE

M. Laurent-Eynac, Minister of Air.
M. Louis Couhe, Secretary General and Chief of the Cabinet.
General Bares, Inspector of National Aeronautics.
M. Caquot, Director.
General Pujo, Chief of National Aeronautics.
Ingenieur General du Genie Maritime Fortant.
Directeur du Service Technique de l'Aéronautique Militaire.
Capitaine de Vaisseau J. J. J. N. Laborde, Directeur de l'Aéronautique Maritime.
All at Paris, France.

GERMANY

Dr. Brandenburg, Ministerialdirigent, Reichsverkehrsministerium, 80 Wilhelmstrasse, Berlin, Germany.
Dr. Wegerdt, Ministerialrat, Reichsverkehrsministerium, 80 Wilhelmstrasse, Berlin, Germany.
Geheimer Regierungsrat Fisch, Ministerialrat, Reichsverkehrsministerium, 80 Wilhelmstrasse, Berlin, Germany.
Ministerial Muehlig-Hofmann, Reichsverkehrsministerium, 80 Wilhelmstrasse, Berlin, Germany.
Regierungsrat Baeumker, Reichsverkehrsministerium, 80 Wilhelmstrasse, Berlin, Germany.
Diplomaingenieur Hen, Reichsverkehrsministerium, 80 Wilhelmstrasse, Berlin, Germany.
Direktor Otto Merkel, Deutsche Luft Hansa Aktiengesellschaft, 61/65 Mauerstrasse, Berlin, Germany.

GREECE

(Ministry of Aviation formed 12-29-29.)
Mr. Venizelos, Minister of Aviation, Athens, Greece.
Mr. Zannas, Assistant Secretary for Aviation, Ministry of Aviation, Athens, Greece.
Colonel Ch. Adamides, Director of Aeronautics, Hellenic Ministry of War, Athens, Greece.
Captain Vaulgario, Director of Aeronautics, Hellenic Ministry of Marine, Athens, Greece.
Mr. C. Theopharropoulos, Ministry of Communications, Athens, Greece.
General Z. Popothanassiou, President, Air Defense League, Athens, Greece.

GUATEMALA

Colonel Garcia Granados, Director General of Civil Aeronautics, Guatemala City, Guatemala.

General José Victor Mejia, Director Escuela de Aviacion, Guatemala City, Guatemala.

HONDURAS

Ministro de Guerra y Marina, Tegucigalpa, Honduras.
Ministro de Fomento, Obras Publicas, Agriculture y Trabajo, Tegucigalpa, Honduras.

HUNGARY

Charles Vassel, Chief, Royal Hungarian Aerial Office, 11, Fo-u, 6, 11, Budapest, Hungary.

INDIA

Air Vice Marshal Sir E. L. Ellington, K. C. B., Royal Air Force, Imperial Secretariat, Raisina, Delhi, India.
Lt. Col. F. C. Shelmerdine, O. B. E., Director of Civil Aviation, Department of Industries and Labor, Government of India, Delhi, India.
H. A. Sams, Director-General of Posts & Telegraphs, Delhi, India.

ITALY

Gen. Italo Balbo, Secretary of State for Air, Air Ministry, Rome, Italy.
Mr. Raffaello Ricardi, Under Secretary of State for Air, Air Ministry, Rome, Italy.
Gen. Giuseppe Valle, Acting Chief of Staff, Air Ministry, Rome, Italy.
Gen. Cristofore Ferrari, Chief Directorate of Studies and Research, Air Ministry, Rome, Italy.
Gen. Arturo Crocco, Director of Construction and Supplies, Air Ministry, Rome, Italy.
Gen. Bosio, Director of Services and Airport Material, Air Ministry, Rome, Italy.
Comm. Manlio Molfese, Chief of Bureau of Civil Aviation and Air Traffic, Air Ministry, Rome, Italy.

JAPAN

Lt. Gen. Jyotaro Wantanabe, Chief of the Army Aviation Dept.
Gen. Mone, Air Service, War Ministry.
Admiral Yamanote, Aviation Branch, Navy Ministry.
Mr. Yamagiya, Commercial Aviation, Ministry of Communications.
Vice Admiral Masataka Ando, Chief of the Navy Aviation.
Capt. T. Sunaga, Inspector for Aviation, 1775 Broadway, New York, N. Y.
Mr. Torozo Yanagidani, Chief, Aviation Bureau, Dept. of Communications.

All at Tokyo, Japan.

LATVIA

Col. Bashko, Commander of Aviation Regiment, Riga, Latvia.
Lt. Col. Jakubov, Chief of Naval Aviation, Riga, Latvia.
Mr. Auzins, Director, Post and Telegraph Department, Ministry of Communications, Riga, Latvia.

LITHUANIA

Col. S. Pundzevicius, Chief of Aviation, Ministry of Defence, Kovno, Lithuania.
Captain Gustaitjo, Assistant Chief of Aviation, Ministry of Defense, Kovno, Lithuania.

MEXICO

Gen. Pedro Caloca, Jefe del Departamento de Aviacion Militar, Secretaria de Guerra y Marina, Mexico, D. F.
Col. Samuel C. Rojas, Assistant Chief Aviation Bureau, Department of War and Marine, Mexico, D. F., Mexico.
Ing. Juan Guillermo Villasana, Jefe del Departamento, de Aeronautica Civil Secretaria de Communicaciones y Obras Publicas, Mexico, D. F., Mexico.
Brig. Gen. José Luis Amezcua, Chief of Aviation, Mexican Army, Valbuena, D. F., Mexico.

NETHERLANDS

Lt. Col. W. F. Silleris, Director, Bureau of Air Defense, General Staff of Army, The Hague, The Netherlands.
Maj. J. J. Van Santen (General Staff), Commander Air Division of Soesterberg, The Hague, The Netherlands.
Col. H. K. Koster, Corps of Anti-Aircraft Artillery, The Hague, The Netherlands.
Capt. J. P. Remijnse, Commanding Officer, Royal Naval Air Service, De Kooij, The Netherlands.
Dr. Wolff, Engineer and Director, Government Institution for the Study of Aeronautics, Amsterdam, The Netherlands.
A. Plesman, Managing Director, Royal Netherlands Air Transport Company, The Hague, The Netherlands.
Mr. E. Th. de Veer, Director, Civil Aviation Section, Ministry of Public Works, The Hague, The Netherlands.

NETHERLANDS EAST INDIES

Lieut. Col. Hoeksema de Groot, Chief Army Aviation Department, Batavia, Java.
Group-Commander E. A. Brunner, Naval Flying Station, Batavia, Java.
Captain W. Leenderts, Department Van Oorlog, Bandoeng, Java.
Lieut. 1st Cl. J. Olivier, Department of Marine, Weltevreden, Batavia, Java.
Mr. H. W. Vreeburg, Chief Engineer, Technical Division, Army Air Service, Bandoeng, Java.
Dr. W. L. Groenveldt, Meijer, Director of Civil Aviation, Bandoeng, Java.

NEW ZEALAND

Maj. Gen. R. Young, New Zealand Air Force, Wellington, N. Z.
Wing Commander G. Grant Dalton, Director of Air Services, Defense Department, Wellington, N. Z.

NORWAY

Lt. Col. T. Klingenberg, Chief Army Air Corps, Kjeller Flyreplass per Lillestrom, Norway.
Commander H. E. Brunsgaard, Chief of Naval Aviation, Karljohansvern, Norway.

Colonel G. Gruner, Chairman, Eprsvarsdepartementels Luftfartsrad, P. O. Box 313, Oslo, Norway.

PARAGUAY

Gen. Manlio Schenoni, Ministry of War and Marine, Asuncion, Paraguay.

PERSIA

Col. Ahmed Khan Nakhitchevan, Chief of Aviation Bureau, Ministry of War, Teheran, Persia.

PERU

Lt. Col. Recavarren, Acting Inspector General of Aviation, Ministry of Marine and Aviation, Lima, Peru.
Captain Ben H. Wyatt, Director of Naval Aviation, Ancon, Peru.
Col. Juan Leguia, Ministry of War, Lima, Peru.
Maj. F. Melgar, Military Aviation School, Las Palmas, Chorrillos, Lima, Peru.
Capt. Carlos Martinez de Pinillos, Ministry of Marine and Aviation, Lima, Peru.

POLAND

Hon. Julian Everhardt, Department of Civil Aviation, Ministry of Communication, Warsaw, Poland.
Lt. Col. Gluchowski, Military Institute for Development of Aeronautic Equipment, Warsaw, Poland.
Mr. Witold Czapski, Department Director, Ministerstwo Kolei, Warsaw, Poland.
Col. Ludomil Rayski, Chief Aviation Department, Ministry of Military Affairs, Warsaw, Poland.
Lt. Col. Adcznski, 2nd Asst. Chief Aviation Department, Ministry of Military Affairs, Warsaw, Poland

PORTUGAL

National Air Council, Edificio do Estado Maior, Lisbon, Portugal.
Ministry of Marine, Lisbon, Portugal.
Ministry of War, Lisbon, Portugal.
Gen. Luis Domingues, Inspector-General da Aeronautica Militar, Lisbon, Portugal.

RUMANIA

Gen. Alexandra Gorski, Inspector General of Aeronautics, Ministry of War, Bucharest, Rumania.
Gen. Ch. Rujinschi, Director of Civil Aviation, Civil Aviation Department, Ministry of Industry & Commerce, Bucharest, Rumania.
Col. Andrei Popovici, Director Rumanian Aircraft Industry, Strada St. Voerozi, 57, Bucharest, III, Rumania.

SIAM

Maj. Gen. Phya Chalvein Akas, Director General of Aeronautics, Ministry of War, Bangkok, Siam.
Some United States materials purchased through: The International Engineering Co., 250 Park Avenue, New York, N. Y.

SOUTH AFRICA

Hon. H. W. Sampson, Minister of Posts and Telegraphs, Union Building, Pretoria, Union of South Africa.
Col. Sir H. A. Van Ryneveld, Director of Air Service, Department of Defense, Pretoria, Union of South Africa.
Mr. P. L. Lindup, Secretary, Civil Air Board, Pretoria, Union of South Africa.

SPAIN

Maj. Gen. Joge Soriano, Vice Presidente del Consejo de Aeronautica, Presidencia del Consejo, Madrid, Spain.
Col. Alfredo Kindelan, Jefe Superior de Aeronautica, Ministerio del Ejercito, Madrid, Spain.

SWEDEN

Gen. K. A. B. Amundson, Commander-in-Chief of the Air Force, Stockholm, Sweden.
Capt. F. Hogberg, Chief of Aeronautics Branch, Department of Communications, Stockholm, Sweden.
Mr. C. J. Carlberg, Chief of Air Traffic Board, Department of Communications, Mynttorget 2, Stockholm, Sweden.

SWITZERLAND

Col. Fierz, Chief Purchasing Division, War Department, Berne, Switzerland.
Director of Civil Aviation (Office Aerien Federal), Major al'E. M. G. A. Isler, Department des Chemins de Fer, Batiment Nord No. 52, Berne, Switzerland.

TURKEY

Abdul Halik Bey, Minister of National Defense, Angora, Turkey.
Monhedin Bey, President, Turkish Aviation League, Angora, Turkey.
Fevzi Pasha, Chief of Staff, Ministry of Defense, Angora, Turkey.
Monzaffer Pasha, Under-Secretary in Charge of Aviation, Ministry of National Defense, Angora, Turkey.
Fuad Bey, Vice President, Turkish Aviation League, Angora, Turkey.

UNITED KINGDOM

Lord Amulree, Secretary of State for Air, London, England.
Sir Hugh M. Trenchard, Marshal of the Royal Air Force, London, England.

URUGUAY

Lieut. Col. Cesareo L. Berisso, Director, School of Military Aviation, Camino Mendoza, Montevideo, Uruguay.
Maj. Rogelio Otero, Chief, Division of Instruction, Military School of Aviation, Camino Mendoza, Montevideo, Uruguay.
Captain Atilio H. Frigerio, Air Service, Direction of the Fleet, Serandi 122, Montevideo, Uruguay.

VENEZUELA

Gen. Tobias Uribe, Secretary of War and Navy, Caracas, Venezuela.
Col. M. H. Lopez Mendez, Director of Marine, Ministry of War and Navy, Caracas, Venezuela.
Col. A. Santiago De Silvestre, Ministry of War and Navy, Caracas, Venezuela.
Colonel Daniel Lopez Henriquez, Director, School of Military Aviation, Maracay, Venezuela.

AERONAUTICAL MAGAZINES OF THE UNITED STATES

Aero Digest, 220 West 42nd Street, New York, N. Y.
Aeronautical Industry, 1265 Broadway, New York, N. Y.
Aeronautical World Journal of Commerce, 1709 West 8th Street, Los Angeles, Calif.
Air Law Review, Washington Square East, New York, N. Y.
Aircraft Age, 113 East 31st Stret, Kansas City, Mo.
Aircraft Servicing, Bank of Manhattan Building, Flushing, L. I., N. Y.
Airport Construction and Management, 145 S. Spring Street, Los Angeles, Calif.
Airports, Bank of Manhattan Building, Flushing, L. I., N. Y.
Airway Age, 30 Church Street, New York, N. Y.
Aviation, 475 Tenth Avenue, New York, N. Y.
Aviation Engineering, 52 Vanderbilt Avenue, New York, N. Y.
Aviation Mechanics, 96 Park Place, New York, N. Y.
Journal of Air Law, 357 East Chicago Avenue, Chicago, Ill.
Model Airplane News, 25 West 43rd Street, New York, N. Y.
National Aeronautic Magazine, Du Pont Circle, Washington, D. C.
National Power Glider, 370 Seventh Avenue, New York, N. Y.
Official Aviation Guide of the Airways, 105 West Adams Street, Chicago, Ill.
Pacific Flyer, 547 Mission Street, 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

Argentina

Aviacion, Calle José Pedro Varela, 3762, Buenos Aires.
Boletin del Aero-Club Argentine, Avenida de Mayo, 646, Buenos Aires.

Australia

Aircraft, Peacock House, 486–490 Bourke Street, Melbourne.

Austria

Flug, Traungasse 11, Vienna III.
Flugzeug und Jacht, Friedrichstrasse 3, Vienna I.
Oesterreischischer Motor der Flug, Josefstaderstrasse 87, Vienna VIII.

Belgium

Bulletin d'Informations du Secretariat de Propagande Aéronautique, 90 rue de la Loi, Brussels.
Bulletin du Laboratoire Aérotechnique, Rhoda Saint-Genèse-les-Bruxelles.
Conquête de l'Air, 16 Rue Thérésienne, Brussels.

Brazil

Aeronautica, 131 Avenida Rio Branco, Rio de Janeiro.
Aviacao, Escola de Aviacao Militar, Rio de Janeiro.
Aviacao Nacional, 110 Avenida Rio Branco, Rio de Janeiro.

Canada

Canadian Air Review, Grosvenor at Bay Street, Toronto.
Canadian Aviation, 210 Dundas Street, W., Toronto 2.

Chile

Auto y Aero, Casilla 3319, Santiago.
Chile Aereo, Casilla 913, Santiago.

China

Aeronautics, Pekin.
Yu Phong, Pekin.

Cuba

El Automovil et Aeronautica, Tenien e rey 92, Havana.
Revista del Transporte, Ave de la Republica 85, Havana.

Czechoslovakia

Flugwesen, Konviktgasse 22, Prague I.
Letec, 8 Lucemburska, Prague XII.
Letectvi, Tr. M. Foche 8, Prague XII.
Le Mois Aéronautique Tchecoslovaque, Celetna ul. 13 Prague I.
Zpravy Vojenskeho, Letuaney, Prague.

Denmark

Flyv, Christianbosg, Copenhagen.

Finland

Aero, Ilmailuvoimen Esikunta, Helsingfors.

France

L'Aéroauto, 139 Quai d'Orsay, Paris.
L'Aéronautique, 55 Quai des Grands Augustins, Paris.
L'Aérophile, 35 Rue François Ier, Paris.
Les Ailes, 40 Quai des Celestins, Paris.
L'Air, 2 Rue Blanche, Paris 9e.
Bulletin de la Chambre Syndicale des Industries Aéronautique, 9 Rue Anatole-de-la-Forge, Paris.
Bulletin de la Fédération Aéronautique Internationale, 35 Rue François Ier, Paris.
Bulletin de la Ligue Aéronautique de France, 9 Rue Montaigne, Paris.
Bulletin de la Navigation Aérienne, 7 Rue St. Lazare, Paris 9e.
Bulletin Technique du Bureau Veritas, 31 Rue d'Offemont, Paris.
Le Document Aéronautique, 65 Rue Faubourg Poissonniére, Paris 9e.
Droit Aérien, 4 Rue Tronchet, Paris.
Etudes Aéronautiques, 282 Blvd. St. Germain, Paris.
L'Indicateur Aérien, 2 Rue Blanche, Paris, 9e.

Journal de l'Aviation Francaise, 80 Rue Taitbout, Paris.
Revue de l'Aéronautique Militaire, 55 Quai des Grands Augustins, Paris.
Revue des Forces Aériennes, 55 Quai des Grands, Augustins, Paris.
Revue Générale de l'Aéronautique, 40 Rue de Seine, Paris.
Revue Juridique Internationale de la Locomotion Aérienne, 4 Rue Tronchet, Paris.
La Technique Aéronautique, 5 Rue de l'Isly, Paris.
La Vie Aérienne et Sportive, 35 Rue de Châteaudun, Paris.
La Vie Maritime et Aérienne, 24 Rue des Ardennes, Paris.

Germany

Der Adler, Seyfferstrasse 66c, Stuttgart.
Automobilwelt-Flugwelt, Breitestr. 8–9, Berlin C. 2.
Deutsche Motor Zeitschrift, Müller-Bersetstr. 17, Dresden A. 19.
Deutsche Sportflieger, Krausenstr. 35, Berlin S. W. 19.
Flugsport, Bahnhofsplatz 8, Frankfurt.
Ikarus, Luftfahrt-Verlag G.m.b.H., Krausenstr. 35, Berlin S. W. 19.
Illustrierte Flug-Woche, Augustastrasse 18, Berlin.
Luft- und Kraftfahrt, Michaelkirchplatz 1, Berlin S. O. 16.
Luftfahrt, Linkstrasse 38, Berlin W. 9.
Luftschau, Blumes Hof 17, Berlin W. 35.
Luftwacht, Blumes Hof 17, Berlin W. 35.
Mitteldeutsche Luftfahrt, Laasenerstrasse 29, Gera.
Nachrichten für Luftfahrer, Wilhelmstr. 86, Berlin W. 8.
Verkehrstechnische Woche, Stallschreiberstr. 35, Berlin S. 14.
Zeitschrift für Flugtechnik und Motorluftschiffahrt, Gluckstr. 8, Munich.

Great Britain

Aerial A. B. C., 4 Duke Street, Adelphi, London W. C. 2.
Aeroplane, 175 Picadilly, London, W. 1.
Air, 2 Bream's Buildings, Chancery Lane, London, E. C. 4.
Aircraft Engineering, 6 Norfolk Street, Strand, London, W. C. 2.
Airways, 6 Norfolk Street, Strand, London, W. C. 2.
Flight, 36 Great Queen Street, Kingsway, London, W. C. 2.
Journal of the Royal Aeronautical Society, 7 Albemarle Street, London, W. 1.

Hungary

Aviatika, Lonyay utca 36, Budapest IX.

Italy

Aeronautica, Via Gesu 6, Milan.
L'Aerotecnica, Via delle Coppelle 35, Rome.
L'Ala d'Italia, Via Settala 22, Milan.
Atti dell'Associazione Italiana di Aerotecnica, Via delle Coppele 85, Rome.
L'Aviazione, Corso Umberto 112, Rome.
Bolletino dell'Aviazione Civile e del Traffico Aereo, Via della Mercede 9, Rome.
Le Comunicazioni Aeree, Via Propaganda 22, Rome.
Il Diritto Aeronautico, Piazza Foro Traiano 1, Rome.
Notiziario Tecnico di Aeronautica, Via Agostina De Pretis 45 A, Rome.
Rassegna Marittima Aeronautica Illustrata, Via Ulisse Seni 5, Rome.
Rendiconti Tecnici, Ministero dell Aeronautica, Rome.
Revista Aeronautica, Via Agostino De Pretis 45 A, Rome.
La Via Azzura, 28 Via Cuma, Naples.
Le Vie dell'Aria, Via Piacenza 6, Rome.

Japan

Hiko, Teikoki-Hiko-Kyokwai, 1 Chome, Yurakucho, Marunouchi, Tokio.

Mexico

Aviacion, San Juan de Lotran 6, Mexico City.
El Piloto, Tiajuana B. C.
Revista Aerea, Departmento Aeronautico, Mexico City.

Netherlands

Het Vliegveld, Heerengracht 450, Amsterdam.

Norway

Lustseilas, Myntgaten 2, Oslo.

Peru

El Motor, 694 Lampa, Lima.

Poland

Lot Polski, Dluga 50, Warsaw.
Lotnik, Fr. Ratajczaka 21g, Posen.
Mlody Lotnik, Krakowski Przedmiescie 57, Warsaw.
Przeglad Lotniczy, Warsaw.

Portugal

Revista Aeronautica, Traversa de Gloria, 22, A 2° D. Lisbon.

Rumania

Aripa, Str. Clemenceau 10, Bucharest.
Aeronautica Romana, 128 Calea Grivitei, Bucharest.
Romania Aeriana, Strada Romana 171, Bucharest.

Russia

Aviation and Chemistry, Ilinka, Khrustalny per, Moscow.
Messenger of the Aero Fleet, Ilinka 3, Moscow.

Spain

Aerea, Glorieta de Atocha 8, Madrid.
Alas, Plaza de la Lealtad 4, Madrid.
Boletin Oficial de la Direccion General de Navegacion y Transportes Aereos, Madrid.
Boletin Oficial del Real Aero-Club de Espagñe, Madrid.
España Automovil y Aeronautica, Plaza de Isabel II, 5, Madrid.
Heraldo Deportivo, Abascal 364, Madrid.
Icaro, Pi y Margall, 18, Madrid.

Sweden

Flygning, Jakobsgaten 6, Stockholm.

Switzerland

Aero Revue, Sihlstrasse 43, Zurich.
En Plein Vol, Case Ville 13741, Lausanne.

Uruguay

Revista del Centro Militar y Naval, Convencion 1332, Montevideo.

A SELECTED LIST OF COMMERCIAL AIRPORTS AND AIRPORT MANAGERS IN THE UNITED STATES

December 31, 1930

All airports listed have sufficient landing area for normal landing and take-offs.
Municipally owned fields are indicated by (*m*) preceding the name of the airport.
Service facilities are indicated by the letters following the names as follows:

T—Transportation available to town. (The existence of taxi service which can be called by telephone is considered transportation.)
H—Hangar space is available for the storage of airplanes.
M—Mechanic services available for minor repairs.
R—There is a restaurant on the field.
L—The field is lighted for night use.
W—Weather information is available at the airport.

The list does not include intermediate or auxiliary fields.

Location	*Name of Port*	*Service*	*Manager*
ALABAMA:			
Atmore	Perdido Hills Airport		J. M. Barrington
Auburn	Pace Field		
Birmingham (*m*)	Municipal Airport		James H. Willis
	Roberts Field	THMLW	
Citronelle	Citronelle Airport		
Mobile (*m*)	Bates Field	THMW	O. N. Barney
Montgomery (*m*)	Montgomery Airport	THMRLW	Lion G. Mason
ARIZONA:			
Ajo (*m*)	Ajo Airport	TM	W. R. Devison
Casa Grande (*m*)	Casa Grande Municipal Airport	T	S. J. Norman, C. E.
Chandler (*m*)	Chandler Municipal Airport	TH	Marg. K. Stewart
Douglas (*m*)	Douglas Int. Airport	THMRL	B. R. Russell, Supt.
Flagstaff (*m*)	Koch Field	THMW	Ross Sampson, Crtkr.
Fredonia (*m*)	Fredonia Airport		Jensen & Brooksby
Gila Bend (*m*)	Gila Bend Airport		
Grand Canyon	Grand Canyon Airport	TH	
Holbrook (*m*)	Holbrook Municipal Airport	TMW	
Kingman	Kingman Field		
Maricopa (*m*)	Maricopa Airport		
Phoenix (*m*)	Municipal Airport		George Todd, C. M.
	Sky Harbor	THMLW	
Prescott (*m*)	Ernest A. Love Airport	THM	S. A. Spear
Quartzite	Conner Field	T	Geo. W. Conner
Safford	Wickersham Airport		P. C. Merrill
Springerville	Springerville Airport		Chamber of Commerce
Tuscon (*m*)	Davis-Monthan Airport	THMLW	R. L. Andrick, S. S.
	Mayse Field	THM	
Vail (*m*)	Vail Airport		
Williams (*m*)	Weber Field		J. C. Butler, T. C.
Winslow (*m*)	Barrigan Field	THMLW	C. W. Helm, C. A. C.
Yuma (*m*)	Fly Field	TMW	Yuma C. of C.
ARKANSAS:			
Brinkley (*m*)	Brinkley Airport	T	City Council
Conway	Conway Airport	T	
Ft. Smith	Alexander Airport	THMW	
Hot Springs (*m*)	Chamber of Comm. Airport	THM	John R. Tate
Little Rock	Little Rock Airport	THMRLW	
Monticello (*m*)	Monticello Mun. Airport	THM	Frank Horsfall
Pine Bluff R. No. 4 B 94	Toney Field	THMRLW	Kenneth Garrett
Texarkana (*m*)	Municipal Airport	TM	J. B. Newbauer, Op.
CALIFORNIA:			
Alameda	San Francisco Bay Airdome	THMRLW	R. U. St. John
	Curtiss-Wright Alameda Airport	THMRLW	Capt. Chadwick Thompson
Amboy (*m*)	Amboy Airport	T	
Bakersfield (*m*) (*m*)	Kern County Airport	THMRLW	H. B. Griffis, Supt.
Banning	Banning Airport	THML	D. A. Innes
Barstow	Barstow Airport	THML	Joseph Kasulaitis
Berkeley (*m*)	Neilson Field		

Location	*Name of Port*	*Service*	*Manager*
Brawley.....(*m*)	Brawley Airport	TH	C. E. Carrell
Burbank.....	United Airport	THMRLW	Fred Denslow
Calexico.....(*m*)	Calexico Mun. Airport	THML	Roy E. Saddler
Calipatria.....(*m*)	Calipatria Airport	H	
Chowchilla.....(*m*)	Chowchilla Airport		
Chula Vista.....(*m*)	Chula Vista Airport	THM	R. Tyce, Mgr.
Coalinga.....(*m*)	Chamber of Commerce Airport	THM	F. E. Butler
Culver City.....	Culver City Airport	THMW	Margaret Perry
El Monte.....	El Monte Airport		
Elsinore.....(*m*)	Lake Elsinore	H	O. W. Graham
Escondido.....(*m*)	Howell Airport		M. L. Howell
Fresno.....(*m*)	Fresno Chandler Airport	THMRLW	Geo. T. Johnson, Supt.
Fullerton.....(*m*)	Fullerton Mun. Airport	THM	Dowling & Dowling
Galt.....	MacCracken Field		
Glendale.....	Grand Central Air Terminal	THMRLW	Maj. C. C. Moseley
Hanford.....(*m*)	Hanford Airport	THML	A. C. Hanford
Hawthorne.....	Kelly Airport	THM	M. E. Kelly
Hollister.....	Hollister Airport	THM	
Imperial.....(*m*)	Imperial County Airport	THMRL	Chas. M. Sproule
Indio.....	Indio Airport	TM	
Inglewood.....(*m*)	Los Angeles Mun. Airport	THMRLW	R. B. Barnitz, Dir.
Lakeport.....(*m*)	Lakeport Mun. Airport		T. V. Ferron
Lancaster.....(*m*)	Lancaster Airport	THM	
Long Beach.....(*m*)	Long Beach Mun. Airport	THMRLW	Wm. J. Putman, Supt.
Los Angeles.....	Aero Corporation Field	THMRLW	Paul E. Richter, Jr.
(136 St.).....	Dycer Field	THMRLW	Edw. A. Dycer
.....	Metropolitan Airport	THMLW	N. R. Wells, Mgr.
Maricopa.....(*m*)	Maricopa Airport	T	
Marysville.....(*m*)	Cheim Airport	THML	C. O. Gates, C. C.
Merced.....	Merced Airport	THM	
Mineral.....(*m*)	Mineral Airport		Arthur G. Holmes
Mojave.....	Mojave Airport	T	
Montague.....(*m*)	Montague Airport	THM	Charles E. Shock
Modesto.....(*m*)	Bud Coffee Field	THMW	F. J. Rossi, C. E.
Needles.....(*m*)	Needles Mun. Airport		George Morden
Oakland.....(*m*)	Oakland Mun. Airport	THMRLW	G. B. Hegardt
Ontario .....(*m*)	Ontario Mun. Airport	TH	
Palmdale.....(*m*)	Palmdale Airport	T	Fred A. Alley
Palo Alto.....	Palo Alto Airport	TH	
Petaluma.....	Petaluma Airport	H	W. G. Fletcher
Pomona.....	Burnley Airport	T	E. H. Rathbun, Mgr.
Porterville.....	Porterville Airport	THM	Maj. Leighroy Miller
Quincy.....(*m*)	Quincy Mun. Airport		H. H. Bar
Red Bluff.....(*m*)	Bidwell Field	THM	John W. Davis
Redding.....(*m*)	Benton Field		L. D. Sarvis, C. A. C.
Redwood.....	Redwood Airport		F. S. Wampler
Riverside.....	Riverside Airport	TH	Thornton Rhodes
San Bruno.....(*m*)	San Francisco Mun. Airport	THMRLW	Capt. Roy N. Francis
Sacramento.....(*m*)	Sacramento Mun. Airport	THMW	J. S. Dean
San Diego.....(*m*)	Lingbergh Field	THML	John Van Horn, Supt.
San Bernardino..	Big Bear Airport	THMR	Calif. Peter Pan Woodland Club
San Jacinto.....(*m*)	Harmon Field	T	C. N. Parker, Mayor
San Mateo.....	Curtiss-Wright San Mateo Airport	THMR	Capt. F. M. Bartlett
San Pedro.....(*m*)	Allen Field	T	Traffic Mgr.—Bd. of Harbor Comm.
San Pedro.....(*m*)	San Pedro Airport		
Santa Ana.....	Eddie Martins Airport	THM	
Santa Barbara...	Ovington Airport		Earle Ovington
Santa Clara.....	Santa Clara Airport		
Santa Monica....(*m*)	Clover Field	THMRLW	Lt. Duff Willson
Santa Rosa.....(*m*)	Santa Rosa Mun. Airport	THML	L. E. Newton
Seal Beach.....	Seal Beach Airport	THM	W. F. Crawford
Sebastopol.....(*m*)	Sebastopol Mun. Airport	THM	L. C. Cnopius, Owner
Selma.....(*m*)	Eagle Field	THML	E. J. Nielsen
Spadra.....(*m*)	W. K. Kellogg Airport	TL	E. H. Rathbun
Stockton.....(*m*)	Stockton Mun. Airport	THML	Henry Nordwick
Strathmore.....(*m*)	Strathmore Airport	THM	C. W. Bouldon
Tracy.....(*m*)	Tracy Airport	THM	W. H. DeVries, Supt.
Tulare.....(*m*)	Tulare Mun. Airport	T	R. M. Berryhill, C. M.
Visalia.....(*m*)	Visalia Mun. Airport	THML	L. E. Crowder
Weed.....	Weed Airport	TR	W. H. King
Westwood.....(*m*)	Westwood Airport	T	
Woodland.....(*m*)	Woodland Airport		
Yreka.....(*m*)	Yreka Airport	THM	Irving L. Eddy
Yuba City.....(*m*)	Yuba City Airport	THM	

Location	*Name of Port*	*Service*	*Manager*
COLORADO:			
Colorado Springs.	Alexander Airport	THMW	Pikes Peak Air Com., Inc.
Colorado Springs Rr-Bx. 7 (*m*)	Colorado Springs Mun. Airport	THML	Max Piele
Denver	Colorado Airways Field	THM	A. F. Joseph
Denver	Curtiss Field	THMW	
Denver 32nd and Ulster St. (*m*)	Denver Mun. Airport	THMRLW	W. F. Wunderlich
Fort Collins (*m*)	Fort Collins Airport	H	
Grand Junction (*m*)	Grand Junction Airport		J. H. Sackett
Monte Vista (*m*)	Monte Vista Airport		W. F. Bowers, C. M.
Otis (*m*)	Otis Mun. Airport		Dee Unger
Pueblo (*m*)	Pueblo Airport	THM	J. P. Raichard
Trinidad	Holloway Field		Mid-Continent Air Express
CONNECTICUT:			
Bridgeport	Bridgeport Airport	THMRLW	W. Parker Seeley
Danbury (*m*)	Danbury Airport	H	Henry Taylor
Hartford (*m*)	Brainard Field	THMRLW	Herbert H. Mills
Meriden Box 33 South (*m*)	Meriden Airport	THMRLW	E. L. Markham
Groton	Turnbull Field		
Wallingford (*m*)	Wallingford Airport	THML	
DELAWARE:			
New Castle	Bellanca Field	THMLW	Del. Flying Service
DIST. OF COLUMBIA:			
Arlington, Va. Bx. 101, S. Wash., Va.	Hoover Field	THMRLW	John S. Wynne
	Washington Airport	THMRW	Paul J. Rabbitt
FLORIDA:			
Bradenton (*m*)	Wallace Field	T	Harry L. Land, Mgr.
Clearwater (*m*)	Clearwater Mun. Airport	THMW	Tropical Airways, Inc., Mgr.
Daytona Beach (*m*)	Bethune Point Airport		A. C. Banks
DeLand (*m*)	Municipal Airport		Aviation Comm. of C. of C.
Fort Meyers (*m*)	Fort Meyers Airport	TH	
Inverness	Inverness Airport	T	A. Noble
Jacksonville (*m*)	Municipal Airport	THMRLW	J. R. Griffis, Mgr.
	Paxon Field	HMW	
Key West	Key West Airport	THMLW	
Lakeland (*m*)	Lakeland Airport	THM	
Lake Wales (*m*)	Lake Wales Mun. Airport		
Leesburg	Leesburg Airport	THM	
Melbourne (*m*)	Melbourne Airport		Clair A. Inskeep, C. M.
Miami (*m*)	Miami Municipal Airport	THMRLW	Aviation Dept., Miami
	Pan American Airport	THMRLW	
Ocala	Ocala Airport	TMR	
Orlando (*m*)	Orlando Airport	THMW	
St. Petersburg (*m*)	Albert Whitted Airport	THM	Allen I. Plummer, Mgr.
Sarasota (*m*)	Sarasota Mun. Airport	T	Dr. J. R. Scully, C. P. W.
Stuart (*m*)	Stuart Airport	THMRL	A. P. Krueger, Mgr.
W. Palm Bch, Drawer E-10	Roosevelt Marine Base		C. S. Collar
Tallahassee (*m*)	Dale Mabry Airport	THM	Wm. R. Gault, C. M.
Titusville (*m*)	Titusville Airport		N. T. Froscher, Mgr.
Tampa (*m*)	Drew Field	THMRLW	I. G. Hedrick
W. Palm Beach	W. Palm Beach Airport		
GEORGIA:			
Albany (*m*)	Albany Airport		
Athens (*m*)	Epps Field		Benn Epps, Mgr.
Atlanta (*m*)	Municipal Airport	THMRLW	J. H. Gray, Mgr.
Augusta (*m*)	Daniel Field	THMRLW	J. B. Lee, Mgr.
Brunswick (*m*)	Redfern Field	TM	
Cedartown (*m*)	Adamson Field		C. Adamson, Jr., Mgr.
Columbus (*m*)	Columbus Airport		H. B. Crawford, C. M.
Douglas (*m*)	State College Airport	TH	J. M. Thrash, Pres., S. G. S. C.
Macon (*m*)	Miller Field	THMLW	Herbert I. Smart, C. A. C.
Rome (*m*)	Rome Airport	TH	Rome Airport Assn.
Savannah (*m*)	Savannah Airport		
Thomasville (*m*)	Thomasville Airport		H. Wimpy
Valdosta (*m*)	Valdosta Airport		P. W. Robertson, Chrm.

Location	*Name of Port*	*Service*	*Manager*
IDAHO:			
Boise.....(*m*)	Boise Mun. Airport.....	THMRLW..	Ivan Nelson, Mgr.
Caldwell.....(*m*)	Walker Field.....		
Coeur D'Alene...(*m*)	Coeur D'Alene Airport.....		George Natwick, Mayor
Pocatello.....(*m*)	Pocatello Mun. Airport.....	THMLW....	E. L. Anderson, Mgr.
Twin Falls.....(*m*)	Twin Falls Airport.....	H.....	Twin Falls, C. of C.
ILLINOIS:			
Aurora.....	Midwest Airport.....	THMRLW..	John H. Livingston, Mgr.
Cairo.....(*m*)	Cairo Landing Field.....		
Champaign.....	Chamber of Com. Airport...	THRW.....	
Chicago.....(*m*)	Aero Club Field.....	H.....	
Chicago, 5932 S. Cicero Ave....(*m*)	Chicago Mun. Airport.....	THMRLW..	John Allen Casey
Danville.....(*m*)	Chamber of Com. Airport...	THM.....	
East St. Louis....	Curtiss-Steinberg Airport...	THMW.....	K. S. Lindsay
East St. Louis....	Parks Airport.....	THMRLW..	Oliver L. Parks
Elgin.....(*m*)	Elgin Airport.....		
Elmhurst.....	Elmhurst Airport.....		
Galena.....	Galena Airport.....	THMR.....	
Glenview.....	Curtiss Reynolds Airport...	THMRLW..	J. B. Neill
Harrisburg.....	Harrisburg Airport.....		Ed. Heath
Hinckley.....	Eagle Airport.....	THMRW...	Dr. Neubauer
Joliet.....	Joliet Airport	THM.....	
Joliet.....(*m*)	Joliet Mun. Airport.....		
Lansing.....	Ford Airport.....	THMLW.....	
Marion.....(*m*)	Marion Airport.....	THMRW...	Walter W. Frick
Moline.....	Moline Airport.....	THMRLW..	L. R. Heath, Mgr.
Monmouth.....	Monmouth Airport.....	THML.....	G. Craig
Mt. Prospect....	Pal-Waukee Airport.....	THMRLW..	Duncan Hodges, Mgr.
Oaklawn.....	Harlem Airport.....	THR.....	C. S. Strong
Peoria.....	Lufbery Flying Field.....	THMRW.....	
Peoria.....(*m*)	Peoria Airport.....	THMRLW..	W. M. Hewitt, Mgr.
Quincy.....	Monroe Airport.....		Neil Monroe
Rockford.....	Rockford Airport.....	THML.....	F. E. Machesney
St. Elmo.....	Smith Field.....	THMRLW..	J. F. Smith
Springfield.....	Commercial Airport.....	THMRLW..	Craig Isabel, Mgr.
Sterling.....(*m*)	Sterling Airport.....	TL.....	David J. Twomey, Mgr.
Stockton.....	Stockton Airport.....	THMW.....	
INDIANA			
Anderson.....(*m*)	Welch Airport.....		
Bedford.....	Bedford Airport.....	THMR.....	
Evansville.....(*m*)	Evansville Airport.....	THMLW....	Jamison
Fort Wayne.....(*m*)	Baer Field.....	THMRLW..	Robert R. Bartel, Mgr.
Fort Wayne.....	Guy Means Airport.....		Capt. C. F. Corrish
Frankfort.....(*m*)	Frankfort Airport.....	THMR.....	
Gary.....	Gary Airport.....	THM.....	
Indianapolis.....	Capital Airways Field.....	THMRLW.....	
Indianapolis, R.R. 18, Bx 300R...	Hoosier Airport, Inc.....	THMRW...	Bob Shank, Mgr.
Indianapolis.....(*m*)	Municipal Airport.....	THW.....	Paul H. Moore, Mgr.
Knox.....	Knox Airport.....	THMW.....	
Kokomo.....	Shockley Field.....	THMW.....	
Lafayette.....	Shambaugh Airport.....	THML.....	
Peru.....	Peru Airport.....	THM.....	
Richmond.....	Richmond Airport.....	THML.....	Claud Berry
Seymour.....	Seymour Airport.....		
South Bend.....(*m*)	Municipal Airport.....	THMR.....	Sergt. Bert. Olmstead, Mgr.
Terre Haute.....(*m*)	Dresser Field.....	THMRLW..	Aviation Commissioners
Valparaiso.....	Valparaiso Airport.....		
Vincennes.....(*m*)	Vincennes Airport.....	THMRW.....	
Wabash, 485 W. Canal St.....	Rettig Airport.....	THMR.....	Geo. O. Rettig
IOWA:			
Ames.....	American Legion Airport...	THM.....	American Legion
Battle Creek.....	Battle Creek Airport.....	TH.....	
Bedford.....(*m*)	Bedford Airport.....	THM.....	
Belle Plaine.....	Belle Plaine Airport.....	TM.....	D. A. Newland
Burlington.....(*m*)	Burlington Mun. Airport...	TH.....	A. J. Hartman
Centreville.....(*m*)	Centreville Airport.....	T.....	V. C. Price
Clarinda.....	Clarinda Airport.....	H.....	E. L. Downing
Council Bluffs....	Council Bluffs Airport.....	THMW.....	
Davenport.....	Cram Field.....	THMRLW..	L. M. Pedigo, Mgr.
Des Moines.....(*m*)	Municipal Airport.....	THMRLW..	E. R. Ahlberg, Mgr.
Dubuque.....(*m*)	Dubuque Airport.....	H.....	W. W. McBoyle, Mgr.
Fort Dodge.....	Fort Dodge Airport.....	THM.....	C. I. Sherwood

Location	*Name of Port*	*Service*	*Manager*
Iowa City.....(*m*)	Smith Field	HL	A. H. Riedesel, Mgr.
Muscatine.....(*m*)	Muscatine Airport, Inc.	TMRL	S. G. Stein, Mgr.
Ottumwa.....	Ottumwa Airport	THM	C. P. Kysor
Rockwell City....(*m*)	Stewart Airport	T	A. R. Eno, Mgr.
Shenandoah.....(*m*)	Kiwanis Airport	THMR	Louis Koenecke, Mgr.
Sioux City.....	Rickenbacker Airport	THMRLW	Arthur Hanford
Waterloo.....(*m*)	Chapman Field		A. B. Livingston, Mgr.
Wesley.....	Wesley Airport	HM	J. A. Hauptman
KANSAS:			
Arkansas City....	Arkansas City Airport	THM	L. H. Lawson
Chanute, Box 514 (*m*)	Chanute Mun. Airport	THMRLW	Vern Carstens, Mgr.
Coffeyville.....(*m*)	Municipal Airport	THM	J. E. Bowen
Dodge City.....	McCoy Airport	THL	
Garden City.....(*m*)	Garden City Mun. Airport	THMRLW	Charles B. Eggen
Goodland.....(*m*)	Goodland Mun. Airport		W. F. Kelley
Great Bend.....(*m*)	Great Bend Mun. Airport	THL	Board of Commissioners
Hays.....(*m*)	Hays Airport		E. J. Haffamier, C. M.
Hosington.....(*m*)	Hosington Airport		
Hutchinson.....	Albright Field	TH	
Kansas City.....	Fairfax Airport	THMRLW	Edward C. Landon
Larned.....(*m*)	Larned Airport	H	Sec., C. of C.
Lawrance.....	Allison Field	THM	
Manhattan.....(*m*)	Manhattan Mun. Airport	TH	C. of P. and Mayor
Newton.....(*m*)	Newton Airport	TH	
Parsons.....(*m*)	Ryan Field	T	A. A. Nusbaum
Plainville.....(*m*)	Gilbert Field	T	V. A. Perkin, Mgr.
Pratt.....	Pratt Airport	TH	F. F. Swinson
Salina.....(*m*)	Salina Airport		
Sedan.....(*m*)	Sedan Airport	THM	W. T. Collier
Washington.....(*m*)	Washington Airport		Edgar Bennett
Wichita.....	Swallow Field	THMW	Geo. R. Bassett
Wichita.....(*m*)	Municipal Airport	THMRLW	Alfred MacDonald
Wichita.....	Swift Airport		
Winfield.....(*m*)	Winfield Airport	TH	G. M. Oaks
KENTUCKY:			
Covington.....	Lionel Flying Field		
Hopkinsville.....	Hopkinsville Airport	TH	C. M. Baker
Lexington.....(*m*)	Lexington Airport	THMW	Woodford N. Baxter
Louisville.....(*m*)	Bowman Field	THMRLW	Maj. H. W. Rogers, Supt.
Newport.....	Boyers Airport		
Owensboro.....	Sheehan Field	TH	
LOUISIANA:			
Baton Rouge....(*m*)	Baton Rouge Airport	HRL	
Chalmett.....	Chalmett Airport		
Crowley.....(*m*)	Crowley Airport	T	Geo. C. Merkel, Sec. C.of C.
Lafayette.....(*m*)	Lafayette Airport		R. E. Chaplin, C. A. Comm.
Mansfield.....(*m*)	Herndon Field	THM	T. B. Herndon
Monroe.....(*m*)	Selman Field	THM	Travis Oliver
Natchitoches.....	Natchitoches Airport	THM	
New Orleans.....(*m*)	New Orleans Mun. Airport	THMRLW	Geo. A. Hero, Jr.
New Orleans, P. O. Box 783..	Menefee Airport	THMRLW	Harry B. Austin
Patterson.....	Patterson Airport		
Shreveport.....	Texaco Airport	THMRLW	
MAINE:			
Bangor.....	Bangor Airport		E. Godfrey
Caribou.....(*m*)	Caribou Airport		G. W. Shaw
Portland.....	Stroudwater Field	THW	
Portland.....	Portland Airport	THMLW	
Rockland, Box 280.....	Curtiss-Wright Airport		W. H. Wincapaw
MARYLAND:			
Baltimore.....	Handler Field		
Baltimore.....	Curtiss-Wright Airport		Maj. W. D. Tipton, Mgr.
Baltimore.....(*m*)	Logan Field	THMLW	Charles F. Goob, C. P. A.
Hagerstown.....	Kreider-Reisner Airport		
Pikeville.....	Park Heights Flying Field		Lt. Otto Melamet
Rockville.....	Congressional Airport		
MASSACHUSETTS:			
Beverly .....(*m*)	Beverly Airport	THMRLW	Elton S. MacNeal, Pres., B. A. C.
Boston (N. Quincy)...	Dennison Airport		

Location	Name of Port	Service	Manager
Boston.....(m)	Boston Municipal Airport	THMRLW	Albert L. Edson
Brockton	Brockton Airport		
Edgarstown	Martha's Vineyard Airport		
Fall River	Fall River Airport		
Hyannis	Hyannis Airport	THMRLW	
Lawrence	Lawrence Airport		
Lowell	Lowell Airport	T	
Mendon	Mendon Airport	THMR	
Revere	Revere Airport		
Seekonk	Seekonk Airport		
Springfield	Bowles Agawan Airport	THM	W. F. Bright
Springfield, 1211 Liberty St.	Springfield Airport	THMRLW	Edmund Fischer
Taunton	King Field		
Westfield.....(m)	Barnes Airport	THMR	P. N. Hall, B. of M.
Worcester	Worcester Airport	HL	
MICHIGAN:			
Ann Arbor.....(m)	Ann Arbor Mun. Airport	THML	L. S. Flo, Pres. F. F. S.
Baldwin.....(m)	Baldwin Airport	T	H. W. Davis, Mgr.
Battle Creek	Kellogg Airport	THMRLW	
Bay City.....(m)	James Clements Airport		Henry Dora
Benton Harbor	Benton Harbor Airport		
Caro.....(m)	Caro Airport	TH	Glenn W. Owen
Dearborn	Ford Airport	THMRLW	LeRoy Manning
Detroit, 400 City Hall..(m)	Detroit City Airport	THMRLW	W. J. Wallace, Eng. Mgr.
Detroit	Grosse Ile Airport	THMRLW	O. Y. Fetterman
East Lansing	East Lansing Airport	THMW	
Flint	Flint Airport		
Grand Haven....(m)	Grand Haven Airport	TH	W. E. Baumgardner, C. M.
Grand Rapids....(m)	Grand Rapids Airport	THMLW	H. Byrne, Pres., K. F. C.
Iron Mountain	Iron Mountain Airport	TH	
Ironwood.....(m)	Gogebic County Airport		
Jackson.....(m)	Reynolds Field	THMRLW	Ross Becker
Kalamazoo.....(m)	Lindbergh Field	H	A. Ten Busschen, Mgr.
Lansing.....(m)	Capital City Airport	THMW	Fostor Airways
Manistique.....(m)	Schoolcraft Airport		
Marysville.....(m)	Marysville Airport	T	Marysville Improvem't Co.
Menominee.....(m)	Menominee Airport	T	S. Justema, Supt.
Muskegon.....(m)	Muskegon County Airport	HL	H. C. Hyland
Newberry.....(m)	Luce County Airport		
Niles.....(m)	Niles Airport	THM	Willis E. Kysor, Mgr.
Northville	Stinson-Northville Airport	THM	
Petoskey.....(m)	Emmet County Airport		Robert D. Tripp
Pontiac.....(m)	Pontiac Mun. Airport	THMRLW	Neal Brackstone
Romulus.....(m)	Wayne County Airport	THMRLW	H. E. Baker, Eng.
Saginaw.....(m)	Junior Board of Commerce Airport	THM	Jos. E. Behse
Sault Ste. Marie..(m)	Sault Ste. Marie Airport	TM	
Traverse City....(m)	Ranson Field		Don Clothier
Wayne	Detroit Wayne Industrial Airport	TM	Earl Smith
Ypsilanti, R. R. No. 4....(m)	Ypsilanti Airport	THMW	M. E. Oliphant, Mgr.
MINNESOTA:			
Alexandria.....(m)	Alexandria Airport		
Brainerd	Rosko's Airport	THM	Rosko Bros.
Coleraine.....(m)	Coleraine Airport		C. M. Murphy
Duluth.....(m)	Williamson-Johnson Airport		
Fergus Falls....(m)	Fergus Falls Airport	THM	Gustav O. Imm
Mankato	Mankato Airport	THM	L. J. Sohler
Maynard	Maynard Airport	THM	
Minneapolis.....(m)	Wold-Chamberlain Field	THMRLW	L. D. Hammond, Dir.
St. Cloud.....(m)	Albert G. Whitney Mem. Airport	TM	
St. Paul.....(m)	St. Paul Airport	THMRLW	F. J. Geng, Master
Virginia	Virginia Airport	HM	Clinton H. Sigel
MISSISSIPPI:			
Greenville	Greenville Airport	TH	T. White
Greenwood.....(m)	Leflore County Airport		
Grenada	Borden Field		
Gulfport	Gulfport Airport		
Hattiesburg.....(m)	Municipal Airport	THMLW	
Jackson.....(m)	Jackson Airport	THRW	Lt. R. H. Ranney, Mgr.
Meridian	Meridian Airport	W	
Pascagoula.....(m)	Raby Field	T	John R. Watts, Mayor

Location	*Name of Port*	*Service*	*Manager*
MISSOURI:			
Anglum (m)	Anglum Airport		
Bucklin	Van Osdee Field		
Carthage	Carthage Airport	THM	
Joplin (m)	Joplin Airport	THML	Ralph L. Nolan, Mgr.
Kansas City (m)	Municipal Airport	THMRLW	Roy C. Farrell
Kansas City	Richards Field	THMRW	
Kirksville	Dodson Airport	THM	
Marshall	Nicholas-Beazley Airport	THMRLW	R. A. Faust, Mgr.
St. Joseph	Rosecrans Field	THMRLW	J. C. Shelton, Jr.
St. Louis (m)	Lambert-St. Louis Airport	THMRLW	O. R. Parks
Springfield (m)	Springfield Mun. Airport	L	Carl McClure
MONTANA:			
Belgrade (m)	Belgrade Airport	T	E. A. Stiefel, C. A. Comm.
Billings (m)	Billings Airport		
Butte (m)	Butte Airport	TH	J. K. Heslet
Dillon	Dillon Airport	THM	
Froid	Schnitzler Field	TH	
Great Falls (m)	Great Falls Airport	THMLW	
Great Falls	Vance Airport	THM	
Helena (m)	Helena Mun. Airport	TH	Fred B. Sheriff, Chrm.
Kalispell (m)	Kalispell Aviation Park	H	C. E. Trekell, Clerk
Livingston (m)	Tollman Field	T	T. A. Ross, C. C.
Miles City (m)	Municipal Airport	THMLW	
Missoula (m)	Missoula Airport	THML	
Sidney	Sidney Airport	TH	W. M. Combes
Terry (m)	Terry Airport		F. L. Patterson
Wolf Point (m)	Wolf Point Airport		James F. Cook
NEBRASKA:			
Alliance	Alliance Airport	TH	
Falls City (m)	Municipal Airport		Airport Com. of Council
Grand Island (m)	Municipal Airport	THMLW	Stover Deats, Mgr.
Hastings (m)	Hastings Mun. Airport		H. J. Dunn, Chrm.
Havelock	Arrow Airport	THMW	James Fisher
Kearney (m)	Municipal Airport	L	J. D. Wolf, Mgr.
Lincoln (m)	Municipal Airport	THMLW	D. L. Erickson, C. E.
Lincoln	Page Airport	THMW	
McCook (m)	American Legion Airport		
North Platte (m)	North Platte Airport	THMLW	C. H. Sluder
Ogallala	Ogallala Airport		
Omaha (m)	Omaha Mun. Airport	THMRLW	Jay Dudley, Mgr.
Scottsbluff	Scottsbluff Airways Airport	THMR	
NEVADA:			
Caliente (m)	Caliente Airport		
Elko (m)	Keddie Field	THMW	Louis Notar
Ely (m)	Ely Airport	THMW	Harold Deeyle, Mgr.
Las Vegas (m)	Las Vegas Airport	THMLW	
Reno (m)	Blanch Field	THMW	Robert E. Overman
Reno	Hubbard Field	THMLW	
Yerington (m)	Kelly Field		L. B. Miller, C. P.
NEW HAMPSHIRE:			
Claremont (m)	Claremont Airport	THMW	Claremont Aero. Service
Concord (m)	Concord Airport	THMRW	Horton C. Chandler, Mgr.
Manchester (m)	Manchester Airport	THM	
Newport (m)	Albert N. Parlin Field		
NEW JERSEY:			
Arcola	Arcola Airport	THMRW	
Atlantic City (m)	Atlantic City Airport	THM	H. B. Baldwin, Supt.
Caldwell	Curtiss-Essex Airport		Walter Avery
Camden	Central Airport	THMRLW	W. Sanger Green
Dover	Dover Airport		
Freehold	Patten Field		
Hasbrouck Hgts.	Teterboro Airport	THMRW	J. W. DeBeaubien
Kenvil	Kenvil Airport		
Keyport	Keyport Airport	TM	Everitt Fisher
Lakehurst	Lakehurst Airport	THMW	
New Brunswick	Hadley Field	THMRLW	C. W. Geo. Chegan, Mgr.
Newark (m)	Newark Met. Airport	THMLW	R. Aldworth, A. T. E.
Red Bank	Airview Flying-Field	THMRLW	J. F. Casey, Pres.
Trenton (m)	Mercer Airport	THMRLW	William S. Borden, Dir.

Location	*Name of Port*	*Service*	*Manager*
NEW MEXICO:			
Albuquerque.....	T. & W. A. Airport		
Albuquerque.....	Albuquerque Airport	THMRLW	D. E. Dalby
Carlsbad.....(*m*)	Carlsbad Airport	TW	
Clayton.....(*m*)	Clayton Mun. Airport		W. H. Hollingsworth, C. M.
Clovis.....	T. A. T. Airport		
Deming.....(*m*)	Deming Airport		G. D. Robinson, Sec. C. of C.
Gage.....(*m*)	Gage Mun. Airport		City of Gage
Gallup.....(*m*)	Gallup Airport		
Roswell.....	Roswell Airport	THMLW	
Silver City.....(*m*)	Silver City Airport		
Socorro.....(*m*)	Socorro Airport		W. E. West, Sec. S. B. M. C.
NEW YORK:			
Albany.....(*m*)	Albany Mun. Airport	THMRLW	J. F. Fitzgerald, Jr.
Angola.....	Angola Airport		
Armonk.....	Westchester Airport		C. D. Bowyer
Binghamton.....	Bennett Field	THMW	R. Bennett
Buffalo.....	Becker's Airport	THMW	E. J. Becker
Buffalo.....(*m*)	Buffalo Mun. Airport	THMRLW	N. E. Duffy, Dir.
Cortland.....(*m*)	Cortland County Airport		
Dansville.....(*m*)	Dansville Airport	THR	L. E. Pickard
Elmira.....	Elmira Airport	THMW	
Endicott.....	Endicott Airport	THM	
Farmingdale.....	Farmingdale Airport	THM	
Flushing.....	New York City Airport	THM	L. B. Halleran, Pres.
Garden City.....	Roosevelt Field	THMRLW	James G. Orr
Geneva.....	Finger Lakes Airport	TH	
Glens Falls.....(*m*)	Glens Falls Airport	THR	
Gloversville.....	Gloversville Airport	THMR	
Hammondsport..	Mercury Field	TH	H. Mummeth
Hemlock.....	Hemlock Airport	TH	Dr. Harold Nott
Jackson Heights, Queens.....	Grand Central Air Terminal	L	
Jamestown.....	Jamestown Airport		
LeRoy.....	D. W. Flying Field	THMRL	Capt. Russell Holderman
Niagara Falls....(*m*)	Niagara Falls Mun. Airport	THMRW	Maj. Harry Hublitz
North Beach.....	Glenn L. Curtiss Airport	THMRLW	Capt. Harry Rodgers
Norwich.....	Norwich Airport	THMW	Warren Eaton, Pres.
Pittsford.....	Pittsford Airport	THMR	
Poughkeepsie....	Poughkeepsie Airport		Ward S. Lent
Rochester.....(*m*)	Rochester Airport	THMLW	Howard M. Shaffer
Rochester.....	Rouse Partidge Airport		
Saratoga Springs.(*m*)	McGregor Airport		
Schenectady.....	Schenectady Airport	THMRLW	V. A. Richards
Silver Creek.....	Silver Creek Airport		Chas. T. Howson
Syracuse.....(*m*)	Syracuse Mun. Airport	THMRLW	R. L. Kincaid
Tonawanda.....	Consolidated Aircraft Airport	THMW	
Utica.....(*m*)	Utica Airport	THMRLW	Reginald J. Heath
Valley Stream....	Curtiss-Wright Airport	THMRLW	Walter L. Avery
Watertown.....(*m*)	Watertown Mun. Airport	THW	F. H. Taylor
Wellsville.....(*m*)	Wellsville Airport	THW	
NORTH CAROLINA:			
Asheville.....(*m*)	Asheville Airport		
Charlotte.....	Charlotte Airport	THML	
Greensboro.....(*m*)	Greensboro Airport	THMRLW	Henry W. Rafus
Goldsboro.....(*m*)	Municipal Airport	HL	Z. G. Hollowell, C. M.
Marion.....(*m*)	Francis Marion Field		
Monroe.....	Monroe Airport		
Pinehurst.....(*m*)	Knollwood Airport	THM	Lloyd O. Yost
Raleigh.....	Raleigh Airport	THMRW	
Reidsville.....	Reidsville Airport	L	
Rockingham.....	Rockingham Airport	THR	V. Ratliff
Rocky Mount....	Eagle Field	THM	
Shelby.....(*m*)	Shelby Airport	TR	
Tarboro.....(*m*)	Tarboro Airport		
Wilmington.....(*m*)	Wilmington Airport		
Winston-Salem...(*m*)	Miller Mun. Airport	THML	Herman B. Leeth
NORTH DAKOTA:			
Bismarck.....(*m*)	Bismarck Mun. Airport		
Fargo.....(*m*)	Hector Airport	TH	Florence E. Klingensmith
Grand Forks.....	Grand Forks Mun. Airport	TMR	E. L. Lium, Act. Mgr.
Jamestown.....	Jamestown Airport	TH	C. A. Henderson, Sec.

Location	*Name of Port*	*Service*	*Manager*
Linton	Seeman Park Airport	T	
Minot (m)	Port of Minot	THM	C. O. Shupe
Pembina (m)	Ashley Airport		Mun. Airport Comm.
Towner	Jake's Airport	THM	
Valley City (m)	Valley City Mun. Airport		
Williston (m)	Williston Airport	THM	E. M. Canfield
OHIO:			
Akron (m)	Municipal Airport	THMRLW	B. E. Fulton
Akron	Stow Field	THM	N. C. Robbins
Alliance	Alliance Airport	THMR	
Bryan	Bryan Air Park	THRLW	E. C. Ewing
Canton	Canton Airport	THMR	J. Curtis
Cincinnati (Sharonville)	Crosley Airport		
Cincinnati	Frank Airport	THM	
Cincinnati (m)	Lunken Airport	THMRLW	Albert B. Wunder, Supt.
Cincinnati	Watson Airport	THMRLW	Hugh Watson
Cleveland (m)	Cleveland Mun. Airport	THMRLW	John Berry, Mgr.
Cleveland	Great Lakes Airport	TH	
Columbus	Columbus Airport	THMRLW	
Columbus (m)	Port of Columbus Airport	THMRLW	Maj. wm. F. Centner, supt.
Coshocton	Coshocton Airport	THM	
Dayton	Maraine Field		
Defiance	Defiance-Simplex Airport	TH	
Findlay	Rummell Aviation Park	THMR	
Gallipolis (m)	Twin City Airport	TH	Charles H. Holzer, M. D., Owner
Greenville	Lansdowne Airport		
Hamilton	Hamilton Airport	H	C. R. Muhlberger
Hudson	Mid City Airport	THM	D. B. Peat
Lima	Thompson Airport	THM	Rollie Thompson
Lorain	Port Mills Airport	THMR	
Mansfield (m)	Municipal Airport		F. D. Wolff, S. S. D.
Martins Ferry	Scott Field	THM	
Marietta (m)	Ohio Valley Airport	THMW	Chris Matthews
Marion (m)	Marion Airport	TH	Lt. H. H. Hunter
Middletown (m)	Middletown Airport Park	H	Geo. J. Wedekind
Sandusky	Parker Field	THMRW	
Springfield (m)	Springfield Mun. Airport	THMRLW	W. B. Little
Steubenville	Steubenville Airport	THMW	
Toledo	Transcontinental Airport	THMLW	S. G. Van Buren
Vandalia	Dayton Airport	THMRLW	E. A. Johnson, Pres.
Van Wert (m)	Municipal Airport	THMW	J. H. Weaver
Willoughby	Lake County Airport	THMR	Harry R. Playford
Youngstown	Bernard Airport	THMR	
Youngstown (m)	Youngstown Airport	THM	
Zanesville	Zanesville Airport	H	R. Charles
OKLAHOMA:			
Ada (m)	Ada Mun. Airport	TH	Lt. Paul Hinds
Altus (m)	Altus Airport		
Ardmore	Ardmore Airport	THM	A. Oakley
Bartlesville	Bartlesville Airport	THM	Wm. Parker
Bristow	Bristow Airport	THM	
Chickasha (m)	Municipal Airport	THM	Sam Gribi
Clinton (m)	Clinton Airport	THM	Tim T. Warren, Sec. C. of C.
Coalgate	Coalgate Airport	T	C. Carson
Duncan (m)	Halliburton Field	THM	J. H. Bender, C. M.
Elk City (m)	Municipal Airport	M	Walter D. Mauk
El Reno (m)	Reno Airport	T	H. M. Woods, C. A. C.
Enid (m)	Enid Airport	THMRL	Capt. Askew
Mangum (m)	Ponder Field	T	Ray Shiffett
McAlester	Legion Field		
Miami	Miami Airport	THMR	
Muskogee (m)	Muskogee Mun. Airport	THMLW	L. L. Rupert
Oklahoma City (m)	Oklahoma City Airport	THMRLW	Wm. E. Fletcher, F. S.
Oklahoma City	Curtiss Airport		
Pauls Valley (m)	Pauls Valley	H	Earl Witten
Ponca City (m)	Everett Taylor Airport	THML	T. D. Harris
Stillwater (m)	Stillwater Airport		
Tulsa	McIntyre Airport	THM	D. A. McIntyre
Tulsa, Box 3156 (m)	Tulsa Mun. Airport	THMRLW	C. W. Short, Jr.
Weewoka (m)	Weewoka Airport	H	
OREGON:			
Albany (m)	Albany Mun. Airport	L	F. E. Bloom, C. A. Comm.
Arlington	Arlington Airport	H	
Canyon (m)	Canyon City Airport		I.B.Hazeltine, C. A. Comm.

Location	*Name of Port*	*Service*	*Manager*
Corvallis	Corvallis Airport	THMLW	
Eugene (*m*)	Eugene Mun. Airport	THML	T. C. DeVaney, Supt.
Grants Pass (*m*)	Josephine County Airport	TL	Josephine County, A. C.
Lakeview (*m*)	Lakeview Airport		Gilbert D. Brown
Lebanon (*m*)	Lebanon Airport	T	R. B. Miller
Medford, Box 1016 (*m*)	Medford Mun. Airport	THMRLW	Seely V. Hall
Portland (*m*)	Portland Airport	THMRLW	James H. Polhemus
Portland	Rankin Airport	THMRW	
Roseburg (*m*)	Roseburg Mun. Airport		A. J. Geddes, Sec. A. C.
Salem (*m*)	Salem Mun. Airport	THMW	Lee Eyerly
Silverton (*m*)	Silverton American Legion Airport	THM	C. A. Reynolds, C. A. C.
Springfield (*m*)	Springfield Mun. Airport	THMW	Lee Inman
Vermonia (*m*)	Vermonia Airport	H	
PENNSYLVANIA:			
Altoona-Tyrone	Stultz Field	THMR	
Bethlehem, Box 93 (*m*)	Bethlehem Mun. Airport	THMW	Rupert E. Herr, O. M.
Bridgeville	Mayer Field		
Connellsville (*m*)	American Legion Airport	T	H. C. Haddock
Conway	Conway Airport	HM	A. J. Moore
Erie	Griswold Field		
Fairview	Erie County Airport	THMLW	N. R. McCray
Gettysburg	Gettysburg Airport	THMR	M. S. Kleinfelter
Honesdale	Matter Airport	TMRW	Paul C. Matter
Johnstown (*m*)	Johnstown Mun. Airport	THML	J. H. Ritter
Jones Mills	Pike Run Airport	TRW	
Lancaster	Lancaster Airport	THMW	
Latrobe	J. D. Hill Airport	THM	
Leighton (*m*)	Martin Jensen Airport	THMRW	Jensen Aviation Corp.
Lemoyne	Stienhauer Airport		
McKeesport	Bettis Field	THMRLW	
Moscow	Moscow Airport	T	
Mt. Pleasant	Mt. Pleasant Airport		
Mount Union (*m*)	Mount Union Airport		
New Castle	Jackson Field		
New Castle	New Castle Airport	TH	
Norristown	Patco Field	THMRW	
Parkesburg	Robb Field	HM	
Philadelphia, Island Rd. (*m*)	Philadelphia Airport	THMRLW	R. P. Hewitt
Philadelphia	Pitcairn Field	THM	
Pottstown	Pottstown Airport	THMRW	
Reading	Whander Field	THMW	
Selingsgrove (*m*)	Selingsgrove Airport		
Sharpsburg, R. D. No. 2 (*m*)	Rodgers Field	THMRW	1st Lt. S. C. Eaton, Jr.
Somerset	Rhoades Field	THM	
Sunbury	Wesley L. Smith Field	THML	
Towanda (*m*)	Towanda Legion Airport	THW	Cecil E. Allen
Waynesburg	Worley Field	TH	
Waynesboro	Waynesboro Airport	THR	
Wilkes-Barre	Wyoming Valley Airport	THMRW	Geo. S. Eckman
Williamsport	Williamsport Airport	TH	T. H. Kinkade
RHODE ISLAND:			
Pawtucket	Pawtucket Airport	H	
Providence	Providence Airport	THMRW	J. K. Fenno
Westerly	Westerly Airport	THM	
Providence	What Cheer Airport		
SOUTH CAROLINA:			
Camden (*m*)	Woodward Airport	H	N. N. Prentiss
Charleston (*m*)	Charleston Airport	TW	
Cheraw	Excelsior Airport	TR	
Florence (*m*)	Florence Airport		
Fort Mills	Spring Field		E. W. Springs
Greenville (*m*)	Greenville Mun. Airport	THMRLW	Everett Williams
Myrtle Beach	Myrtle Beach Airport	TH	C. G. Brown
Seneca	Seneca Airport	T	R. M. Tribble
Spartanburg (*m*)	Municipal Airport	THMLW	C. R. Coleman
SOUTH DAKOTA:			
Aberdeen (*m*)	Aberdeen Airport	TM	W. C. Boardman, Sec. C. of C.
Belle Fourche	Belle Fourche Airport	THM	Clyde Ice
Lemmon (*m*)	Lemmon Airport		C. of C.

Location	*Name of Port*	*Service*	*Manager*
Mitchell.....(*m*)	Mitchell Airport	H	H. Bowring
Mobridge.....	Mobridge Airport		I. L. Hagen
Pierre.....(*m*)	Walter J. Smith Airport Park	H	City of Pierre
Rapid City.....	Rapid City Airport	THMW	Rapid Air Lines
Tyndal.....	Tyndal Airport		
Vermillion.....(*m*)	Municipal Airport	TW	R. V.Newcomb, C. E.
Volga.....	Volga Airport	THMR	L. W. Lieb
Wagner.....(*m*)	Wagner Mun. Airport	THMW	C. W. Knight, Sec'y
Watertown.....(*m*)	Watertown Airport	THMLW	
TENNESSEE:			
Chattanooga.....(*m*)	Lovell Field	THMRW	W. Deland Dyke
Knoxville.....(*m*)	McGhee-Tyson Airport		
Memphis.....(*m*)	Memphis Mun. Airport	THMLW	B. B. Holmes
Memphis.....	Arrowland Airport	THMRLW	
Memphis.....	Armstrong Field		
Nashville.....(*m*)	McConnell Field	THW	William K. Bukley
Nashville.....	Skyharbor	THMRLW	
TEXAS:			
Albany.....(*m*)	Plane Haven	H	A. M. Brackett
Abilene.....	Kinsolving Field	THMLW	T. E. Derryberry
Amarillo.....	English Field	THMRLW	Harold W. English
Austin.....	Robert Mueller Airport		
Austin.....	University Airport	THMRW	
Beaumont.....(*m*)	Beaumont Airport	THMLW	Frank L. Bertschler
Big Springs.....	Big Springs Airport	THMRLW	
Bonham.....(*m*)	Jones Field		L. K. Crawford
Breckenridge.....(*m*)	Breckenridge Airport		City of Breckenridge
Brownsville.....(*m*)	Municipal Airport	THMRLW	T. E. Gilmore
Cisco.....(*m*)	Cisco Airport	T	
Corpus Christi...(*m*)	Corpus Christi Airport	THW	W. C. Maus
Dallas.....(*m*)	Love Field	THMRLW	Preston Sneed, Dir.
Del Rio.....(*m*)	Warner Airport		John Y. Long, Mayor
Denison.....(*m*)	Gray Airport	TH	R. Gray
Denton.....(*m*)	Denton Mun. Airport		B. W. McKenzie, Mayor
El Paso.....(*m*)	Municipal Airport	THMLW	A. E. Johnson
El Paso.....	Standard Airport		
Fort Worth.....(*m*)	Meachem Field	THMRLW	William G. Fuller
Harlingen.....	Harlingen Airport	THM	
Houston.....	Houston Airport	THMRLW	
Jasper.....(*m*)	Jasper Mun. Airport		Goldman S. Drury
Kerrville.....(*m*)	Louis Schreiner Airport		C. L. Mason, C. A. Comm.
Lubbock.....(*m*)	Municipal Airport		J. Bryan Miller, City Mgr.
Midland.....(*m*)	Midland Airport	THMRW	H. M. Becherer
Pampa.....(*m*)	Pampa Airport	TH	
Pecos.....(*m*)	Pecos Airport		Ralph Sparke
Port Arthur, P. O. Box 712..	Texaco Airport	T	F. P. Dodge
Ranger.....(*m*)	Ranger-Haugland Airport	TH	C. J. Moore, Mgr.
San Angelo.....(*m*)	Municipal Airport	THM	Autrey Monsey
San Antonio.....(*m*)	Winburn Field	THMRLW	J. Wayne Parks
Sherman.....(*m*)	Sherman Airport		
Sweetwater.....(*m*)	Municipal Airport	THM	W. A. Larner
Texarkana.....(*m*)	Texarkana Airport	TM	
Vernon.....(*m*)	Vernon Airport		M. K. Berry, C. A. Comm.
Waco.....(*m*)	Rich Field	THML	C. E. Coder
Wichita Falls....(*m*)	Municipal Airport	THML	C. P. Logan
UTAH:			
Ogden.....(*m*)	Ogden Airport	THLW	Harold R. Tripp
Salt Lake City...(*m*)	Salt Lake Mun. Airport	THMLW	Gilbert R. Rich
VERMONT:			
Burlington.....(*m*)	Burlington Airport	THW	S. E. Astles
Manchester.....	Equinox Airport	THM	F. W. Orvis
Newport.....	Newport Airport	THMR	
Springfield.....(*m*)	Springfield Airport	TH	R. M. Wilcomb
White River Junction.....	Twin State Airport		A. W. Stone, Pres.
VIRGINIA:			
Alexandria.....	Alexandria Airport	THMR	
Bristol.....	Harkrader-Kilgore Airport	H	
Clifton Forge....	Clifton Forge Airport		
Danville.....(*m*)	Danville Mun. Airport		M. G. Robinson

Location	*Name of Port*	*Service*	*Manager*
Fredericksburg...	Shannon Field	H	
Hopewell	Hopewell Airport		
Lynchburg, Box 782 (m)	Preston Glenn Airport		R. D. Apperson
Norfolk	Grand Central Air Terminal		
Port Richmond (m)	Thompson Field	TM	Crosby Thompson, Mayor
Richmond (m)	Richard E. Byrd Field	THMLW	Richmond Air Transport
Richmond	Charles Field	THM	
Richmond	Richmond Air Junction		
Roanoke (m)	Roanoke Airport		
Waynesboro	Valley Airport	TH	C. C. Loth
Winchester (m)	Bowler Field	THM	Roy W. Richards

WASHINGTON:

Aberdeen (m)	Grays Harbor Airport	THMRW	F. D. Hobi
Bellingham	Graham Field	THM	R. C. Graham
Bellingham	Tulip Field		
Centralia (m)	Centralia Airport	HM	T. R. Patton
Chehalis (m)	Chehalis Mun. Airport	HL	A. C. St. John, Pres.
Everett (m)	Everett Airport		
Kennewick (m)	Kennewick Airport		
Olympia (m)	Olympia Airport		E. N. Steele
Pasco (m)	Franklin County Airport	THMLW	County Commissioners
Renton	Renton Airport		
Seattle (m)	Boeing Field	THMRLW	Maj. David G. Logg
Spokane (m)	Felts Field	THMRLW	Andrew J. Fabian, C. P. U.
Tacoma, P.O. Box 1183 (m)	Tacoma Field	THMRLW	L. E. Wilkeson
Wenatchee	Wenatchee Airport		
Yakima (m)	Yakima County Airport	TH	County Commissioners

WEST VIRGINIA:

Bluefield	College Field	THMRW	
Moundsville	Langin Field	THM	
Morgantown (m)	Morgan Field	TR	W. E. Brooks, C. M.
White Sulphur Springs	Greenbrier Airport		

WISCONSIN:

Appleton	Appleton Airport	H	E. West
Appleton (m)	Geo. A. Whiting Airport	THMRW	Eluryn West
Athelstane	Athelstane Airport		R. H. Schaf
Delavan	Delavan Airport	H	J. D. Campbell
Eagle River	Keystone Airport	TR	F. G. Steinmuller
Eagle River	Otter Rapids Airport	TR	
Fond Du Lac	Fond Du Lac Airport	TH	
Green Bay	Green Bay Airport	H	
Janesville	Janesville Airport	THML	
Kilbourn	Kilbourn Airport	TRL	C. Berry
Kohler (m)	Kohler-Sheboygan Airport		A. W. Sommers
LaCrosse (m)	LaCrosse Mun. Airport	THMLW	Board Pub. Works
Land O'Lakes (m)	Land O'Lakes Airport		J. F. Handles, Sec. & Mgr.
Madison	Madison Airport	THMLW	
Madison	Penco Field	THMW	
Manitowoc (m)	Manitowoc Airport	THMRW	F. Shoblaska
Marshfield	Miners Airport		W. Miner
Milwaukee	Curtiss-Wright Airport	THMLW	Dan Kiser
Milwaukee (m)	Milwaukee County Airport	THMRLW	Maj. Stanley E. Piasecki
Milwaukee (City Hall R. 711) (m)	Maitland Airport	THMRLW	Frank A. Kaiser, H. E.
Mosinee	Mosinee Airport	THM	
Oshkosh	Oshkosh Airport	THMW	R. A. Mensing, Jr.
Portage, 130 E. Cook St.	Miller & Winkler Airport	TM	E. L. Zastrow
Princeton (m)	Princeton Airport		G. V. Kelly
Rhinelander (m)	Rhinelander Airport	TMLW	Steve Shadbreck
Sheboygan (m)	Sheboygan Airport	H	Kohler-Sheboygan
Stevens Point	Stevens Point Airport	TW	
Three Lakes (m)	Three Lakes Airport	THM	F. E. Olkowski
Washington Island	Washington Island Airport	TMR	E. L. Zastrow
Wausau (m)	Alexander Airport	THMRW	H. D. Putnam
Wisconsin Rapids	Tri City Airport	THMW	Maj. L. G. Mulzer

Location		*Name of Port*	*Service*	*Manager*
WYOMING:				
Casper	(*m*)	Wardell Field	THMLW	E. C. Dilgarde
Cheyenne	(*m*)	Cheyenne Airport	THMRLW	Boeing Air Transport
Gillett		Gillett Airport		
Lander	(*m*)	Lander Airport	TW	Hugh D. Spangler, C. A. Comm.
New Castle	(*m*)	New Castle Airport		
Parco	(*m*)	Parco Airport	L	
Rock Springs	(*m*)	Stevens Airport	THMLW	E. S. Maroney
Sheridan	(*m*)	Sheridan Airport		Bob Garrett
Wheatland	(*m*)	Wheatland Airport		

COMMERCIAL SEAPLANE TERMINALS

Atlantic Coast

Facilities *	*Location*	*Owner*
A R S H G	Atlantic City, N. J.	Paul Bradley
A R S H G	Baltimore, Md.	City of Baltimore
A R S H G	Bridgeport, Conn.	Bridgeport Airport, Inc.
A G	Charleston, S. C.	Standard Oil Co. (N. J.)
A R S G	East Boston, Mass.	City of Boston
A S G	Fort Myers, Fla.	City of Fort Myers
A R S H G	Miami, Fla.	Curtiss-Wright Flying Service
A R S H G	Miami, Fla.	City of Miami
A R S H G	New Haven, Conn.	Yale Flying Service
A	Newport News, Va.	City of Newport News
A R S H G	North Beach, Queens, L. I., N. Y.	Curtiss-Wright Airport Corp.
A R S G	North Quincy, Mass.	John A. Sullivan
A G	Portland, Me.	Portland Yacht Club
A R S H G	Port Washington, L. I., N. Y.	American Aeronautical Corp.
A R S G	Rockland, Me.	Curtiss-Wright Flying Service
A R S H G	South Jacksonville, Fla.	City of South Jacksonville
A G	Wilmington, N. C.	City of Wilmington

Great Lakes

R G	Bristol, Pa.	Keystone Aircraft Corp.
R G	Chicago, Ill.	South Park Commission
R S G	Cleveland, O.	Thompson Aeronautical Corp.
R S G	Detroit, Mich.	Thompson Aeronautical Corp.
A G	Erie, Pa.	Erie Yacht Club
A G	Essington, Pa.	Frank Mills
A R S G	Lake George, N. Y.	Curtiss-Wright Flying Service
R G	Milwaukee, Wisc.	City of Milwaukee
R G	Muskegon, Mich.	City of Muskegon
A R S H G	Ottawa, Can.	Department of National Defense
A R G	Sault Ste. Marie, Can.	Ontario Provincial Air Force

Gulf Coast

A G	Biloxi, Miss.	
A R S G	New Orleans, La.	Arthur Cambas

Pacific Coast

R	Bremerton, Wash.	Gorst Air Transport
A S G	San Diego, Calif.	City of San Diego
R G	San Francisco, Calif.	Air Ferries, Ltd.
A R S H G	Seattle, Wash. (Lake Union)	Alaska Washington Airways
A R S H G	Seattle, Wash. (Lake Union)	Barnes & Gorst Co.
A R S H G	Seattle, Wash. (Lake Washington)	Northwest Air Service, Inc.
R G	Seattle, Wash. (Galbraith Pier)	Gorst Air Transport

(*)

A	Anchorage
R	Ramp
S	Service (Repair)
H	Hangar
G	Gas and Oil

SEAPLANE ANCHORAGES

List Supplied by Hydrographic Office, Navy Department, Washington, D. C.

Atlantic Coast

CLASS I. ANCHORAGES WITH RAMP, ETC.

Maine

Bar Harbor

Massachusetts

Gloucester (Coast Guard Air Station)
South Dartmouth (Round Hill Airport)
Squantum (Naval Reserve Air Station)

Rhode Island

Newport (Gould Island)

Connecticut

Bridgeport

New York

Port Washington, Long Island
Amityville, Long Island
North Beach, Long Island
New Dorp, Staten Island

Pennsylvania

Bristol
Essington
Philadelphia (Naval Aircraft Factory)

New Jersey

Cape May

Virginia

Hampton (Langley Field)
Quantico
Hampton Roads (Naval Air Station)
Dahlgren

District of Columbia

Washington (Naval Air Station, Anacostia)

Florida

Miami
Key West

CLASS II. ANCHORAGES WITH ORDINARY HARBOR FACILITIES

Maine

Eastport
Portland
Rockland

New Hampshire

Portsmouth

Massachusetts

Newburyport
Boston
West Barnstable
New Bedford
Nantucket
Vineyard Haven
Salem
Provincetown
Onset
Fall River
Edgartown

Rhode Island

Providence

Connecticut

Stonington
New Haven
New London

New York

Port Jefferson, Long Island
Jamaica, Long Island

New Jersey

Keyport

Maryland

Aberdeen
Annapolis
Baltimore

North Carolina

Elizabeth
Morehead City
Wilmington
Edenton
New Bern
Southport

South Carolina

Georgetown
Beaufort
Charleston

Georgia

Savannah
Brunswick

Florida

Fernandina
St. Augustine
Titusville
West Palm Beach
Jacksonville
Daytona Beach
Fort Pierce

Gulf Coast

CLASS I. ANCHORAGES WITH RAMP, ETC.

Florida

St. Petersburg
Pensacola (Naval Air Station)

CLASS II. ANCHORAGES WITH ORDINARY HARBOR FACILITIES

Florida

Marco
Punta Gorda
Tampa
Carrabelle
Port St. Joe
New Valparaiso
Fort Myers
Sarasota
Cedar Keys
Apalachicola
Panama City
Camp Walton

Alabama

Mobile

Mississippi

Pascagoula
Gulfport
Biloxi
Bay St. Louis

Louisiana

New Orleans

Texas

Port Arthur
Houston
Corpus Christi
Galveston
Rockport
Point Isabel
Weeks

Pacific Coast

CLASS I. ANCHORAGES WITH RAMP, ETC.

California

San Diego (Naval Air Station)
Santa Monica

Washington

Seattle (Sand Point, Naval Reserve Air Station)
Port Townsend
Seattle

CLASS II. ANCHORAGES WITH ORDINARY HARBOR FACILITIES

California

Los Angeles
Port San Luis
Santa Cruz
Oakland
Eureka
Santa Catalina Island
Monterey
San Francisco
Sausalito
Crescent City

Oregon

Port Oxford
Marshfield
Yaquina River
Empire
Winchester Bay
Astoria

Washington

Grays Harbor
Port Angeles
Everett
Anacortes
Neah Bay
Bremerton
Dungeness
Bellingham

ALASKAN FLYING FIELDS

List Supplied by Aeronautics Branch, Department of Commerce

Anchorage, Anchorage Aviation Field, municipal
Fairbanks, Weeks Field, commercial
Fort Yukon, Fort Yukon Aviation Field, commercial
American Creek, American Creek Field, auxiliary
Anchorage, Anchorage 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 Field, auxiliary
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
Kantiahna District, Kantiahna Field, auxiliary
Kasilof, Kasilof Field, auxiliary
Kenai, Kenai Field, auxiliary
Kiwalik, Kiwalik Field, auxiliary
Kobuk, Kobuk Field, auxiliary (formerly Shumgnak)
Kotzebue, Kotzebue Field, auxiliary
Koyuk, Koyuk Field, auxiliary
Lake Minchumina, Lake Minchumina Field, auxiliary
Lake Spenard, Lake Spenard Field, auxiliary
Livengood, Livengood Field, auxiliary
Lost River, Lost River Field, auxiliary
Lower Tonsina, Lower Tonsina Field, auxiliary
McCarthy, McCarthy Field, auxiliary
McGrath, McGrath Field, auxiliary
Medfra, Medfra Field, auxiliary
Moose Creek, Moose Creek Field, auxiliary
Moses, Moses Field, auxiliary
Nabesna, Nabesna Field, auxiliary
Nenana, Nenana Field, auxiliary
Ninilchik, Ninilchik Field, auxiliary
Nome, Nome Field, auxiliary
Nulato, Nulato Field, auxiliary
Palmer Creek, Palmer Creek Field, auxiliary
Pilgrim Springs, Pilgrim Hot Springs Field, auxiliary
Ruby, Ruby Field, auxiliary
Seward, Seward Field, auxiliary
Solomon, Solomon Field, auxiliary
Susitna Station, Susitna Station Field, auxiliary
Takotna, Takotna Field, auxiliary
Tanana, Tanana Field, auxiliary
Telida, Telida Field, auxiliary
Teller, Teller Field, auxiliary
Unalakleet, Unalakleet Field, auxiliary
Upper Tonsina, Upper Tonsina Field, auxiliary
Valdez, Valdez Field, auxiliary
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
Wiseman, Wiseman Field, auxiliary

FLYING IN THE UNITED STATES

Calendar Year 1930

Air Transport Summary

	1926	1927	1928	1929	1930
Operators	19	24	32	27	35
Planes in service	95	144	294	619	685
Miles scheduled	.....	.....	.....	.....	30,703,119
Miles flown	4,608,880a	5,242,839b	10,472,024	20,242,891	28,833,967
Passengers	5,782	12,594	52,934	165,263	385,910
Express, lbs.	1,733,092c	2,307,579c	2,148,059c	197,538f	286,798f
Mail, lbs.	433,649	1,222,843d	3,632,059e	7,096,930	8,005,201

a—Includes 2,583,056 miles flown on government operated mail routes.
b—Includes 1,320,535 miles flown on government operated mail routes.
c—Includes miscellaneous 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 only express poundage carried on regular schedules.

Aerial Service Summary

	1926	1927	1928	1929	1930
Operators reporting	420	357	168	800*	600*
Planes in service	969	768	489	7,408	5,324
Miles flown	7,656,492	8,341,517	8,411,889	104,336,560	95,959,645
Passengers carried	380,201	476,724	526,203	2,995,530	2,621,769

* Statistical estimates based on typical reports.

Private Flying Summary

(Corporate and Personal)

Estimated

	1928	1929	1930
Miles flown	12,000,000	25,000,000	40,000,000

Government Operations

	1926	1927	1928	1929	1930
U. S. Army	16,764,540	14,871,870	19,546,450a	27,405,790a	32,500,000
U. S. Navy	8,352,800	10,452,720	14,135,490b	19,513,095b	26,478,700 (b)
U. S. Coast Guard	16,300	28,960	83,083	48,254	67,655
U. S. Dept. of Commerce	.....	.....	900,000	1,000,000	1,427,000

a—Includes National Guard.
b—Includes Marine Corps and Naval Reserve.

General Summary

	1929	1930
Civilian and Commercial	149,579,451 miles	164,793,612 miles
Government	47,967,139 miles	60,473,355 miles

PRODUCTION AND SALES OF SALABLE AIRCRAFT IN THE UNITED STATES
COMMERCIAL AND MILITARY

Type	Places	Production—1928		Production—1929		Production—1930		Sales—1930	
		Number	Value	Number	Value	Number	Value	Number	Value
Biplanes									
Open Cockpit	1	.....	.....	.....	.....	8	$58,300.00	7	$55,370.00
	2	.....	.....	.....	.....	421	1,103,641.00	412	1,102,592.00
	3	.....	.....	.....	.....	646	1,926,943.00	790	2,222,353.00
	Up	.....	.....	.....	.....	8	77,426.00	8	81,098.00
Total		2348	.....	3071	$10,415,599.00	1083	$3,166,310.00	1217	$3,461,413.00
Cabin Single Engine	All	69	.....	47	598,040.00	20	285,880.00	19	267,980.00
Cabin Multi-Engine	All	5	.....	8	505,000.00	7	505,581.00	7	505,581.00
Total Biplanes		2422	$7,541,615.00	3126	$11,518,639.00	1110	$3,957,771.00	1243	$4,234,974.00
Monoplanes									
Open Cockpit	1	.....	.....	.....	.....	58	$104,618.00	49	$101,658.00
	2	.....	.....	.....	.....	166	524,073.00	150	425,022.00
	3	.....	.....	.....	.....	22	73,680.00	22	73,680.00
	Up	.....	.....	.....	.....	4	29,619.00	3	15,990.00
Total		171	.....	320	$871,890.00	250	$731,990.00	224	$616,350.00
Cabin Single Engine	1	.....	.....	.....	.....	4	$40,025.00	3	$41,550.00
	2	.....	.....	.....	.....	29	115,870.00	25	94,810.00
	3	.....	.....	.....	.....	34	112,261.00	263	593,385.00
	4	.....	.....	.....	.....	276	1,135,211.00	293	1,174,525.00
	5	.....	.....	.....	.....	9	86,729.00	12	104,364.00
	6	.....	.....	.....	.....	109	1,243,860.00	118	1,328,607.00
	7	.....	.....	.....	.....	31	458,732.00	39	544,748.00
	8 and Up	.....	.....	.....	.....	13	224,855.00	10	174,840.00
Total		850	.....	1562	$10,557,635.00	505	$3,417,543.00	763	$4,056,829.00
Cabin Multi-Engine	All	58	.....	178	6,122,742.00	38	1,389,984.00	35	1,027,155.00
Total Monoplanes		1079	$8,738,683.00	2060	$17,552,267.00	793	$5,539,517.00	1022	$5,700,334.00
Seaplanes	All	11	.....	32	834,950.00	17	954,386.00	23	1,091,539.00
Amphibians	All	30	.....	139	3,718,900.00	17	294,369.00	36	639,362.00
Total		41	$914,000.00	171	$4,553,850.00	34	$1,248,755.00	59	$1,730,901.00
Commercial Total		3542	$17,194,298.00	5357	$33,624,756.00	1937	$10,746,043.00	2324	$11,666,209.00
Military Total		1219	.....	677	10,832,544.00	747	10,723,720.00	801	11,272,343.00
Grand Total		4761	.....	6034	$44,457,300.00	2684	$21,469,763.00	3125	$22,938,552.00

PRODUCTION OF AIRPLANE ENGINES IN THE UNITED STATES

COMMERCIAL AND MILITARY

H.P.	1929 Production		1930 Production		1930 Sales	
	No.	Value	No.	Value	No.	Value
Under 75	479	$367,950.00	215	$158,213.00	188	$125,126.00
76–125	1309	2,013,750.00	678	1,277,884.00	649	1,201,219.00
126–175	1208	3,158,000.00	68	165,248.00	84	210,093.00
176–225	565	1,638,500.00	280	604,600.00	289	642,700.00
226–300	552	1,990,000.00	260	1,094,895.00	322	1,387,571.00
301–up	1404	8,727,100.00	424	2,954,653.00	429	2,744,042.00
Commercial Totals..	5517	$17,895,300.00	1925	$6,255,493.00	1961	$6,310,751.00
Military Totals	1861	8,600,530.15	1841	10,823,423.00	1885	10,977,468.00
Commercial and Military Totals...	7378	$26,495,830.15	3766	$17,078,916.00	3846	$17,288,219.00

EXPORTS OF AIRCRAFT, ENGINES AND PARTS FROM THE UNITED STATES IN 1930

Compiled by the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C.

Airplanes, Seaplanes and Amphibians

Country of Destination	1928 No.	1928 Value	1929 No.	1929 Value	1930 First 11 Months No.	1930 First 11 Months Value
China	9	$102,175	20	$402,741	37	$901,272
Peru	24	199,810	7	115,652	43	756,654
Canada	62	685,712	80	799,353	57	666,778
Mexico	20	190,133	83	1,574,501	45	445,626
Brazil	5	66,340	11	184,951	18	445,098
Japan	3	63,000	17	291,767	14	301,687
Chile	...	.....	40	721,750	15	292,956
Argentina	5	55,052	21	365,188	20	233,871
Java and Madura	...	.....	...	.....	7	140,000
United Kingdom	3	22,263	3	77,080	6	122,552
Panama	1	23,844	8	162,353	10	73,042
Hong Kong	...	.....	11	104,600	8	51,564
Cuba	4	54,887	3	33,670	5	36,858
Colombia	1	19,250	1	60,000	2	33,350
Other Netherland—East Indies	...	.....	...	.....	1	20,000
Italy	2	84,950	5	99,219	1	10,800
Union South Africa	...	.....	...	.....	2	6,097
Bermudas	1	2,850	...	.....	1	6,000
Denmark	...	.....	...	.....	1	4,513
Guatemala	3	36,400	4	10,000	2	4,032
Spain	...	.....	...	.....	1	2,790
Venezuela	...	.....	...	.....	1	1,220
Iceland	...	.....	...	.....	1	1,040
Equador	...	.....	5	187,237	...	.....
Philippine Islands	2	34,500	5	88,622	...	.....
Salvador	...	.....	3	27,840	...	.....
Honduras	1	9,000	3	22,761	...	.....
Netherlands	...	.....	3	16,000	...	.....
Norway	...	.....	2	8,053	...	.....
French Oceana	1	6,000	1	7,000	...	.....
New Zealand	...	.....	1	3,954	...	.....
Australia	7	50,872	1	3,600	...	.....
Dominican Republic	...	.....	1	2,525	...	.....
Uruguay	...	.....	1	1,800	...	.....
Germany	1	5,500	...	.....	...	.....
Belgium	1	4,183	...	.....	...	.....
Siam	4	38,400	...	.....	...	.....
Switzerland	2	4,532	...	.....	...	.....
Total	162	$1,759,653	340	$5,372,217	298	$4,557,791

NOTE.—Late compilations of December exports, while not complete as this book goes to press, indicate that American exports for 1930 were within five per cent. of the total for the peak year 1929.

Aircraft Engines

Country of Destination	Full Year, 1928		First 11 Months, 1929		First 11 Months, 1930	
	No.	Value	No.	Value	No.	Value
Germany	23	$132,510	49	$321,471	30	$212,747
Soviet Russia	...	.....	2	19,643	46	185,188
Peru	2	8,002	7	43,242	34	180,007
Panama	1	150	31	165,869	34	138,984
Netherlands	14	62,712	14	46,366	27	121,683
Java and Madura	...	.....	...	.....	14	105,961
Mexico	10	24,773	39	109,605	22	77,383
Chile	...	.....	6	30,577	14	71,900
Canada	48	177,946	26	105,418	50	69,819
China	5	38,900	9	39,000	11	65,090
Japan	10	41,281	24	75,098	14	64,557
Honduras	...	.....	2	4,949	15	59,255
Brazil	8	6,200	3	10,163	4	27,122
Argentina	7	23,315	12	32,132	5	26,030
Italy	4	8,338	3	5,660	6	23,292
Australia	2	1,525	2	1,529	5	22,734
Trinidad and Tobago	...	.....	1	766	3	22,444
Cuba	3	250	1	4,827	7	21,153
Belgium	1	10,000	1	12,000	5	20,275
Rumania	...	.....	...	.....	6	19,083
Sweden	2	19,911	3	1,810	1	15,865
West Indies	...	.....	...	.....	2	9,000
Guatemala	...	.....	4	7,150	4	7,758
Bolivia	...	.....	...	.....	1	7,650
Finland	...	.....	...	.....	1	7,496
Spain	1	3,111	...	.....	2	7,252
Venezuela	...	.....	...	.....	1	7,232
Colombia	...	.....	3	20,021	1	7,200
Union of South Africa	...	.....	...	.....	1	6,890
United Kingdom	29	75,780	3	12,100	1	4,462
France	3	6,223	9	30,061	1	4,025
Hong Kong	4	980	...	.....	1	4,000
Philippine Islands	...	.....	5	52,271	1	200
Poland and Danzig	1	3,574	35	121,015	...	.....
Switzerland	...	.....	1	19,375	...	.....
New Zealand	...	.....	2	8,266	...	.....
Nicaragua	...	.....	1	4,000	...	.....
Dutch Guiana	...	.....	1	4,000	...	.....
Salvador	...	.....	1	913	...	.....
Norway	...	.....	1	200	...	.....
French Oceana	...	.....	1	150	...	.....
Denmark	1	19,345	...	.....	...	.....
Total	179	$664,826	302	$1,309,647	370	$1,623,737

Aircraft Parts (Except Tires)

Country of Destination	Full Year, 1928	First 11 Months, 1929	First 11 Months, 1930
Canada	$540,215	$818,283	$453,906
Soviet Russia in Europe	155,313	187,097	337,987
Chile	17,443	37,477	261,431
Argentina	15,499	41,583	181,740
Peru	15,693	113,948	143,214
Brazil	40,686	25,136	104,662
China	86,888	134,405	131,173
Mexico	21,162	108,637	79,455

Country of Destination	Full Year, 1928	First 11 Months, 1929	First 11 Months, 1930
Japan	31,797	67,535	63,752
Cuba	24,184	39,496	46,880
Panama	22,705	37,424	45,380
Germany	70,548	87,544	43,095
Netherlands	20,483	30,874	36,269
Java and Madura	3,250	67	27,135
Surinam	.....	.....	21,286
Australia	2,741	13,462	19,515
Trinidad	.....	396	18,618
United Kingdom	58,166	58,461	17,121
Colombia	10,482	23,972	14,284
Philippine Islands	53,630	20,110	12,027
Belgium	.....	22,660	11,603
France	1,303	20,036	10,688
Jugoslavia	.....	.....	9,731
Italy	6,546	20,529	9,533
Spain	15,940	.....	7,490
Poland and Danzig	4,575	24,340	6,887
Switzerland	950	985	6,622
Other French Africa	.....	.....	6,037
Salvadore	.....	1,913	4,243
Nicaragua	990	2,865	4,241
Bolivia	.....	567	4,222
Union of South Africa	.....	.....	3,831
Siam	1,101	30,023	3,321
Sweden	4,455	1,946	3,126
Haiti	.....	3,152	2,678
Venezuela	.....	17	2,408
Czechoslovakia	3,890	1,096	2,062
Uruguay	.....	.....	2,042
Persia	.....	.....	1,800
Virgin Islands of United States	.....	1,603	1,536
Guatemala	1,517	50	1,432
Costa Rica	.....	.....	1,175
Dominican Republic	.....	231	1,101
British Honduras	.....	.....	1,057
Honduras	2,253	1,331	894
Other British West Indies	.....	1,625	872
Hong Kong	2,182	5,500	619
Austria	.....	.....	610
British India	.....	31	534
Syria	.....	.....	430
Newfoundland and Laborador	.....	.....	294
Denmark	.....	2,742	175
British East Africa	.....	.....	98
New Zealand	.....	1,363	85
Other Portugese Africa	.....	.....	25
Lithuania	.....	.....	25
Hungary	.....	.....	25
British Malaya	.....	.....	19
Bermuda	.....	4,575	.....
Finland	.....	4,050	.....
Norway	1,925	1,500	.....
Equador	.....	1,030	.....
French Oceana	.....	860	.....
Dutch Guiana	.....	655	.....
French West Indies	.....	300	.....
Other Countries	1,732	4,637	.....
Total	$1,240,244	$2,008,119	$2,172,501

COMPARATIVE TABULATIONS OF ACCIDENTS—CIVIL AERONAUTICS FOR THE YEARS, 1927, 1928, 1929 AND THE FIRST SIX MONTHS OF 1930

(Compiled by Aeronautics Branch, Department of Commerce)

Mileage Flown Per Accident

	January–December, 1927	*January–June, 1928**	*July–December, 1928*	*January–June, 1929**	*July–December, 1929*	*January–June, 1930**
Miles flown in scheduled transport operation	5,870,489	4,484,612	6,188,838	9,201,338	15,940,161	16,902,728
Miles flown in miscellaneous operations, including student instruction and experimental flying	†30,000,000	12,000,000	48,000,000	47,000,000	63,000,000	51,767,200
Total	35,870,489	16,484,612	54,188,838	56,201,338	78,940,161	68,669,928
Accidents, all services	‡278	430	692	774	924	930
Miles flown per accident, all services	‡129,031	38,337	78,308	72,612	85,433	73,839
Accidents, scheduled transport operations	‡25	35	51	61	76	44
Miles flown per accident, scheduled transport operations	‡234,820	128,132	121,350	150,842	209,739	384,152
Accidents, miscellaneous operations	‡253	395	651	713	848	886
Miles flown per accident, miscellaneous operations	‡118,577	30,380	74,883	65,919	74,292	58,427
Fatal accidents, all services§	‡99	97	130	127	183	150
Miles flown per fatal accident, all services	‡362,328	169,944	416,837	442,530	431,367	457,800
Fatal accidents, scheduled transport operations§	§4	5	7	9	15	6
Miles flown per fatal accident, scheduled transport operations	‡1,467,622	896,922	884,120	1,022,371	1,062,677	2,817,121
Fatal accidents, miscellaneous operations§	‡95	92	123	118	168	144
Miles flown per fatal accident, miscellaneous operations	‡315,789	130,435	390,244	398,305	375,000	359,494
Pilot fatalities, all services	‡61	69	92	87	140	123
Miles flown per pilot fatality, all services	‡588,041	238,907	589,009	645,992	563,858	558,292
Pilot fatalities, scheduled transport operations	‡4	4	5	9	14	5
Miles flown per pilot fatality, scheduled transport operations	‡1,467,622	1,121,153	1,237,768	1,022,371	1,138,583	3,380,545
Pilot fatalities, miscellaneous operations	‡57	65	87	78	126	118
Miles flown per pilot fatality, miscellaneous operations	‡526,316	184,615	551,724	602,564	500,000	438,705

* 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.

†The figure of 30,000,000 miles listed under miscellaneous operations for 1927 was estimated from reports received on flying operations for 1928 as no operations report was made for 1927.

‡The 1927 figures should not be used for comparative purposes, as the accident reports for that period apparently were incomplete due to the fact that the inspection service was in the formative stage with a shortage of field personnel to carry on the work. For the same reason there were doubtless some unreported accidents in 1928.

§A fatal aircraft accident is one in which 1 or more persons (passengers, pilot, or crew) were killed or fatally injured.

Causes of Accidents

Causes	Percentages					
	January–December, 1927	*January–June, 1928*	*July–December, 1928*	*January–June, 1929**	*July–December, 1929**	*January–June, 1930**
PERSONNEL:						
Pilot:						
Error of judgment	6.91	8.45	12.64	12.79	11.71	11.35
Poor technique	39.50	22.95	29.80	32.49	28.30	35.85
Disobedience of orders	2.65	4.95	2.65	1.92	3.81	1.98
Carelessness or negligence	2.63	6.32	10.12	9.57	6.59	6.08
Miscellaneous	.27	.62	.58	.54	2.09	.57
Total pilot errors	51.96	43.29	55.79	57.31	52.50	55.83
Other personnel:						
Supervisory	.70	.35	.50	.25	1.20	.47
Miscellaneous	.20	3.10	1.68	1.48	2.05	.84
Total errors of personnel	52.86	46.74	57.97	59.04	55.75	57.14
MATÉRIEL:						
Power Plant:						
Fuel system	5.18	5.12	3.78	6.15	5.36	2.83
Cooling system	.18	.57	.74	.84	.97	.53
Ignition system	2.14	4.00	2.48	2.75	1.91	1.31
Lubrication system	.40	.13	.30	.35	.10	.13
Engine structure	.74	1.29	1.75	1.68	2.40	8.37
Propellers and accessories	.54	.44	.56	.78	.63	.23
Engine-control system	0	0	.58	.06	.43	.29
Miscellaneous	.27	.45	0	.26	.16	.40
Undetermined	5.05	4.59	5.55	5.21	6.99	.93
Total power-plant failures	14.50	16.59	15.74	18.08	18.95	15.02
Structural:						
Flight-control system	.18	.85	.29	.26	.96	.52
Movable surfaces	1.03	.35	.07	.13	.51	0
Stabilizing surfaces	0	0	0	.13	.08	.22
Wings, struts, and bracing	3.05	1.09	1.15	1.23	1.36	1.10
Undercarriage	1.87	1.64	1.87	2.94	3.58	2.59
Wheels, tires, and brakes	.55	.19	.85	1.10	1.89	1.37
Pontoons or boats	.35	.03	0	0	0	.05
Fuselage, engine mount, and fittings	.70	.75	.07	.33	.46	.23
Tail-skid assembly	0	.19	.14	0	0	.16
Miscellaneous	0	.23	0	.26	.46	.22
Undetermined	.18	0	.03	0	.11	.27
Total structural failures	7.91	5.32	4.47	6.38	9.41	6.73
Handling qualities	.95	.44	.25	2.36	1.80	2.05
Instruments	0	0	0	.06	.05	0
Total airplane failures	8.86	5.76	4.72	8.80	11.26	8.78
MISCELLANEOUS:						
Weather	7.40	10.23	4.67	5.02	4.12	6.52
Darkness	1.62	1.28	.50	.51	.61	.09
Airport and terrain	5.50	8.72	3.70	2.78	2.12	9.71
Other	3.68	3.90	3.25	1.04	1.62	1.33
Total miscellaneous causes	18.20	24.13	12.12	9.35	8.47	17.65
Undetermined and doubtful	5.58	6.78	9.45	4.73	5.57	1.41

*Figures prior to 1929 include some minor mishaps.

Injuries

January to June,

Kind of Flying	Per Cent. of Accidents	Pilots					Copilots or Students				
		Fatal	Severe	Minor	No Injury	Total	Fatal	Severe	Minor	No Injury	Total
Schedule	4.73	5	1	8	31	45	1	0	2	3	6
Student instruction	22.04	21	13	22	154	210	7	7	2	40	56
Experimental	1.94	7	0	3	8	18	0	0	0	0	0
Commercial	26.13	34	16	39	160	249	1	2	1	6	10
Pleasure	45.16	56	38	64	263	421	3	3	1	6	13
Total	100.00	123	68	136	616	943	12	12	6	55	85

AIRCRAFT APPROPRIATIONS, UNITED STATES

1922–1932

			Total	Increase or Decrease	Net
1922–23	Army	$12,895,000		−$6,305,000	
	Navy	14,683,590		+1,270,159	
	Air Mail	1,900,000		+650,000	
	N.A.C.A.	210,000	$29,688,590	+10,000	−$4,347,841
1923–24	Army	12,426,000		−469,000	
	Navy	14,647,174		−36,416	
	Air Mail	1,500,000		−400,000	
	N.A.C.A.	283,000	28,856,174	+73,000	−832,416
1924–25	Army	14,113,043.80		+1,687,043.80	
	Navy	15,150,000		+502,826	
	Air Mail	2,750,000		+1,250,000	
	N.A.C.A.	470,000	32,483,043.80	+187,000	+3,626,869.80
1925–26	Army	14,700,000*		+586,956.20	
	Navy	14,790,000‡		−360,000	
	Air Mail	2,810,000††		−150,000	
	N.A.C.A.	534,000	32,624,000	+64,000	+350,956.20
1926–27	Army	15,050,000		+350,000	
	Navy	18,505,288		+3,715,288	
	Air Mail	2,650,000††		−160,000	
	N.A.C.A.	513,000	36,718,288**	−21,000	+3,884,288
1927–28	Army	20,396,300		+5,346,300	
	Navy	20,100,000		+1,594,712	
	Air Mail	4,150,000		+1,500,000	
	N.A.C.A.	513,000			
	Commerce	3,791,500	48,950,800	+3,791,500	+12,232,512
1928–29	Army	24,848,562(1)		+4,452,262	
	Navy	32,189,560(2)		+12,089,560	
	Air Mail	6,430,000		+2,280,000	
	N.A.C.A.	600,000		+87,000	
	Commerce	4,361,850	68,429,972	+570,350	+19,479,172
1929–30	Army	34,690,785		+9,842,223	
	Navy	31,430,000(2)		−759,560	
	Air Mail	13,300,000		+6,870,000	
	N.A.C.A.	1,292,200		+692,200	
	Commerce	6,416,620	87,129,605	+2,054,770	+18,699,633
1930–31	Army	35,823,473		+1,132,688	
	Navy	32,033,211		+603,211	
	Air Mail(5)	21,600,000		+8,300,000	
	N.A.C.A. (3)	1,321,000		+29,000	
	Commerce (4)	9,207,430	99,985,114	+2,790,810	+12,855,498
1931–32‡‡	Army	37,461,285		+1,637,812	
	Navy	30,850,000		−1,183,211	
	Air Mail(8)	27,000,000		+5,400,000	
	N.A.C.A.(6)	1,053,790		−267,210	
	Commerce (7)	10,375,000	106,740,075	+1,167,570	+6,754,961

(1) And contract authorization of $5,000,000. (2) And contract authorization of $10,000,000.
(3) Includes $15,000 for printing.
(4) Includes $7,944,000 for new and improved air navigation facilities.
(5) Includes $6,600,000 for Foreign Air Mail. (6) Includes $23,000 for printing.
(7) Includes $9,000,000 for new and improved air navigation facilities.
(8) Includes $7,000,000 for Foreign Air Mail.
* Plus $2,150,000 "contract authorizations" for additional purchases of aircraft.
‡ Plus $4,100,000 "contract authorizations" for additional purchases of aircraft.
** Plus $6,250,000 "contract authorizations" for additional purchases of aircraft.
†† For the contract Air Mail Service $500,000 was appropriated for 1926 and $2,000,000 was allowed for 1927. + Shows amount of increase.
− Shows amount of decrease. ‡‡ Proposed expenditures.

Classified

1930, Inclusive

Kind of Flying	Per Cent. of Accidents	Passengers					Aircraft crew				
		Fatal	Severe	Minor	No Injury	Total	Fatal	Severe	Minor	No Injury	Total
Schedule	4.73	22	1	9	73	105	0	0	1	0	1
Student instruction	22.04	2	1	0	2	5	0	0	0	0	0
Experimental	1.94	2	1	0	2	5	0	0	0	2	2
Commercial	26.13	42	13	33	187	275	1	0	0	6	7
Pleasure	45.16	63	31	47	188	329	1	0	0	2	3
Total	100.00	131	47	89	452	719	2	0	1	10	13

AIRPLANE IDENTIFICATIONS

October 15, 1930

State	Total No.	No Date	Mfd. Prior 1926	Mfd. 1926	Mfd. 1927	Mfd. 1928	Mfd. 1929	Mfd. 1930	By Manufacturers	By Schools	By Aerial Service	By Others
Alabama	18	4	3	1	3	3	4	.....	.....	.....	12	6
Arizona	9	.....	2	1	1	3	1	1	.....	.....	4	5
Arkansas	15	4	3	1	2	3	.....	2	.....	.....	5	10
California	187	55	48	5	18	19	19	23	13	6	58	110
Colorado	19	5	1	1	2	1	3	6	4	.....	7	8
Connecticut	23	7	3	1	1	5	4	2	4	.....	4	15
Delaware	10	.....	.....	.....	1	.....	1	8	8	.....	.....	2
Dist. of Col.	5	.....	.....	.....	1	4	.....	.....	.....	.....	4	1
Florida	40	12	4	1	7	7	6	3	1	.....	15	24
Georgia	32	11	4	2	6	3	4	2	.....	.....	8	24
Idaho	6	1	1	.....	1	2	1	.....	.....	.....	1	5
Illinois	197	80	16	6	16	28	26	25	23	.....	51	123
Indiana	85	34	7	2	9	17	6	10	8	.....	28	49
Iowa	44	19	2	2	4	9	5	3	6	.....	9	29
Kansas	159	46	6	1	15	21	42	28	48	2	32	77
Kentucky	18	3	2	2	.....	5	3	3	.....	.....	3	15
Louisiana	17	5	1	.....	2	5	2	2	.....	.....	6	11
Maine	13	6	1	.....	.....	3	1	2	.....	.....	7	6
Maryland	20	6	.....	1	2	2	3	6	2	1	7	10
Mass.	37	13	2	1	1	9	5	6	.....	.....	14	23
Michigan	120	43	14	6	15	11	20	11	20	.....	37	63
Minnesota	61	26	2	1	5	12	12	3	2	1	17	41
Mississippi	6	3	.....	.....	1	1	1	.....	.....	.....	4	2
Missouri	113	51	8	4	10	12	13	15	13	10	30	60
Montana	30	8	2	2	5	10	1	2	.....	.....	14	16
Nebraska	99	13	1	1	5	11	58	10	68	2	6	23
Nevada	1	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1
N. Hampshire	4	.....	2	.....	.....	1	1	.....	.....	.....	2	2
New Jersey	98	30	10	5	7	14	16	16	14	.....	27	57
New Mexico	3	2	.....	.....	.....	1	.....	.....	.....	.....	.....	3
New York	182	52	23	9	16	25	35	22	20	1	56	105
N. Carolina	37	13	2	1	5	10	2	4	.....	.....	13	24
N. Dakota	32	17	4	2	1	3	2	3	.....	1	10	21
Ohio	164	53	14	4	17	19	19	38	37	.....	33	94
Oklahoma	99	42	6	2	13	13	13	10	5	.....	29	65
Oregon	51	22	.....	.....	5	11	6	7	.....	4	19	28
Penn.	76	27	8	2	5	5	10	19	15	1	18	42
Rhode Island	7	3	1	.....	.....	.....	1	2	.....	.....	4	3
S. Carolina	25	11	.....	1	2	2	5	4	.....	.....	12	13
S. Dakota	16	3	3	.....	2	8	.....	.....	.....	.....	6	10
Tennessee	25	8	2	.....	3	6	2	4	.....	.....	14	11
Texas	90	42	11	.....	7	14	9	7	.....	3	38	49
Utah	7	2	2	.....	.....	1	2	.....	.....	.....	2	5
Vermont	2	.....	1	.....	.....	1	.....	.....	.....	.....	1	1
Virginia	19	8	.....	2	.....	4	2	3	3	.....	6	10
Washington	34	10	4	3	6	7	2	2	.....	.....	16	18
West Virginia	10	5	3	.....	1	.....	1	.....	.....	.....	5	5
Wisconsin	69	26	9	2	8	5	11	8	9	.....	23	34
Wyoming	9	.....	.....	.....	2	5	1	1	.....	.....	2	7
Alaska, etc.	12	6	2	1	1	.....	1	1	.....	.....	6	6
Total	2455	837	240	76	234	362	382	324	323	32	725	1375

AIRPLANE LICENSES AND IDENTIFICATIONS

October 15, 1930

State	Total Number	No Date of Mfg.	Mfd. Prior 1926	Mfd. 1926	Mfd. 1927	Mfd. 1928	Mfd. 1929	Mfd. 1930	By Manufacturers	By Transport	By Schools	By Aerial Service	By Others
Ala.	42	4	3	2	5	12	11	5	.....	3	7	14	18
Ariz.	35	.....	3	1	2	9	15	5	.....	5	.....	10	20
Ark.	65	4	3	1	7	19	15	16	10	.....	.....	15	40
Calif.	1,188	55	56	18	112	326	463	158	98	104	38	286	662
Colo.	76	5	1	1	5	15	30	19	9	7	.....	27	33
Conn.	151	7	3	1	2	31	71	36	41	3	2	43	02
Del.	45	.....	.....	1	3	5	20	16	25	.....	.....	7	13
D. C.	73	.....	2	1	7	21	21	21	.....	11	.....	11	51
Fla.	129	12	5	5	14	33	40	20	2	9	.....	44	74
Ga.	76	11	4	2	9	10	26	14	2	4	.....	29	41
Idaho.	21	1	1	2	3	6	4	4	.....	3	.....	7	11
Ill.	731	80	20	21	42	181	268	119	50	68	31	185	397
Ind.	244	34	8	2	20	65	83	32	11	16	5	89	123
Iowa.	165	19	2	3	13	44	54	30	8	.....	.....	52	105
Kans.	371	46	8	1	28	54	148	86	124	11	7	74	155
Ky.	65	3	2	3	5	21	21	10	.....	4	.....	24	37
La.	100	5	11	.....	4	23	39	18	.....	44	.....	15	41
Me.	40	6	1	1	.....	11	17	4	.....	1	.....	20	19
Md.	88	6	1	1	5	11	47	17	18	.....	4	24	42
Mass.	242	13	4	4	10	59	100	52	26	4	1	99	112
Mich.	512	43	14	12	41	108	185	109	108	11	6	137	250
Minn.	188	26	4	4	14	59	59	22	3	24	1	41	119
Miss.	29	3	.....	.....	4	7	10	5	.....	.....	.....	12	17
Mo.	438	51	11	6	23	88	187	72	79	65	16	113	165
Mont.	73	8	2	2	7	24	23	7	.....	.....	1	34	38
Neb.	244	13	1	1	10	35	134	50	88	22	9	46	79
Nev.	9	.....	.....	.....	1	4	4	.....	.....	.....	.....	4	5
N. H.	29	.....	3	.....	4	6	12	4	.....	.....	.....	14	15
N. J.	297	30	12	7	19	54	110	65	50	2	3	103	139
N. M.	22	2	.....	.....	1	3	13	3	.....	1	.....	8	13
N. Y.	1,242	52	41	13	55	258	610	213	148	125	21	369	579
N. C.	90	13	2	4	13	28	18	12	.....	.....	.....	36	54
N. D.	75	17	4	2	4	18	19	11	.....	.....	1	25	49
Ohio.	601	53	20	10	41	139	210	128	99	44	4	180	274
Okla.	356	42	7	2	22	60	161	62	49	16	13	94	184
Ore.	130	22	1	1	13	29	45	19	.....	10	13	43	64
Penn.	506	27	11	11	33	126	185	113	64	35	5	136	266
R. I.	38	3	1	.....	1	4	17	12	1	1	.....	21	15
S. C.	39	11	.....	1	5	6	12	4	.....	.....	.....	20	19
S. D.	70	3	3	.....	4	30	23	7	.....	5	.....	24	41
Tenn.	100	8	2	.....	6	16	50	18	.....	.....	.....	64	36
Texas.	408	42	16	3	30	79	191	47	2	18	21	182	185
Utah.	32	2	2	.....	.....	9	16	3	.....	7	1	12	12
Vt.	17	.....	1	.....	.....	8	6	2	.....	.....	.....	7	10
Va.	69	8	1	2	5	21	21	11	3	.....	.....	38	28
Wash.	193	10	4	4	31	63	53	28	15	48	9	54	67
W. Va.	39	5	3	.....	2	7	10	12	.....	.....	.....	18	21
Wis.	247	26	10	7	26	71	65	42	13	.....	1	87	146
Wyo.	58	.....	.....	.....	17	19	16	6	.....	32	.....	11	15
Total, U. S.	10,098	831	314	163	728	2335	3958	1769	1146	763	220	3008	4961
Alaska, etc.	33	6	2	4	1	2	13	5	.....	10	.....	10	13
Grand Total.	10,131	837	316	167	729	2337	3971	1774	1146	773	220	3018	4974

AIRPLANE LICENSES

October 15, 1930

State	Lics.	Mfd. Prior 1926	Mfd. 1926	Mfd. 1927	Mfd. 1928	Mfd. 1929	Mfd. 1930	By Manufacturers	By Transport	By Schools	By Aerial Service	By Others
Ala.	24	.....	1	2	9	7	5	.....	3	7	2	12
Ariz.	26	1	.....	1	6	14	4	.....	5	.....	6	15
Ark.	50	.....	.....	5	16	15	14	10	.....	.....	10	30
Calif.	1001	8	13	94	307	444	135	85	104	32	228	552
Colo.	57	.....	.....	3	14	27	13	5	7	.....	20	25
Conn.	128	.....	.....	1	26	67	34	37	3	2	39	47
Del.	35	.....	1	2	5	19	8	17	.....	.....	7	11
D. C.	68	2	1	6	17	21	21	.....	11	.....	7	50
Fla.	89	1	4	7	26	34	17	1	9	.....	29	50
Ga.	44	.....	.....	3	7	22	12	2	4	.....	21	17
Idaho.	15	.....	2	2	4	3	4	.....	3	.....	6	6
Ill.	534	4	15	26	153	242	94	27	68	31	134	274
Ind.	159	1	.....	11	48	77	22	3	16	5	61	74
Iowa.	121	.....	1	9	35	49	27	2	.....	.....	43	76
Kans.	212	2	.....	13	33	106	58	76	11	5	42	78
Ky.	47	.....	1	5	16	18	7	.....	4	.....	21	22
La.	83	10	.....	2	18	37	16	.....	44	.....	9	30
Me.	27	.....	1	.....	8	16	2	.....	1	.....	13	13
Md.	68	1	.....	3	9	44	11	16	.....	3	17	32
Mass.	205	2	3	9	50	95	46	26	4	1	85	89
Mich.	392	.....	6	26	97	165	98	88	11	6	100	187
Minn.	127	2	3	9	47	47	19	1	24	.....	24	78
Miss.	23	.....	.....	3	6	9	5	.....	.....	.....	8	15
Mo.	325	3	2	13	76	174	57	66	65	6	83	105
Mont.	43	.....	.....	2	14	22	5	.....	.....	1	20	22
Neb.	145	.....	.....	5	24	76	40	20	22	7	40	56
Nev.	8	.....	.....	1	3	4	.....	.....	.....	.....	4	4
N. H.	25	1	.....	4	5	11	4	.....	.....	.....	12	13
N. J.	199	2	2	12	40	94	49	36	2	3	76	82
N. Mex.	19	.....	.....	1	2	13	3	.....	1	.....	8	10
N. Y.	1060	18	4	39	233	575	191	128	125	20	313	474
N. C.	53	.....	3	8	18	16	8	.....	.....	.....	23	30
N. D.	43	.....	.....	3	15	17	8	.....	.....	.....	15	28
Ohio.	437	6	6	24	120	191	90	62	44	4	147	180
Okla.	257	1	.....	9	47	148	52	44	16	13	65	119
Ore.	79	1	1	8	18	39	12	.....	10	9	24	36
Penn.	430	3	9	28	121	175	94	49	35	4	118	224
R. I.	31	.....	.....	1	4	16	10	1	1	.....	17	12
S. C.	14	.....	.....	3	4	7	.....	.....	.....	.....	8	6
S. D.	54	.....	.....	2	22	23	7	.....	5	.....	18	31
Tenn.	75	.....	.....	3	10	48	14	.....	.....	.....	50	25
Texas.	318	5	3	23	65	182	40	2	18	18	144	136
Utah.	25	.....	.....	.....	8	14	3	.....	7	1	10	7
Vt.	15	.....	.....	.....	7	6	2	.....	.....	.....	6	9
Va.	50	1	.....	5	17	19	8	.....	.....	.....	32	18
Wash.	159	.....	1	25	56	51	26	15	48	9	38	49
W. Va.	29	.....	.....	1	7	9	12	.....	.....	.....	13	16
Wis.	178	1	5	18	66	54	34	4	.....	1	64	109
Wyo.	49	.....	.....	15	14	15	5	.....	32	.....	9	8
Alaska.	13	.....	2	.....	1	6	4	.....	6	.....	4	3
H. Islands.	6	.....	.....	.....	.....	6	.....	.....	4	.....	.....	2
Misc.	2	.....	1	.....	1	.....	.....	.....	.....	.....	.....	2
Total.	7676	76	91	495	1975	3589	1450	823	773	188	2293	3599

GLIDER LICENSES AND IDENTIFICATIONS

October 15, 1930

State	Total Number	Mfd. Prior 1928 or no date	Mfd. 1929	Mfd. 1930	By Manufacturers	By Others
Alabama	2	.....	.....	2	2	
Arizona	3	.....	.....	3	.....	3
California	207	11	16	180	42	165
Colorado	95	.....	.....	95	90	5
Connecticut	8	.....	.....	8	.....	8
Delaware	2	.....	.....	2	.....	2
District of Columbia	7	.....	.....	7	.....	7
Florida	6	.....	1	5	.....	6
Georgia	1	.....	.....	1	.....	1
Idaho	5	.....	.....	5	.....	5
Illinois	46	4	2	40	.....	46
Indiana	25	.....	.....	25	.....	25
Iowa	11	1	.....	10	.....	11
Kansas	44	3	2	39	15	29
Louisiana	1	.....	.....	1	.....	1
Maine	1	.....	.....	1	.....	1
Maryland	2	.....	.....	2	.....	2
Massachusetts	17	2	.....	15	.....	17
Michigan	94	12	9	73	44	50
Minnesota	11	.....	1	10	.....	11
Mississippi	1	.....	.....	1	.....	1
Missouri	10	4	.....	6	.....	10
Nebraska	5	.....	.....	5	1	4
Nevada	2	.....	.....	2	.....	2
New Hampshire	3	.....	.....	3	.....	4
New Jersey	28	3	1	24	.....	28
New Mexico	2	.....	.....	2	.....	2
New York	88	4	6	78	38	50
North Carolina	3	.....	.....	3	.....	3
North Dakota	4	.....	.....	4	.....	4
Ohio	79	3	8	68	31	48
Oklahoma	7	.....	.....	7	.....	7
Oregon	8	1	1	6	.....	8
Pennsylvania	26	1	.....	25	.....	26
South Carolina	2	.....	.....	2	.....	2
South Dakota	9	.....	.....	9	.....	9
Tennessee	6	1	.....	5	.....	6
Texas	12	1	.....	11	.....	11
Utah	3	1	1	1	.....	3
Virginia	7	1	.....	6	.....	7
Washington	4	.....	1	3	.....	4
West Virginia	3	.....	1	2	.....	3
Wisconsin	17	1	1	15	.....	17
Wyoming	2	.....	.....	2	.....	2
Total	919	54	51	814	263	656

AIR MAIL SERVICE

POST OFFICE DEPARTMENT

Washington, D. C.

Postmaster General ..... Walter F. Brown
Second Assistant Postmaster General ..... W. Irving Glover
Deputy Second Assistant Postmaster General ..... Chase C. Gove
Superintendent ..... E. B. Wadsworth
Assistant Superintendent ..... J. W. Sutherin

B. F. Myers, Assistant Superintendent ..... Chicago, Ill.
Joseph Menth, Assistant Superintendent ..... New York, N. Y.
A. O. Willoughby, Assistant Superintendent ..... San Francisco, Calif.

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

AIR MAIL OPERATIONS BY ROUTES DURING CALENDAR YEAR 1930

Miles of Service

	Length of Route (Miles)	Scheduled	Actually Flown	Total Weight of Mails Dispatched (Pounds)	Amount Paid to Carrier
1. Boston-New York	200	197,000	178,540	125,225	$221,444.72
2. Chicago-St. Louis	276	403,920	373,869	61,370	207,481.70
3. Chicago-Dallas	1,078	1,497,369	1,367,157	441,433	1,194,699.40
4. Salt Lake City-San Diego	771	968,641	927,893	857,724	1,589,224.41
5. Salt Lake City-Seattle	1,028	1,040,077	970,312	313,529	894,509.91
8. Seattle-San Diego	1,238	836,102	811,119	289,105	717,380.07
9. Chicago-St. Paul	892	1,027,596	985,560	225,157	650,278.10
11. Cleveland-Pittsburgh	140	207,939	190,917	65,067	172,138.31
12. Cheyenne-Pueblo	204	151,338	141,704	89,399	81,105.42
16. Cleveland-Louisville	351	271,874	248,329	79,548	113,333.57
17. New York-Chicago	736	1,429,272	1,269,400	1,693,964	1,379,057.13
18. Chicago-San Francisco	2,030	2,812,176	2,679,852	1,954,965	3,787,411.79
19. New York-Atlanta	803	1,182,274	1,066,496	461,918	1,348,182.26
20. Albany-Cleveland	463	285,743	258,792	64,274	92,517.37
21. Dallas-Galveston	333	234,834	220,676	36,410	107,002.13
22. Dallas-Brownsville	547	388,334	374,392	88,265	256,158.39
23. Atlanta-New Orleans	488	353,142	339,834	109,906	197,772.12
24. Chicago-Cincinnati	274	410,261	359,576	77,210	121,815.58
25. Atlanta-Miami	777	560,351	512,817	188,207	276,610.64
26. Great Falls-Salt Lake City	509	494,380	486,701	63,503	223,597.66
27. Bay City-Chicago	974	661,530	611,170	184,774	287,015.33
28. St. Louis-Omaha	404	592,164	566,460	181,671	142,550.04
29. New Orleans-Houston	319	233,429	232,522	52,461	52,449.47
30. Chicago-Atlanta	810	688,016	624,872	123,986	95,798.42
32. Pasco-Seattle*	449	189,416	176,253	83,028	7,472.57
33. Atlanta-Los Angeles†	2,375	375,180	326,258	44,169	293,212.91
34. New York-Los Angeles†	3,333	456,299	361,293	48,933	140,904.27
Total	21,802	17,948,657	16,662,764	8,005,201	$14,651,123.69

* 32 C.A.M. Consolidated with C.A.M. 5, effective July 1. 1930.
† Operations started October 1930.

Note—Figures are subject to very slight revisions as the result of late corrections sometimes filed by operators.

Contract Air Mail Operators on December 31, 1930

Trip	From	To	Mileage	Rate per Mile
	C. A. M. 1. Colonial Air Transport, Inc.			
12:00 Noon	Boston, Mass.	New York, N. Y.	200	$.69
6:15 P.M.	Boston, Mass.	New York, N. Y.	200	.86½
5:15 A.M.	New York, N. Y.	Boston, Mass.	200	.96½
	C. A. M. 2. Robertson Aircraft Corporation			
11:00 A.M.	Chicago, Ill.	St. Louis, Mo.	276	.67
6:10 A.M.	Chicago, Ill.	St. Louis, Mo.	276	.59½
1:45 P.M.	St. Louis, Mo.	Chicago, Ill.	276	.67
4:15 P.M.	St. Louis, Mo.	Chicago, Ill.	276	.59½
	C. A. M. 3. National Air Transport, Inc.			
6:10 A.M.	Chicago, Ill.	Dallas, Tex.	1,078	.80½
9:30 A.M.	Dallas, Tex.	Chicago, Ill.	1,078	.80½
8:00 P.M.	Chicago, Ill. (including trip, Ponca City to Tulsa)	Dallas, Tex.	1,078	.95½
7:30 P.M.	Dallas, Tex. (including trip, Tulsa to Ponca City)	Chicago, Ill.	1,078	.95½
	C. A. M. 4. Western Air Express, Inc.			
9:10 A.M.	Salt Lake City, U.	Los Angeles, Calif.	588	1.17½
9:30 P.M.	Salt Lake City, U.	Los Angeles, Calif.	588	1.17
7:35 A.M.	Los Angeles, Calif.	Salt Lake City, U.	588	1.07½
7:00 P.M.	Los Angeles, Calif.	Salt Lake City, U.	588	1.14½
4:30 A.M.	Los Angeles, Calif.	San Diego, Calif.	114	.80
5:30 P.M.	San Diego, Calif.	Los Angeles, Calif.	114	.80

C. A. M. 5. Varney Air Lines, Inc.

9:30 P.M.	Salt Lake City, U.	Seattle, Wash.	1,028	.98
3:40 P.M.	Seattle, Wash.	Salt Lake City, U.	1,028	.8
9:30 A.M.	Salt Lake City, U.	Pasco, Wash.	525	.83
4:00 P.M.	Pasco, Wash.	Portland, Ore.	178	.7
6:15 A.M.	Portland, Ore.	Pasco, Wash.	178	.73
8:15 A.M.	Pasco, Wash.	Salt Lake City, U.	525	.8
4:14 A.M.	Pasco, Wash.	Spokane, Wash.	127	.58
5:40 P.M.	Spokane, Wash.	Pasco, Wash.	127	.58

C. A. M. 6. Discontinued

C. A. M. 7. Discontinued

C. A. M. 8. Pacific Air Transport, Inc.

10:15 P.M.	San Diego, Calif.	Seattle, Wash. (including trip, San Jose to Oakland)	1,238	.92
7:00 P.M.	Seattle, Wash.	San Diego, Calif. (including trip, Oakland to San Jose)	1,238	.92

C. A. M. 9. Northwest Airways, Inc.

6:10 A.M.	Chicago, Ill.	St. Paul, Minn. (Via Milwaukee)	892	.71½
3:00 P.M.	Chicago, Ill.	St. Paul, Minn.	892	.60½
11:30 P.M.	Chicago, Ill.	St. Paul, Minn. (Via Milwaukee)	892	.83½
7:30 A.M.	Milwaukee, Wisc.	Green Bay, Wisc.	125	.59
7:00 A.M.	Chicago, Ill.	Madison, Wisc.	132	.56½
2:45 P.M.	St. Paul, Minn.	Chicago, Ill. (Via Milwaukee)	892	.71½
8:45 A.M.	St. Paul, Minn.	Chicago, Ill.	892	.60½
11:30 P.M.	St. Paul, Minn.	Chicago, Ill. (Via Milwaukee)	892	.83½
4:30 P.M.	Green Bay, Wisc.	Milwaukee, Wisc.	125	.59
4:40 P.M.	Madison, Wisc.	Chicago, Ill.	132	.56½

C. A. M. 10. Discontinued

C. A. M. 11. Pennsylvania Air Lines, Inc.

12:15 P.M.	Cleveland, Ohio	Pittsburgh, Pa.	140	.71½
12:00 P.M.	Pittsburgh, Pa.	Cleveland, Ohio.	140	.71½
12:15 P.M.	Cleveland, Ohio	Pittsburgh, Pa.	140	.58
2:40 P.M.	Pittsburgh, Pa.	Cleveland, Ohio.	140	.58

C. A. M. 12. Western Air Express, Inc.

5:00 A.M.	Cheyenne, Wyo.	Pueblo, Colo.	204	.85
4:15 P.M.	Pueblo, Colo.	Cheyenne, Wyo.	204	.70

C. A. M. 13. Discontinued

C. A. M. 14. Discontinued

C. A. M. 15. Discontinued

C. A. M. 16. Continental Air Lines, Inc.

2:45 A.M.	Cleveland, Ohio	Louisville, Ky.	351	.85½
6:15 P.M.	Louisville, Ky.	Cleveland, Ohio.	351	.85½
12:45 P.M.	Cleveland, Ohio	Akron, Ohio.	31	.59½
3:45 P.M.	Akron, Ohio	Cleveland, Ohio.	31	.59½

C. A. M. 17. National Air Transport, Inc.

9:30 A.M.	Chicago, Ill.	Cleveland, Ohio.	314	$1.15
1:40 P.M.	Cleveland, Ohio.	New York, N. Y.	393	1.02
8:30 P.M.	Chicago, Ill.	New York, N. Y.	736	1.14
10:00 P.M.	Chicago, Ill.	New York, N. Y.	736	1.14
12:15 P.M.	New York, N. Y.	Cleveland, Ohio.	393	1.02
4:35 P.M.	Cleveland, Ohio.	Chicago, Ill.	314	1.15
9:20 P.M.	New York, N. Y.	Chicago, Ill.	736	1.14
10:15 P.M.	New York, N. Y.	Chicago, Ill.	736	1.14

C. A. M. 18. Boeing Air Transport, Inc.

8:00 A.M.	Chicago, Ill.	Salt Lake City, U.	1,323	1.18½
8:00 P.M.	Chicago, Ill.	Salt Lake City, U.	1,323	1.18
4:00 P.M.	Salt Lake City, U.	Chicago, Ill.	1,323	1.03
4:00 A.M.	Salt Lake City, U.	Chicago, Ill.	1,323	1.25 Night flying 1.18½ Day flying
9:00 P.M.	Salt Lake City, U.	San Francisco, Calif.	615	1.25 Night flying 1.16 Day flying
9:00 A.M.	Salt Lake City, U.	San Francisco, Calif.	615	.95½
9:00 A.M.	San Francisco, Calif.	Salt Lake City, U.	615	.95½
8:00 P.M.	San Francisco, Calif.	Salt Lake City, U.	615	1.25 Night flying 1.16 Day flying

C. A. M. 19. Eastern Air Transport, Inc.

5:00 A.M.	New York, N. Y.	Washington, D. C.	210	.85
3:00 P.M.	New York, N. Y.	Atlanta, Ga.	803	.72½
9:10 P.M.	New York, N. Y.	Atlanta, Ga.	803	.97½
8:00 P.M.	Atlanta, Ga.	New York, N. Y.	803	.97½
12:45 A.M.	Atlanta, Ga.	New York, N. Y.	803	.97½
6:50 P.M.	Washington, D. C.	New York, N. Y.	210	.85½

C. A. M. 20. Colonial Western Airways, Inc.

1:00 A.M.	Cleveland, Ohio	Albany, N. Y.	463	.85½
6:45 P.M.	Albany, N. Y.	Cleveland, Ohio	463	.85½

C. A. M. 21. Texas Air Transport, Inc.

9:20 A.M.	Waco, Tex.	Galveston, Tex.	206	.61
4:00 P.M.	Galveston, Tex.	Waco, Tex.	206	.61

C. A. M. 22. Texas Air Transport, Inc.

7:45 A.M.	Dallas, Tex.	Brownsville, Tex.	547	.71
1:25 P.M.	Brownsville, Tex.	Dallas, Tex.	547	.71

C. A. M. 23. Gulf Coast Airways, Inc.

5:30 A.M.	Atlanta, Ga.	New Orleans, La.	488	.85½
1:00 P.M.	New Orleans, La.	Atlanta, Ga.	488	.70½

C. A. M. 24. Embry-Riddle Company

8:30 A.M.	Chicago, Ill.	Cincinnati, Ohio	274	.62½
9:00 P.M.	Chicago, Ill.	Cincinnati, Ohio	274	.74½
4:00 A.M.	Cincinnati, Ohio	Chicago, Ill.	274	.74½
5:00 P.M.	Cincinnati, Ohio	Chicago, Ill.	274	.77½

C. A. M. 25. Eastern Air Transport, Inc.

6:45 A.M.	Atlanta, Ga.	Miami, Fla.	777	.93
5:30 P.M.	Miami, Fla.	Atlanta, Ga.	777	.93
11:05 A.M.	Daytona Beach, Fla.	St. Petersburg, Fla.	147	.56
4:15 P.M.	St. Petersburg, Fla.	Daytona Beach, Fla.	147	.56

C. A. M. 26. National Parks Airways, Inc.

9:00 A.M.	Great Falls, Mont.	Salt Lake City, U.	509	.61
4:00 A.M.	Salt Lake City, U.	Great Falls, Mont.	509	.76
2:00 A.M.	Pocatello, Idaho	Salt Lake City, U.	155	.74½
4:00 P.M.	Salt Lake City, U.	Pocatello, Idaho	155	.59½

C. A. M. 27. Thompson Aeronautical Corporation

4:25 P.M.	Bay City, Mich.	Kalamazoo, Mich.	151	.61
4:20 P.M.	Pontiac, Mich.	Kalamazoo, Mich.	172	.61
4:40 P.M.	Muskegon, Mich.	Kalamazoo, Mich.	80	.61
3:00 A.M.	Cleveland, Ohio	Bay City, Mich.	251	.84½
11:00 A.M.	Cleveland, Ohio	Detroit, Mich.	93	.66½
5:30 A.M.	Pontiac, Mich.	Muskegon, Mich.	123	.59½
5:40 P.M.	Kalamazoo, Mich.	Chicago, Ill.	133	.69
9:40 A.M.	Kalamazoo, Mich.	Bay City, Mich.	151	.61
9:40 A.M.	Kalamazoo, Mich.	Pontiac, Mich.	172	.61
9:40 A.M.	Kalamazoo, Mich.	Muskegon, Mich.	80	.61
8:15 P.M.	Bay City, Mich.	Cleveland, Ohio	87	.84½
9:00 A.M.	Detroit, Mich.	Cleveland, Ohio	93	.66½
1:00 P.M.	Detroit, Mich.	Cleveland, Ohio	93	.66½
6:30 P.M.	Muskegon, Mich.	Pontiac, Mich.	123	.74½
8:00 A.M.	Chicago, Ill.	Kalamazoo, Mich.	133	.69
8:30 P.M.	Chicago, Ill.	Kalamazoo, Mich.	133	.82½

C. A. M. 28. Robertson Aircraft Corporation

7:25 A.M.	St. Louis, Mo.	Omaha, Nebr.	404	.78½ (per lb.)
7:30 P.M.	St. Louis, Mo.	Omaha, Nebr.	404	.78½ (per lb.)
1:10 A.M.	Omaha, Nebr.	St. Louis, Mo.	404	.78½ (per lb.)
1:10 P.M.	Omaha, Nebr.	St. Louis, Mo.	404	.78½ (per lb.)

C. A. M. 29. Gulf Coast Airways, Inc.

11:30 A.M.	New Orleans, La.	Houston, Tex.	319	1.00 (per lb.)
8:45 A.M.	Houston, Tex.	New Orleans, La.	319	1.00 (per lb.)

C. A. M. 30. Interstate Air Lines, Inc.

9:30 P.M.	Chicago, Ill.	Atlanta, Ga.	623	.85½
12:00 P.M.	Atlanta, Ga.	Chicago, Ill.	623	.85½
3:30 P.M.	Nashville, Tenn.	Atlanta, Ga.	222	.62
9:25 A.M.	Atlanta, Ga.	Nashville, Tenn.	222	.62
4:35 A.M.	Evansville, Ind.	St. Louis, Mo.	145	.73
10:50 P.M.	St. Louis, Mo.	Evansville, Ind.	145	.73

C. A. M. 31. Discontinued

C. A. M. 32. Discontinued

C. A. M. 33. Southern Air Fast Express, Inc.

8:00 A.M.	Atlanta, Ga.	Ft. Worth, Tex.	602	.88
11:25 A.M.	Ft. Worth, Tex.	Atlanta, Ga.	602	.88
8:10 A.M.	Dallas, Tex.	Los Angeles, Calif.	1,215	.88
5:35 A.M.	Los Angeles, Calif.	Dallas, Tex.	1,215	.88
4:55 P.M.	Big Spring, Tex.	San Antonio, Tex.	266	.77½
7:30 A.M.	San Antonio, Tex.	Big Spring, Tex.	266	.77½

C. A. M. 34. Transcontinental & Western Air, Inc.

8:00 A.M.	New York, N. Y.	Kansas City, Mo.	990	.39
6:35 A.M.	Kansas City, Mo.	New York, N. Y.	990	.39
8:30 A.M.	Kansas City, Mo.	Los Angeles, Calif.	1,266	.39
5:00 A.M.	Los Angeles, Calif.	Kansas City, Mo.	1,266	.39
10:58 A.M.	St. Louis, Mo.	Amarillo, Tex.	699	.39
7:57 A.M.	Amarillo, Tex.	St. Louis, Mo.	699	.39

Foreign Air Mail Routes

U. S. Post Office Department

Route No.	*Contractor*	*One Way Distance*
	Canadian Colonial Airways, Inc. 122 East 42nd Street, New York, N. Y.	
F. A. M. 1	New York, N. Y., via Albany, N. Y., to Montreal, Canada	334 Miles
	Seattle-Victoria Air Mail, Inc. 56 Roanoke St., Seattle, Wash.	
F. A. M. 2	Seattle, Wash., to Victoria, B. C., and return	74 Miles
	Arthur E. Cambas 4322 Burgundy St., New Orleans, La.	
F. A. M. 3	New Orleans to Pilottown, La., and return	75 Miles
	Pan American Airways, Inc. 122 East 42nd St., New York, N. Y.	
F. A. M. 4	Miami, Florida, to Havana, Cuba, one way. (Cuban mail carried on return trip)	251 Miles

Pan American Airways, Inc.

122 East 42nd St., New York, N. Y.

F. A. M. 5 *Long Flight.*—Miami, Florida, via Havana, Cuba; Cozumel, Mexico; Belize, British Honduras; Tela, Republic of Honduras; San Salvador, El Salvador; San Lorenzo, Republic of Honduras; Managua, Nicaragua; Puntarenas, Costa Rica; San José, Costa Rica; David and Panama City, Panama; to Cristobal, Canal Zone, and return.2,141.5 Miles
Short Flight.—Miami, Florida, via Havana, Cuba; and Puerto Cabezas, Nicaragua, to Cristobal, Canal Zone, and return.....1,412.5 Miles

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Pan American Airways, Inc.

122 East 42nd St., New York, N. Y.

F. A. M. 5 (Extended) Cristobal, Canal Zone; via Cartagena and Barranquilla, Colombia; Maracaibo, Venezuela; Curacao, Dutch West Indies; to Puerto Cabello, Venezuela, and return..... 1,058 Miles

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Pan American Airways, Inc.

122 East 42nd St., New York, N. Y.

F. A. M. 6 Miami, Florida, via Camaguey, Cuba; Port-au-Prince, Haiti; Santo Domingo, Dom. Rep.; San Juan, Porto Rico; St. Thomas, U. S. V. I.; St. Johns, Antigua, Castries, St. Lucia; Port-of-Spain, Trinidad; Georgetown, British Guiana, to Paramaribo, Dutch Guiana, and return..... 2,631 Miles

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Pan American Airways, Inc.

122 East 42nd St., New York, N. Y.

F. A. M. 7 Miami, Fla., to Nassau, Bahama Islands (Bahamas mail carried on return trip)..... 193.5 Miles

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Pan American Airways, Inc.

122 East 42nd St., New York, N. Y.

F. A. M. 8 Brownsville, Texas, via Tampico, Mexico, to Mexico City, Mexico.. 501 Miles
Brownsville, Texas, via Tampico, Vera Cruz, San Jeronimo and Tapachula, Mexico; and Guatemala City, Guatemala, to San Salvador, El Salvador, and return..... 1,256 Miles

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Pan American-Grace Airways, Inc.

122 East 42nd St., New York, N. Y.

F. A. M. 9 Cristobal, Canal Zone, via Buenaventura and Tumaco, Colombia; St. Elena and Guayaquil, Ecuador; Talara, Piura, Pimentel, Truiillo, Lima, Arequipa and Tacna, Peru; Arica, Antofagasta, Ovalle and Santiago, Chile; Mendoza and Buenos Aires, Argentina; to Montevideo, Uruguay, and return..... 4,522 Miles

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Pan American Airways, Inc.

122 East 42nd St., New York, N. Y.

F. A. M. 10 Paramaribo, Dutch Guiana, via Cayenne, French Guiana; Para, Maranhao, Fortaleza, Natal, Pernambuco, Bahia, Victoria and Rio de Janeiro, Brazil; to Santos, Brazil, and return.....3,619.5 Miles

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POSTAGE RATES

U. S. Air Mail to Foreign Countries

Postage (plus fee for air mail service) for each half ounce or fraction is as follows:

Argentina	55 cents
Bahamas	5 cents
Barbados	20 cents
Bolivia (by ordinary means from Arequipa)	40 cents
Brazil	50 cents
Canal Zone	20 cents
Chile	50 cents
Colombia	30 cents
Costa Rica	20 cents
Cuba	5 cents
Dominican Republic	10 cents
Dutch West Indies:	
Curacao, Bonaire, Aruba	30 cents
St. Martins, St. Eustatius, Saba	20 cents
Ecuador	30 cents
Guadeloupe (including Desirade, Les Saintes, Marie Galante, Petite Terre, St. Bartholomew (Barthelemy) and the French Part of St. Martins	20 cents
Guatemala	15 cents
Guianas (British, Dutch, French)	30 cents
Haiti	10 cents
Honduras (British)	15 cents
Honduras (Republic of)	15 cents
Jamaica	10 cents
Leeward Islands:	
Anguilla, Antigua, Barbuda, Dominica, Montserrat, Nevis, Redonda, St. Christopher, St. Kitts	20 cents
British Virgin Islands	10 cents
Martinique	20 cents
Nicaragua	15 cents
Panama	20 cents
Paraguay	55 cents
Peru	40 cents
Porto Rico	10 cents
Salvador (El)	15 cents
Trinidad	20 cents
Uruguay	55 cents
Venezuela	30 cents
Virgin Islands, U. S.	10 cents
Windward Islands:	
Granada, Grenadines, St. Lucia, St. Vincent	20 cents

The rate (postage plus fee for air service) to Canada and Mexico 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 and Mexico, dispatch by the domestic air routes of Canada and Mexico, respectively, where available.

McNARY-WATRES ACT

AN ACT to amend the Air Mail Act of February 2, 1925, as amended by the Acts of June 3, 1926, and May 17, 1928, further to encourage commercial aviation.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That Section 4 of the Air Mail Act of February 2, 1925, as amended by the Act of June 3, 1926 (44 Stat. 692; U. S. C., Supp. III, title 39, sec. 464), be amended to read as follows:

"Sec. 4. The Postmaster General is authorized to award contracts for the transportation of air mail by aircraft between such points as he may designate to the lowest responsible bidder at fixed rates per mile for definite weight spaces, one cubic foot of space being computed as the equivalent of nine pounds of air mail, such rates not to exceed $1.25 per mile: Provided, That where the air mail moving between the designated points does not exceed twenty-five cubic feet, or two hundred and twenty-five pounds, per trip the Postmaster General may award to the lowest responsible bidder, who has owned and operated an air transportation service on a fixed daily schedule over a distance of not less than two hundred and fifty miles and for a period of not less than six months prior to the advertisement for bids, a contract at a rate not to exceed 40

cents per mile for a weight space of twenty-five cubic feet, or two hundred and twenty-five pounds. Whenever sufficient air mail is not available, first-class mail matter may be added to make up the maximum load specified in such contract."

Sec. 2. That section 6 of the Act of May 17, 1928 (45 Stat. 594; U. S. C., Supp. III, title 39, sec. 465c), be amended to read as follows:

"Sec. 6. The Postmaster General may, if in his judgment the public interest will be promoted thereby, upon the surrender of any air-mail contract, issue in substitution therefor a route certificate for a period of not exceeding ten years from the date service started under such contract to any contractor or subcontractor who has satisfactorily operated an air-mail route for a period of not less than two years, which certificate shall provide that the holder thereof shall have the right, so long as he complies with all rules, regulations, and orders that may be issued by the Postmaster General for meeting the needs of the Postal Service and adjusting mail operations to the advances in the art of flying and passenger transportation, to carry air mail over the route set out in the certificate or any modification thereof at rates of compensation to be fixed from time to time, at least annually, by the Postmaster General, and he shall publish in his annual report his reasons for the continuance or the modification of any rates: Provided, That such rates shall not exceed $1.25 per mile. Such certificate may be canceled at any time for willful neglect on the part of the holder to carry out any rules, regulations, or orders made for his guidance, notice of such intended cancellation to be given in writing by the Postmaster General and forty-five days allowed the holder in which to show cause why the certificate should not be canceled."

Sec. 3. That after section 6 of the said Act as amended, additional sections shall be added as follows:

"Sec. 7. The Postmaster General, when in his judgment the public interest will be promoted thereby, may make any extensions or consolidations of routes which are now or may hereafter be established.

"Sec. 8. That the Postmaster General in establishing routes for the transportation of mail by aircraft under this Act may provide service to Canada within one hundred and fifty miles of the international boundary line, over domestic routes which are now or may hereafter be established and may authorize the carrying of either foreign or domestic mail, or both, to and from any points on such routes and make payment for services over such routes out of the appropriation for the domestic air mail service: Provided, That this section shall not be construed as repealing the authority given by the Act of March 2, 1929, to contract for foreign air mail service.

"Sec. 9. After July 1, 1931, the Postmaster General shall not enter into contracts for the transportation of air mail between points which have not theretofore had such service unless the contract air-mail appropriation proposed to be obligated therewith is sufficient to care for such contracts, and all other obligations against such appropriation without incurring a deficiency therein."

Approved, April 29, 1930.

RESOLUTION ON FUEL MARKETING PRACTICES

WHEREAS, the Advertising, Sales and Ethics Committee of the Fuel and Lubricants Section of the Aeronautical Chamber of Commerce recommends:

(1) That the Chamber and all its members accept in full the Code of Marketing Practices adopted by the American Petroleum Institute.

(2) That the member companies do not donate lubricating oil or aviation gasoline to individual operators except that said companies may donate their products to engine manufacturers and airline operators for test to secure the approval of their products.

(3) That the member companies do not pay monies, grant special discounts or furnish free advertising for the exclusive right to market aviation products at an airport.

(4) That no member company make any donation of monies, prices or products in connection with a flying project unless the ships are owned and/or chartered by a member company in which case the ships are to be considered under direct control of said company.

(5) That no member company carry direct newspaper or display advertising strictly for the benefit of airport operators and/or persons not connected with the member company carrying said advertising, provided, however, that where a member company advertises its own products, mention may be made therein that certain fields, operators and/or persons are using their products.

NOW THEREFORE RESOLVED that the foregoing recommendations of said Committe be and hereby are adopted.

STATE AERONAUTICAL LEGISLATION 1929-1930 SESSION

The following is a list of the states which considered aeronautical legislation during the 1929–30 sessions, showing the number of bills introduced, laws enacted and bills defeated in each state. The list was prepared by the Legal and Legislative Research Service of the Aeronautical Chamber of Commerce.

Character of Legislation	*Favorable Action*	*Unfavorable Action*	*Total*
AIRPORT ENABLING ACTS			
1. Kentucky	1	0	
2. Louisiana	0	1	
3. Massachusetts	2	2	
4. New York	1	1	
5. South Carolina	0	1	
6. Tennessee	1	0	
7. Virginia	3	1	14
LICENSING BILLS			
1. Kentucky	1	0	
2. Louisiana	0	1	
3. New Jersey	1	0	
4. New York	0	1	
5. South Carolina	1	0	
6. Virginia	1	0	6
AIR TRAFFIC RULES			
1. Kentucky	1	0	
2. New York	1	3	5
REGULATORY BODIES			
1. Louisiana	1	0	
2. Mississippi	0	1	
3. New Jersey	0	2	
4. New York	1	1	
5. Tennessee	1	0	7
AVIATION SCHOOLS			
1. New York	0	2	2
LIABILITY			
1. New York	0	2	2
INSURANCE			
1. Louisiana	0	2	
2. Massachusetts	0	1	
3. New York	2	1	6
TAXATION			
1. Louisiana	1	1	
2. Mississippi	0	1	
3. South Carolina	0	1	
4. Virginia	0	1	5
MISCELLANEOUS			
1. Kentucky	1	0	
2. Louisiana	1	0	
3. Massachusetts	1	4	
4. New York	1	3	
5. Rhode Island	0	2	
6. Texas	1	0	14
	25	36	61

AVIATION GASOLINE TAX SUMMARY

The following is a summary of gasoline tax laws as they apply to aviation in the several states. The list was prepared by the Legal and Legislative Research Service of the Aeronautical Chamber of Commerce.

State	*Tax*	*Disposition of Receipts*	*Applicable to Aircraft Fuel*	*Exemption or Refund*
1. Alabama	4¢	Highways	Yes	No
2. Arizona	4¢	Highways	Yes	Refund
3. Arkansas	5¢	Highways	Yes	Refund
4. California	3¢	Highways	Yes	Refund
5. Colorado	4¢	Highways	Yes	Refund
6. Connecticut	2¢	Highways	No	Exemption
7. Delaware	3¢	Highways	Yes	Refund
8. Dist. of Columbia	2¢	Highways	Yes	Refund
9. Florida	6¢	Roads and Schools	Except in interstate flying	No
10. Georgia	6¢	Roads and Schools	Yes	No
11. Idaho	5¢	Air fuel tax to aero fund	Yes	No
12. Illinois	3¢	Highways	Yes	Refund
13. Indiana	4¢	Highways	Yes	Refund
14. Iowa	3¢	Highways	Yes	Refund
15. Kansas	3¢	Highways	Yes	Refund
16. Kentucky	5¢	Highways	Yes	No
17. Louisiana	5¢	Highways	Yes	Fed. Gov't only
18. Maine	4¢	Highways	Yes	Refund of ¾ of tax
19. Maryland	4¢	Highways	Yes	Refund
20. Massachusetts	2¢	Highways	Yes	Refund
21. Michigan	3¢	Highways and Airports	Yes	No
22. Minnesota	3¢	Highways	Yes	Refund
23. Mississippi	5¢	Highways	Yes	No
24. Missouri	2¢	Highways	Yes	Refund
25. Montana	5¢	Highways	Yes	Refund
26. Nebraska	4¢	Highways	Yes	No
27. Nevada	4¢	Highways	Yes	Refund
28. New Hampshire	4¢	Highways	Yes	Refund
29. New Jersey	3¢	Highways and Waterways	No	Exemption
30. New Mexico	5¢	Highways	Yes	No
31. New York	2¢	Highways	Yes	Refund
32. North Carolina	5¢	Highways	Yes	Refund
33. North Dakota	3¢	Highways	Yes	Refund
34. Ohio	4¢	Highways	Yes	Refund
35. Oklahoma	4¢	Highways	Yes	No
36. Oregon	4¢	Highways	Yes	Refund
37. Pennsylvania	4¢	Highways	Yes	No
38. Rhode Island	2¢	Highways	Yes	Refund
39. South Carolina	6¢	Highways	Yes	No
40. South Dakota	4¢	Highways	Yes	Refund
41. Tennessee	5¢	Highways exceed $50,000 to airways	Yes	No
42. Texas	4¢	Highways, Schools	Yes	Refund
43. Utah	3½¢	Highways	Yes	No
44. Vermont	4¢	Highways	Yes	No
45. Virginia	5¢	Highways, Bridges	Yes	Refund
46. Washington	3¢	Highways	Yes 1	Refund
47. West Virginia	4¢	Highways	Yes	Refund 2
48. Wisconsin	2¢	Highways	Yes	Refund
49. Wyoming	4¢	Highways 3	Yes	No

AERONAUTICAL EDUCATION IN AMERICAN UNIVERSITIES AND COLLEGES

The following table of statistics on aeronautical education in American universities and colleges was compiled from the second annual survey on Aeronautical Education made by the Aeronautical Chamber of Commerce for "The Aircraft Year Book". Those starred (*) offer full courses leading to a degree in aeronautical engineering.

Name of Institution	*Number Full Time Instructors*	*Number Part Time Instructors*	*Number Students Enrolled*	*Faculty Attitude on Flight Training*
Alabama Polytechnic Institute	1	0	46	.....
University of Alabama *	1	3	40	.....
University of Arizona	0	1	15	.....

Name of Institution	*Number Full Time Instructors*	*Number Part Time Instructors*	*Number Students Enrolled*	*Faculty Attitude on Flight Training*
University of Arkansas	0	1	7	.....
Armour Institute of Technology	0	4	36	.....
Bradley Polytechnic Institute	1	0	10	.....
University of Buffalo	1	5	50	Favorable
California Institute of Technology *	3	4	15	.....
University of California	0	3	80	Favorable
Carnegie Institute of Technology *	0	2	60	Favorable
Catholic University of America	1	1	4	.....
University of Cincinnati *	2	5	110	Favorable
Clarkson College of Technology	1	0	..	.....
Colorado College	0	1	10	.....
Connecticut Agricultural College	0	1	11	.....
Cornell University	0	1	22	.....
College of City of Detroit	0	1	40	.....
University of Detroit	1	4	40	Favorable
University of Florida	0	2	11	Favorable
Georgia School of Technology *	2	0	17	.....
University of Idaho	0	2	15	.....
University of Illinois	0	1	19	.....
Iowa State College	0	3	20	Favorable
Kansas State Agricultural College	0	3	5	Favorable
University of Kansas	0	2	10	.....
Lake Forest College	0	2	36	.....
Lehigh University	0	1	13	.....
Marquette University	2	0	28	Favorable
Massachusetts Institute of Technology *	12	7	121	.....
University of Miami	1	1	76	.....
University of Michigan *	5	0	249	.....
University of Minnesota *	2	2	237	.....
Montana State College	0	1	20	.....
Morningside College	0	1	10	Favorable
University of Nebraska	0	2	3	.....
University of Nevada	0	1	10	.....
University of New Hampshire	0	3	40	.....
New Mexico College of A. and M. A.	0	1	8	.....
New York University *	9	8	56	.....
North Carolina State College	0	3	61	Favorable
University of North Carolina	1	0	32	Favorable
North Dakota Agricultural College	0	2	..	.....
Ohio State University	..	..	15	.....
Oklahoma A. and M. College	0	3	9	.....
University of Oklahoma	0	2	20	.....
University of Omaha	0	1	10	.....
Oregon State College	1	2	27	.....
University of Oregon	0	2	67	.....
Penn State College	0	1	7	Favorable
University of Pennsylvania	..	..	..	.....
University of Pittsburgh *	2	4	175	Favorable
Purdue University	1	1	48	.....
Rensselaer Polytechnic Institute	0	5	35	.....
Rose Polytechnic Institute	0	1	14	.....
University of South Dakota	1	5	16	.....
University of Southern California *	2	2	170	Favorable
Stanford University *	3	2	14	Favorable
Syracuse University	1	2	40	.....
University of Texas *	0	2	60	.....
Tulane University	1	0	7	.....
United States Military Academy	0	12	300	Favorable
United States Naval Academy	0	54	447	Favorable
Utah State Agricultural College	0	1	29	.....
University of Utah	0	1	15	.....
Vanderbilt University	0	3	29	.....
Virginia Polytechnic Institute	0	2	30	.....
University of Virginia	1	0	10	.....
State College of Washington	0	1	15	.....
Washington University (St. Louis)	0	5	32	Favorable
University of Washington *	3	1	95	.....
University of Wisconsin	1	6	151	.....
Worcester Polytechnic Institute	0	6	6	Favorable
University of Wyoming	0	1	6	Favorable
Yale University	0	2	1	Favorable
TOTALS	63	215	3,593	22 Favorable

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AIRCRAFT HAVING APPROVED TYPE CERTIFICATES

December 31, 1930

KEY: P—Place; O—Open; C—Closed; L—Landplane; S—Seaplane; Am—Amphibian; FB—Flying boat; B—Biplane; M—Monoplane; *—No longer manufactured.

A.T.C. No.	*Date Issued*	*Airplane*	*Weight Empty*	*Useful Load*	*Gross Weigh.*
1	3-29-27	Buhl Airster CA3, 3POLB, J5 220 h.p.....	1,686	1,383	3,069
2	7-26-27	Boeing 40A (Mail), 3PCLB, Wasp 425 h.p.....	3,531	2,469	6,000
*3		Obsolete.			
*4	6- 8-27	Douglas O2, 2POLB, Liberty 12 400 h.p.....	2,885	1,870	4,755
*5	6- 8-27	Douglas M2, 3POLB, Liberty 12 400 h.p.....	2,885	1,870	4,755
*6	6- 8-27	Douglas M4, 3POLB, Liberty 12 400 h.p. Small Wings..	3,405	1,495	4,900
		Large Wings..	3,580	2,195	5,775
*7	4- 7-27	Alexander "Combination Wing Eaglerock," 3POLB, OX5, 90 h.p. or OXX6, 100 h.p.....	1,470	760	2,230
*8	4- 7-27	Alexander "Long Wing Eaglerock," 3POLB, OX5 90 h.p. or OXX6 100 h.p.....	1,470	760	2,230
9	6-17-27	Atlantic Universal 7PCL-SM, WW 220 h.p. Landplane..	2,192	1,808	4,000
		(Hamilton Pontoons) Seaplane....	2,653	1,347	4,000
*10	7- 2-27	Fairchild FC2, 5PCL-SM, WW 220 h.p. Landplane..	2,160	1,440	3,600
		(Fairchild Pontoons) Seaplane....	2,427	1,573	4,000
11	7-19-27	Advance Waco 9, 3POLB, OX5 90 h.p., or OXX6 102 h.p.....	1,320	780	2,100
*12	9-27-27	Buhl Airsedan, 5PCLB, WW 220 h.p.....	2,072	1,628	3,700
13	10- 6-27	Advance Waco 10, 3POLB, OX5 90 h.p. or OXX6 h.p.....	1,200	825	2,025
14	10- 6-27	Douglas C-1, 10PCLB, Liberty 12A 400 h.p....	3,800	3,600	7,400
*15	10-26-27	Driggs Dart 2POLB, Anzani 3A-2 35 h.p.....	380	400	780
*16	11- 1-27	Stinson SM1, 6PCLM J5 220 h.p.....	1,970	1,515	3,485
*17	11-10-27	American Eagle 101, 3POLB, OX5 90 h.p. or OXX6 100 h.p.....	1,227	814	2,041
18	11-15-27	Pitcairn PA5, 1POLB, WW 220 h.p.....	1,742	1,070	2,812
19	12- 1-27	Fairchild KR-31 (Formerly Kreider Reisner Model C-2) 3POLB, OX5 90 h.p. or OXX6 100 h.p.....	1,236	764	2,000

A.T.C. No.	Date Issued	Airplane	Weight Empty	Useful Load	Gross Weight
*20	12- 1-27	Fairchild FC-2W, 5PCL-SM, Wasp 450 h.p.			
		(Fairchild Pontoons) Seaplane....	2,770	1,830	4,600
		Landplane..	2,418	2,182	4,600
		Skiplane....	3,030	1,570	4,600
*21	12- 8-27	Swallow "Swallow" 3POLB, OX5 90 h.p. or OXX6 100 h.p.	1,447	753	2,200
*22	1- 4-28	Mono Aircraft Monocoupe 2PCLM, Anzani 60-80 h.p.	700	475	1,175
		or Siemens 70 h.p.	749	426	1,175
23	4-30-28	Boeing B1D, 4PCFbB, WW 220 h.p.	2,588	1,155	3,743
*24	1- 6-28	Stinson SB1, 5PCLB, WW 220 h.p.	1,815	1,465	3,280
*25	1-27-28	Mahoney-Ryan B1, 5PCLM, WW 220 h.p.	1,870	1,430	3,300
26	2- 8-28	Waco 125, 3POLB, Siemens Halske 100-122 h.p.	1,349	676	2,025
27	2-25-28	Boeing 40B, 3PCLB, Hornet 525 h.p.	3,714	2,365	6,079
*28	3-12-28	Lincoln Page 1928, 3POLB, OX5 90 h.p. or OXX6 102 h.p.	1,250	950	2,200
*29	4- 2-28	National Airways Air King, 3POLB, OX5 90 h.p.	1,380	755	2,135
30	3-22-28	Curtiss-Wright Travel Air 2000, 3POLB, OX5 90 h.p. or OXX6 100 h.p.	1,347	833	2,180
31	3-22-28	Travel Air 3000, 3POLB, Hisso 150-180 h.p.	1,664	926	2,590
*32	3-22-28	Travel Air 4000, 3POLB, WW 220 h.p.	1,660	753	2,413
33	4- 3-28	Buhl CA5A, 5PCLB, WW 220 h.p.	2,100	1,600	3,700
*34	4- 4-28	Loening 7PCAmB, Wasp 425 h.p.	3,730	2,170	5,900
35	4- 4-28	International F17, 3POLB, OX5 90 h.p. or OXX6 102 h.p.	1,480	620	2,100
*36	4- 7-28	Pheasant H-10, 3POLB, OX5 90 h.p.	1,351	675	2,026
*37	4-11-28	Travel Air 8000, 3POLB, Caminez 120 h.p.	1,475	825	2,300
*38	4-11-28	Travel Air 9000, 3POLB, Ryan Siemens 125 h.p.	1,475	825	2,300
*39	5- 9-28	Berliner CM-4, 3POLM, OX5 90 h.p.	1,490	810	2,300
40	5-28-28	Curtiss Robin, 3PCLM, OX5 90 h.p.			
		With 30 gal. tank..	1,489	728	2,217
		With 50 gal. tank..	1,504	766	2,270
41	6-18-28	Waco ASO, 3POL-SB (Edo DeLuxe Floats)			
		(Wright J5 220 h.p.) Landplane..	1,411	899	2,310
		Seaplane....	1,888	772	2,660
42	6-18-28	Waco DSO (Formerly Waco 10) 3POLB, Hisso 150-180 h.p.	1,508	896	2,404
43	6-14-28	Simplex "Red Arrow," 2POLM, Kinner 100 h.p.	1,020	572	1,592
44	6-14-28	Simplex "Red Arrow," 2PCLM, Kinner 100 h.p.	1,020	572	1,592
45	6-23-28	Texas Temple, 1POLM, WW 220 h.p.	1,350	900	2,250
46	6-16-28	Buhl CA-3C, 3PCLB, WW 220 h.p.	1,760	1,440	3,200
47	6-18-28	Bellanca CH, 8PCLM, J5 WW 220 h.p.	2,190	1,860	4,050
48	11-22-28	Stinson SM-2, 4PCLM, Warner 110 h.p.	1,547	953	2,500
49	7- 9-28	Lockheed 1 Vega, 5PCLM, Wright J5 220 h.p.	1,875	1,595	3,470
50	7- 9-28	Swallow, 3POLB, Hisso 150-180 h.p.	1,728	972	2,700
51	7- 9-28	Swallow, 3POLB, WW 220 h.p.	1,716	984	2,700
52	7- 9-28	Fokker Super Universal, 7PCLM, Wasp 420 h.p.	3,250	2,300	5,550
		(Hamilton Floats) 6PCSM, Wasp 420 h.p.	3,550	1,600	5,150
53	7- 9-28	Arkansas 3C3 Command-Aire, 3POLB, OX5 90 h.p. or OXX6 102 h.p.	1,492	794	2,286
54	7-14-28	Boeing 40C, 5PCLB, Wasp 425 h.p.	3,522	2,553	6,075
55	7-27-28	Stearman C3B, 3POLB, Wright J5 220 h.p.	1,625	1,025	2,605
56	7-30-28	Atlantic 14PCLM, 3 Wasps @ 425 h.p.	7,390	5,110	12,500
57	8- 6-28	Alexander A1, 3POLB, Wright J5 220 h.p.	1,705	786	2,491
58	8- 6-28	Alexander A2, 3POLB, OX5 90 h.p. or OXX6 102 h.p.	1,459	982	2,441
59	8- 6-28	Alexander A3, A4, 3POLB, Hisso 150-180 h.p.	1,877	741	2,618
60	8- 8-28	Sikorsky S38A, 11PCAmB, 2 Wasps @ 425 h.p.	6,000	4,480	10,480
61	1-11-29	Fairchild FC-2W2, 5-6-7PCL-SM, Wasp 450 h.p.			
		Landplane..	2,732	2,768	5,500
		(Fairchild Pontoons) Seaplane....	3,072	2,428	5,500
62	8-15-28	Stearman C3C, 3POLB, Hisso 150-180 h.p.	1,790	960	2,750
63	8-15-28	Curtiss Robin, 3PCLM, Challenger 170 h.p.	1,576	864	2,440
64	8-24-28	Boeing B1E, 4PCFbB, Wasp 450 h.p.	3,260	1,240	4,500
65	8-27-28	Cessna AA, 4PCLM, Anzani 120 h.p.	1,304	956	2,260
66	8-27-28	Loening, 5PCAmB, Hornet 525 h.p.	3,867	2,033	5,900
67	8-27-28	Loening, 6PCAmB, Cyclone 525 h.p.	3,849	2,051	5,900
68	8-29-28	Curtiss-Robertson Robin, 3PCLM, OX5 90 h.p.			
		With 30 gal. tank..	1,489	728	2,217
		With 50 gal. tank..	1,504	766	2,270
69	8-29-28	Curtiss-Robertson, 3PCLM, Challenger 170 h.p.	1,576	864	2,440

A.T.C. No.	Date Issued	Airplane	Weight Empty	Useful Load	Gross Weight
70	9- 5-28	Mono Aircraft Monocoupe, 2PCLM, Velie 55 h.p.	795	555	1,350
*71	9- 6-28	Spartan C3, 3POLB, SH-12, 128 h.p.	1,355	848	2,203
72	9- 7-28	Cessna AW, 4PCLM, Warner 110 h.p.	1,225	1,035	2,260
73	10-12-28	Spartan C3-120, 3POLB, Walter 120 h.p.	1,390	801	2,191
74	10-16-28	Stinson SM-1DA, 6PCLM, J5 220 h.p.	2,432	2,068	4,500
75	10-24-28	Fairchild FC-2, 5PCLM, Challenger 185 h.p.	2,239	1,361	3,600
*76	10-29-28	Stinson SM-1DB, 6PCLM, J5 220 h.p.	2,522	1,978	4,500
77	10-29-28	Stinson SM-1DC, 2PCLM, WW 220 h.p.	2,514	1,986	4,500
78	10-29-28	Stinson SM-1DD, 2PCLM, WW 220 h.p.	2,280	2,220	4,500
79	11- 7-28	Consolidated PT-1, 2POLB, Hispano 150-180 h.p.	1,805	713	2,518
80	11- 7-28	Consolidated NY-1, 2POLB, WW 220 h.p.	1,773	722	2,495
81	11- 7-28	Consolidated NY-2, 2POL-SB, WW 220 h.p. Landplane	1,800	698	2,498
		Seaplane	2,145	698	2,843
82	11- 7-28	Consolidated O-17, 2POLB, WW 220 h.p.	1,881	842	2,723
83	11- 7-28	Consolidated PT-3 and PT-3A, 2POLB, WW 220 h.p.	1,747	698	2,445
84	11-10-28	Consolidated Model 14, 2POLB, Warner 110 h.p.	976	554	1,530
85	11-13-28	Hamilton H-45, 8PCLM, Wasp 450 h.p.	3,639	2,111	5,750
86	11-17-28	Laird LC-B, 3POLB, WW 220 h.p.	1,812	1,038	2,850
87	11-19-28	Ford 4-AT-B, 14PCLM, 3 Wright J5's @ 220 h.p.	6,169	3,961	10,130
88	11-23-28	Fairchild KR-34-B (Formerly Kreider Reisner Model C-4-B) 3POLB, Comet 130 h.p.	1,331	1,069	2,400
89	11-24-28	Fairchild Model 71, 7PCL-SM, Wasp 420 h.p. (Fairchild P-6 Floats) Landplane	2,940†	2,560	5,500
		Seaplane	3,280†	2,220	5,500
90	11-24-28	Loening C-2-C, 8PCAmB, Cyclone 525 h.p.	3,894	2,356	6,250
91	11-24-28	Loening C-2-H, 8PCAmB, Hornet 525 h.p.	3,894	2,356	6,250
92	12- 1-28	Pitcairn PA-6, 1-3POLB, Wright J5 220 h.p.	1,892	1,158	3,050
93	12- 1-28	Lockheed Vega Model 5, 5PCLSM (Edo K Floats) Wasp 420 h.p. Landplane	2,492	1,725	4,217
		Seaplane	2,977	1,721	4,698
94	12- 1-28	Boeing (Hamilton Metalplane Division) H-47, 8 PCLM, or 7PCSM Hornet 525 h.p. Landplane	3,699	2,051	5,750
		Seaplane	4,140	2,235	6,375
*95	12- 4-28	Mohawk Pinto MLV, 2POLM, Velie 55 h.p.	858	474	1,332
96	1-29-29	Fokker AFX, 14PCLM, 3 Wasps @ 420 h.p.	7,780	5,320	13,100
*97		DeLuxe Model, 8PCLM, 3 Wasps @ 420 h.p. Obsolete.	8,164	4,936	13,100
98	1- 3-29	Buhl CA-8A, 8PCLB, Cyclone 525 h.p.	3,542	2,558	6,100
99	1- 3-29	Buhl CA-8B, 8PCLB, Hornet 525 h.p.	3,542	2,558	6,100
100	1- 3-29	Travel Air Model 6000, 6PCLM J5, 220 h.p.	2,430	1,670	4,100
101	1- 5-29	Brunner-Winkle Bird A, 3POLB, OX5 90 h.p.	1,319	831	2,150
102	1-11-29	Lockheed Air Express, 5PCLM, Wasp 425 h.p.	2,533	1,842	4,375
103	1-22-29	Curtiss Falcon Mail Plane, 1POLB, Liberty 12A	3,341	1,924	5,265
104	1-24-29	Mahoney-Ryan B-3, 6PCLM, WW 220 h.p.	2,114	1,590	3,704
105	1-28-29	Swallow TP, 2POLB, OX5 90 h.p.	1,283	542	1,825
106	1-30-29	Boeing Model 95, 1POLB, Hornet 525 h.p.	3,196	2,644	5,840
		(With 25 gals. extra fuel)	3,222	2,618	5,840
107	2- 5-29	New Standard D-24, 5POLB, Hisso 180 h.p.	2,066	1,334	3,400
108	2- 5-29	New Standard D-25, 5POLB, Wright J5 220 h.p.	2,010	1,390	3,400
109	2- 5-29	New Standard D-26, 3POLB, WW 220 h.p.	2,010	1,390	3,400
110	2- 5-29	New Standard D-27, 1POLB, WW 220 h.p.	2,010	1,390	3,400
111	2- 9-29	Travel Air SC-2000, 3POLB, Curtiss C-6 160 h.p.	1,659	941	2,600
112	2-15-29	Curtiss-Wright Travel Air W-4000, 3POLB, Warner Scarab 110 h.p. With 30 gal. capacity	1,337	778	2,115
		With 42 gal. capacity	1,337	850	2,187
		With 57 gal. capacity	1,337	940	2,277
113	2-20-29	Mono Monocoupe 113, 2PCLM, Velie 55 h.p.	848	502	1,350
114	2-25-29	Bach 3-CT-6, 10PCLM, 1 Hornet, 2 Comets 785 h.p.	4,739	3,261	8,000
115	2-26-29	Arrow Sport Model 2A, 2POLB, LeBlond 65 h.p.	811	459	1,270
116	2-27-29	Curtiss-Wright Travel Air A-6000-A, 6PCLM, Wasp 450 h.p.	3,225‡	2,025	5,250

† NOTE: Empty weight does not include tools or airwheel installation. (Total weight airwheel installation 145 lbs.)

‡ Empty weight does not include landing lights, flares, battery or generator.

A.T.C. No.	Date Issued	Airplane	Weight Empty	Useful Load	Gross Weight
117	3- 7-29	General Aristocrat 102A, 3PCLM, Warner 110 h.p.	1,327	783	2,110
118	3- 7-29	Command-Aire 3C-3A, 3POLB, Warner 110 h.p.	1,357	815	2,172
119	3- 7-29	Wallace Touroplane B, 3PCLM, Kinner K-5 90 h.p.	1,320	780	2,100
120	3-11-29	Command-Aire 3-C-3B, 3POLB, SH-14 113 h.p.	1,325	808	2,133
121	3-12-29	Aeromarine Klemm L-25-A, 2POLM, Salmson AD9 40 h.p.	815	510	1,325
122	6-15-29	Fleet Model 1, 2POLB, Warner Scarab 110 h.p.	1,022	558	1,580
		With Belly Tank Attached	1,075	745	1,820
123	3-15-29	Advance Waco 10-T, 3POLB, Wright J5 220 h.p.	1,787	813	2,600
124	3-18-29	American Eagle A1-29, 3POLB, Kinner 90 h.p.	1,220	800	2,020
125	3-20-29	Swallow F-28-AX, 3POLB, Axelson 115 h.p.	1,574	923	2,497
126	5-15-29	Sikorsky S-38-B, 10PCAmB, 2 Wasps @ 420 h.p.	6,550†	3,930	10,480
127	3-23-29	Stearman M-2, 1POLB, Cyclone 525 h.p.	3,442	2,136	5,578
128	5- 6-29	Buhl CA-6, 6PCLB, Wright R-975 300 h.p.	2,478	1,722	4,200
		With Extra Fuel	2,478	1,878	4,356
129	5-29-29	Bellanca CH-300 Pacemaker, 6PCL-SM, R-975 300 h.p. Landplane	2,275	1,800	4,075
		Landplane with Extra Tank	2,387	1,913	4,300
		(Edo Floats) Seaplane	2,810	1,800	4,610
		Seaplane with Extra Tank	2,922	1,913	4,835
130	3-30-29	Curtiss-Wright Travel Air S-6000-B, 6PCL-SM, Wright R-975 300 h.p. Landplane	2,608	1,622	4,230
		(Edo K Floats) Seaplane	3,030	1,590	4,620
131	6-15-29	Fleet Model 2, 2POLSB, Kinner 100 h.p. (Edo I Floats) Landplane	1,010	565	1,575
		Landplane with extra tank	1,063	757	1,820
		Seaplane	1,183	543	1,726
		Seaplane with extra tank	1,223	728	1,951
132	3-30-29	Ford 4-AT-E, 14PCLM, 3 Wright R-975's @ 300 h.p.	6,696‡	3,434‡	10,130
133	4- 1-29	Boeing Model 100, 1POLB, Wasp 450 h.p.	1,882	817	2,699
134	11-23-29	Viking Bourdon B-2, 3POLB, SH-14 113 h.p.	1,139	760	1,899
135	4- 2-29	Butler Black Hawk, 3POLB, Wright J5 220 h.p.	1,885	1,015	2,900
136	4- 2-29	Stinson SM-1F, 6PCLM, R-975-A 300 h.p.	2,614	1,686	4,300
137	4- 4-29	Stearman C3-MB, 1POLB, Wright J5 220 h.p.	1,895	935	2,830
138	4-12-29	Star Cavalier, 2POLM, Velie 55 h.p.	862	538	1,400
139	4-15-29	Alexander A-12, 3POLB, Comet 130 h.p.	1,627	953	2,580
140	4-29-29	Lockheed Vega, 5PCLM, Wright R-975 300 h.p.	2,140	1,713	3,853
141	5- 4-29	Alexander A-13, 3POLB, Challenger 170 h.p.	1,705	945	2,650
142	6-13-29	Ryan B-5, 6PCLSM (Edo Q Floats) R-975 300 h.p. Landplane	2,251	1,749	4,000
		Seaplane	2,582	1,518	4,100
		Landplane with Townend Ring	2,269	1,731	4,000
		Seaplane with Townend Ring	2,600	1,500	4,100
143	6-17-29	Curtiss-Robertson C-1 Robin, 3PCLM, Chal. 185	1,638	962	2,600
		(A) Edo DeLuxe Floats, 3PCSM, Chal. 185	1,885	775	2,660
		(B) Edo P Floats, 3 PCSM, Chal. 185	2,017	893	2,910
144	5-16-29	Curtiss-Robertson C2, 3PCLM, Challenger 170 h.p.	1,667	933	2,600
145	5-20-29	Stinson SM-2AA, 4PCLM, Wright R-540 165 h.p.	1,972	1,180	3,152
146	6-11-29	Curtiss-Wright Travel Air B-4000, 3POLB, Wright J5 220 h.p.	1,893	1,007	2,900‡
147	5-21-29	Curtiss-Wright Travel Air BM-4000, 1POLB, Wright J5 220 h.p.	1,928	1,072	3,000
148	5-21-29	Travel Air A-4000, 3POLB, Axelson 115 h.p.	1,655	995	2,650
149	5-21-29	Curtiss-Wright Travel Air C-4000, 3POLB, Challenger 185 h.p.			
		Weights with old wings	1,590	1,007	2,597
		Weight with new wings	1,630	1,007	2,637
150	5-22-29	Command-Aire 3C-3 Trainer, 2POLB, OX-5 90 h.p.	1,439	670	2,109
151	5-22-29	Command-Aire 3C-3A Trainer, 2POLB, Warner 110 h.p.	1,284	706	1,990
152	5-27-29	Laird LCR, 3POLB, Wright J5 220 h.p.	1,848	1,066	2,914
153	5-25-29	Ireland N-2-B, 5PO-CAmB, Wright R-975 300 h.p.	2,949	1,451	4,400

† NOTE: Empty weight does not include battery and starters, total 96 lbs.

‡ NOTE: Approximate: will vary with fuel capacity and cabin arrangement.

A.T.C. No.	Date Issued	Airplane	Weight Empty	Useful Load	Gross Weight
154	5-31-29	International F-17-W, 3POLB, Wright J5 220 h.p.	1,780	920	2,700
155	5-31-29	International F-17-H, 3POLB, Hisso 150-180 h.p.	1,755	951	2,706
156	6- 4-29	Stout (Ford) 5-AT-B, 12-17PCLM 3 Wasp @ 450 h.p.	7,576	5,674	13,250
157	6- 6-29	Boeing 204, 6PCFbB, Wasp 450 h.p.	3,371	1,629	5,000
158	6-10-29	Sikorsky S-38-C, 12PCAmB, 2 Wasps @ 420 h.p.	6,460†	4,020	10,480
159	6-10-29	Curtiss Thrush, 6PCLM, Challenger 170 h.p.	2,232	1,468	3,700
160	6-10-29	Curtiss Thrush, 6PCLM, Challenger 170 h.p.	2,232	1,468	3,700
161	6-11-29	Stinson SM-2-AB, 4PCLM, Wright J5 220 h.p.	2,169	1,031	3,200
162	6-11-29	Fairchild KR-34-C, 3POLB R-540 165 h.p.	1,524	844	2,368
163	6-12-29	Buhl CA-3-D, 3PCLB, Wright R-975 300 h.p.	2,017	1,183	3,200
164	6-29-29	Fokker Standard Universal, 7PCLM, R-975, 300 h.p.	2,482	1,818	4,300
165	6-14-29	Ford 5-AT-C, 17PCLM, 3 Wasps @ 420 h.p.	7,500‡	6,000‡	13,500
166	6-21-29	Viking B-4, 3POLB, Kinner K5 90 h.p.	1,107	768	1,875
		(Edo L Floats) 3POSB Kinner K5 90 h.p.	1,420	780	2,200
167	6-25-29	Great Lakes 2T1, 2POLB, Cirrus Mark III 85 h.p.	1,002	578	1,580
168	6-25-29	Waco BS-165, 1POLB Wright R-540 165 h.p.	1,563	1,037	2,600
		3POLB Wright R-540 165 h.p.	1,529	1,001	2,530
169	6-28-29	Lockheed Vega, 6PCLM, Wasp 450 h.p.	2,465	1,568	4,033
170	6-29-29	Kreutzer K-3, 6PCLM, 3 LeBlonds @ 90 h.p.	2,846	1,654	4,500
171	7-25-29	Kreutzer, 6PCLM, 2 LeBlonds @ 65 h.p. 1 LeBlond @ 90 h.p.	2,697	1,748	4,445
		With electric starter equipment	2,807	1,693	4,500
172	7- 2-29	Bach 3-CT-8, 10PCLM, 2 R-540's and 1 Hornet 855 h.p.	4,785	3,195	7,980
173	7-26-29	Stout (Ford) 6-AT, 15PCLM, 3 R-875's @ 300 h.p.	7,048	5,096	12,144
		With 231 gals. fuel	7,009	4,721	11,730
*174	7-10-29	Nicholas-Beazley NB3, 3POLM, LeBlond 65h.p.	744	629	1,373
175	7-16-29	Curtiss-Wright Travel Air SA-6000-A, 6PCSM, Wasp 450 h.p. Edo JF1	3,676§	1,824	5,500
176	7-17-29	Laird LCR-300, 3POLB, Wright R-975 300 h.p.	1,922	1,088	3,010
177	7-19-29	Cunningham-Hall PT-6, 6PCLB, Wright R-975 300 h.p.	2,680	1,670	4,350
		With Single Controls	2,670	1,680	4,350
178	7-20-29	Alliance "Argo," 2POLB, Hess Warrior 115 h.p.	1,077	538	1,615
		Serial 102 and up, with 8 gal. reserve fuel tank	1,085	586	1,671
179	7-23-29	Parks P-1, 3POLB, OX-5 90 h.p.	1,331	747	2,078
180	7-24-29	Timm Collegiate, 2POLM, Kinner K-5 90 h.p.	1,309	643	1,952
181	7-26-29	Lincoln PT, 2POLB, OX-5 90 h.p.	1,428	540	1,968
182	7-26-29	Curtiss Fledgling Junior, 2POLB, Challenger 170 h.p.	1,921	671	2,592
183	7-26-29	Boeing 40-B4, 1 or 5PCLB, Hornet 525 h.p.	3,809	2,271	6,080
		Boeing 40-B4, 1PCLB, Hornet Mailplane	3,709	2,371	6,080
184	7-27-29	Command-Aire 5-C-3, 3POL-SB, Challenger 170 h.p. Landplane	1,482	883	2,365
		(Edo DeLuxe Floats) Seaplane	1,664	883	2,547
185	7-27-29	Command-Aire 5-C-3A, 3POLB, Hisso 150 h.p.	1,610	913	2,523
186	7-30-29	Swallow TP-K, 2POLB, Kinner 90 h.p.	1,170	530	1,700
187	7-30-29	Stearman LT-1, 5PCLB, Hornet 525 h.p.	3,890	2,360	6,250
188	7-30-29	Curtiss-Wright Travel Air E-4000, 3POLB, Wright R-540 165 h.p.	1,695	1,007	2,702
		(Edo M Floats) 3POSB, Wright R-540 165 h.p.	1,885	835	2,720
189	7-31-29	Travel Air BC-4000, 3POLB, Challenger 170 h.p.	1,793	1,007	2,800
190	7-30-29	Alexander A-15, 3POLB, Kinner K5 100 h.p.	1,423	838	2,261
191	8- 2-29	Curtiss Fledgling, 2POLB, Challenger 170 h.p.	1,990	696	2,686
		(With modifications for military planes)	2,005	696	2,701
192	8- 5-29	Metal Aircraft G2W Flamingo, 8PCLM Wasp 420 h.p.	3,370	2,430	5,800
193	10-23-29	Curtiss Condor CO, 21PCLB, 2 Geared Conq. GV-1570 @ 600 h.p. For G-1, G-2, G-3	11,574	6,326	17,900
		For G-4 and up	11,818	6,082	17,900
194	8- 9-29	Stinson SM-2AC, 4PCLM, Wright R-760 225 h.p.	2,091	1,126	3,217
		SM-2ACS, 4PCSM, Wright R-760 225 h.p. (Fairchild P-2-B Floats)	2,396	1,126	3,522
195	9- 9-29	Spartan C3-165, 3POLB, Wright R-540 165 h.p. (With Fuselage Tank)	1,650	968	2,618
		(Without Fuselage Tank)	1,633	878	2,511

† NOTE: Empty weight does not include storage, battery and starters. Total 96 lbs.
‡ NOTE: Approximate: will vary with fuel capacity and cabin arrangement.
§ NOTE: Weight empty includes 91 lbs. of equipment.

A.T.C. No.	Date Issued	Airplane	Weight Empty	Useful Load	Gross Weight
196	8-13-29	Pitcairn PA-7S Sport, 3POLB, Wright R-760 225 h.p.	1,821	1,129	2,950
		Pitcairn PA-7M Mail, 1POLB, Wright R-760 225 h.p.	1,821	1,229	3,050
197	8-16-29	Moth 60-GM and 60-GMW, 2POLSB (Edo H Floats) DH Gipsy 85 or Wright Gipsy 90 h.p. Landplane..	1,045	605	1,650
		Seaplane....	1,143	527	1,670
198	8-15-29	New Standard D-29, 2POLB, Cirrus Mark III 85 h.p.	1,097	535	1,632
199	8-16-29	Crown B-3, 2POLB, Kinner 90 h.p.	1,243	513	1,756
200	8-16-29	Detroit Ryan Speedster P-2 (Formerly Parks P-2), 3POLB, Axelson 115 h.p.	1,520	920	2,440
201	8-16-29	Mono Aircraft Monocoach, 4PCLM, Wright J5 220 h.p.	1,919	1,173	3,092
202	8-16-29	Golden Eagle Chief, 2POLM, LeBlond 90 h.p.	966	513	1,479
203	8-23-29	Aeromarine Klemm AKL-26, 2POLSM, LeBlond 5 D65 h.p. (Edo H Floats) Landplane.	940	500	1,440
		Seaplane...	1,090	500	1,590
204	8-23-29	Aeromarine Klemm AKL-26-A, 2POLSM, LeBlond 65 h.p.	1,025	565	1,590
		(Edo H Floats and Kantner Floats) Seaplane	1,100	500	1,600
205	8-17-29	Travel Air K-4000, 3POLB, Kinner 90 h.p...	1,340	940	2,280
206	8-20-29	Boeing, 80-A and 80-A1, 13-20PCLB 3, Hornets @ 525 h.p. Model 80-A...	10,582	6,918	17,500
		Model 80-A1..	10,735	6,765	17,500
207	8-19-29	Cessna DC-6, 4PCLM, Challenger 170 h.p...	1,767	1,221	2,988
208	8-20-29	Fairchild KR-34-A (Formerly Kreider Reisner Model C-4-D), 3POLB, Challenger 185 h.p..	1,462	901	2,363
209	8-22-29	Command-Aire 3C-3B Trainer, 2POLB, SH-14 113 h.p.	1,340	682	2,022
210	8-23-29	General 102-E, 3 PCLM, Wright R-540 165 h.p.	1,524	776	2,300
211	8-24-29	Boeing 203A, 3POLB, R-540 165 h.p.	1,789	788	2,577
212	8-24-29	Stimson SM-1FS, 6PCSM, Wright R-975 300 h.p. (Edo K Floats)	3,198	1,502	4,700
213	8-26-29	Curtiss Falcon, 2POLB, Geared Conqueror 600 h.p.	3,367	1,898	5,265
214	8-26-29	Command-Aire 5C-3B, 3POLB, Axelson 115 h.p.	1,503	869	2,372
215	8-26-29	Fairchild KR-21 (Formerly Kreider Reisner C6B), 2POLB, Kinner K5 100 h.p.	1,068	535	1,603
216	8-28-29	New Standard D-29-A, 2POLB, Kinner 100 h.p.	1,165	625	1,790
217	8-28-29	Stinson SM-6B, 8PCLM, Wasp 450 h.p.	3,496	1,854	5,350
218	8-30-29	Mono Aircraft Monoprep, 2POLM, Velie 55 h.p.	783	505	1,288
219	9- 4-29	Keystone K-84 Commuter, 4PCAmB, Wright R-975 300 h.p.	2,920	1,230	4,150
220	9- 5-29	Curtiss-Robertson Robin J1, 3PCLM, R-540 165 h.p.	1,625	898	2,523
		(Edo DeLuxe Floats) Robin J1, 3PCSM, R-540 165 h.p.	1,790	870	2,660
		(DeLuxe Equipment) Robin J1, 3PCLM, R-540 165 h.p.	1,683	898	2,581
221	9- 5-29	Curtiss-Robertson Robin J2, 3PCLM, Wright R-540 165 h.p.	1,565	1,035	2,600
222	9- 5-29	Fokker AF-X1, SPCAm M Cyclone 525 h.p..	4,470	2,430	6,900
223	9- 6-29	Kreutzer K5, 6PCLM, 3 Kinners @ 90 h.p...	2,745	1,698	4,443
224	9- 7-29	New Standard D-25-A, 5POLB, Wright R-760 225 h.p.	2,055	1,290	3,345
225	9- 7-29	New Standard D-26-A, 3POLB, Wright R-760 225 h.p.	2,055	1,345	3,400
226	9- 7-29	New Standard D-27-A, 1POLB, Wright R-760 225 h.p.	2,055	1,345	3,400
227	1-23-30	Lockheed Wasp Vega 5-B, 7PCLM, Wasp 450 h.p.	2,490	1,775	4,265
		(Edo K Floats) 5-B, 7PCSM, Wasp 450 h.p	2,820	1,930	4,750
228	9-17-29	Great Lakes 2T-1A, 1-2POLB, American Cirrus 90 h.p.	1,002	578	1,580
229	9-17-29	General 111-C, 2POLM, Warner 110 h.p.....	1,206	535	1,741
230	9-18-29	Nicholas-Beazley, NB3V, 3POLM, Velie 65 h.p.	772	629	1,401
231	9-18-29	Nicholas-Beazley, NB3G, 3POLM, Genet Mark II 80 h.p.	735	629	1,364
		Without Oil Radiator..	735	629	1,364
		With Oil Radiator.....	768	637	1,405
232	9-18-29	Rearwin 2000-C, 3POLB, Challenger 170 h.p..	1,495	885	2,380
233	9-18-29	Command-Aire 5C-3C, 3POLB, Wright R-540 165 h.p.	1,559	931	2,490

A.T.C. No.	Date Issued	Airplane	Weight Empty	Useful Load	Gross Weight
234	9-21-29	Fokker AF-XIV, 1, 7, or 9 PCLM, Hornet 525 h.p.	4,346	2,854	7,200
		Mailplane 1PCLM	4,245	2,955	7,200
235	9-21-29	Mercury Chic T-2, 2POLM, LeBlond 90 h.p.	935	578	1,513
236	9-25-29	Curtiss Thrush "J," 6PCLM, Wright R-760 225 h.p.	2,260	1,540	3,800
237	9-25-29	Curtiss Carrier Pigeon, 1POLB, Geared Conq. 600 h.p.	4,210	3,390	7,600
238	9-26-29	Simplex W-2-S, 2POLM, Warner 110 h.p. (See Eng. Memo)	1,152	627	1,779
239	9-26-29	Brunner-Winkle Bird BK, 3POLB, Kinner 90 h.p.	1,199	781	1,980
240	9-30-29	Wzco CSO, 3POLSB (Edo M Floats) Wright R-760 240 h.p. Landplane..	1,628	972	2,600
		Seaplane....	1,845	978	2,823
241	9-28-29	Moreland M-1, 3POLM, J5 220 h.p.	2,000	800	2,800
242	9-30-29	Fairchild Model 42, 4PCLM, R-975 300 h.p.	2,676	1,570	4,246
243	9-30-29	Cessna DC-6 A, 4PCLM, Wright R-975 300 h.p.	1,932	1,248	3,180
244	9-29-29	Cessna DC-6B, 4PCLM, Wright R-760 240 h.p.	1,871	1,229	3,100
245	9-30-29	Bellanca PM-300, 4PCLM, Wright R-975 300 h.p.	2,290	2,310	4,600
246	9-30-29	Ford 7AT, 15PCLM, 2 Wright R-975's @ 300 h.p. 1 Wasp 420 h.p.	7,280	5,630	12,910
247	10- 2-29	Doyle O2, 2POLM, LeBlond 65 h.p.	792	529	1,321
248	10- 4-29	Ireland N2C, 5PO-CAmB, P&W Wasp 450 h.p.	3,294	1,566	4,860
249	10- 4-29	Mono Aircraft Monosport 1, 2PCLM, Warner 110 h.p.	1,056	594	1,650
250	10 -4-29	Mono Aircraft Monosport 2, 2PCLM, Kinner 90 h.p.	1,053	597	1,650
251	10-27-29	Stearman C-3R, 3POL-SB, (Edo P Floats) R-760 225 h.p.	1,741	1,013	2,754
252	10- 7-29	Lockheed Vega, 7PCLM, Wright R-975 300 h.p.	2,305	1,915	4,220
253	10- 9-29	Swallow TPW, 2POLB, Warner 110 h.p.	1,201	538	1,739
254	10-12-29	Curtiss-Wright Travel Air 4D, 3POLB, Wright R-760 240 h.p.	1,837	1,043	2,880
		(Edo P Floats) 3POSB, Wright R-760 240 h.p.	2,044	956	3,000
255	10-12-29	Star Model C, 2PCLM, LeBlond 65 h.p.	861	529	1,400
256	11- 8-29	Davis D-1, 2POLM, LeBlond 5D 65 h.p. or LeBlond 5DE 70 h.p.	839	495	1,334
257	10-16-29	Waco CTO, 3POLB, R-760 240 h.p.	1,677	923	2,600
258	11-20-29	Consolidated "Commodore" Type 1 and Type 2,25 or 33 PCFbM 2 Hornet "B" @ 575 h.p.. Weights for Type 1.	10,550	7,050	17,600
		Weights for Type 2.	10,500	7,100	17,600
259	10-19-29	Inland S-300, 2POLM, LeBlond 65 h.p.	768	524	1,290
260	10-30-29	Keystone K-78-D Patrician, 20PCLM, 3 Cyclones @ 525 h.p.	10,224	6,376	16,600
261	10-24-29	Curtiss-Robertson Thrush J, 6PCLM, R-760 225 h.p.	2,260	1,540	3,800
262	10-26-29	Ryan B-7, 6PCL-SM, (Edo K Floats) Wasp 420 h.p.	2,503	1,780	4,283
		Seaplane..	3,053	1,617	4,670
263	10-28-29	Rand M-1-CK, 2POLM, Kinner 90 h.p.	1,142	658	1,800
264	11-14-29	St. Louis Cardinal C2-90, 2PCLM, LeBlond 90 h.p.	999	558	1,557
265	11- 2-29	Paramount Cabinaire, 4PCLB, Wright R-540 165 h.p.	1,620	1,010	2,630
266	11-14-29	Curtiss Fledgling J1, 2POLB, Wright R-540 165 h.p.	2,009	691	2,700
267	8- 8-29	Verville 104, 4PCLM, R-760 225 h.p.	2,166	1,234	3,400
268	11- 4-29	Curtiss-Robertson Robin W, 3PCLM, Warner 110 h.p.	1,520	780	2,300
269	11- 6-29	Curtiss Fledgling J2, 2POLB, Wright R-760 225 h.p.	2,117	888	3,005
270	11- 6-29	Curtiss-Robertson Robin 4-C, 4PCLM, Challenger 170 h.p.	1,676	924	2,600
271	11- 8-29	Bach 3-CT-9, 10PCLM, 2 Wright R-760's @ 225 h.p. 1 Wasp 450 h.p.	5,010	2,990	8,000
272	11-12-29	Davis D-1-K, 2POLM, Kinner 90 h.p.	925	536	1,461
273	11-13-29	St. Louis Cardinal C-2, 2PCLM, LeBlond 65 h.p.	929	521	1,450
274	11-14-29	Rogers, RB-X, 4POFbB, R-760 240 h.p.	2,396	1,034	3,430
275	11-13-29	Mono Aircraft Monocoach 275, 4PCLM, Wright R-760 225 h.p.	1,883	1,217	3,100
276	11-14-29	Detroit Ryan Speedster P-2-A (formerly Parks P-2-A), 3POLB, Wright R-540 165 h.p.	1,483	897	2,380

A.T.C. No.	Date Issued	Airplane	Weight Empty	Useful Load	Gross Weight
277	12- 4-29	St. Louis Cardinal C2-110, 2PCLM, Kinner 90 h.p.	1,006	557	1,563
278	12- 2-29	Curtiss-Wright Travel Air 10-D, 4PCLM, Wright R-760 225 h.p.	2,130	1,270	3,400
279	12- 4-29	Lincoln PT Kinner, 2POLB, Kinner 90 h.p.	1,176	591	1,767
280	12-12-29	Travel Air 4-P, 3POLB, ACE LA-1 140 h.p.	1,531	857	2,388
281	12-13-29	Fokker AF-32, 32PCLM, 4 Hornet "B" @ 575 h.p.	14,910	9,340	24,250
282	12-13-29	American Eagle Phaeton R-540, 3POLB, Wright R-540 165 h.p.	1,759	801	2,560
283	12-16-29	American Eagle, Phaeton J5, 3POLB, Wright J5 220 h.p.	1,896	907	2,803
284	12-31-29	Lincoln PT Warner, 2POLB, Warner 110 h.p.	1,203	591	1,794
285	1- 3-30	Courier PB-1, 3PCLM, Kinner 90 h.p.	1,387	713	2,100
286	1- 2-30	Spartan C3-225, 3POLB, Wright R-760 225 h.p.	1,741	959	2,700
287	1- 4-30	American Aeronautical Savoia Marchetti (American) S-56, 3POAmB, Kinner 90 h.p.	1,451	699	2,150
288	1-22-30	Detroit Sea Rover, 4POFbB, Challenger 185 h.p. (See Eng. Memo.)	1,745	980	2,725
289	1-14-30	Fairchild 71-A, 7PCLM, Wasp 420 h.p.	3,156	2,344	5,500
290	1-20-30	Spartan C3-166, 3POLB, Comet 130 h.p.	1,637	968	2,605
291	1-23-30	Consolidated Fleetster 17, 8PCLM, Hornet B 575 h.p.	3,326	1,974	5,300
		Consolidated Fleetster 17, 6PCSM, Hornet B 575 h.p. (Edo J Floats)	3,822	1,748	5,570
292	1-23-30	Stearman 4-E, 3POLB, Wasp 420 h.p.	2,426	1,510	3,936
293	1-28-30	American Eagle 201, 3POLB, Kinner 90 h.p. (See Eng. Memo.)	1,168	782	1,950
294	2- 1-30	Stinson SM-8B, 4PCLM, Wright R-760 225 h.p.	2,063	1,137	3,200
295	2-11-30	Stinson SM-8A, 4PCLSM (Edo P Floats) Lycoming R-680 215 h.p. Landplane	2,061	1,134	3,195
		Seaplane	2,440	1,080	3,520
296	2-12-30	Ford 5AT-CS, 15PCSM, 3 Wasps @ 450 h.p. (Aircraft Products A-27000 Floats)	8,675	4,825	13,500
297	2-15-30	Rand M-1-CW Warner, 2POLM, Warner 110 h.p.	1,124	658	1,782
298	2-18-30	Stinson SM-7A, 4PCLM, Wright R-975 300 h.p.	2,234	1,266	3,500
299	3-12-30	Bach 3-CT-9S, 9PCLM, 2 R-760's @ 225 and 1 Wasp 450 h.p.	5,193	2,807	8,000
300	3-14-30	Lockheed Sirius 8 and 8A, 2POLM, Wasp 420 h.p. Model 8A	2,978	1,622	4,600
		Model 8	3,060	1,540	4,600
301	3-18-30	American Eagle D-430, 4PCLM, R-540 165 h.p.	1,864	1,133	2,997
302	3-18-30	American Eagle E-430, 4PCLM, Continental A-70 165 h.p.	1,875	1,133	3,008
303	3-24-30	Driggs Skylark Model 3, 2POLB, Rover 75 h.p.	878	501	1,379
304	3-26-30	Stearman 4C, 3POLB, R-975 300 h.p.	2,256	1,544	3,800
305	4- 3-30	Stearman 4D, 3POLB, Wasp Junior 300 h.p.	2,297	1,503	3,800
306	4- 2-30	Mono, Monocoupe 90, 2PCLSM (Edo H Floats) Lambert R-226 90 h.p. Landplane	859	631	1,490
		Landplane with ring and starter	888	631	1,519
		Seaplane	989	591	1,580
307	4- 2-30	Ford 9A, 13PCLM, 3 Wasp Juniors @ 300 h.p.	6,863	3,267	10,130
308	4- 2-30	Detroit Vega DL-1, 7PCLM, Wasp 450 h.p.	2,595	1,905	4,500
309	4- 3-30	Curtiss-Robertson Robin 4C-1A, 4PCLM, 185 h.p. (See Eng. Memo.)	1,811	1,039	2,850
310	4- 5-30	Spartan C-4-225, 4PCLM, R-760 225 h.p.	2,325	1,190	3,515
311	4- 7-30	Waco RNF, 3POLSB Warner 110 h.p. (Edo L Floats) Landplane	1,150†	747	1,897†
		Seaplane	1,421†	757	2,178†
312	4- 8-30	Stinson SM-8D, 4PCLM, Packard Diesel R-980 225 h.p.	2,175	1,025	3,200
313	4-12-30	Waco KNF, 3POLB, Kinner 100 h.p.	1,125	747	1,872
314	4-16-30	Rearwin 2000-CO, 3POLB, Continental A-70 165 h.p.	1,447	912	2,359
315	3-16-30	Inland Model W-500, 2POLM, Warner 110 h.p.	916	574	1,490
316	4-16-30	Verville 104-P, 4PCLM, Packard Diesel DR-980 225 h.p.	2,300	1,100	3,400
317	4-24-30	Davis D-1-66, 2POLM, LeBlond 66 85 h.p.	854	526	1,380
318	5- 6-30	Alexander Bullet C-7, 4PCLM, R-540 165 h.p.	1,708	1,082	2,790

† These weights decreased 15 lbs. if wood propeller substituted for steel.

A.T.C. No.	Date Issued	Airplane	Weight Empty	Useful Load	Gross Weight
319	4-30-30	Bellanca Skyrocket (CH-400), 6PCL-SM, Wasp 420 h.p. ..... Landplane..	2,592	2,008	4,600
		Seaplane (Edo K or Aircraft Products A-9500 Floats)	3,012	1,988	5,000
320	5- 7-30	Consolidated Fleetster 20 Type 2, 6PCLM, Hornet B 575 h.p.	3,439	2,461	5,900
321	5- 6-30	Star E Cavalier, 2PCLM, Lambert R-266, 90 h.p.	919	506	1,425
322	5- 9-30	Stearman 4 EM, 1POLB, Wasp 450 h.p.	2,455	1,481	3,936
323	5-19-30	Verville AT, 2POLB, Continental A-70 165 h.p.	1,562	678	2,240
324	5-27-30	New Standard Model D-29-S, 2POLB, Kinner K-5 100 h.p.	1,195	655	1,850
325	5-27-30	Stearman 4CM, 1POLB, Wright R-975 300 h.p.	2,285	1,651	3,936
326	5-27-30	Stearman 4DM, 1POLB, Wasp, Jr. 300 h.p.	2,326	1,610	3,936
327	6-16-30	Mono Aircraft Monocoupe 110, 2PCLM, Warner 110 h.p.	991	620	1,611
328	6-19-30	Bellanca Pacemaker 300 W (Edo K) float, 6PCL-SM, Wasp Jr. 300 h.p.	2,465	1,835	4,300
		Seaplane..	2,922	1,835	4,757
329	6-20-30	Stinson SM-7B, 4PCLM, Wasp Jr. 300 h.p ...	2,312	1,188	3,500
330	6-24-30	Boeing Model 200 Monomail, 1POLM, Hornet B 575 h.p.	4,626	3,374	8,000
331	6-25-30	Kari-Keen Model 90, 2PCLM, Lambert 90 h.p.	1,014	534	1,548
332	6-25-30	Ogden Osprey, 6PCLM, 3 Amer. Cirrus @ 90 h.p.	2,898	1,650	4,548
333	6-27-30	Waco HSO, 3POLB, Packard R-980 225 h.p...	1,814	786	2,600
334	6-27-30	Aeromarine Klemm AKL-26-B, 2POLM, LeBlond 5DF 85 h.p.	1,016	565	1,581
335	7-10-30	Stinson SM-6000, 11PCLM, 3 Lycomings R-680 @ 215 h.p.	5,622	2,778	8,400
		(With Radio Installed)..	5,575	2,925	8,500
336	7-11-30	American Aero. S-56-B, 3POAmB, Kinner R-440, 125 h.p.	1,462	738	2,200
337	7-14-30	Waco QSO, 3POLB, Continental 165 h.p.	1,585	1,001	2,586
338	7-17-30	Detroit E-2A, 3POAmB, Challenger 185 h.p...	1,970	755	2,725
339	7-17-30	Waco PSO, 3POLB, A.C.E. LA-1, 140 h.p.	1,508	933	2,441
340	7-22-30	Sikorsky S-39-A, 4PCAmM, Wasp Jr. 300 h.p..	2,555	1,145	3,700
341	7-22-30	Swallow H-A, 3POLB, Axelson 150 h.p.	1,416	784	2,200
342	7-25-30	Inland S-300-E, 2POLM, LeBlond 5DE 70 h.p.	786	504	1,290
343	7-23-30	Inland R-400, 2POLM, Warner V-2 85 h.p.	857	564	1,421
344	7-25-30	Lincoln PTT, 2POLB, Brownback C400 90 h.p.	1,164	598	1,762
345	8- 2-30	Waco INF, 3POLB, Kinner R-440 125 h.p. With Wood Propeller..	1,156	740	1,896
		With Metal Propeller..	1,171	740	1,911
346	8-11-30	Ryan C-1, 4PCLM, R-760 240 h.p.	2,133	1,217	3,350
347	8-16-30	Curtiss-Robertson Kingbird D-1, 8PCLM, 2 R-760's @ 240 h.p.	3,754	2,361	6,115
348	8-16-30	Curtiss-Robertson Kingbird D-2, 8PCLM, 2 Wright R-975's @ 300 h.p.	3,877	2,238	6,115
349	8-11-30	States B-3, 2POLM, Kinner 100 h.p.	1,083	552	1,635
350	8-11-30	St. Louis C-2-85, 2PCLM, LeBlond 85 h.p.	940	580	1,520
351	8-13-30	Aeronautical Aeronca C-2 and Aeronca PC-2, 1POLB and 1POSB, (APC Model A-1680 floats (Aeronca E-107A 26 h.p.)	398	274	672
352	8-13-30	Curtiss-Wright Travel Air 6B, 6PCLM, R-975 300 h.p.	2,707	1,713	4,420
353	8-20-30	Laird LCB-300, 3POLB, R-975 300 h.p.	1,958	1,064	3,022
354	8-20-30	Great Lakes 2T-1E, 1POLB, Amer. Cirrus Ensign 95 h.p.	1,012	568	1,580
355	8-20-30	Mono Aircraft Monocoupe 90J, 2PCLM, Warner Jr. 90 h.p.	902	609	1,511
356	8-23-30	Sikorsky S-38-BH, 10CAmB, 2 Hornet B's @ 575 h.p.	6,900	3,580	10,480
357	8-25-30	Fairchild 51, 5PCSM (P-4 floats) R-975 300 h.p.	2,702	1,298	4,000
358	8-25-30	Fairchild 51-A, 5PCLM, Wasp Jr. 300 h.p.	2,440	1,480	3,920
359	8-23-30	Mono Aircraft Monocoupe 125, 2PCLM, Kinner B5 125 h.p.	1,007	583	1,590
360	8-27-30	Bellanca, 12PCLM, geared Conqueror 600 h.p. (Nos. 701 and up)	5,490	4,010	9,500
361	8-30-30	Viking V2, 4POFbB, Wright R-760 240 h.p.	2,300	1,150	3,450
362	9- 2-30	Waco CRG, 1POLB, Wright R-760 240 h.p.	1,359	1,241	2,600
363	9-10-30	Fairchild KR-21B, 2POLB, Kinner R-440 (B-5) 125 h.p.	1,120	610	1,730
364	9-13-30	Pitcairn PA-8, 1 or 3POLB, Wright R-975 300 h.p.	2,294	1,706	4,000

A.T.C. No.	Date Issued	Airplane	Weight Empty	Useful Load	Gross Weigh
365	9-13-30	Stearman 6A, 2POLB, Wright R-540 165 h.p...	1,733	667	2,400
366	9-16-30	Boeing 221, 9PCLM, Hornet B 575 h.p.....	4,990	3,010	8,000
367	9-19-30	Stinson SM-6000-A, 10PCLM, 3 Lycoming R-680's @ 215 h.p.....	5,600	2,900	8,500
368	9-22-30	Fairchild 125, 2POLB, Fairchild 6-390 120 h.p..	1,295	595	1,890
369	9-29-30	Consolidated Fleetster 17 Type 2-C, 8PCLM, Cyclone R-1820E 575 h.p.....	3,443	2,157	5,600
370	9-29-30	Ireland Privateer Model P-2, 2POAmM, Warner Scarab 110 h.p.....	1,403	562	1,965
371	9-30-30	Stearman 6F, 2POLB, Continental A-70 165 h.p.....	1,727	673	2,400
372	10- 1-30	Lincoln AP-B5, 3PCLM, Kinner B5 125 h.p....	1,352	828	2,180
373	10- 1-30	Lincoln AP-K5, 3PCLM, Kinner K5 100 h.p...	1,320	828	2,148
374	10- 4-30	Fleet Model 7, 7-C, Model 7, DeLuxe 1-2, PO-CL-5B, Kinner B-5 125 h.p.			
		Model 7, 7-C Landplane.....	1,146	594	1,740
		Model 7, DeLuxe Landplane.....	1,187	744	1,931
		One place Seaplane (Edo I Model 1835 Floats)	1,319	632	1,951
		Two place Seaplane (Edo I Model 1835 Floats)	1,279	594	1,873
375	10- 8-30	Sikorsky, S-39-B, 5PCAmM, Wasp Jr. 300 h.p.	2,678	1,322	4,000
376	10-17-30	Fairchild KR-34-D, 3POLB, Comet 7E 165 h.p.....	1,515	855	2,370
377	10-24-30	Laird LC-RW300, 3POLB, Wasp Jr. 300 h.p...	1,922	1,088	3,010
378	10-27-30	Lockheed Sirius DL-2, 1-2POLM, Wasp 420 h.p.....Mail passenger type..	2,958†	2,212	5,170
		Mail type.....	2,958†	2,242	5,200
379	10-28-30	Swallow HW, 3POLB, R-540 165 h.p.....	1,380	820	2,200
380	11-18-30	American Eagle American Eaglet Model 230, 2POLM, Szekely SR-3L 30 h.p.....	467	400	867
381	11-22-30	Northrup Alpha Model 2, 1-7PCLM, Wasp 420 h.p.....Mail Type.....	2,590‡	1,910	4,500
		Mail and Passenger Type..	2,679‡	1,821	4,500
382	11-24-30	Brunner-Winkle Bird BW, 3POLB Warner Scarab 110 h.p.....	1,235	785	2,020
383	11-26-30	Spartan C4-300, 4PCLM, Wright R-975 300 h.p.....	2,567§	1,398	3,965

AIRCRAFT APPROVED FOR LICENSE WITHOUT APPROVED TYPE CERTIFICATES

Memo No.	Date Approved	Airplane	Gross Weight	Manufacturers' Numbers
2- 1	1- 1-29	Cancelled: only plane eligible destroyed.		
2- 2	1- 7-29	Fokker FX, 14PCLM, 3 Wasps @ 450 h.p.....12,500		1000-1004
2- 3	5-22-29	Fokker Super-Universal, 6PCLM, Wasp 420 h.p.	4,500	800
2- 4	10-22-28	Boeing 80, 14PCLB, 3 Wasps @ 450 h.p.....15,660		1030-1033
2- 5	6- 1-28	Breese 5, 5PCLM, Wright J5 220 h.p.....	3,100	All
2- 6	3- 1-29	Buhl Army Training, 2POLB, Wright J5 220 h.p.	2,583	One only
2- 7	12-16-28	Cessna, 4PCLM, Wright J5 220 h.p.....	2,435	113, 116, 117, 118, 120, 121, 125, 135, 138, 142, 143, 144, 147
2- 8	1- 5-29	Cessna, 4PCLM, SH-12 128 h.p.....	2,260	All
2- 9	9-25-28	Stout (Ford) 4-AT-A, 14PCLM, 3 Wright J5's @ 220 h.p.....	9,300	1-14
2- 10		Superseded by A.T.C. No. 87.		
2- 11	10-27-28	Stout (Ford) 4-AT-C, 14PCLM, 2 Wright J5's @ 220 h.p. 1 Wasp @ 450 h.p.....10,000		47
2- 12	2-16-29	Stout (Ford) 5-AT-B, 14PCLM, 3 Wasps @ 420 h.p.....12,650		4 and up
2- 13	8-27-28	Hamilton 43, 8PCLM, Wasp 420 h.p.....	6,000	43
2- 14		Superseded by A.T.C. No. 94.		
2- 15	3- 1-29	International F-18,5PCLB, Wright J5 220 h.p..	4,000	11-12
2- 16	11-16-28	Ireland N-2, 5POAmB, Wright J5 220 h.p.....	3,620	16 and up
2- 17	8-27-28	Laird LCB, 3POLB, J5 220 h.p.....	2,850	Manufactured before Oct, 1, 1928.
2- 18	7-18-28	Mahoney-Ryan B-1, 5PCL-SM, Wright J5 220 h.p. (Fairchild Floats).....	3,300	61
2- 19	9-22-28	Metal Aircraft G-1, 5PCLM, Wasp 450 h.p....	5,000	1
2- 20	11- 1-27	Pitcairn PA-3, 3POLB, OX5 90 h.p.....	1,965	All
2- 21	11- 1-27	Pitcairn PA-4, 3POLB, OX5 90 h.p.....	1,880	All
2- 22		Superseded by A.T.C. No. 92.		

† NOTE: Empty weight includes landing lights, battery, starter, generator, N.A.C.A. cowling and wheel streamlines.

‡ NOTE: Empty weight does not include starter, generator and battery (Total 46 lbs.).

§ NOTE: Empty weight includes Townend Ring and high or low pressure tires.

Memo No.	Date Approved	Airplane	Gross Weight	Manufacturers' Numbers
2- 23	6-15-28	ikorsky UN-4 Wing on JN4D, 2POLM, OX5 90 h.p.	2,100	All
2- 24	10-24-28	Stinson SM-1B, 6PCLM, Wright J5 220 h.p. M-241, 253 and 254 as 3 place of same weight.	3,485	All
2- 25	7- 6-28	Travel Air Smith Incubator, 3POLB, Anzani 120 h.p.	2,180	277
2- 26	6-14-28	Travel Air Huff-Daland, 3POLB, OX5 90 h.p.	2,180	501-502
2- 27	2-23-29	Travel Air 5000, 5PCLM, Wright J5 220 h.p.	3,600	Only relicensing
2- 28		Superseded by A.T.C. No. 100.		
2- 29	12- 1-28	Thaden T-1, 7PCLM, Wasp 450 h.p.	5,320	All
2- 30	11-30-29	Boeing 40B Modified, 4POLB, Hornet 525 h.p.	6,079	882, 1095
2- 31		Superseded by A.T.C. No. 103.		
2- 32	2- 7-29	Ford 5-AT-A, 12-14PCLM, 3 Wasps @ 420 h.p.	12,150	2 and 3
2- 33	1-12-29	Brunner Winkle Bird A, 3POLB, OX5 90 h.p.	2,150	1000-1008
2- 34	1- 4-29	Fokker FVII,10PCLM, Hornet 525 h.p.	7,553	617
2- 35	2-16-29	Travel Air W-4000, 3POLB, Warner 110 h.p.	2,276	All
2- 36	12-17-28	Sikorsky S-38-AH, 6PCAmB, 2 Hornets @ 525 h.p.	10,480	14-6
2- 37	2- 2-29	Curtiss Falcon Cargo, 2POLB, D-12-D 435 h.p.	4,658	5
2- 38	1-19-29	New Standard D-24, 5POLB, Hisso 180 h.p.	3,400	101, 102, 104
2- 39	10-11-29	A. V. Roe & Co., Ltd. Avro Avian, 2POLB, Cirrus Mark III 85 h.p. or Mark II 80 h.p.	1,450	135-143, inc., 147, 157, 166, 169, 186-190, inc., 194-197 inc., 242-281 inc.
2- 40	2- 2-29	Fairchild FC-2C, 5PCLM, Curtiss C-6A 160 h.p.	3,300	57, 58, 87, 89.
2- 41	8- 2-29	Moth (British), 2POLB, DH Gipsy 85 h.p.	1,650	341, 814, 885, 886, 910-913, 924-926, 978-980, 1044, 1063, 1064, 2A-6A
2- 42	2-16-29	Travel Air 2000, 3POSB, OX5 90 h.p. (Edo Floats)	2,351	280
2- 43	2-21-29	Boeing 64 Navy Training, 2POLB, Wright J5 220 h.p.	2,735	Two only
2- 44	2-23-29	Kreider-Reisner C-5,3POLB, Warner 110 h.p.	1,255	179, 181, 255
2- 45	3- 1-29	Douglas M-4, 3POLB, Hornet 525 h.p.		314
2- 46	6-28-29	Buhl CA-8, 6PCLB, Wasp 450 h.p.	6,100	34 and 39
2- 47	3-23-29	Aeromarine-Klemm AKL-25-A, 2POLM, Salmson AD9 40 h.p.	1,325	1, 2, 4
2- 48	3-19-29	American Eagle A-1, 3POLB, SH-12 128 h.p.	1,960	150
2- 49	3-22-29	Butler Black Hawk, 3POLB, Wright J5 220 h.p.	2,859	103
2- 50	3-26-29	Ryan B-3, 5PCLM, R-975 300 h.p.	3,704	183-186
2- 51	5- 2-29	Buhl CA-6 Special, 4PCLB, Wright R-975 300 h.p.	4,050	43
2- 52	3-28-29	Bellanca CH-300, 6PCLM, Wright R-975 300 h.p.	4,050	129
2- 53	3-29-29	Stearman C2-K, 3POLB, SH-12 128 h.p.	2,400	117
2- 54	3-30-29	Keystone K-47-A, 11PCLB, 3 Wright J5's @ 220 h.p.	10,600	137
2- 55	4-15-29	American Eagle A, 3POLB, Hisso 150-180 h.p.	2,463	103, 168, 171, 181, 200, 206, 230, 240, 255-259, 276, 286, 290, 291, 297, 313, 315, 392.
2- 56	4- 1-29	Viking (Bourdon) B-2, 3POLB, SH-14 113 h.p.	1,950	2-7
2- 57	6-12-29	International F-17-H, 3POLB, Hisso 150-180 h.p.	2,706	34-68
2- 58	4-12-29	Stearman C3-L, 3POLB, Comet 130 h.p.	2,525	169
2- 59	7- 9-29	Curtiss Fledgling, 2POLB, Challenger 170 h.p. (Convertible military planes permissible gross weight 2,701)		1 and up and B1 and up
2- 60	11- 7-29	Stinson SM-1D-300, 6PCLM, Wright R-975 300 h.p.	4,300	300-307
2- 61		Superseded by A.T.C. No. 199.		
2- 62	7-31-29	Metal Aircraft G2-W Flamingo, 8PCLM, Wasp 4 0 h.p.	5,800	4-11
2- 63	5-14-29	Metal Aircraft G-2 Flamingo, 6PCLM, Wasp 450 h.p.	5,718	2
2- 64	6-10-29	Boeing 40-B Modified, 5PCLB, Hornet 525 h.p.	6,075	All
2- 65	11- 4-29	Moth 60-G, 2POLB, DH Gipsy 85 h.p. (American)	1,550	1A and 1B
2- 66	9- 5-29	Lincoln 3A, 3POLB, Hisso 150-180 h.p.	2,718	247, 250 and up
2- 67	5-13-29	Metal Aircraft G2-H, 6PCLM, Hornet 525 h.p.	5,890	3
2- 68	5-15-29	Sikorsky S-38-B Special, 11PCAmB, 2 Wasps @ 450 h.p.	10,480	114-7—114-8

Memo No.	Date Approved	Airplane	Gross Weight	Manufacturers' Numbers
2- 69	5-16-29	Sikorsky S-38-B Special, 4PCAmB, 2 Wasps @ 450. h.p.	10,480	114-9
2- 70	5-22-29	Stearman C3-K, 3POLB, SH-14 128 h.p.	2,400	109
2- 71	5-31-29	Curtiss Falcon, 2POLB, Conqueror 600 h.p.	4,560	6
2- 72	7-24-29	Buhl CA-3D Special, 4PCLB, Wright R-975 300 h.p.	3,200	45 and up
2- 73	5-31-29	Stinson SM-2AA, 4PCLM, Wright R-540 165 h.p.	3,152	1046-1055
2- 74	6- 4-29	Sikorsky S-38-B Special, 6PCAmB, 2 Wasps @ 450 h.p.	10,480	114-14
2- 75	6-12-29	Metal Aircraft G2-H, 8PCLM, Hornet 525 h.p.	6,000	9 and up
2- 76	6-11-29	Travel Air A-6000-A, 7PCLM, Wasp 450 h.p.	5,500	840, 892, 963, 1078, 2003, 981, 1084, 1097, 1098
2- 77	6-14-29	Spartan C3-3, 3POLB, Challenger 170 h.p.	2,606	101 and up
2- 78	6-14-29	Spartan C3-4, 3POLB, Axelson 115 h.p.	2,486	101 and up
2- 79	6-14-29	Spartan C3-5, 3POLB, Wright R-540 165 h.p.	2,587	101 and up
2- 80	11- 8-29	Ford 6-ATS (Special), 12PCSM, 3 Wright R-975's @ 300 h.p. (Brewster Floats)	12,500	6-ATS-1
2- 81	6-18-29	Kari-Keen Coupe, 6PCLM, Velie 55 h.p.	1,400	210 and up
2- 82		Superseded by A.T.C. No. 197.		
2- 83	6-21-29	Boeing 100 Special, 2POLB, Wasp 450 h.p.	2,694	1094
2- 84	7- 2-29	Curtiss-Wright Travel Air D-4000, 3POLB, Wright J5 220 h.p.	2,650	690 and up. (See Engineering memo.)
2- 85	6-24-29	Keystone K-78, 20 PCLM, 3 Cyclones @ 525 h.p.	15,000	186
2- 86	6-28-29	Fairchild Model 51, 5PCLM, Wright R-975 300 h.p.	4,000	157
2- 87	7- 1-29	Aeromarine-Klemm AKL-25, 2POSM, Salmson AD9 40 h.p.	1,490	2 and up
2- 88		Superseded by A.T.C. No. 247.		
2- 89	7- 3-29	Stinson SM-6B, 7PCLM, Wasp 450 h.p.	5,000	2000-2001
2- 90	9-10-29	Mono Monoprep, 2POLM, Velie 65 h.p.	1,360	6004, 6005, 6006, 6013, 6014, 6015, 6016, 6017, 6021, 6025-6035 inc.
2- 91	7- 8-29	Curtiss-Robertson C Robin Special, 3PCLM, Challenger 170 h.p.	2,440	180 and 210
2- 92		Superseded by A.T.C. No. 273.		
2- 93	7-17-29	Laird LCA-A, 6PCLB, Wasp 450 h.p.	5,338	163
2- 94	7-22-29	Kreutzer K-2, 6PCLM, 2 LeBlond 60's @ 65 h.p. 1 LeBlond 90, 90 h.p.	4,445	104
2- 95	1-15-30	American Aeronautical Savoia Marchetti S-56, 2POAmB, Kinner 90 h.p.	2,100	2 and 3
2- 96	8- 2-29	American Aeronautical Savoia Marchetti S-56, 2POAmB, Kinner 90 h.p.	1,870	50603
2- 97	7-23-29	Ford, 6-AT, 16PCLM, 3 R-975's @ 300 h.p.	12,176	4 and up
2- 98	7-27-29	Bach 3-CT-5, 10PCLM, 2 Comets @ 130 h.p. 1 Wasp, 450 h.p.	8,000	2
2- 99		Superseded by A.T.C. No. 200.		
2-100	7-27-29	International F-17, 3POLB, OX5 90 h.p. or OXX6 102 h.p.	2,356	40-100
2-101	7-26-29	Waco 220, 3POLB, Wright J5 220 h.p.	2,310	A-117 and up
2-102	7-30-29	Waco 10, 3POSB, Wright J5 220 h.p. (Edo DeLuxe Floats)	2,660	818 and A-116
2-103	7-31-29	Alexander A-14, 3POLB, Wright R-540 165 h.p.	2,588	849 and up
2-104	2-18-30	Bach 3-CT-S, 9PCLM, 2 Wright J5's @ 220 h.p. 1, Wasp 450 h.p.	8,000	8
2-105	7-31-29	Mahoney-Ryan B-3A, 6PCLM, Wright J5 220 h.p.	3,700	210 and up
2-106	8- 9-29	Rearwin 2000-C, 3POLB, Challenger 170 h.p.	2,380	101 and up
2-107	8-12-29	Golden Eagle Chief, 2POLM, LeBlond 90 90 h.p.	1,480	803 and up
2-108	8-15-29	Atlantic Coast F5-L, 14PCSB, 2 Liberty's @ 400 h.p.	13,600	1-5
2-109	8-16-29	Mono Aircraft Monocoach, 4PCLM, Wright J5 220 h.p.	3,092	5002-5007
2-110	8-16-29	Arrow Sport, 2POLB, Kinner 90 h.p.	1,529	412 and up
2-111	8-22-29	Aeromarine-Klemm AKL-26 Special, 2POSM, LeBlond 60 65 h.p.	1,590	2-32 and up
2-112	8-23-29	Fleet Model 3, 2POLB, Wright R-540 165 h.p.	2,000	166
2-113	3- 8-30	Schreck 17-HT-4, 4POFbB, Hisso 180 h.p.	3,321	133 and 162, etc. (See Eng. memo.)
2-114	8-27-29	Taylor Chummy B-2, 2POLM, Kinner 90 h.p.	1,643	9 and up
2-115	8-29-29	Moth 60GM—Superseded by A.T.C. No. 197.		
2-116	9- 4-29	Keystone Loening C2C, 9PCAmN, Cyclone 525 h.p.	6,135	216, 232, 244

Memo No.	Date Approved	Airplane	Gross Weight	Manufacturers' Numbers
2-117	9- 6-29	Command-Aire 5C-3C, 3POLB, Wright R-540 165 h.p.	2,490	W-92
2-118	9- 6-29	Avileo Liore et Olivier Le'O 180, 2PCFbM, Salmson 9Ac 180 h.p.	2,165	2 and 3
2-119	9- 6-29	Davis V-3, 2POLM, LeBlond 65 h.p.	1,328	101-123
2-120	9- 6-29	Mono Aircraft Monocoupe 113 Special, 2PCLM, Warner 110 h.p.	1,650	321
2-121	9- 6-29	American Eagle—Superseded by A.T.C. 283.		
2-122	9- 6-29	Curtiss Kingbird J (formerly Kingbird C), 6PCLM, 2 R-760's at 240 h.p.	5,600	G-1
2-123		Superseded by A.T.C. No. 282.		
2-124	9- 7-29	Stearman C3B, 3POSB, J5 220 h.p. (Edo P floats)	2,850	2 5
2-125	9- 7-29	Hamilton H-47, 7PCSM, Hornet 525 h.p.	6,375	58
2-126		Superseded by A.T.C. No. 235.		
2-127		Cancelled by A.T.C. No. 242.		
2-128	9-10-29	Mono Aircraft Monoprep, 2POLM, Velie 55 h.p.	1,288	6050–6055
2-129	2-28-29	Hamilton H-47, 8PCLM, Cyclone 525 h.p.	5,750	All
2-130		Cancelled.		
2-131	9-26-29	Courier PB-1, 3PCLM, Kinner 90 h.p.	2,095	100
2-132	9-26-29	Curtiss-Robertson Robin, Hisso, 3PCLM, Hisso 150 h.p.	2,560	112
2-133	4- 4-30	Buhl CA-6W, 4PCLB, Wasp 450 h.p.	4,200	48
2-134	10- 4-29	Mono Aircraft Monosport 1, 2PCLM, Warner 110 h.p.	1,650	2000-2001, 2002, 2005
2-135	10- 4-29	Mono Aircraft Monosport, 2PCLM, Kinner 90 h.p.	1,650	2003 and 2004;
2-136	10- 4-29	Stinson SM-2, 3PCLM, Kinner 90 h.p.	2,500	1029, 1033, 1037
2-137	10- 4-29	Command-Aire 3C3A, 3POSB, Warner 110 h.p. (Edo DeLuxe Floats)	2,305	W-79
2-138	10- 5-29	Curtiss Wright Travel Air S-6000B, 7PCLM, Wright R-975 300 h.p.	4,230	All
2-139	10- 9-29	Cancelled (Planes converted to Model 203A on A.T.C. No. 211).		
2-140	10- 9-29	Corman 3000, 7PCLM, 3 Wright J5's @ 220 h.p.	7,652	2
2-141	10-21-29	Thunderbird W-14, 3POLB, OX5 90 h.p.	2,361	284
2-142	10-23-29	Stinson SM-1D Special, 4PCLM, Wright J5 220 h.p.	4,500	All
2-143	10-23-29	Stinson SM-2AC, 4PCSM, Wright R-760 225 h.p. (Edo P2 Modified Floats)	3,522	1093
2-144	10-30-29	Monarch A, 3POLB, OX5 90 h.p.	2,150	6 and up
2-145	11- 1-29	Coffman A, 3PCLM, OX5 90 h.p.	2,132	3 and 100-110
2-146	11- 1-29	Mono Aircraft Monocoupe, 2PCLM, Genet 80 h.p.	1,362	317
2-147	11- 2-29	Boeing 81-B, 2POLB, Axelson 115 h.p.	2,230	1037
2-148	11-15-29	Davis D-1-K, 2POLM, Kinner 90 h.p.	1,476	501
2-149	11-14-29	Stearman M-2 Special, 2POLB, Hornet 525 h.p.	5,558	1007
2-150	11-14-29	Moth (British) 60-X, 2POLB, Cirrus Mark II 76 h.p.	1,402	547 and 626
2-151	11-15-29	Aircraft Industries Sierra BLW-2, 3PCLM, Comet 130 h.p.	2,131	2 and up
2-152	11-15-29	Fleet 5, 2POLB, Brownback C-400 90 h.p.	1,620	206 and up
2-153	12-14-29	Travel Air 6000B Special, 5PCLM, Wright R-975 300 h.p.	4,230	6-B-2028
2-154	11-20-29	Travel Air SBC-4000, 3POSB, Challenger 170 h.p. (Edo P Floats)	2,900	1041
2-155	11-22-29	Stearman 4C, 3POLB, Wright R-975 300 h.p.	3,794	4001, 4002, 4003 4007
2-156		Superseded by A.T.C. No. 188.		
2-157	11-26-29	Nicholas Beazley NB3, 2POLM, LeBlond 65 h.p.	1,296	18
2-158	12- 2-29	Bolte LW-2, 2POLM, Kinner 90 h.p.	1,525	4 and up
2-159	12- 4-29	Stearman C-3-B Special, 3POLB, Wright J5 220 h.p.	2,830	All
2-160	12- 4-29	Travel Air 4-P, 3POLB, Aircraft LA-1 ACE 140 h.p.	2,388	1332 and up
2-161	12- 5-29	Bird Wing Imperial No. 10, 3POLB, Wright R-540 165 h.p.	2,270	100 and up
2-162		Cancelled.		
2-163	12- 6-29	Fokker F-XI-A, 6PCAmM, Cyclone 525 h.p.	6,000	901
2-164	12-16-29	Paramount Cabinaire 110, 4PCLB, Warner 110 h.p.	2,255	6
2-165	12-16-29	Paramount Cabinaire 110, 3PCLB, Warner 110 h.p.	2,252	1-5
2-166	12-16-29	American Eagle Phaeton Hisso, 3POLB, Hisso 180 h.p.	2,849	600 and up

Memo No.	Date Approved	Airplane	Gross Weight	Manufacturers' Numbers
2-167	1- 3-30	Travel Air 6000-B, 6PCLM, Wright R-975 300 h.p.	4,230	2025
2-168	1- 4-30	Viking (Schreck) 17 HMT2, 2POFbB, Hisso 180 h.p.	3,144	64
2-169	1- 7-30	Travel Air 4D Special, 3POLB, Wright R-760 225 h.p.	2,880	1160
2-170	1- 7-30	Sikorsky S-37-2, 10PCLB, 2 Hornets @ 525 h.p.	14,500	2
2-171	2- 3-30	Emsco B-2, 8PCLM, 3 Challengers @ 170 h.p.	7,233	2-6
2-172	1- 9-30	Fokker F-XI AHB Special, 8PCAmM, Hornet B 575 h.p.	7,200	904
2-173	1-11-30	Miami MM-201, 4PCFbM, Wright R-975 300 h.p.	3,750	52
2-174	1-16-30	Stinson SM1 Special, 6PCLM, Wright J5 220 h.p.	3,485	M-219, M-249, M-250, M-251, M-255, M-224, M-234
2-175	1-17-30	Bach 3-CT-9 Special, 7PCLM, 2 Wright R-760's @ 225 h.p. and 1 Wasp 450 h.p.	8,000	19
2-176	1-31-30	Whittelsey Avian Mark IV-M, 2POLB, ADC Cirrus Mark III 85 h.p.	1,579	101 and up
2-177	2- 5-30	Stearman 4CM Mailplane, 1POLB, Wright R-975 300 h.p.	3,800	4012
2-178	2- 5-30	Curtiss Wright Travel Air D-4-D, 3POLB, Wright R-760 240 h.p.	2,650	1340, 1372, 1374, 1376
2-179	2-10-30	Superseded by A.T.C. No. 299.		
2-180	2-12-30	Superseded by A.T.C. No. 303.		
2-181	2-18-30	Superseded by A.T.C. No. 318.		
2-182	2-21-30	Watkins Skylark SL, 2POLM, LeBlond 65 h.p.	1,477	101 and up
2-183		Superseded by Approval 2-264.		
2-184	2-27-30	Fokker Super Universal, 8PCLM, Wasp 450 h.p.	5,550	841
2-185	2-28-30	Bellanca CH-300 Pacemaker Special, 6PCLM, Wright R-975 300 h.p.	4,300	182
2-186	2-28-30	Swallow R-760 225, 3POLB, Wright R-760 225 h.p.	2,700	1042
2-187	3- 4-30	Keystone C2H, 9PCAB, Hornet 525 h.p.	6,135	243, 244, 245
2-188	3- 4-30	St. Louis C2-110, 2PCLM, Kinner 90 h.p.	1,575	118
2-189	3- 4-30	Laird LCB-300, 3POLB, R-975 300 h.p.	3,022	176, 184, 186
2-190		Sikorsky—Superseded by A.T.C. 356.		
2-191	3- 7-30	Star D, 2PCLM, Genet 80 h.p.	1,400	116 and 120
2-192	3-13-30	Robin C-1, 3PCLM, Challenger 185 (Goodyear Airwheels and rigid landing gear struts)	2,600	668
2-193	3-15-30	Pitcairn PA-4W, 3POLB, Warner 110 h.p.	1,920	1
2-194	3-18-30	Granville Gee Bee A, 2POLB, Kinner K5 100 h.p.	1,654	P-1-P-6 inc.
2-195	3-24-30	Davis D1-L, 2POLM, Lambert 90 h.p.	1,377	301
2-196	3-26-30	Curtiss Kingbird J3, 2 or 6PCLM, 2 R-975's @ 300 h.p. Mailplane.. / Passenger..	5,339 / 5,689	G-2
2-197	3-26-30	Ogden Osprey, 6PCLM, 3 Amer. Cirrus @ 90 h.p.	4,500	102, 103
2-198	4- 3-30	Curtiss 4C-1, 3PCLM, Challenger 170 h.p.	2,600	769
2-199	4- 5-30	Ireland N-2-B, 5POFbB, R-975 300 h.p.	4,256	32
2-200	4- 5-30	Fokker FXI-AHB, 10PCAmM, Hornet B 575 h.p.	7,200	906
2-201	4- 7-30	Command-Aire 3-C-3, 3POLB, OX5 90 h.p.	2,118	640-656 inc.
2-202	4-12-30	Timm Collegiate, 2POLM, Challenger 185 h.p.	2,212	103
2-203	4-16-30	Fairchild 42, 5PCLM, Wright R-975 300 h.p.	4,300	3
2-204	4-16-30	Command-Aire BS-14, 2POLB, Warner 110 h.p.	1,983	W-138
2-205	4-30-30	Bellanca Skyrocket (Special), 5PCLM, Wasp 450 h.p.	4,600	601
2-206	5- 1-30	American Aeronautical Savoia Marchetti S-55-P, 15PCFbM, 2 I. F. Asso's @ 500 h.p.	16,100	10514, 10517
2-207	5- 1-30	Air Associates Avro Avian (Special), 2POLB, Wright Gipsy 90 h.p.	1,450	136
2-208	5- 2-30	Fairchild KR-32, 2POLB, R-540 165 h.p.	2,210	385
2-209	5- 8-30	Timm C-165, 2POLM, Comet 165 h.p.	2,176	101, 102
2-210	5- 9-30	Curtiss-Robertson Thrush J (Special), 6PCLM, Wright R-760 240 h.p.	3,800	1005
2-211	5- 9-30	Hodkinson HT-1, 7PCLB, 3 Challengers @ 185 h.p.	6,780	101
2-212	5-10-30	Zenith Z-6-A, 7PCLB, Wasp 450 h.p.	4,394	3
2-213	5-16-30	Bellanca Skyrocket CH-400 (Special), 6PCLM, Wasp 450 h.p.	4,600	606
2-214	5-14-30	Overcashier O-12, 3POLM, OX5 90 h.p.	2,344	1-4 inc.
2-215	5-19-30	Boeing B1E, 5PCFbB, Wasp 450 h.p.	4,500	1074
2-216	5-19-30	Superseded by A.T.C. No. 351.		

Memo No.	Date Approved	Airplane	Gross Weight	Manufacturers' Numbers
2-217	5-28-30	Lincoln LP3 Axelson, 3POLB, Axelson 115 h.p...	2,529	268
2-218	6- 5-30	Atlanta PW-1, 8PCLM, 3 R-760's @ 420 h.p....	7,345	2
2-219	6- 6-30	Consolidated Fleetster Type 2 (Special), 6PCLM, Hornet A 525 h.p.....	5,900	3
2-220	6-13-30	Ryan B5A, 6PCLM, Wasp Jr. 300 h.p.....	4,000	200
2-221	6-13-30	Cessna DC-6-B, 1PCLM or 4PCLM, R-760 240 h.p.....Passenger plane weights..	3,100	
		Newspaper plane weights..	3,100	200, 201, 202, 211, 213, 216, 217, 218, 219 and 222
2-222	6-13-30	Curtiss Wright Travel Air D-4000, 3POLB, J5 220 h.p.....	2,650	1391
2-223	6-13-30	Ryan B7, 6PCLM, Wasp 450 h.p.....	4,300	255
2-224	6-13-30	Stinson SM1B Special, 5PCLM, Wright J5 220 h.p.....	3,597	M-212
2-225	6-13-30	Buhl CA-6B, 6POLB, Wasp 450 h.p.....	4,665	61, 62, 63
2-226	6-16-30	Bellanca CH-400, 5PCLM, Wasp 450 h.p.....	4,530	605
2-227	6-17-30	Viking Kitty-Hawk B-4, 3POLB, Kinner K5 100 h.p.....	1,988	12
2-228	6-20-30	Stinson SM-1DX, 3PCLM, Packard Diesel 225 h.p.....	4,245	303
2-229	6-23-30	Soul Model 1000, 4PCLM, 3 LeBlond @ 65 h.p..	3,240	1001
2-230	6-26-30	Pitcairn PA-4K, 3POLB, Kinner K5 100 h.p....	1,920	1
2-231	7- 2-30	Consolidated Fleetster 20 Type 1, 1POLM or 4PCLM, Hornet B 575 h.p.....	5,900	1 and 2
2-232	7- 3-30	General 102F Aristocrat, 3PCLM, Cont. A-70 165 h.p.....	2,305	22, 27, 28, 29 and 30
2-233	7- 9-30	Paramount Cabinaire A70, 4PCLB, Cont. A-70 165 h.p.....	2,600	9
2-234	7- 9-30	Travel Air 6000-B Special, 6PCLM, R-975 300 h.p.....	4,230	6-B-2012
2-235	7-12-30	Cancelled by Approved Type Cert. 131.		
2-236	7-17-30	Breese R-6, 1POLM, R-975 300 h.p.....	3,600	9
2-237	7-17-30	Cessna AF Special, 3PCLM, Axelson 115 h.p....	2,262	141
2-238	7-22-30	Bellanca Pacemaker CH-200, 6PCLM, Packard DR-980 225 h.p.....	4,242	185
2-239	7-25-30	Timm Collegiate Panther, 2POLM, Panther 150 h.p.....	2,199	M-105
2-240	7-26-30	Ford 5-ATC Special, 15PCLM, 3 Wasps @ 420 h.p.....13,245		
		If wheel fairings and radio installed.....13,500		3
2-241		Superseded by A.T.C. No. 358.		
2-242	7-28-30	Ford 5-ATC Special, 15PCLM, 3 Wasps @ 420 h.p.....13,500		70
2-243	7-28-30	Travel Air J4-4000, 3POLB, J4 200 h.p.....	2,654	1339
2-244	7-29-30	Fairchild Model 71, 7PCLM, Wasp 420 h.p.....	5,500	623
2-245	7-30-30	Waco 150-DSO, 3POL-SB, Hisso 150 h.p. (Edo DeLuxe Floats).....Landplane..	2,404	
		Seaplane....	2,660	D-3190
2-246	8- 4-30	Franklin Model A, 2POLB, Velie 65 h.p.....	1,312	No. 3 and up
2-247	8- 6-30	Pittsburgh Thaden T-4, 4PCLM, R-975 300 h.p.	3,800	1
2-248	8- 6-30	Boeing 80-B1, 16PCLB, 3 Hornet B's @ 575 h.p.	17,500	1092
2-249	8- 7-30	Command-Aire 5C-3B, 3POLB, Axelson 115 h.p.	2,510	W-142
2-250		Superseded by A.T.C. No. 376.		
2-251	8-12-30	Command-Aire 5C3, 3POLB, Challenger 185 h.p.....	2,419	W-143
2-252	8- 8-30	Solar MS-1, 8PCLB, Wasp 420 h.p.....	5,650	101
2-253	8- 9-30	Fleet 2X Special, 2POLB, Kinner K5 100 h.p....	1,675	52
2-254	8-12-30	States B-2, 2POLM, Michigan Aero Rover, 75 h.p.....	1,558	102 if baggage compartment sealed; 101 if changed to conform
2-255	8-12-30	Waco RNF, 2POLB, Warner 110 h.p.....	1,900	3316
2-256	8-13-30	Lockheed Vega Special, 5PCLSM (APC floats No A-9500).....Landplane..	4,265	102
		Seaplane....	4,698	102
2-257	8-13-30	Fairchild KR-34-C, 3POSB, R-540 165 h.p. (Fairchild P-1A Floats).....	2,640	1 and 900-908
2-258	8-14-30	Aircraft Builders Student Prince X, 2POLB, Amer. Cirrus 90 h.p.....	1,500	101 and up
2-259	8-14-30	Fairchild 51, 5PCLSM, R-975 300 h.p. (P-4 Floats).....	4,000	102
2-260	8-15-30	Nicholas Beazley NB-4L, 3POLM, Lambert R-266 90 h.p.....	1,511	103 and up
2-261		Superseded by A.T.C. No. 354.		

Memo No.	Date Approved	Airplane	Gross Weight	Manufacturers' Numbers
2-262	8-20-30	Waco BSO, 3POSB, R-540 165 h.p. (Edo M Floats)	2,738	3002
2-263	8-20-30	Detroit Ryan Foursome C-2, 4PCLM, Packard Diesel R-980 225 h.p.	3,450	401 and up
2-264	8-27-30	Nicholas Beazley NB-4W, 3POLM, Warner Jr. 90 h.p.	1,543	105 and up
2-265	9- 2-30	Timm TC-165, 2POLM, Continental A-70 165 h.p.	2,230	104 and up
2-266	9- 5-30	Mooney A-1, 4PCLM, Kinner K5 100 h.p.	2,250	1 and up
2-267	9- 6-30	Stinson SM2AB, 4PCSM, Wright J5 220 h.p.	3,450	1062
2-268	9-10-30	Boeing H-22, 6PCSM, Wasp 420 h.p.	5,725	44
2-269	9-15-30	Zenith Z-6-A, 7PCLB, Wasp 420 h.p.	4,393	3 and up
2-270	9-17-30	Inland S-300-DF, 2POLM, LeBlond 5DF 85 h.p.	1,314	S-316-DF
2-271	9-18-30	California Cub D-1, 2POLM, Lambert R-266 90 h.p.	1,489	2
2-272	9-24-30	New Standard D-29-S, 2POLB, Kinner K5 100 h.p.	1,839	1020
2-273	9-25-30	Consolidated Fleetster 17 Type 2-C, 7PCLM, Cyclone R-1820E 575 h.p.	5,600	6
2-274	9-29-30	Lockheed Vega Model 5B, 5PCLM, Wasp 420 h.p.	4,265	101
2-275	9-30-30	Sikorsky S-36, 8PCSB, 2 J 5's @ 220 h.p.	6,800	S-36-5
2-276	10- 3-30	New Standard D-31, 2POLB, Kinner B5 125 h.p.	1,850	1025
2-277	10- 3-30	American Aeronautical S-55, 11PCFbM, 2 I. F. Asso.'s @ 518 h.p.	15,000	1
2-278	10- 6-30	Stearman 4E Special, 3POLB, Wasp 420 h.p.	3,936	4021 and 4022
2-279	10- 6-30	Stearman 4EX, 2POLB, Wasp Supercharged 450 h.p.	3,936	4020
2-280	10- 7-30	Nicholas Beazley NB-4G, 3POLM, Genet Mark II 80 h.p.	1,529	103 and up
2-281	10-10-30	Driggs Skylark 3-95, 2POLB, Cirrus Hi-Drive 95 h.p.	1,535	3015
2-282	10-10-30	Ford 5-AT-A, 13PCLM 3 Wasps @ 420 h.p.	12,000	1
2-283	10-10-30	Buhl CA-1WA, 3POLM, Wasp 420 h.p.	3,580	64
2-284	10-10-30	Lockheed Wasp Vega Model 5 Special, 5PCLM, Wasp SC 450 h.p.	4,217	80
2-285	10-13-30	General Western Bantham P-2, 2POLM, Kinner K5 100 h.p.	1,650	101
2-286	10-14-30	Sikorsky S-41, 13PCAmM, 2 Hornet B's @ 575 h.p.	11,504	1100-X
2-287	10-16-30	Curtiss Falcon Mailplane, 1POLB, Cyclone R-1820-E 575 h.p.	4,650	3
2-288	10-17-30	Fokker A-FX-A DeLuxe, 10PCLM, 3 Wasps @ 420 h.p.	13,600	1036
2-289	10-17-30	Overland Sport Trainer, 2POLB, LeBlond 5DE 70 h.p.	1,301	114 and up
2-290	10-18-30	Fairchild 71A, 5PCLM, Wasp 420 h.p.	5,500	3501
2-291	10-21-30	Towle TA-3, 6PCAmM, 2 Packard Diesel DR-980's @ 225 h.p.	5,805	1
2-292	10-22-30	Fairchild KR-34-C, 1POLB, Wright R-540 165 h.p.	2,368	333
2-293	10-23-30	Bellanca Skyrocket Special CH-400, 6PCLM, Wasp 420 h.p.	4,600	609
2-294	10-29-30	Curtiss Wright Travel Air S6000B, 4PCLM, R-975 300 h.p.	4,230	964, 986 and 1029
2-295	10-30-30	Ogden Osprey Pirate, 6PCLM, 3 Menasco Pirate B4's @ 95 h.p.	4,500	105 and up
2-296	10-31-30	Curtiss-Wright Travel Air 6000B, 5PCLM, Wright R-975 300 h.p.	4,230	6B-2036
2-297	11- 5-30	Bellanca CH-300 Special, 6PCLM, Wright R-975 300 h.p.	4,300	186
2-298	11- 5-30	Keystone C-4-C Air Yacht, 6PCAmB, Wright Cyclone 525 h.p.	6,250	600
2-299	11-10-30	Granville Gee Bee Sport Model C, 1POLM, Menasco Pirate B4 95 h.p.	1,335	3
2-300	11-14-30	Curtiss-Wright Travel Air 4D, 3POLB, Wright R-760 240 h.p.	2,880	1367
2-301	11-15-30	Stinson SM-8A, 4PCLM, Lycoming R-680 215 h.p.	3,195	4201
2-302	11-18-30	Curtiss-Wright Travel Air S6000B Special, 4PCLM, Wright R-975 300 h.p.	4,230	966
2-303	11-18-30	American Eagle American Eaglet Model 230, 2POLM, Szekely SR-3L 30 h.p.	867	1000-1033
2-304	11-18-30	Mercury Mars, 8PCLM, Wasp 420 h.p.	5,700	101
2-305	11-21-30	Fleet 1 Special, 2POLB, Menasco B-4 95 h.p.	1,613	218
2-306	11-25-30	Verville 104, 4PCLM, R-760 240 h.p.	3,400	7
2-307	11-29-30	Roe Avian Special, 2POLB, Menasco B-4 95 h.p.	1,525	246
2-308	11- 1-30	Curtiss Wright Travel Air A-6000-A Special, 7PCLM, Wasp 420 h.p.	5,250	1095

ENGINES ISSUED APPROVED TYPE CERTIFICATES

December 31, 1930

KEY: 4—number of cylinders; R—radial (arrangement); V—vee (arrangement); L—in line (arrangement); I—inverted; A—air cooled; W—water-cooled; G—gear drive.

A.T.C. No.	*Date Issued*	*Description*		*Rated H.P.*	*Rated R.P.M.*
1	6- 1-28	Fairchild, Caminez 447-C	4RA	120	960
2	4- 2-28	Warner, Scarab	7RA	110	1850
3	6-18-28	Kinner, K-5	5RA	100	1810
4	6-22-28	Lambert, Velie M-5 (R-250)	5RA	65	1900
5	7-26-28	Curtiss, Challenger R-600	6RA	185	2000
6	8-31-28	Curtiss, Conqueror V-1550	12VW	600	2400
7	9-13-28	Curtiss, Conqueror GV-1570	12VW (geared)	600	2400
8	9-13-28	Curtiss, Chieftain H-1640	12RA	600	2200
9	9-19-28	Aircraft, Comet	7RA	130	1825
10	10-11-28	Curtiss, D-12	12VW	435	2300
11	4- 4-29	Dayton, Bear	4LA	100	1500
12	11-30-28	LeBlond, LeBlond 60 (5D)	5RA	65	1950
13	1-26-29	Wright, J-5 Whirlwind	9RA	220	2000
14	1-22-29	Pratt & Whitney, Wasp R-1340-C	9RA	420	2000
15	12-19-28	Pratt & Whitney, Hornet	9RA	525	1900
16	2- 5-29	Axelson, Axelson	7RA	115	1800
17	1-26-29	Wright, Cyclone R-1750-A	9RA	525	1900
18	1-26-29	Packard, 3A-1500 Direct	12VW	525	2100
19	1-26-29	Packard, 3A-2500 Direct	12VW	800	2000
20	2- 6-29	LeBlond, LeBlond 90 (7D)	7RA	90	1975
21	2-15-29	Wright, J-6 R-975	9RA	300	2000
22	3-11-29	Arnold Harris	8VW	90	1400
23	3-27-29	Wright, J-6 R-540	5RA	165	2000
24	6- 3-29	Alliance, Hess Warrior	7RA	115	1925
25	6- 8-29	Michigan, Rover	4LAI	55	1900
26	7- 9-29	Wright, J-6 R-760	7RA	240	2000
27	8-14-29	Lycoming, R-645	9RA	185	2000
28	8-30-29	Pratt & Whitney, Hornet R-1860 Series B	9RA	575	1950
29	8-30-29	Pratt & Whitney, Hornet R-1690-A Geared 2:1	9RA	500	1900
30	9-13-29	American Cirrus, Mark III	4LA	90	2100
31	2- 7-30	Jacobs, LA-1	7RA	140	1800
32	10- 5-29	Continental, A-70	7RA	165	2000
33	11-16-29	Light Mfg. & Foundry Co., Brownback Tiger C-400	6RA	90	1700
34	11-14-29	Kimball, Beetle K	7RA	120	1850
35	12- 4-29	Chevrolet, Chevrolair D-4	4LAI	90	2000
36	12-19-29	General Airmotors Moore	5RA	120	1600
37	1- 4-30	Michigan Aero, Rover	4LAI	75	1975
38	1- 7-30	Lambert, R-266	5RA	90	2375
39	1- 8-30	Pratt & Whitney, Wasp Junior	9RA	300	2000
40	1- 9-30	Wright, Gipsy, L-320	4LAI	90	1950
41	1-11-30	Aeromarine, RAD-B	9RA	115	1925
42	2- 4-30	Lycoming, Lycoming R-680	9RA	215	2000
43	3- 3-30	Packard, Diesel, DR-980	9RA	225	1950
44	3- 5-30	American Cirrus, Mark III Supercharged	4LA	110	2100
45	3-19-30	Western, L-7	7RA	130	1850
46	4- 8-30	LeBlond, LeBlond 85 (5DF)	5RA	85	2125
47	5- 1-30	Comet, Model 7-E	7RA	165	1900
48	5- 3-30	LeBlond, LeBlond 70 (5DE)	5RA	70	1950
49	5- 5-30	MacClatchie, Panther Model X-2	7RA	150	1900
50	5-10-30	Menasco, Pirate A-4	4LAI	90	1925
51	5-31-30	Kinner, B-5 (R-440)	5RA	125	1925
52	5-31-30	LeBlond, LeBlond 110 (7DF)	7RA	110	2150
53	5-31-30	Szekely, SR-3	3RA	30	1750
54	6-21-30	Warner, Scarab, Jr.	5RA	90	2025
55	7- 3-30	Pratt & Whitney, Wasp Model R-1340-C (Geared)	9RA	425	2050
56	7- 7-30	Chevrolet, Chevrolair D-6	6LAI	165	2175
57	7-14-30	Fairchild, 6-390	6LI	120	2150
58	7-14-30	Pratt & Whitney, Wasp SC (10:1 Impeller gears)	9RA	450	2100
59	7-16-30	Chevrolet, Model 333	4LAI	120	2100
60	8-18-30	American Cirrus, Cirrus Hi-Drive	4LAI	95	2100
61	9- 8-30	Wright, Cyclone Model R-1820-E	9RA	575	1900
62	10- 6-30	Kinner, Model (R-715) C-5	5RA	210	1900
63	10- 3-30	Milwaukee, Tank 502 (V-470)	8VA	115	1650
64	10-29-30	Wright, Whirlwind R-975 C, (10.15:1 Impeller gears)	9RA	400	2300
65	11- 1-30	Menasco, Pirate B-4	4LAI	95	2000

DOMESTIC ENGINES APPROVED FOR LICENSE WITHOUT APPROVED TYPE CERTIFICATES

December 31, 1930

KEY: 4—number of cylinders; R—radial (arrangement); V—vee (arrangement); L—in line (arrangement); A—air cooled; W—water-cooled; G—gear drive.

Date	*Name*	*Model*	*Description*	*Rated H.P.*	*Rated R.P.M.*
.....	Curtiss	OX-5	8VW	90	1400
.....	Curtiss	OXX-6	8VW	102	1400
.....	Curtiss	C-6	6LW	160	1750
.....	Curtiss	K-6	6LW	150	1700
.....	Hall-Scott	L-4	4LW	125	1650
.....	Liberty	12-A	12VW	400	1700
.....	Wright Hispano	A	8VW	150	1450
.....	Wright Hispano	D	8VW	200	2200
.....	Wright Hispano	E	8VW	180	1800
.....	Wright Hispano	I	8VW	150	1450
6-6-29	Wright Hispano	H	8VW	300	1800

ENGINES MANUFACTURED IN FOREIGN COUNTRIES WHICH ARE TEMPORARILY APPROVED FOR LICENSE

December 31, 1930

KEY: 4—number of cylinders; R—radial (arrangement); V—vee (arrangement); L—in line (arrangement); A—air cooled; W—water-cooled; G—gear drive; *—subject to special condition.

Date	*Name*	*Model*	*Description*	*Rated H.P.*	*Rated R.P.M.*
1-26-29	Armstrong Sideley (Fairchild)	Genet Mark II	5RA	80	2200
1-11-29	*Bristol (Bliss)	Jupiter	9RA	460	1765
3- 8-29	*Bristol (Bliss)	Jupiter	9RA G	500	2000
3- 2-29	Cirrus (American Cirrus Co.)	Mark III	4LA	85	1900
9-17-28	DeHaviland (Moth)	Gipsy	4LA	85	1900
2-11-29	Junkers	L-5	6LW	300	1400
9-12-28	*Salmson (Aeromarine)	AD-9	9RA	40	2000
11- 1-28	Siemens Halske (Frank)	SH-4	5RA	60	1540
3-28-28	Siemens Halske (Frank)	SH-10	5RA	70	1557
3-28-28	Siemens Halske (Frank)	SH-11	7RA	100	1584
2-14-29	Siemens Halske (Frank)	SH-12	9RA	128	1736
6-10-29	Siemens Halske (Frank)	SH-13	5RA	83	1710
6-10-29	Siemens Halske (Frank)	SH-14	7RA	113	1720
9- 4-28	Walter (Willis C. Brown)	NZ	9RA	120	1600

GLIDERS APPROVED FOR LICENSE WITHOUT APPROVED TYPE CERTIFICATE

December 31, 1930

No.	*Date*	*Description*
G-2-1	9-16-30	Bowlus, S-1000, 1 POLM sailplane, 440 lb.; S-34 to S-40, inc.

GLIDERS HAVING APPROVED TYPE CERTIFICATES

December 31, 1930

A.T.C. No.	*Date*	*Description*	*Weight Empty*	*Useful Load*	*Gross Weight*
G-1	6-20-30	Detroit, Gull Model G-1, 1 POLM, Primary Training	206	170	376

PONTOONS APPROVED FOR USE ON LICENSED AIRCRAFT

December 31, 1930

Date	Manufacturer	Model	No. per Airplane	Maximum Allowable Airplane Weight
5- 9-28	Edo	C	2	2,580
5- 9-28	Edo	DeLuxe	2	2,660
5- 9-28	Edo	E-3	2	4,100
7- 9-28	Hamilton	Series F	2	5,230
7-16-28	Hamilton	Series D	2	3,840
8- 9-28	Fairchild	P-6	2	5,470
1- 8-29	Edo	H	2	1,600
2- 7-29	Brewster	B-5500	2	5,000
5-21-29	Edo	J	2	5,570
5-21-29	Edo	K	2	4,880
7- 1-29	Edo	I	2	1,930
8-13-29	Edo	P (Model 3300)	2	3,450
8-13-29	Edo	Q (Model 3850)	2	4,020
8-29-29	Fairchild	P-4	2	4,680
9-27-29	Fairchild	P-2-B	2	3,730
10-15-29	Edo	L (Model 2262)	2	2,380
10-15-29	Edo	M (Model 2665)	2	2,810
12-16-29	Fairchild	P-20	2	10,750
12-16-29	Fairchild	P-20	1	5,375
1-28-30	Great Lakes	1334	2	13,500

PROPELLERS HAVING APPROVED TYPE CERTIFICATES

December 31, 1930

KEY: W—Wood; A—Aluminum Alloy; S—Steel; C—Special non-metallic composition

A.T.C. No.	Date Issued	Propeller	M'f'l	Diameter	Pitch	H.P.	R.P.M.
	1928–1929						
1	9- 6-28	Standard Steel No. 1609	A	8′ 6″	Adj.	100	@ 1,800
2	9- 7-28	Paragon Monoid	C	8′ 8″	5′5⅜″	100	@ 1,600
3	1-23-29	Hamilton H-1207	A	9′ 0″	Adj.	330	@ 2,000
4	12-14-28	Hamilton H-1407	A	9′10″	Adj.	500	@ 2,000
5	12-14-28	Hamilton H-1408	A	10′ 1″	Adj.	490	@ 2,000
6	3-14-29	Westinghouse Micarta	C	8′10″	6′6½″	250	@ 2,000
7	3-14-29	Westinghouse Micarta	C	8′ 6″	5′8½″	100	@ 1,400
8	3-18-29	Supreme No. 750	W	8′ 6″	5′6″	100	@ 1,400
9	4-22-29	American No. 1	W	8′ 5½″	5′3″	90	@ 1,400
10	10-19-28	Dakota Fahlin	W	8′ 4″	5′3″	100	@ 1,400
	1929						
11	3-30	Dakota Fahlin D-5000	W	7′ 0″	3′8″	55	@ 1,815
12	4-22	American No. 12	W	8′ 9½″	5′6″	180	@ 1,800
13	4-24	Paragon No. 60-A	W	8′ 8″	5′0″	90	@ 1,400
14	4-24	Paragon No. 60-B	W	8′ 0″	4′6″ to 5′0″	120	@ 2,000
15	5-11	Hamilton H-403	W	6′ 0″	4′0½″	65	@ 1,950
16	5-22	Master No. 103	W	8′ 6″	5′4″	90	@ 1,400
17	6-10	Standard Steel No. 6001	A	9′ 0″	Adj.	220	@ 2,000
18	6-13	Hamilton HB-1215—H-5149-A	A	9′ 0″	Adj.	225	@ 2,000
19	6-13	Hamilton HB-1215—H-5155-A	A	9′ 0″	Adj.	170	@ 1,800
20	6-13	Hamilton HB-1215—H-5090	A	9′ 0″	Adj.	220	@ 2,000
21	6-13	Hamilton HB-1301—H-5144	A	9′ 3″	Adj.	525	@ 1,900
22	6-13	Hamilton HB-1311—H-5149-A	A	8′ 6″	Adj.	450	@ 2,100
23	6-13	Hamilton HB-1501—H-5149-A	A	10′ 6″	Adj.	450	@ 2,100
24	6-13	Hamilton HB-1501—H-5144	A	10′ 6″	Adj.	525	@ 1,900
25	6-13	Hamilton HB-1503—P & W	A	10′ 6″	Adj.	525	@ 1,900
26	6-13	Hamilton HB-1506—P & W	A	12′ 0″	Adj.	525	@ 950
27	6-13	Hamilton HB-1511—P & W	A	12′ 6″	Adj.	525	@ 950
28	6-13	Hamilton HB-1301—H-5149-A	A	9′ 3″	Adj.	450	@ 2,100
29	7- 1	Hartzell No. 368	W	8′ 6″	5′0″	90	@ 1,400
30	7- 1	Hartzell No. 50	W	8′ 6″	5′4″	220	@ 2,000
31	7- 2	Standard Steel 1A1-O	A	10′ 0″	Adj.	700	@ 2,500
32	7- 2	Standard Steel 1A1-2	A	9′10″	Adj.	690	@ 2,500
33	7- 2	Standard Steel 1A1-4	A	9′ 8″	Adj.	680	@ 2,500
34	7- 2	Standard Steel 1A1-4A	A	9′ 8″	Adj.	680	@ 2,500
35	7- 2	Standard Steel 1A1-4B	A	9′ 8″	Adj.	680	@ 2,500
36	7- 2	Standard Steel 1A1-6	A	9′ 6″	Adj.	675	@ 2,500
37	7- 2	Standard Steel 1A1-6A	A	9′ 6″	Adj.	675	@ 2,500
38	7- 2	Standard Steel 1A1-6B	A	9′ 6″	Adj.	675	@ 2,500
39	7- 2	Standard Steel 1A1-6½	A	9′ 5½″	Adj.	670	@ 2,500
40	7- 2	Standard Steel 1A1-8	A	9′ 4″	Adj.	665	@ 2,500

A.T.C. No.	Date Issued	Propellers	M'f'l	Diameter	Pitch	H.P. R.P.M.
	1929					
41	7- 2	Standard Steel 1A1-9	A	9′ 3″	Adj.	660 @ 2,500
42	7- 2	Standard Steel 1A1-10	A	9′ 2″	Adj.	655 @ 2,500
43	7- 2	Standard Steel 1A1-12	A	9′ 0″	Adj.	650 @ 2,500
44	7- 2	Standard Steel 1A1-12A	A	9′ 0″	Adj.	650 @ 2,500
45	7- 2	Standard Steel 1A1-18	A	8′ 6″	Adj.	620 @ 2,500
46	7- 2	Standard Steel 1A1-22	A	8′ 2″	Adj.	605 @ 2,500
47	7- 2	Standard Steel 1A1-24	A	8′ 0″	Adj.	600 @ 2,500
48	7- 2	Standard Steel 1A1½-O	A	10′ 0″	Adj.	700 @ 2,500
49	7-11	Standard Steel 3A1-O	A	10′ 0″	Adj.	700 @ 2,500
50	7-11	Standard Steel 3A1-4	A	9′ 8″	Adj.	680 @ 2,500
51	7-11	Standard Steel 3A1-6	A	9′ 6″	Adj.	675 @ 2,500
52	7-11	Standard Steel 3A1-8	A	9′ 4″	Adj.	665 @ 2,500
53	7-11	Standard Steel 3A1-9	A	9′ 3″	Adj.	660 @ 2,500
54	7-11	Standard Steel 3A1-12	A	9′ 0″	Adj.	650 @ 2,500
55	7-11	Standard Steel 3A1-20	A	8′ 4″	Adj.	610 @ 2,500
56	7-11	Standard Steel 3A1-24	A	8′ 0″	Adj.	600 @ 2,500
57	7-16	Standard Steel 5B1-O	A	9′ 0″	Adj.	250 @ 2,400
58	7-16	Standard Steel 5B1-1	A	8′11″	Adj.	250 @ 2,400
59	7-16	Standard Steel 5B1-2	A	8′10″	Adj.	245 @ 2,400
60	7-16	Standard Steel 5B1-3	A	8′ 9″	Adj.	245 @ 2,400
61	7-16	Standard Steel 5B1-4	A	8′ 8″	Adj.	240 @ 2,400
62	7-16	Standard Steel 5B1-6	A	8′ 6″	Adj.	235 @ 2,400
63	7-16	Standard Steel 5B1-6A	A	8′ 6″	Adj.	235 @ 2,400
64	7-16	Standard Steel 5B1-6B	A	8′ 6″	Adj.	235 @ 2,400
65	7-16	Standard Steel 5B1-7	A	8′ 5″	Adj.	230 @ 2,400
66	7-16	Standard Steel 5B1-8	A	8′ 4″	Adj.	230 @ 2,400
67	7-16	Standard Steel 5B1-10	A	8′ 2″	Adj.	230 @ 2,400
68	7-16	Standard Steel 5B1-11	A	8′ 1″	Adj.	225 @ 2,400
69	7-16	Standard Steel 5B1-12	A	8′ 0″	Adj.	225 @ 2,400
70	7-16	Standard Steel 5B1-14	A	7′10″	Adj.	220 @ 2,400
71	7-16	Standard Steel 5B1-15	A	7′ 9″	Adj.	215 @ 2,400
72	7-16	Standard Steel 5B1-24	A	7′ 0″	Adj.	200 @ 2,400
73	7-16	Standard Steel 7C1-O	A	10′ 9″	Adj.	550 @ 2,200
74	7-16	Standard Steel 7C1½-O	A	10′ 0″	Adj.	550 @ 2,200
75	7-16	Standard Steel 7C1-1	A	10′ 8″	Adj.	550 @ 2,200
76	7-16	Standard Steel 7C1-3	A	10′ '6′	Adj.	540 @ 2,200
77	7-16	Standard Steel 7C1-5	A	10′ 4″	Adj.	535 @ 2,200
78	7-16	Standard Steel 7C1-9	A	10′10″	Adj.	530 @ 2,200
79	7-16	Standard Steel 7C1-15	A	9′ 6″	Adj.	520 @ 2,200
80	7-16	Standard Steel 7C1-17	A	9′ 4″	Adj.	515 @ 2,200
81	7-16	Standard Steel 7C1-21	A	9′ 0″	Adj.	505 @ 2,200
82	7-16	Standard Steel 7C1-23	A	8′ 0″	Adj.	500 @ 2,200
83	7-16	Standard Steel 7C1-24	A	8′ 9″	Adj.	500 @ 2,200
84	7-16	Standard Steel 7C1½-3	A	10′ 6″	Adj.	540 @ 2,200
85	7-16	Standard Steel 7C1½-24	A	8′ 9″	Adj.	500 @ 2,200
86	7-22	Paragon Engineers 40-F	W	6′ 6″	4.50′	95 @ 2,200
87	7-22	Paragon Engineers 80-A	W	9′ 0″	5.0′ to 5.50′	325 @ 2,000
88	8- 1	Gardner No. 567	W	8′ 6″	4.67′	95 @ 1,500
89	9- 7	Jacuzzi No. 3	W	9′ 0″	5′6″	250 @ 2,000
90	9- 7	Flottorp Standard OX-5	W	8′ 6½″	5′0″	95 @ 1,400
91	9-12	Standard Steel 9C1½-24	A	8′ 6″	Adj.	510 @ 2,200
92	9-12	Standard Steel 9C2-6	A	10′ 0″	Adj.	540 @ 2,200
93	9-12	Standard Steel 9C2-9	A	9′ 9″	Adj.	535 @ 2,200
94	9-12	Standard Steel 9C2-24	A	8′ 6″	Adj.	500 @ 2,200
95	9-12	Standard Steel 9C1-2	A	10′ 4″	Adj.	545 @ 2,200
96	9-12	Standard Steel 9C1-6	A	10′ 0″	Adj.	540 @ 2,200
97	9-12	Standard Steel 9C1-8	A	9′10″	Adj.	540 @ 2,200
98	9-12	Standard Steel 9C1-9	A	9′ 9″	Adj.	535 @ 2,200
99	9-12	Standard Steel 9C1-5½	A	10′ ½″	Adj.	540 @ 2,200
100	9-20	Standard Steel 5B1-6C	A	8′ 6″	Adj.	235 @ 2,400
101	9-12	Standard Steel 9C1-12	A	9′ 6″	Adj.	530 @ 2,200
102	9-12	Standard Steel 9C1-12½	A	9′ 5½″	Adj.	530 @ 2,200
103	9-12	Standard Steel 9C1-18	A	9′ 0″	Adj.	520 @ 2,200
104	9-12	Standard Steel 9C1-20	A	8′10″	Adj.	520 @ 2,200
105	9-12	Standard Steel 9C1-24	A	8′ 6″	Adj.	510 @ 2,200
106	9-12	Standard Steel 9C1-29	A	8′ 1″	Adj.	500 @ 2,200
107	9-12	Standard Steel 9C1-30	A	8′ 0″	Adj.	500 @ 2,200
108	9-20	Standard Steel 9C2-O	A	10′ 6″	Adj.	550 @ 2,200
109	9-12	Standard Steel 9C1-O	A	10′ 6″	Adj.	550 @ 2,200
110	9-12	Standard Steel 9C1-OA	A	10′ 6″	Adj.	550 @ 2,200
111	9-12	Standard Steel 9C1½-O	A	10′ 6″	Adj.	550 @ 2,200
112	9-26	Curtiss Curtiss-Reed Type R EX-33505	A	10′ 0″	7′9″	525 @ 1,600
113	9-26	Curtiss Curtiss-Reed Type R EX-33073	A	8′ 9″	6′6″	525 @ 2,000
114	9-26	Curtiss Curtiss-Reed Type R EX-33079	A	9′ 3″	7′9″	525 @ 1,775
115	9-26	Curtiss Curtiss-Reed Type R EX-33525	A	9′ 0″	5′6″	575 @ 2,000

A.T.C. No.	Date Issued	Propeller	M't'l	Diameter	Pitch	H.P. R.P.M.
	1929					
116	9-26	Curtiss Curtiss-Reed Type R EX-32934	A	9′ 0″	5′6″	160 @ 1,750
117	9-26	Curtiss Curtiss-Reed Type R EX-32923	A	8′ 6″	4′9″	160 @ 1,750
118	9-25	Standard Steel 11C1-O	A	9′ 0″	Adj.	325 @ 2,300
119	9-25	Standard Steel 11C1-2	A	8′10″	Adj.	320 @ 2,300
120	9-25	Standard Steel 11C1-3	A	8′ 9″	Adj.	315 @ 2,300
121	9-25	Standard Steel 11C1-4	A	8′ 8″	Adj.	310 @ 2,300
122	9-25	Standard Steel 11C1-4A	A	8′ 8″	Adj.	310 @ 2,300
123	9-25	Standard Steel 11C1-6	A	8′ 6″	Adj.	305 @ 2,300
124	9-25	Standard Steel 11C1-6A	A	8′ 6″	Adj.	305 @ 2,300
125	9-25	Standard Steel 11C1-8	A	8′ 4″	Adj.	300 @ 2,300
126	9-25	Standard Steel 11C1-10	A	8′ 2″	Adj.	295 @ 2,300
127	9-25	Standard Steel 11C1-11	A	8′ 1″	Adj.	290 @ 2,300
128	9-25	Standard Steel 11C1-12	A	8′ 0″	Adj.	285 @ 2,300
129	9-25	Standard Steel 11C1-15	A	7′ 9″	Adj.	275 @ 2,300
130	9-25	Standard Steel 11C1-24	A	7′ 0″	Adj.	250 @ 2,300
131	10- 2	Standard Steel 11C1-9	A	8′ 3″	Adj.	295 @ 2,300
132	10-10	Curtiss Curtiss-Reed Type R EX-33570	A	8′10 ″	5′3″	170 @ 1,800
133	10-24	Aircraft Specialties Gunn Steel	S	8′ 6 ″	56′	90 @ 1,400
134	10-24	Aeromarine Klemm LB (1134)	S	7′ 2½″	72.5″	85 @ 2,125
135	12- 9	Kari-Keen D-4000	W	8′ 6″	60.4″	90 @ 1,400
136	12-20	Curtiss Curtiss-Reed Type D EX-31900	A	9′ 0″	60.7″	225 @ 2,000
	1930					
137	1-22	Air Propellers No. 15601	W	7′ 8″	[72″	90 @ 1,810
138	3- 1	Hamilton Standard 19V2-O	A	8′ 4″	Adj.	125 @ 2,200
139	3- 1	Hamilton Standard 25V1-O	A	7′ 0″	Adj.	110 @ 2,400
140	3- 1	Hamilton Standard 7C1½-11	A	9′10″	Adj.	525 @ 2,200
141	3- 1	Hamilton Standard 1-A1½-4A	A	9′ 8″	Adj.	680 @ 2,500
142	3- 1	Hamilton Standard 7C1½-15	A	9′ 6″	Adj.	520 @ 2,200
143	3- 1	Hamilton Standard 1A1½-O	A	10′ 0″	Adj.	700 @ 2,500
144	3- 1	Hamilton Standard 7C1½-13A	A	9′ 8″	Adj.	520 @ 2,200
145	3- 1	Hamilton Standard 7C1-11	A	9′10″	Adj.	525 @ 2,200
146	3- 1	Hamilton Standard 7C1½-5	A	10′ 4″	Adj.	535 @ 2,200
147	3-13	Hamilton Standard 2101-O	A	8′ 9″	Adj.	500 @ 2,500
148	3-13	Hamilton Standard 2101-1	A	8′ 8″	Adj.	495 @ 2,500
149	3-13	Hamilton Standard 2101-2	A	8′ 7″	Adj.	490 @ 2,500
150	3-13	Hamilton Standard 2101-3	A	8′ 6″	Adj.	485 @ 2,500
151	3-13	Hamilton Standard 2101-4	A	8′ 5″	Adj.	485 @ 2,500
152	3-13	Hamilton Standard 2101-5	A	8′ 4″	Adj.	480 @ 2,500
153	3-13	Hamilton Standard 2101-6	A	8′ 3″	Adj.	475 @ 2,500
154	3-13	Hamilton Standard 2101-7	A	8′ 2″	Adj.	470 @ 2,500
155	3-13	Hamilton Standard 2101-8	A	8′1 ″	Adj.	465 @ 2,500
156	3-13	Hamilton Standard 2101-9	A	8′ 0″	Adj.	460 @ 2,500
157	3-13	Hamilton Standard 2101-10	A	7′11″	Adj.	455 @ 2,500
158	3-13	Hamilton Standard 2101-11	A	7′ 0″	Adj.	450 @ 2,500
159	3-13	Hamilton Standard 2101-12	A	7′ 9″	Adj.	450 @ 2,500
160	3-13	Hamilton Standard 2101-13	A	7′ 8″	Adj.	445 @ 2,500
161	3-13	Hamilton Standard 2101-14	A	7′ 7″	Adj.	440 @ 2,500
162	3-13	Hamilton Standard 2101-15	A	7′ 6″	Adj.	435 @ 2,500
163	3-13	Hamilton Standard 2101-16	A	7′ 5″	Adj.	430 @ 2,500
164	3-13	Hamilton Standard 2101-17	A	7′ 4″	Adj.	425 @ 2,500
165	3-13	Hamilton Standard 2101-18	A	7′ 3″	Adj.	425 @ 2,500
166	3-13	Hamilton Standard 2101-19	A	7′ 2″	Adj.	420 @ 2,500
167	3-13	Hamilton Standard 2101-20	A	7′ 1″	Adj.	415 @ 2,500
168	3-13	Hamilton Standard 2101-21	A	7′ 0″	Adj.	410 @ 2,500
169	3-13	Hamilton Standard 2101-22	A	6′11″	Adj.	405 @ 2,500
170	3-13	Hamilton Standard 2101-23	A	6′10″	Adj.	405 @ 2,500
171	3-13	Hamilton Standard 2101-24	A	6′ 9″	Adj.	400 @ 2,500
172	3-18	Aircraft Propeller Co. Design 40	W	6′10″	44.6″	65 @ 195
173	5- 3	Pittsburgh Model 2	S	9′	Adj.	550 @ 2,400
174	5-16	Hamilton Standard 25V2-O	A	7′ 0″	Adj.	110 @ 2,400
175	7-25	Curtiss, Design No. 55500	A	7′ 0″	4′6″	100 @ 2,100
176	7-25	Curtiss, Design No. 55501	A	8′ 6″	5′6″	185 @ 2,000
177	7-25	Curtiss, Design No. 55502	A	8′10″	5′6″	240 @ 2,000
178	7-29	Hamilton, Model 11T4-O	S	9′ 0″	Adj.	250 @ 2,300
179	8- 2	Gardner, Design No. 456 (RH) and Design No. 457 (LH)	W	6′ 9″	4′6″	94 @ 1,950
			S	9′ 0″	Adj.	550 @ 2,400
180	9-19	Pittsburgh, Model 1	W	7′ 0″	4′0″	90 @ 1,975
181	9-22	Brown, Model 1	W	7′ 6″	4.5′	120 @ 2,000
182	10-17	American, Paragon 60-C	W	7′ 6″	4.85′	120 @ 2,000
183	10-17	American, Paragon 61-C	W	7′ 6″	5′	120 @ 2,000
184	10-17	American, Paragon 62-C	W	8′ 0″	4′	125 @ 2,000
185	11-15	American Model 61-E	blade and hub			

PARACHUTES ISSUED APPROVED TYPE CERTIFICATES

December 31, 1930

KEY: Fm Ft—form fitting; Str—straight

A.T.C. No.	Dates Issued and Amended	Manufacturer	Model Designation	Pack Type	Canopy Type	Diameter Canopy	Canopy Material
1	8-30-30	Russell	CS-1	Seat	Lobe	24′	Cotton
2	8-30-30	Russell	CB-1	Back	Lobe	24′	Cotton
3	8-30-30	Russell	SS-1	Seat	Lobe	24′	Silk
4	8-30-30	Russell	SB-1	Back	Lobe	24′	Silk
5	9- 3-30 9- 3-30	Irving	S-FF-1 S-FF-2	Back (FmFt)	Standard	24′ 28′	White Silk
6	9- 3-30	Irving	S-SB-1 S-SB-2	Back (Str)	Standard	24′ 28′	White Silk
7	9- 3-30	Irving	S-S-1 S-S-2	Seat	Standard	24′ 28′	White Silk
8	9- 3-30	Irving	S-L-1 S-L-2	Lap	Standard	24′ 28′	White Silk
9	9- 9-30	Irving	S-QQ-1 S-QQ-2	Chest	Standard	24′ 28′	White Silk
10	9- 9-30	Irving	C-FF-1 C-FF-2	Back (FmFt)	Caterpillar	24′ 28′	Pongee Silk
11	9- 9-30	Irving	C-SB-1 C-SB-2	Back (Str)	Caterpillar	24′ 28′	Pongee Silk
12	9- 9-30	Irving	C-S-1 C-S-2	Seat	Caterpillar	24′ 28′	Pongee Silk
13	9- 9-30	Irving	C-L-1 C-L-2	Lap	Caterpillar	24′ 28′	Pongee Silk
14	9- 9-30	Irving	C-QQ-1 C-QQ-2	Chest	Caterpillar	24′ 28′	Pongee Silk
15	9-23-30	Switlik	100	Seat	Standard	24′	White Silk
16	10- 2-30	Floyd Smith	PSS	Seat	Standard	24′	Pongee Silk
17	10- 2-30	Floyd Smith	PBT	Back	Standard	28′	Pongee Silk
18	10- 2-30	Floyd Smith	SSS	Seat	Standard	24′	White Silk
19	10- 2-30	Floyd Smith	SST	Seat	Standard	28′	White Silk
20	11- 6-30	Switlik	100-A	Seat	Standard	24′	Pongee Silk

FLYING SCHOOLS GRANTED APPROVED CERTIFICATES BY DEPARTMENT OF COMMERCE

		Ratings for which Approved	*Approved Certificate Issued*
Airtech Training School Airtech Field San Diego, Calif.	Ground and Flying	Transport Lim. Commercial Private	7-15-29
Standard Flying School 9401 S. Western Ave. Los Angeles, Calif.	Ground and Flying	Transport Lim. Commercial Private	10-26-29 7-15-29
Parks Air College, Inc. Parks Airport E. St. Louis, Ill.	Ground and Flying	Transport Lim. Commercial Private	7-15-29
D. W. Flying Service, Inc. Le Roy Airport Le Roy, N. Y.	Ground and Flying	Lim. Commercial Private	7-15-29
T. C. Ryan Flying Service Ryan Airport 3300 Barnet Ave. San Diego, Calif. In combination with Pacific Technical University 2219 Kettner Blvd. San Diego, Calif.	Ground and Flying	Transport Lim. Commercial Private	7-19-29
Universal Flying School Wold-Chamberlain Field Minneapolis, Minn.	Ground and Flying	Transport Lim. Commercial Private	8-9-29
Curtiss Flying Service Valley Stream Airport Valley Stream, L. I., N. Y. In combination with New York University New York, N. Y.	Ground and Flying	Transport Lim. Commercial Private	2-6-30 8-14-29
Universal Flying School Lambert Field St. Louis, Mo.	Ground and Flying	Transport Lim. Commercial Private	8-18-29
Curtiss Flying Service Grosse Ile Airport Grosse Ile, Mich.	Ground and Flying	Transport Lim. Commercial Private	10-9-29 8-20-29
California Aerial Transport Flying School Municipal Airport Los Angeles, Calif.	Ground and Flying	Transport Lim. Commercial Private	7-23-30
Curtiss Flying Service of the Middle West Fairfax Airport Kansas City, Kans.	Ground and Flying	Transport Lim. Commercial Private	9-24-29
Von Hoffman Aircraft School Lambert Field Anglum, Mo.	Ground and Flying	Transport Lim. Commercial Private	10-3-29
Curtiss-Wright Flying Service 1338 S. Michigan Ave. Chicago, Ill. (Ground) Curtiss-Reynolds Airport Glenview, Ill. (Flying)	Ground and Flying	Transport Lim. Commercial Private	10-9-29
Boeing School of Aeronautics Oakland Municipal Airport Oakland, Calif.	Ground and Flying	Transport Lim. Commercial Private	10-17-29
Spartan School of Aeronautics Apache Blvd. & Chamberlain Dr. Tulsa, Okla.	Ground and Flying	Transport Lim. Commercial Private	10-18-29
Curtiss Flying Service Los Angeles Municipal Airport Inglewood, Calif.	Ground and Flying	Transport Lim. Commercial Private	10-21-29
Roosevelt Aviation School, Inc. 119 W. 57th St. New York, N. Y. (Ground) Roosevelt Field No. 1 Mineola, L. I., N. Y. (Flying)	Ground and Flying	Transport Lim. Commercial Private	10-25-29

		Ratings for which Approved	*Approved Certificate Issued*
Curtiss Flying Service of Indiana Stout Field, Mars Hill Indianapolis, Ind.	Ground and Flying	Lim. Commercial Private	11-7-29
Curtiss Flying Service of South Memphis Municipal Airport Memphis, Tenn.	Ground and Flying	Transport Lim. Commercial Private	6-26-30 11-16-29
Penn School of Aviation Pittsburgh-Butler Airport Butler, Pa.	Ground and Flying	Transport Lim. Commercial Private	12-12-29
Curtiss Flying Service of Kentucky Bowman Field Louisville, Ky.	Ground and Flying	Transport Lim. Commercial Private	7-23-30 12-27-29
Curtiss-Wright Flying Service 55 Allyn Street (Ground) Brainard Field (Flying) Hartford, Conn.	Ground and Flying	Transport Lim. Commercial Private	1-18-30
Curtiss-Wright Flying Service 115 High St. (Ground) Portland, Me. Portland Airport (Flying) Scarboro, Me.	Ground and Flying	Transport Lim. Commercial Private	1-21-30
Curtiss-Wright Flying Service 46th & Colorado Blvd. Denver, Colo.	Ground and Flying	Lim. Commercial Private	3-5-30
Curtiss-Wright Flying Service Port Columbus Columbus, O.	Ground and Flying	Transport Lim. Commercial Private	3-13-30
Lincoln Airplane & Flying School 2415 O St. Lincoln, Nebr. (Ground) Municipal Airport Lincoln, Nebr. (Flying)	Ground and Flying	Transport Lim. Commercial Private	3-31-30
Yellow Cab School of Aviation Municipal Airport Des Moines, Ia.	Ground and Flying	Transport Lim. Commercial Private	4-3-30
Altoona Aircraft Corp. Stultz Field Tyrone, Pa.	Ground and Flying	Lim. Commercial Private	4-22-30
Curtiss-Wright Flying Service North Carolina State College (Ground) Raleigh Airport (Flying) Raleigh, N. Car.	Ground and Flying	Lim. Commercial Private	4-28-30
Hancock Found. College of Aero. Santa Maria Airport Santa Maria, Calif.	Ground and Flying	Transport	4-30-30
Curtiss-Wright Flying Service Curtiss-Wright Airport Dalworth, Tex.	Ground and Flying	Lim. Commercial Private	5-16-30
Pitcairn Aviation of Pa., Inc. Pitcairn Field Willow Grove, Pa.	Ground and Flying	Lim. Commercial Private	5-28-30
Curtiss-Wright Flying Service Curtiss-Wright Airport (Logan Field-Auxiliary) Baltimore, Md.	Ground and Flying	Transport Lim. Commercial Private	6-9-30
Curtiss-Wright Flying 613 Grant Bldg. Pittsburgh, Pa. (Ground) Curtiss-Bettis Airport McKeesport, Pa. (Flying)	Ground and Flying	Lim. Commercial Private	6-16-30
Nepco Tri-City Flying Service Nepco Tri-City Airport Wisconsin Rapids, Wisc.	Ground and Flying	Transport Lim. Commercial Private	6-16-30
Curtiss-Wright Flying Service Curtiss-Wright Airport San Mateo, Calif.	Ground and Flying	Transport Lim. Commercial Private	6-26-30

		Ratings for which Approved	*Approved Certificate Issued*
Curtiss-Wright Flying Service Curtiss-Steinberg Airport E. St. Louis, Ill.	Ground and Flying	Transport Lim. Commercial Private	7-31-30
Furniture Capital Air Service Grand Rapids Airport Grand Rapids, Mich.	Ground and Flying	Transport Lim. Commercial Private	8-21-30

AIRWAY MARKING AND LIGHTING IN 1930

Airway	*LIGHTING*				*WEATHER*		*RADIO*	
	Lighted Miles	*Lighted Fields*	*24-Inch Lights*	*Flash Lights*	*Teletype*	*Others*	*Communications Stns.*	*Range Beacon Stns.*
Albuquerque—Wichita	305	10	23	15	0	0	1	0
Atlanta—Chicago	656	23	51	2	2	15	3	1
Atlanta—New York	788	33	76	4	9	4	6	1
Brownsville—Ft. Worth	210	9	8	0	0	3	1	0
Brownsville—Houston	120	6	12	0	0	2	0	0
Chicago—New York	740	41	73	5	22	1	5	5
Chicago—Twin Cities	472	18	42	7	0	1	2	0
Chicago—Twin Cities Cutoff	40	0	0	0	0	1	0	0
Cincinnati—Chicago	274	11	25	0	3	0	1	1
Cleveland—Albany	459	20	38	2	0	8	3	0
Cleveland—Detroit	134	4	7	0	4	0	1	1
Dallas—Kansas City	545	20	48	30	0	9	4	0
Kansas City—Chicago	455	17	30	5	0	4	2	1
Kansas City—Omaha	158	6	11	0	4	0	2	0
Kansas City—St. Louis	228	10	21	0	5	0	2	0
Los Angeles—Albuquerque	34	1	3	0	0	0	1	0
Los Angeles—Salt Lake	670	28	47	79	0	22	2	0
Los Angeles—San Francisco	380	20	33	4	13	19	3	0
Louisville—Cleveland	367	16	29	0	8	3	1	1
Miami—Atlanta	631	26	46	2	0	6	1	0
Michigan Airways	362	11	17	0	4	3	0	0
Milwaukee—Green Bay	63	6	5	0	0	1	0	0
New Orleans—Atlanta	226	9	21	5	0	2	1	0
New York—Boston	201	15	20	10	8	0	2	2
New York—Montreal	142	7	12	2	0	5	2	0
Omaha—Chicago	431	20	36	26	8	3	3	2
Pueblo—Cheyenne	200	11	17	7	0	1	1	0
Salt Lake—Great Falls	150	11	14	4	0	11	1	0
Salt Lake—Omaha	943	36	78	23	18	3	5	0
Salt Lake—Pasco	560	18	51	12	0	8	3	0
San Francisco—Salt Lake	670	29	63	90	17	11	4	0
Battle Mt.—Parran Cutoff	166	0	0	0	0	0	0	0
San Francisco—Seattle	762	36	70	13	15	17	4	0
St. Louis—Columbus	135	6	10	0	7	0	0	0
Portland—Spokane	134	6	13	0	0	9	2	0
(Portland—Pasco Section)								
St. Louis—Chicago	275	14	25	5	4	1	2	0
St. Louis—Evansville	162	6	15	0	0	1	1	0
Tulsa—Ponca City	76	4	2	19	0	2	1	0
Washington—Cleveland	135	11	7	0	0	2	2	0
(Pittsburgh—Cleveland)								
Total	13,459	575	1,099	378	120	178	35	9
Under Construction as of June 30th:								
Brownsville—Ft. Worth	312	10	25	0	0	0	0	0
(Kingsville—Waco Section)								
Brownsville—Houston	226	8	22	0	0	0	0	0
(Kingsville—Houston Sec.)								
Columbus—Philadelphia	415	18	36	20	0	0	0	0
Norfolk—Washington	138	6	11	0	0	0	0	0
Portland—Spokane	198	9	20	10	0	0	0	0
(Portland—Pasco)								
Salt Lake—Great Falls	357	16	0	0	0	0	0	0
(Pocatello—Great Falls)								
(Day Fields)								
St. Louis—Indianapolis	235	8	19	2	0	0	0	0
Washington—Cleveland	197	9	18	4	0	0	0	0
(Washington—Pittsburgh)								
Total	2,078	84	151	36	0	0	0	0

U. S. AIR CORPS, WAR DEPARTMENT

Officers on Duty in Washington

F. Trubee Davison.....Assistant Secretary of War
Maj. Gen. James E. Fechet.....Chief of the Air Corps
Brig. Gen. B. D. Foulois.....Assistant Chief of the Air Corps

Colonels—Hathaway, L. M. (MC).
Lieutenant-Colonels—Andrews, F. M., Longanecker, Ira.
Majors—Davis, M. F., Hale, W. H., Jones, J. W., Kennedy, Frank, Kilner, W. G., Longacre, R. F. (MC), MacDill, Leslie, McDonnell, J. C., Netherwood, D. B., Pirie, J. H.
Captains—Adler, E. E., Beveridge, J., Jr., Elmendorf, H. M., Farthing, W. E., Flood, W. J., Hastey, T. W., House, Edwin J., Hopkins, H. V., Jacobs, L. B., Mathis, P. J., McClelland, H. M., McDaniel, A. B., Prime, C. P.
Lieutenants—Abbey, Evers, Archer, C. E., Birnn, Roland, Brand, Harold, Craig, H. A., Davies, Isaiah, Dunton, Delmar H., Ennis, A. I., Haddon, J. B., Hough, Walter B., Hutchins, D. L., Kirksey, Guy, Longfellow, Newton, Owens, R. L., Quesada, E. R., Robbins, O. K., Sullivan, C. W., Whitten, L. P., Wood, M. R.

Air Corps Posts

AKRON, OHIO—Balloon Production & Inspection. Procurement Section, District Office (Chief of the Air Corps) P. O. c/o Goodyear Tire & Rubber Co., Akron, Ohio.
ARMSTRONG, FT.—(H Dept.) P. O. Honolulu, T. H. Air Depot.
BIGGS FIELD—(Eighth Corps Area) P. O. Ft. Bliss, Texas. Intermediate Landing Field.
BOLLING FIELD—P. O. Anacostia, D. C. (Chief of the Air Corps) Air Corps Detachment. Flying Field.
BOSTON AIRPORT—(First Corps Area) P. O. Boston, Mass. Corps Area Hq. Flight. Intermediate Landing Field. Reserve Flying. Reserve Airdrome.
BOWMAN FIELD—(Fifth Corps Area) P. O. Jeffersontown, Ky. Intermediate Landing Field. Reserve Airdrome.
BRAGG, FT.—(Fourth Corps Area) P. O. Ft. Bragg, N. C. 2d Balloon Co.
BRISTOL, PA.—(Chief of the Air Corps) P. O. Bristol, Pa. Air Corps Representative. Keystone Aircraft Corp.
BROOKS FIELD—(Chief of the Air Corps) P. O. San Antonio, Texas. 11th School Group Hq. 46th School Sq. 62d Service Sq. 51st, 52d School Sqs. 20th Photo Section. Flying Cadet Detachment. School of Aviation Medicine. Primary Flying School. Border Patrol Station. Airdrome. Intermediate Landing Field.
BUFFALO, N. Y.—(Chief of the Air Corps) P. O. 398 Ellicott Square, Buffalo, N. Y. Procurement Planning Representative. Air Corps Rep. Curtiss Aeroplane & Motor Corp. Air Corps Procurement Dist.
BURGESS FIELD—(Chief of the Air Corps) P. O. Uniontown, Pa. Intermediate Landing Field.
CHANUTE FIELD—(Chief of the Air Corps) P. O. Rantoul, Ill. Technical School. School Troops. Air Corps Band.
CHICAGO, ILL.—(Chief of the Air Corps) P. O. 1819 W. Pershing Road, Chicago, Ill. Procurement Planning Representative. Air Corps Procurement Dist.
CLARK FIELD—(P. Dept.) P. O. Camp Stotsenburg, P. I. 3d Pursuit Sq.
CLARK, FT.—(Eighth Corps Area) P. O. Brackettville, Texas. Airdrome. Intermediate Landing Field.
CRISSY FIELD—(Ninth Corps Area) P. O. Presidio of San Francisco, Cal. 91st Obs. Sq. 15th Photo Section.
CROCKETT, FT.—(Eighth Corps Area) P. O. Galveston, Texas. Hq. 3d Attack Gp. 8th, 90th Attack Sqs. 60th Service Sq. 13th Attack Sq. Air Corps Band.
CROOK, FT.—(Seventh Corps Area) P. O. Ft. Crook, Nebr. Corps Area Hq. Flight. Intermediate Landing Field. Reserve Flying.
CUMBERLAND LANDING FIELD—(Chief of the Air Corps) P. O. Cumberland, Md. Intermediate Landing Field.
DETROIT, MICH.—(Chief of the Air Corps) P. O. 802 Farwell Bldg., Detroit, Mich. Procurement Planning Representative. Air Corps Procurement Dist.
DODD FIELD—(Eighth Corps Area) P. O. Ft. Sam Houston, Texas. Airdrome, 12th Obs. Sq. 1st Photo Section.
DOUGLAS, ARIZONA—(Eighth Corps Area) P. O. Douglas, Arizona. Airdrome. Intermediate Landing Field.
DRYDEN, TEXAS—(Eighth Corps Area) P. O. Dryden, Texas. Border Patrol Station. Airdrome. Intermediate Landing Field.
DUNCAN FIELD—(Chief of the Air Corps) P. O. San Antonio, Texas. Air Corps Training Center. Supply and Repair Depot.
EDGEWOOD ARSENAL—P. O. Edgewood, Md. Air Corps Detachment.
FAIRFIELD AIR DEPOT—(Chief of the Air Corps) P. O. Fairfield, Ohio. Supply & Repair Depot.
FRANCE FIELD—(P. C. Dept.) P. O. France Field, Canal Zone. 6th Composite Group Hq. 7th Obs. Sq. 12th Photo Sec. 63d Service Sq. 24th Pursuit Sq. 25th Bomb. Sq. Aerial Coast Defense. Air Corps Band. Panama Air Depot.
GARDEN CITY (Chief of the Air Corps) P. O. Long Island, N. Y. Air Corps Representative Curtiss Aeroplane & Motor Corp.

HATBOX FIELD—(Eighth Corps Area) P. O. Muskogee, Oklahoma. Intermediate Landing Field.

HOUSTON, FT. SAM—(Eighth Corps Area) P. O. Ft. Sam Houston, Texas. Airway Control Officer. (See Dodd Field.)

KELLY FIELD—(Chief of the Air Corps) P. O. Kelly Field, Texas. Advanced Flying School. 10th School Group Sq. 24th School Wing Hq. 40th, 41st, 42d, 43d School Sqs. 68th Service Sq. 22d Photo Sec. 39th, 48th School Sqs. Flying Cadet Detach. Air Corps Band.

LANGLEY FIELD—(Chief of the Air Corps) P. O. Hampton, Va. Hq. 2d Wing. 19th Airship Co. Hq. 2d Bomb. Gp. 20th, 49th, 96th Bomb. Sqs. A. C. Band. 59th Service Sq. 2d Photo Sec. Tactical School. Flying Field.

LEAVENWORTH, FT.—P. O. Ft. Leavenworth, Kansas. Air Corps Detach. Intermediate Landing Field.

LITTLE ROCK AIR DEPOT—(Chief of the Air Corps) P. O. Little Rock, Ark. Supply Depot. Flying Field.

LONG BEACH, CALIF.—(Formerly Clover Field) Municipal Airport.

LOGAN FIELD—(Third Corps Area) P. O. Dundalk, Md. Intermediate Landing Field. Flying Field for 104th Obs. Sq., Md. Nat. Guard.

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

LOVE FIELD—(Eighth Corps Area) P. O. Dallas, Texas. Intermediate Landing Field.

LUKE FIELD—(H Dept.) P. O. Honolulu, T. H. Hq. 5th Composite Group. 4th Obs. Sq. 23d, 72d Bomb. Sqs. 65th Service Sq. 11th Photo Sec. Aerial Coast Defense.

LUNKEN AIRPORT—(Fifth Corps Area) P. O. Cincinnati, Ohio. (Station C.) Airdrome, Intermediate Landing Field. Reserve Airdrome.

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

MARCH FIELD—(Chief of the Air Corps) P. O. Riverside, Cal. Primary Flying School. 13th School Gp. Hq. 70th Service Sq. 23d Photo Section, 47th School Sq. 53d, 54th School Sqs. Flying Cadet Detach. A. C. Band.

MARSHALL FIELD—(Seventh Corps Area) P. O. Ft. Riley, Kansas. 16th Obs. Sq. 9th Photo Section.

MAXWELL FIELD—(Fourth Corps Area) P. O. Montgomery, Ala. 22d Obs. Sq. (Less Det. at Ft. Bragg), 4th Photo Section.

MIDDLETOWN AIR DEPOT—(Chief of the Air Corps) P. O. Middletown, Pa. Repair & Supply Depot. Flying Field.

MITCHEL FIELD—(Second Corps Area) P. O. Mitchel Field, L. I., N. Y. Hq. 9th Obs. Gp. 8th, 14th Photo Sections. 1st, 5th, 99th Obs. Sqs. 61st Service Sq. A. C. Band.

NEW YORK—(Chief of the Air Corps) P. O. 39 Whitehall St., New York City, N. Y. District Property & Survey Officer. District Office Procurement Section (Materiel Division). Procurement Planning Representative. Air Corps Procurement Dist.

NICHOLS FIELD—(P. Dept.) P. O. Maricaban, Rizal, P. I. Hq. 4th Composite Gp. 66th Service Sq. 6th Photo Section. 28th Bomb. Sq. Philippine Air Depot. 2d Obs. Sq.

NORTON FIELD—(Fifth Corps Area) P. O. Columbus, Ohio. Corps Area Hq. Flight. Intermediate Landing Field. Reserve Airdrome.

OFFUTT FIELD—(Seventh Corps Area) P. O. Ft. Crook, Nebr. Corps Area Hq. Flight. Intermediate Landing Field. Reserve Flying.

PEARSON FIELD—(Ninth Corps Area) P. O. Vancouver, Wash. Intermediate Landing Field.

PHILLIPS FIELD—P. O. Aberdeen Proving Ground, Md. Detach. 49th Bomb. Sq.

PITTSBURGH AIRPORT—Third Corps Area) R. D. No. 2, Sharpsburg, Pa. Airport. Intermediate Landing Field. Reserve Airdrome.

POPE FIELD—(Fourth Corps Area) P. O. Ft. Bragg, N. C. Detach. 22d Obs. Sq. Flying Field.

POST FIELD—P. O. Ft. Sill, Oklahoma. 88th Obs. Sq. 1st Balloon Co. Flying Field.

RANDOLPH FIELD—(Chief of the Air Corps) P. O. Randolph Field, Texas. Flying Field.

RICHARDS FIELD—(Seventh Corps Area) P. O. Kansas City, Mo. Intermediate Landing Field. Reserve Airdrome. (Part of Kansas City Municipal Airport.)

ROCKWELL FIELD—(Chief of the Air Corps) P. O. Rockwell Field, Coronado, Calif. Supply & Repair Depot. Flying Field. 7th Bomb. Gp. Hq. 11th Bomb. Sq. 95th Pursuit Sq.

ROSS FIELD—(Ninth Corps Area) P. O. Arcadia, Calif. Det. 91st Obs. Sq. Intermediate Landing Field.

RUSSELL, FT. D. A.—(Eighth Corps Area) P. O. Marfa, Texas. Airdrome. Intermediate Landing Field.

SALT LAKE CITY—Municipal Airport. P. O. Salt Lake City, Utah. (Formerly Woodward Field.) Reserve Airdrome.

SAN ANTONIO AIR DEPOT—(Chief of the Air Corps) P. O. Duncan Field, San Antonio, Texas. Supply & Repair Depot.

SAND POINT—(Ninth Corps Area) P. O. Seattle, Wash. Intermediate Landing Field. Reserve Airdrome.

SAN FRANCISCO—(Chief of the Air Corps) P. O. Room 624, Exchange Block, 369 Pine St., San Francisco, Calif. Procurement Planning Representative. Air Corps Procurement Dist.

SANTA MONICA—(Chief of the Air Corps) P. O. 2435 Wilshire Blvd., Santa Monica, Cal. District Procurement Office. Production Manager. Air Corps Representative, Douglas Aircraft Co.

SCHOEN FIELD—(Fifth Corps Area) P. O. Ft. Benjamin Harrison, Ind. Intermediate Landing Field. Reserve Airdrome.

SCOTT FIELD—(Chief of the Air Corps) P. O. Scott Field, Belleville, Ill. 9th Airship Co. 21st Airship Gp. Hq. 21st Photo Sec. 24th Airship Service Co. Balloon & Airship School. Air Depot. Flying Field.

SEATTLE—(Chief of the Air Corps) P. O. c/o Boeing Airplane Co., Georgetown Station, Seattle, Wash. District Procurement Office. Air Corps Representative, Boeing Airplane Co.

SELFRIDGE FIELD—(Sixth Corps Area) P. O. Mt. Clements, Mich. Hq. 1st Pursuit Gp. 57th Service Sq. 17th, 27th, 94th Pursuit Sqs. Flying Field. 5th Photo Section, 15th Observation Sq.

SHERIDAN, FT.—(Sixth Corps Area) P. O. Ft. Sheridan, Ill. Corps Area Hq. Flight. Intermediate Landing Field.

TUCSON—(Eighth Corps Area) P. O. Tucson, Arizona. Airdrome. Intermediate Landing Field.

WHEELER FIELD (H Dept.) P. O. Schofield Barracks, Honolulu, T. H. Hq. 18th Pursuit Group. 6th, 19th Pursuit Sqs. Flying Field.

WRIGHT FIELD—(Chief of the Air Corps) P. O. Dayton, Ohio. Materiel Division, Engineering School. Experimental Engineering Section. Procurement Planning Representative. Repair & Maintenance Section. Industrial War Plans. Field Service Section. Procurement Sec. Air Corps Procurement Dist.

Organized Reserve Airdromes and Stations for Reserve Flying—Boston Airport, Bowman Field, Lunken Airport, Municipal Airport—Salt Lake City, Utah (formerly Woodward Field), Municipal Airport—Long Beach, Calif. (formerly Clover Field), Norton Field, Pearson Field, Pittsburgh Airport, Richards Field, Sand Point, Schoen Field.

Air Depots—Fairfield, Little Rock, Middletown, Rockwell, San Antonio, Scott Field.

Special Service Schools—Advanced Flying School, Kelly Field, Texas; Primary Flying School, Brooks Field, Texas; Primary Flying School, March Field, Calif.; Tactical School, Langley Field, Hampton, Va.; Technical School, Chanute Field, Rantoul, Ill.; Engineering School, Wright Field, Dayton, Ohio; School of Aviation Medicine, Brooks Field, San Antonio, Texas; Balloon & Airship School, Scott Field, Belleville, Ill.

NOTE: Reserve flying also conducted at Air Corps stations at which one or more Air Corps units are operating.

Air Corps National Guard Units

Organization	*P. O. Address*
101st Obs. Sq. & Photo Sec., Mass. Nat. Gd.	Boston Airport, Boston, Mass.
102d Obs. Sq. & Photo Sec., N. Y. Nat. Gd.	Miller Field, Staten Island, N. Y.
103d Obs. Sq., Penna. Nat. Gd.	Philadelphia, Pa.
104th Obs. Sq. & Photo Sec., Md. Nat. Gd.	Logan Field, Baltimore, Md.
105th Obs. Sq. & Photo Sec., Tenn. Nat. Gd.	McConnell Field, Nashville, Tenn.
106th Obs. Sq. & Photo Sec., Ala. Nat. Gd.	Roberts Field, Birmingham, Ala.
107th Obs. Sq. & Photo Sec., Mich. Nat. Gd.	Route 9, Box 453, Detroit, Mich.
108th Obs. Sq., Illinois Nat. Gd.	Chicago, Ill.
109th Obs. Sq. & Photo Sec., Minn. Nat. Gd.	Chamberlain-Wold Field, St. Paul, Minn.
110th Obs. Sq. & Photo Sec., Mo. Nat. Gd.	Lambert Field, Robertson, Mo.
111th Obs. Sq. & Photo Sec., Texas Nat. Gd.	Houston, Texas
112th Obs. Sq., Ohio Nat. Gd.	Cleveland, Ohio
113th Obs. Sq. & Photo Sec., Ind. Nat. Gd.	Indianapolis, Ind.
115th Obs. Sq. & Photo Sec., Cal. Nat. Gd.	Los Angeles Airport, Griffith Park, Cal.
116th Obs. Sq. & Photo Sec., Wash. Nat. Gd.	Parkwater Aviation Field, Spokane, Wash.
118th Obs. Sq. & Photo Sec., Conn. Nat. Gd.	Municipal Airdrome, Hartford, Conn.
120th Obs. Sq. & Photo Sec., Colo. Nat. Gd.	Lowry Field, Denver, Colo.
154th Obs. Sq., Arkansas Nat. Gd.	Little Rock, Ark.

District Procurement and Planning Representative

Buffalo	Wright Field
Chicago	New York
Detroit	San Francisco

Air Corps Procurement Districts

Buffalo, N. Y.	644 Elliott Square
Chicago, Ill.	1819 W. Pershing Road
Cleveland, Ohio	Wright Field, Dayton, Ohio
Detroit, Mich.	802 Farwell Bldg.
New York, N. Y.	39 Whitehall St.
San Francisco, Calif.	369 Pine St.

Materiel Division

Wright Field, Dayton, Ohio

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

Executive	Maj. Henry H. Arnold
Assistant Executive	Capt. Aaron E. Jones
Commanding Officer and Chief of Administration	Maj. John D. Reardon
Chief Engineer	Maj. Clinton W. Howard
Chief of Procurement	Maj. Oliver P. Echols
Chief of Field Service	Maj. Fred H. Coleman
Chief of Industrial War Plans	Maj. W. H. Crom
Chief of Finance Budget	Mr. C. E. Orton
Assistant Commandant Air Corps Engineering School	Capt. Grandison Gardner
Adjutant	Capt. J. G. Whitesides
Finance Officer	Capt. L. H. Price
Flight Surgeon	Maj. E. C. Reinartz
Quartermaster	Capt. Elmer Hostetter
Constructing Quartermaster	Capt. L. S. Doten
Signal Officer	
Station Supply Officer	Capt. A. M. Drake
Engineer Corps Representative	Capt. B. C. Hill
Ordnance Corps Representative	Maj. J. L. Hatcher
Signal Corps Representative	Maj. Hugh Mitchell
Navy Corps Representative	Lt. Spencer H. Warner

ARMY PURCHASES OF AERONAUTICAL EQUIPMENT

Fiscal Year 1930

Aircraft

Heavier-than-Air Equipment:

1. Airplanes and Spares:

No.	*Types*	*Cost*
59	Pursuit Airplanes with Spares, Model P-12 B with R-1340 C engines	$1,534,167.77
63	Bombardment Airplanes with Spares, Model B-3A with R-1690 engines	3,650,699.07
10	Bombardment Airplanes with Spares, Model Y1B4 and Y1B5 with R-1690 engines	578,928.20
78	Attack Airplanes with Spares, Model A-33 with D-12 engines	2,118,759.73
70	Observation Airplanes with Spares, Model O-19B with R-1340 C engines	1,968,917.26
53	Observation Airplanes with Spares, Model O-25B with G IV-1570 engines	1,887,178.08
30	Observation Airplanes with Spares, Model O-32 with R-1340 C engines	768,426.44
10	Amphibian Airplanes, Model C-6A with R-1340 C engines	652,996.56
16	Training Airplanes with Spares, Model YPT-6 with Kinner engines	77,536.50
8	Photographic Airplanes with Spares, Model YF-1	91,568.66
1	Observation Airplane, Model XO-31	17,500.00

2. Engines:

128	Curtiss Engines D-12	876,256.16
106	Curtiss Engines V-1570	1,048,213.09
351	Pratt & Whitney Engines R-1340	2,116,956.53
292	Pratt & Whitney Engines R-1690	1,674,107.69
29	Kinner Engines (These are initial equipment for above airplanes.)	
150	Liberty Engines Reconditioned	675,594.00
89	Curtiss V-1570	687,448.93
40	Curtiss Engines D-12	246,990.00
8	Pratt & Whitney Engines R-1340	38,843.36
12	Pratt & Whitney Engines R-1690	60,315.04
3	Pratt & Whitney Engines, Wasp Jr.	11,901.30
2	Packard DR 980 Engines	6,137.50
1	Kinner Engine K-5	1,381.50

3. Miscellaneous:

1165	Parachutes	190,791.40
387	Flying Suits—Winter	36,501.40
3011	Flying Suits—Summer	14,855.11
2168	Pairs Goggles	24,038.82
700	Helmets—Summer	1,807.61
420	Helmets—Winter	1,459.28
3175	Aviators' Jackets	3,013.35
480	Flying Coats—non-sinkable	2,251.20
300	Gauntlets—Winter	3,200.00
704	Face Masks	1,000.39
6	Cameras, Type T-2A	20,178.60
6	Cameras, Type K-10	3,210.48

No.	Types	Cost
2	Cameras, Type F-4	$3,938.50
1	Camera, Hand Held	1,607.50
2	Cameras, Type K-13	4,604.00
	Government-furnished equipment for future airplanes	586,796.66
	Airplane Equipment and Accessories	344,179.30
	Power Plant Equipment and Accessories	329,869.17
	Photographic Equipment	18,398.12
	Armament Equipment	117,868.76
	Miscellaneous Equipment	23,713.00
	Transportation and Crating	152,729.37

Strength of the Army Air Corps

Dec. 31, 1930

Commissioned Officers		1,341
Student Officers	134	
Pilots	1,070	
Enlisted men		11,533
Civilians	3,344	

Strength of Air Corps Organized Reserves

Officers	5,687
Pilots and Observers	3,582
Number of Civilian Employees, Dec. 31, 1930	3,344

Army Flying Time and Distances

1930

Heavier-than-air	325,273	hours
Lighter-than-air	2,493	hours
Total flying time	327,766	hours
Miles flown	35,823,473	miles

AIRPLANES DELIVERED TO U. S. ARMY IN 1930

Fiscal Year

No.	Type and Model	Contractor
59	Attack Model A-3B	Curtiss Aeroplane & Motor Co., Inc.
14	Bombardment Model LB-6	Keystone Aircraft Corp., Inc.
1	Bombardment Model LB-10	Keystone Aircraft Corp., Inc.
1	Bombardment Model LB-11	Keystone Aircraft Corp., Inc.
1	Bombardment Model LB-9	Keystone Aircraft Corp., Inc.
10	Bombardment Model B-2	Curtiss Aeroplane & Motor Co., Inc.
1	Observation Model O-20	Thomas Morse Aircraft Company
2	Observation Model O-19A	Thomas Morse Aircraft Company
1	Observation Model O-22	The Douglas Company
35	Observation Model O-1E	Curtiss Aeroplane & Motor Co., Inc.
1	Observation Model O-1F	Curtiss Aeroplane & Motor Co., Inc.
32	Observation Model O-19B	Thomas Morse Aircraft Company
3	Observation Model O-25B	The Douglas Company
1	Observation Model O-26	Curtiss Aeroplane & Motor Co., Inc.
1	Observation Model Y-O-23	Thomas Morse Aircraft Company
15	Observation Model O-25-A	The Douglas Company
3	Observation Model O-13-C	Curtiss Aeroplane & Motor Co., Inc.
10	Pursuit Model P-6	Curtiss Aeroplane & Motor Co., Inc.
89	Pursuit Model P-12-B	Boeing Airplane Company
26	Primary Training Model PT-3A	Consolidated Aircraft Corporation
10	Primary Training Model YPT-6	Fleet Aircraft Incorporated
30	Basic Training Model BT-2A	The Douglas Company
3	Cargo Model C-9	Ford Motor Company
1	Cargo Model C-6	Sikorsky Aviation Corporation
3	Cargo Model C-7-A	Fokker Aircraft Corporation
8	Photo Model YF-1	Fairchild Airplane Mfg. Co.

BUREAU OF AERONAUTICS, NAVY DEPARTMENT

Chief of Bureau.....Rear Admiral William A. Moffett
Assistant Chief of Bureau...Captain John H. Towers
Administration Division.....Comdr. A. H. Gray, Lt. Comdr. G. D. Price, Lt. W. M. Lockhart, Lt. W. E. Gist, Lt. S. C. Ring
Plans Division.....Comdr. R. K. Turner, Lt. Comdr. M. A. Mitcher, Lt. Comdr. C. E. Rosendahl, Lt. F. C. Fake, Lt. M. T. Seligman, Capt. W. G. Farrell (USMC)
Financial Division.....Comdr. E. A. Cobey (SC)
Flight Division.....Comdr. H. B. Cecil, Lt. Comdr. F. D. Wagner, Lt. Comdr. O. B. Hardison, Lt. W. M. Dillon

Materiel Division.....Comdr. S. M. Kraus, Comdr. G. Fulton (CC), Comdr. W. W. Webster (CC), Comdr. C. A. Pownall, Lt. Comdr. H. R. Bogusch, Lt. Comdr. A. C. Miles (CC), Lt. Comdr. H. R. Oster (CC), Lt. Comdr. J. E. Ostrander, Lt. Comdr. L. B. Richardson (CC), Lt. Comdr. C. A. Nicholson (CC), Major W. H. Sitz (USMC), Lt. Comdr. G. Rowe, Lt. H. S. Kendall, Lt. G. D. Townsend, Lt. L. D. Webb, Lt. G. R. Henderson, Lt. R. S. Barnaby (CC), Lt. R. D. MacCart (CC), Lt. W. S. Diehl (CC), Lt. J. D. Barner, Lt. L. J. Maxson (CC), Capt. J. A. Nelson (USMC).

Marine Corps Aviation.....Colonel T. C. Turner, Capt. L. E. Woods, Capt. T. R. Shearer.

Naval Air Stations

Name	*Commanding Officer*
Hampton Roads, Va.	Kenneth Whiting, Captain
San Diego, Calif.	Robert R. Paunack, Comdr.
Pensacola, Fla.	Albert W. Marshall, Rear Admiral
Anacostia, D. C.	Archibald H. Douglas, Comdr.
Seattle, Wash.	Alfred E. Montgomery, Lt. Comdr.
Lakehurst, N. J.	Harry E. Shoemaker, Capt.
Coco Solo, C. Z.	Comdr. Alva D. Bernhard
Pearl Harbor, T. H.	Victor D. Herbster, Comdr.

Marine Flying Fields

Name	*Commanding Officer*
Quantico, Va.	Major Roy S. Geiger
San Diego, Calif.	Major Ross E. Rowell
Port au Prince, Haiti	Major James E. Davis
Managua, Nicaragua	Major Ralph J. Mitchell
Sumay, Guam	Captain Harold D. Campbell

Carrier Divisions

Commander—Rear Admiral Joseph M. Reeves.
(Additional duty as Commander Carrier Division Two.)
Chief of Staff—Captain Arthur B. Cook.
Commander, Carrier Division One—Captain Frederick J. Horne.
U. S. S. *Lexington*—Commanding Officer—Captain Ernest J. King.
U. S. S. *Saratoga*—Commanding Officer—Captain Frank R. McCrary.
U. S. S. *Langley*—Commanding Officer—Captain Rufus F. Zogbaum.

Airship

U. S. S. *Los Angeles*—Commanding Officer—Lt. Comdr. Vincent A. Clarke.

Naval Aircraft Factory

Philadelphia, Pa.—Manager—Comdr. Ralph D. Weyerbacher.

Special Aviation Duty

Aide to Asst. Secretary of the Navy (Air)	Lt. Comdr. Robert P. Molten
Aide to Commander-in-Chief, U. S. Fleet	Lt. Comdr. Donald B. Duncan
Aide to Commander-in-Chief, Battle Fleet	Lt. Comdr. Gail Morgan
Aide to Commander, Scouting Fleet	Lt. Comdr. William D. Thomas
Office of Naval Operations	Lt. Comdr. Calvin T. Durgin
Office of Fleet Training	Lt. Comdr. Samuel P. Ginder
Board of Inspection & Survey	Lt. Thomas P. Jeter
Bureau of Navigation	Comdr. Wadleigh Capehart
Bureau of Ordnance	Lt. Frederick I. Entwistle
Bureau of Engineering	Lt. Herbert C. Rodd
Hydrographic Office	Lt. John P. W. Vest

NAVY PURCHASES OF AERONAUTICAL EQUIPMENT

Fiscal Year 1930

Aircraft

No.		*Cost*
102	Fighting Planes	$1,181,082.92
54	Observation Planes	1,134,240.00
54	Patrol Planes	2,634,979.55
20	Torpedo Planes	903,140.00
1	Scouting Plane	32,500.00
53	Training Planes	266,946.72
3	Transport Planes	140,007.40
	Total	$6,292,896.59

Engines

Contractor	Model	No.	Cost
Wright Aeronautical Corporation	R-760	50	$ 170,105.00
Wright Aeronautical Corporation	R-1510	2	50,000.00
Wright Aeronautical Corporation	R-1820E	345	2,054,877.67
Wright Aeronautical Corporation	R-975	3	17,413.15
Wright Aeronautical Corporation	V-1110	2	41,950.04
Pratt & Whitney Aircraft Co.	R-1860	3	21,036.26
Kinner Aeroplane & Motor Co.	R-370	18	28,327.50
Pratt & Whitney Aircraft Co.	R-1340C	3	15,599.26
Pratt & Whitney Aircraft Co.	R-1340D	112	592,101.44
Pratt & Whitney Aircraft Co.	R-985	4	16,998.48
Allison Engineering Company	V-1710	1	75,000.00
Packard Motor Company	DR-980	2	7,180.60
Maybach Motor Company	VL-2	2	19,600.00
Comet Engineering Company	Comet	1	25,000.00
Loening Aeronautical Corporation	Warner "Scarab"	1	2,000.00
Total		549	$3,852,365.61

Airplanes Delivered to U. S. Navy in 1930

Model	Number Delivered	Contractor
F8C-5	52	Curtiss Aeroplane & Motor Company
F4B-2	46	Boeing Aircraft Company
XF5B-1	1	Boeing Aircraft Company
XF9C-1	1	Curtiss Aeroplane & Motor Company
XFA-1	1	Atlantic Aircraft Corporation
Bristol Bulldog	1	Bristol Aeroplane Company
XO2L-1	2	Loening Aeronautical Eng. Corporation
O3U-1	36	Chance Vought Corporation
XO4U-1	1	Chance Vought Corporation
OL-9	15	Loening Aeronautical Eng. Corporation
PK-1	18	Keystone Aircraft Corporation
XP2S-1	1	Sikorsky Aviation Corporation
PM-2	25	Glenn L. Martin Company
PH-1	9	Hall Aluminum Aircraft Corporation
XP2H-1	1	Hall Aluminum Aircraft Corporation
T2D-2	18	Douglas Aircraft Company
XT3D-1	1	Douglas Aircraft Company
XBN-1	1	Navy Department
XSL-1	1	Loening Aeronautical Eng. Corporation
NY-3	20	Consolidated Aircraft Corporation
N2C-2	20	Curtiss Aeroplane & Motor Company
NT-1	6	New Standard Aircraft Corporation
N2Y-1	6	Consolidated Aircraft Corporation
A8546 Glider	1	American Motorless Aviation Corp.
JR-3	2	Ford Motor Company
XJQ-2	1	Fairchild Aviation Corporation
Total	287	

Aircraft Engines Delivered to U. S. Navy in 1930

Model	Number Delivered	Contractor
R-760	50	Wright Aeronautical Corporation
R-1510	2	Wright Aeronautical Corporation
R-1820E	345	Wright Aeronautical Corporation
R-975	3	Wright Aeronautical Corporation
V-1110	2	Wright Aeronautical Corporation
R-1860	3	Pratt & Whitney Aircraft Co.
R-370	18	Kinner Aeroplane & Motor Company
R-1340C	3	Pratt & Whitney Aircraft Co.
R-1340D	112	Pratt & Whitney Aircraft Co.
R-985	4	Pratt & Whitney Aircraft Co.
V-1710	1	Allison Engineering Company
DR-980	2	Aeronautical Engine Laboratory
VL-2	2	Maybach Motor Company
Comet	1	Comet Engineering Corporation
Warner "Scarab"	1	Loening Aeronautical Eng. Corporation
Total	549	

NATIONAL BALLOON RACE

Bellaire Field, Houston, Texas, July 4, 1930

Official Standing of Contestants

Place	Entry	Pilot and Aide	Place of landing	Distance
1.	Goodyear-Zeppelin Corp.	Roland J. Blair F. A. Trotter	2.5 mi. NW Greensburg, Ky. 11.25 mi. SW Campbellsville, Ky.	768 mi.
2.	Detroit Balloon Club	E. J. Hill A. G. Schlosser	19.7 mi. NW Columbia, Ky. 3 ¾ mi. SW Russellville, Ky. 11 mi. NNW Adairville, Ky. 5 ¼ mi. NE Olmstead, Ky.	688 mi.
3.	United Van Service, Inc.	George Hineman Milford Vanik	16 mi. NNE Elkton, Ky. 1.6 mi. W Kirkmansville, Ky. 20.3 mi. N Trenton, Ky.	685 mi.
4.	U. S. Navy	T. G. W. Settle R. G. Mayer	7 mi. NW Dover, Tenn. 6 mi. E Tennessee River in Lat. 36-36 N. 72 mi. WNW Nashville, Tenn.	633 mi.
5.	U. S. Navy	Wilfred Bushnell J. L. Greenwald	10 mi. Piggott, Ark. 10 mi. Rector, Ark. 20 mi. Corning, Ark.	538 mi.
6.	U. S. Army	Walter D. Buie J. P. Kidwell	4 mi. NE Danville, Ark. 6 mi. S Chickalah, Ark. 6 mi. NW Ola, Ark.	385 mi.
7.	U. S. Army	K. S. Axtater R. E. Holmes	18 mi. W. Mena, Ark. 1 ¼ mi. SW Polk, Montg. Co. Line 2 ½ mi. NW Egger 3 ½ mi. E and N Waters	343 mi.
8.	U. S. Navy	R. R. Dennett C. F. Miller	16 mi. Dierck, Ark. 2 mi. W Daisy, Ark.	333 mi.
9.	Aero Digest	S. T. Moore W. O. Eareckson	4 mi. SE Umpire, Ark. 4 mi. S Athens Between Umpire and Athens, Ark.	330 mi.
10.	Detroit Balloon Club	S. A. U. Rassmussen T. W. Southworth	5 mi. SW Kirby, Ark.	325 mi.
11.	Dr. George M. LeGallee	Dr. G. M. LeGallee R. W. Ebert	3 mi. SW Horatio, Ark. 8 mi. S DeQueen 47 mi. NW Texacano, Ark.	300 mi.
12.	Detroit Balloon Club	W. Klickoff R. Cunningham	15 mi. NE Texarkana on the Red River—L. C. Adams plantation	275 mi.
13.	U. S. Army	W. R. Turnbull C. M. Brown	55 mi. Greenville, Tex. 70 mi. Texarkana, Texas 25 mi. Paris, Texas	252 mi.
14.	Cleveland Chamber of Commerce	Chas. H. Roth Wm. Carey	6 mi. S Cuthland, Tex. 7 mi. E Johnstown, Tex. 3 mi. W Talco, Texas	250 mi.

GORDON BENNETT BALLOON RACE

Cleveland, Ohio, September 1, 1930

Cleveland Airport

Official Standing of Contestants

Place	Entry	Pilot and Aide	Place of landing	Distance
1.	United States	Ward T. Van Orman Alan L. MacCracken	Norfolk Co., Mass., 1 mile North Canton	542 mi.
2.	Belgium	E. Demuyter L. Coeckelberg	Berkshire Co., Adams, Mass., Eastern slope of Mt. Greylock	448 mi.
3.	United States	Edw. J. Hill Arthur J. Schlosser	Albany Co., N. Y., Teneyck Powel Farm	417 mi.
4.	United States	R. J. Blair F. A. Trotter	Copenhagen, N. Y., 1½ miles S	348 mi.
5.	Germany	Dr. Hugo Kraulen Carl Gotze	New Lisbon, N. Y., 1 mile S	343 mi.
6.	France	Albert Boitard Jean Herbe	Smithville, Ont., 3 miles N.	165 mi.

NATIONAL AIR TOUR, 1930

Place	*Plane*	*A.T.C. No.*	*Motor Used*	*No. of Engines*	*Rated H.P.*	*Pilot*	*Points*
1st	Ford	246	2 Wrights 1 Wasp	3	1,020	H. L. Russell	58,575.6
2nd	Waco	362	Wright	1	240	John Livingston	55,628.2
3rd	Waco	362	Wright	1	240	Art Davis	55,226.0
4th	Ford	165	Wasps	3	1,260	M. E. Zeller	55,016.2
5th	Bellanca	245	Wright	1	300	Geo. Haldeman	53,830.3
6th	Curtiss Kingbird	348	Wrights	2	600	W. H. Beech	53,794.8
7th	Bellanca	129	Wright	1	300	J. W. Smith	47,648.7
8th	Cessna	72	Warner	1	110	E. Schneider	47,488.0
9th	Travel Air	352	Wright	1	300	T. T. Wadlow	42,976.3
10th	Waco	345	Kinner	1	125	Les. Bowman	42,742.9
11th	Ken Royce	314	Continental	1	165	J. B. Story	41,504.7
12th	Monocoupe	306	Lambert	1	90	B. Stevenson	39,255.5
13th	American Eagle	302	Continental	1	165	Larry Ruch	37,710.8
14th	Kitty Hawk	166	Kinner	1	90	Nancy Hopkins	36,528.0
15th	Cabinaire	265	Wright	1	165	W. J. Carr	35,887.2
16th	Great Lakes	354	Cirrus	1	95	C. W. Meyers	33,905.4
17th	Mercury	235	LeBlond	1	90	H. C. Mummert	30,130.2
18th	Sikorsky	340	Wasp, Jr	1	300	Geo. Meissner	27,899.6

1930 NATIONAL AIR RACES

August 23rd—September 1st

Curtiss-Reynolds Airport, Chicago, Illinois

WOMEN'S CLASS "A" PACIFIC DERBY—LONG BEACH, CALIF., TO CHICAGO, ILL.

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Cash Prize*
1st	Gladys O'Donnell	Waco	J-6-7	15:13.16	$3,500.00
2nd	Mildred Morgan	Travel Air	J-5	21:08.35	2,100.00
3rd	Jean LaRene	Am. Eagle	J-6-7	21:45.49	1,400.00
4th	Ruth M. Stewart	Robin	Chall	26:38.06	
5th	Ruth W. Barron	Buhl	J-5	38:33.41	
	Margorie L. Doig	Pitcairn	J-6	Forced out at Emporia, Kansas	

WOMEN'S CLASS "B" DIXIE DERBY—WASHINGTON, D. C., TO CHICAGO, ILL.

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Cash Prize*
1st	Phoebe F. Omlie	Monocoupe	Warner	11:42.21	$2,000.00
2nd	Martie Bowman	Fleet	Kinner	14:48.39	1,200.00
3rd	Laura Ingalls	DH Moth	Gypsy	16:47.26	800.00
4th	Nancy Hopkins	Kitty Hawk	Kinner	19:18.18	
5th	Charity Langdon	Whit. Avian	Cirrus	20:44.47	

MEN'S CLASS "A" ATLANTIC DERBY—MIAMI, FLA., TO CHICAGO, ILL.

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Cash Prize*
1st	A. W. Killips	Waco	J-5	11:53.23.1	$1,750.00
2nd	A. J. Davis	Waco	J-6-7	11:59.40.6	1,050.00
3rd	G. T. Burrell	Stearman		14:00.07.6	700.00

MEN'S CLASS "B" ATLANTIC DERBY—HARTFORD, CONN., TO CHICAGO, ILL.

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Cash Prize*
1st	J. Wesley Smith	Monocoupe	Warner	8:24.37.1	$1,250.00
2nd	H. A. Little, Jr.	Monosport	Warner	8:29.29.6	750.00
3rd	C. W. Meyers	Great Lakes	Cirrus	9:04.58.1	500.00
4th	Leslie Bowman	Monosport	Kinner	9:38.34.2	

MEN'S CLASS "A" PACIFIC DERBY—SEATTLE, WASH., TO CHICAGO, ILL.

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Cash Prize*
1st	John Blum	Lockheed	J-5	18:24.31.1	$3,500.00
2nd	Nick Mamer	Stearman	J-5	18:47.46.4	2,100.00
3rd	Frank Kammer	Ryan	J-5	19:27.01.9	1,400.00
4th	Bert Rouff	Ryan	J-5	20:41.50.7	
5th	Floyd Keadle	Waco	J-5	23:08.12	

MEN'S CLASS "B" PACIFIC DERBY—BROWNSVILLE, TEXAS, TO CHICAGO, ILL.

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	John H. Livingston	Monocoupe	Warner	16:10.29	$2,000.00
2nd	Willfred G. Moore	Inland Spt	Warner	17:28.52.7	1,200.00

MEN'S NONSTOP DERBY—LOS ANGELES, CALIF., TO CHICAGO, ILL.

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Wiley Post	Lockheed	Wasp	9:09.04	$7,500.00
2nd	Arthur Goebel	Lockheed	Wasp	9:21.21.4	4,500.00
3rd	Lee Shoenhair	Lockheed	Wasp	9:39.17	
4th	William S. Brock	Lockheed	Wasp	9:53.57	
5th	Roscoe Turner	Lockheed	Ex. Hornet	9:58.41	

EVENT NO. 1—WOMEN'S 500 CU. IN.—OPEN SHIPS—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	May Haizlip	Inland Spt	Warner	12:23.3	$500.00
2nd	Vera D. Walker	Inland Spt	Warner	12:25.9	300.00
3rd	Laura Ingalls	DH Moth	Gypsy	13:26.8	200.00
4th	Betty Lund	Inland Spt	Warner	14:07.5	

EVENT NO. 2—WOMEN'S 500 CU. IN.—CABIN SHIPS—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Phoebe F. Omlie	Monocoupe	Warner	11:05.7	$500.00
2nd	Martie Bowman	Monosport	Kinner	11:11.6	300.00
3rd	Gladys O'Donnell	Monocoupe	Warner	11:22.3	200.00

EVENT NO. 3—MEN'S 110 CU. IN. FREE FOR ALL—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	E. B. Heath	Parasol	Bristol	18:57.4	$375.00
2nd	Delbert Koerner	White Aero-Speed	Heath	20:44.9	225.00
3rd	Gus Palmquist	Midwing	Bristol	21:28.4	150.00
	M. Lambert			Did not finish	
	Guy Mencaccy			Did not finish	
	W. W. Kratz			Disqualified	

EVENT NO. 4—MARINE CORPS CLOSED EVENT—ATTACK PLANES—10 LAPS 5 MILE COURSE

Place	Pilot	Plane
1st	Lt. Sanderson	Boeing Ftr.
2nd	Lt. Burchard	Boeing Ftr.
3rd	Lt. Kerr	Boeing Ftr.
4th	Sgt. Shepard	Boeing Ftr.
5th	Lt. Cloud	Boeing Ftr.
6th	Lt. Brewster	Boeing Ftr.

EVENT NO. 5—MEN'S 275 CU. IN. OPEN SHIPS—5 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Cash Prize*
1st	Art. Chester	Davis	LeBlond	13:21.5	$375.00
2nd	B. W. Diggle	Inland Spt	LeBlond	13:46.3	225.00
3rd	Freddie Lund	Davis	LeBlond	15:42.1	150.00

EVENT NO. 6—MEN'S 275 CU. IN. CABIN SHIPS—5 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Cash Prize*
1st	Bart. Stevenson	Monocoupe	Lambert	12:46.2	$375.00
2nd	C. B. Burmood	Monocoupe	Lambert	12:08.7	225.00
3rd	J. H. Livingston	Monocoupe	Lambert	13:39.9	150.00

EVENT NO. 7—MEN'S 275 CU. IN. FREE FOR ALL—5 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Cash Prize*
1st	E. B. Heath	Cannon Ball	Heath	12:42.4	$375.00
2nd	Bart. Stevenson	Monocoupe	Lambert	12:57.9	225.00
3rd	D. A. Fowlie	Phantom	Pobjoy Rad	13:01	150.00
4th	Art Chester	Davis	LeBlond	13:20.5	
5th	C. B. Burmood	Monocoupe	Lambert	13:22.4	
6th	B. W. Diggle	Inland Spt	LeBlond	13:38.2	

EVENT NO. 10—MEN'S OPEN OX_5 RACE—5 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Cash Prize*
1st	Art Chester	Travel Air	Curtiss	$500.00
2nd	Herman Hamer	Travel Air	Curtiss	300.00
3rd	S. J. Wittman	Pheasant	Curtiss	200.00

EVENT NO. 11—MEN'S CABIN OX_5 RACE—CANCELLED FOR LACK OF ENTRIES

EVENT NO. 12—MEN'S 350 CU. IN.—OPEN SHIPS—5 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Cash Prize*
1st	Charles Meyers	Gt. Lakes	Cirrus	12:49.7	$500.00
2nd	W. S. Green	Inland Spt	Cirrus	13:34.9	300.00
3rd	B. W. Diggle	Inland Spt	LeBlond	14:00.5	200.00
4th	F. G. Sparks	DH Moth	Gypsy	14:15.1	
5th	H. S. Darr	Mercury	LeBlond	14:29.3	

EVENT NO. 13—MEN'S 350 CU. IN. CABIN RACE—5 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Cash Prize*
1st	Vern Roberts	Monocoupe	Lambert	12:25.2	$500.00
2nd	F. G. M. Sparks	D. H. Puss	DH-4	12:30.4	300.00
3rd	Bart Stevenson	Monocoupe	Lambert	12:55.3	200.00
4th	C. B. Burmood	Monocoupe	Lambert	13:32.6	

EVENT NO. 14—MEN'S FREE FOR ALL—350 CU. IN.—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Ben O. Howard	Howard	Gypsy	9:12.1	$500.00
2nd	E. V. Newsom	Commandaire	Cirrus	9:52.7	300.00
3rd	J. R. Wedell	Wedell Wms	Cirrus	10:42.5	200.00
4th	Willard van King	Airistocrat	Cirrus	10:54.2	
5th	Herman Hamer	Laird	Cirrus	10:59.4	
6th	F. G. Sparks	Puss Moth	Gypsy	12:13	

EVENT NO. 15—MEN'S 450 CU. IN.—OPEN SHIPS—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	W. G. Moore	Inland Spt	Warner	11:38	$500.00
2nd	Les. Bowman	Waco F	Kinner	12:36	300.00
3rd	Chas. W. Meyers	Great Lakes	Cirrus	12:55	200.00
4th	Wm. A. Ong	Inland Spt	Warner	12:57.1	
5th	Wm. Green	Inland Spt	Warner	12:37.1	

EVENT NO. 16—MEN'S 450 CU. IN.—CABIN RACE—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Vern Roberts	Monocoupe	Warner	10:15.6	$500.00
2nd	J. H. Livingston	Monocoupe	Warner	10:16	300.00
3rd	R. T. Quimby	Monocoupe	Warner	10:44.6	200.00
4th	J. Wesley Smith	Monocoupe	Warner	11:28.7	
5th	Henry A. Little, Jr.	Monosport	Kinner	11:35.4	

EVENT NO. 17—MEN'S 450 CU. IN. FREE FOR ALL—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Ben O. Howard	Howard	Gypsy	9:41.3	$500.00
2nd	Wm. O. Ong	Cessna	Warner	10:18.6	300.00
3rd	E. V. Newsom	Commandaire	Cirrus	10:22.9	200.00
4th	R. T. Quimby	Monocoupe	Warner	11:06.2	
5th	Jas. R. Wedell	Wedell Wms. Spec	Cirrus	11:20.6	
6th	Willard van King	Airistocrat	Cirrus	11:24.2	
7th	Bob E. Dake	Am. Moth Spec	Warner Scarab	13:01.2	

EVENT NO. 18—MEN'S 650 CU. IN.—OPEN SHIPS—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Wm. A. Ong	Inland Spt	Warner	11:33.3	$600.00
2nd	W. G. Moore	Inland Spt	Warner	11:46.8	360.00
3rd	J. B. Story	Kenroyce	Con'tl	12:06.7	240.00
4th	Les. Bowman	Waco	Kinner	12:38.7	

EVENT NO. 19—MEN'S 650 CU. IN.—OPEN SHIPS—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Vern Roberts	Monocoupe	Warner	10:34.2	$600.00
2nd	Les. Bowman	Monocoupe	Kinner	10:42.8	360.00
3rd	R. T. Quimby	Monocoupe	Warner	10:55.3	240.00
	John H. Livingston	Monocoupe	Warner	Out on the 5th lap	

EVENT NO. 20—MEN'S FREE FOR ALL—650 CU. IN.—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Ben O. Howard	Howard	Gypsy	19:19.9	$600.00
2nd	Wm. A. Ong	Cessna	Warner	20:17.6	360.00
3rd	E. Z. Newsom	Commandaire	Cirrus	20:53.1	240.00
4th	R. T. Quimby	Monosport	Cirrus	21:00.3	

EVENT NO. 21—NATIONAL GUARD RACE—LIBERTY ENGINE BUILDERS TROPHY

Place	Pilot	Plane	Engine
1st	Wilson V. Newhall	Douglas	O 2H
2nd	C. Barnhill	Douglas	Liberty
3rd	Phil Love	Douglas	Liberty

EVENT NO. 22—MEN'S 800 CU. IN.—OPEN SHIPS—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Lloyd O'Donnell	Waco 10	J-6-7	9:52.9	$750.00
2nd	A. J. Davis	Waco 10	J-6-7	10:10.4	450.00
3rd	A. W. Killips	Waco 10	J-5	10:27.1	300.00
4th	M. E. Grevemberg	Pitcairn	J-6	10:38.6	
	Freddie Lund	Waco	J-6	Out of race at first lap	

EVENT NO. 23—MEN'S 800 CU. IN. CABIN RACE—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Vern Roberts	Monocoupe	Warner	10:18.2	$750.00
2nd	John H. Livingston	Monocoupe	Warner	10:19.0	450.00
3rd	R. T. Quimby	Monocoupe	Warner	10:42.8	300.00
4th	J. H. Bridges	Cessna	J-6-7	10:50.5	
5th	Casey Jones	Cessna	W. Whirl	11:07.7	

EVENT NO. 24—MEN'S FREE FOR ALL—800 CU. IN.—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Ben O. Howard	Howard	Gypsy	9:14.1	$750.00
2nd	Erett Williams	Wedell Wms.	J-6	9:16.5	450.00
3rd	Wm. A. Ong	Cessna	Warner	10:17.1	300.00
	Jas. A. McCready	Menasco		Forced down in 1st lap	
	E. M. Laird	Speedwing	Chevolair	Forced down in 1st lap	
	Casey Jones	Cessna	Wright	Forced down in 2nd lap	

EVENT NO. 25—PARACHUTE JUMPING CONTEST

August 24, 1930

Place	Pilot	Cash Prize
1st	R. D. Rae	$100.00
2nd	E. V. Stewart	60.00
3rd	Joe Crane	40.00

Place	*Pilot*	August 25, 1930	*Cash Prize*
1st	Ralph LaPere		$100.00
2nd	Joe Crane		60.00
3rd	R. D. Rae		40.00

		August 26, 1930	
1st	R. D. Rae		$100.00
2nd	Enrique Miles		60.00
3rd	Joe Crane		40.00
4th	D. V. Stewart		

		August 27, 1930	
1st	R. D. Rae		$100.00
2nd	Joe Crane		60.00
3rd	J. Runger		40.00

		August 28, 1930	
1st	E. V. Stewart		$100.00
2nd	Joe Crane		60.00
3rd	Ralph LaPere		40.00

		August 29, 1930	
1st	Joe Crane		$100.00
2nd	R. D. Rae		60.00
3rd	Enrique Miles		40.00

		August 30, 1930	
1st	R. D. Rae		$100.00
2nd	Joe Crane		60.00
3rd	Enrique Miles		40.00

		August 31st, 1930	
1st	R. D. Rae		$100.00
2nd	E. V. Stewart		60.00
3rd	Enrique Miles		40.00

		September 1, 1930	
1st	R. D. Rae		$100.00
2nd	Ralph LaPere		60.00
3rd	Joe Crane		40.00

EVENT NO. 26—MEN'S 1,000 CU. IN.—OPEN SHIPS—6 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Cash Prize*
1st	James Haizlip	Travel Air	J-6-9	9:49	$1,000.00
2nd	Chas. Holman	Laird	J-6-9	10:32.6	600.00
3rd	Ben O. Howard	Howard	W. Gypsy	11:17.4	400.00
4th	Erett Williams	Wedell Wms.	J-6-7	11:58.1	

EVENT NO. 27—MEN'S 1,000 CU. IN.—CABIN RACE—10 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Casey Jones	Cessna	Wright	20:4.7	$1,000.00
2nd	Geo. L. Harte	Cessna	Wright 300	20:13.3	600.00
3rd	Geo. W. Haldeman	Bellanca	Wright J-6-7	22:02.6	400.00

EVENT NO. 28—MEN'S FREE FOR ALL—1,000 CU. IN.—10 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Ben O. Howard	Howard	Gypsy		$1,000.00
2nd	Erett Williams	Wedell Wms.	J-6-7		600.00
3rd	G. L. Harte	Cessna	W 300		400.00
4th	Earl B. Smith	Cessna	Cirrus		
	Casey Jones	Cessna	W 300	Out at 9th lap	
	Speed Holman	Laird	Wright	Disqualified—cut No. 2 pylon—1st lap	

EVENT NO. 29—AIR TRANSPORT & EFFICIENCY RACE—10 LAPS 5 MILE COURSE

For Speed

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	James Haizlip	Lockheed V	Wasp	18:38.7	160.90	$450.00
2nd	Harold Young	Pacemaker	J-6	23:09	129.59	270.00
3rd	Geo. Haldeman	Airbus	Conq	24:13.7	123.82	180.00
4th	Stewart Chadwick	Bellanca	J-5	27:38.4	108.54	

For Efficiency

Place	Pilot	Plane	Engine	Cu. In.	Lbs.	Speed	Cash Prize
1st	Harold Young	Pacemaker	J-6	975	1,570	626.02	$450.00
2nd	Geo. Haldeman	Airbus	Conq	1,569	2,570	608.45	270.00
3rd	Stewart Chadwick	Bellanca	J-5	788	1,142	471.90	180.00
4th	James Haizlip	Lockheed V	Wasp	1,344	1,000	359.14	

EVENT NO. 30—MEN'S OPEN OR CABIN MULTI-MOTORED RACE—10 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Leroy Manning	Ford	Wasp	20:47.9	$750.00
2nd	W. J. Fleming	Bach	Hornet	21:49.7	450.00
	Frank Kern	Kingbird	Wr. Whirl	Out at 5th lap	

EVENT NO. 31—U. S. NAVY RACE—10 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Lt. D. S. Cornwell	Boeing	P & W Wasp	23:34.8	Trophy
2nd	Lt. Comdr. J. H. Campman	Boeing	P & W Wasp	23:52.1	
3rd	Lt. J. P. DeShazo	Boeing	P & W Wasp	23:54.0	

EVENT NO. 32—MEN'S FREE FOR ALL—THOMPSON TROPHY RACE—20 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Cash Prize*
1st	Chas. Holman	Laird	P & W	29:43.0	$5,000.00
2nd	James Haizlip	Travel Air	W-9	30:01.8	3,000.00
3rd	Ben O. Howard	Howard	Gypsy	36:51.3	2,000.00
4th	Paul T. Adams	Travel Air	W-9	42:03.8	
	Erett Williams	Cessna	Cirrus	Landed at 8th Lap	
	Arthur H. Page	Curtiss-Hawk	Curtiss	Crashed at 17th Lap	
	Frank Hawks	Travelair	WW Sped	Landed at 4th Lap	

EVENT NO, 32-A—WOMEN'S FREE FOR ALL—MRS. R. McCORMICK TROPHY—10 LAPS 5 MILE COURSE

Place	*Pilot*	*Plane*	*Engine*	*Time*	*Cash Prize*
1st	Gladys O'Donnell	Waco	J-6-7	20:00.8	$1,250.00
2nd	May Haizlip	Cessna	Warner	20:12.8	750.00
3rd	Opal Kunz	Travel Air	W 300	20:34.9	500.00
4th	Margery Doig	Pitcairn	J-6-7	21:32.5	
5th	Phoebe Omlie	Monocoupe	Warner	22:17.6	
	Ruth Nichols	Laird	Chev	Disqualified—cut No. 1 pylon—3rd lap	
	Mildred Morgan	Travel Air	J-5	Landed at 5th lap	

EVENT NO. 33—MEN'S DEAD STICK LANDING CONTEST

August 24th

Place	*Pilot*	*Plane*	*Engine*	*Cash Prize*
1st	John H. Livingston	Waco F	Warner	$100.00
2nd	W. W. Krantz	Aeronca	Aeronca	50.00
3rd	Harold Neumann	Travel Air	Curtiss	25.00

August 25th

1st	John H. Livingston	Waco F	Warner	$100.00
2nd	M. M. Foss	DH Moth	Gypsy	50.00
3rd	R. D. Rae	Challenger	OX5	25.00

August 26th

1st	M. Hersberger	Argo	Hess War	$100.00
2nd	John H. Livingston	Waco F	Warner	50.00
3rd	Harold Neumann	Travel Air	Curtiss	25.00

August 27th

1st	D. A. Fowlie	Travel Air	OX	$100.00
2nd	W. W. Krantz	Aeronca	Aeronca	50.00
3rd	Art. Davis	Waco	J-6	25.00

August 28th

Place	Pilot	Plane	Engine	Cash Prize
1st	R. E. Kuser	Waco	OX	$100.00
2nd	Basil Sims	Waco	OX	50.00
3rd	Lee Brusse	Fleet	Kinner	25.00

August 29th

1st	Art Chester	Travel Air	OX	$100.00
2nd	E. B. Heath	Parasol	Heath	50.00
3rd	John H. Livingston	Waco	Warner	25.00

August 30th

1st	Art Davis	Waco	J-6	$100.00
2nd	W. W. Krantz	Aeronca	Aeronca	50.00
3rd	Basil Sims	Waco	OX	25.00

August 31st

1st	W. A. Krantz	Aeronca	Aeronca	$100.00
2nd	J. H. Livingston	Waco	Warner	50.00
3rd	Art. Davis	Waco	W-J-6	25.00
4th	Harold Neumann	Travel Air	OX5	

September 1st

1st	Don Rae	Challenger	OX5	$100.00
2nd	W. W. Krantz	Aeronca	Aeronca	50.00
3rd	J. H. Livingston	Waco F	Warner	25.00

EVENT NO. 34—WOMEN'S 800 CU. IN.—OPEN SHIPS—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Gladys O'Donnell	Waco	J-6-7	10:45.4	$750.00
2nd	Margery Doig	Pitcairn	J-6	11:05.4	450.00
3rd	Mildred Morgan	Travel Air	J-5	13:59.2	300.00

EVENT NO. 35—WOMEN'S 800 CU. IN.—CABIN SHIPS—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Engine	Time	Cash Prize
1st	Phoebe Omlie	Monocoupe	Warner	10:43	$750.00
2nd	Gladys O'Donnell	Monocoupe	Warner	10:43.6	450.00
3rd	May Haizlip	Cessna	J-6	11:08.1	300.00

EVENT NO. 36—WOMEN'S DEAD STICK LANDING CONTEST

August 28th

Place	Pilot	Plane	Engine	Cash Prize
1st	Charity Langdon	Whit		$100.00
2nd	Betty Lund	Aeronca	Aeronca	50.00
3rd	Nancy Hopkins	Kitty Hawk	Kinner	25.00

August 29th

Place	Pilot	Plane	Engine	Cash Prize
1st	Mildred Morgan	Travel Air	J-5	$100.00
2nd	Nancy Hopkins	Kitty Hawk	Kinner	50.00
3rd	Betty Lund	Aeronca	Aeronca	25.00

August 30th

1st	Ruth Nichols	Birdwing	J-6	$100.00
2nd	Nancy Hopkins	Kitty Hawk	Kinner	50.00
3rd	Betty Lund	Aeronca	Aeronca	25.00

August 31st

1st	Betty Lund	Aeronca	Aeronca	$100.00
2nd	Ruth Nichols	Brunner Winkle	J-6	50.00
3rd	Nancy Hopkins	Kitty Hawk	Kinner	25.00

September 1st

1st	Betty Lund	Aeronca	Aeronca	$100.00
2nd	Mildred Morgan	Travel Air	W-J-5	50.00
3rd	Nancy Hopkins	Kitty Hawk	Kinner	25.00

EVENT NO. 37—BALLOON BURSTING CONTEST FOR MEN

August 24th

Place	Pilot	Plane	Engine	Time Sec.	Cash Prize
1st	J. H. Livingston	Waco	Warner	28.1	$50.00
2nd	Freddy Lund	Waco	J-5	58.5	

August 25th

1st	J. H. Livingston	Waco	Warner	28.1	$50.00

August 26th

1st	Harold Neumann	Travel Air	OX5	31.1	$50.00
2nd	Doug Davis	Travel Air	OX5	33.3	
3rd	Art Davis	Waco	J-6	48.5	

August 27th

1st	Art Chester	Travel Air	Curtiss	24.4	$50.00

August 28th

1st	Doug Davis	Waco	OX5	56	$50.00

August 29th

1st	Doug Davis	Travel Air	J-6	40	$50.00

August 30th

Place	*Pilot*	*Plane*	*Engine*		*Cash Prize*
1st	Art Davis	Waco	J-6	25.5	$50.00
2nd	Doug Davis	Travel Air	J-6	29.1	

August 31st

1st	J. H. Livingston	Waco	Warner	25	$50.00

EVENT NO. 38—CIVILIAN ACROBATIC EXHIBITION

August 23rd

Pilot	*Plane*	*Engine*	*Cash Prize*
Fred Lund	Waco	J-5	$150.00
Doug Davis	Travel Air	J-6-7	150.00

August 24th

Fred Lund	Waco	J-5	$150.00
Doug Davis	Travel Air	J-6-7	150.00

August 25th

Fred Lund	Waco	J-5	$150.00
Doug Davis	Travel Air	J-6-7	150.00

August 26th

Art Davis	$150.00
Lowell Bayles	150.00

August 27th

Art Davis	$150.00
Lowell Bayles	150.00

August 28th

S. Quimby	$150.00
Vern Roberts	150.00

August 29th

S. Quimby	$150.00
Vern Roberts	150.00

August 30th

Art Killips	$150.00
Fred Lund	150.00

August 31st

Place	Pilot	Cash Prize
Doug Davis		$150.00
M. Hersberger		150.00

September 1st

Doug Davis		$150.00
J. H. Livingston		150.00

EVENT NO. 39—SPEED & EFFICIENCY CABIN RACE—10 LAPS 5 MILE COURSE

For Speed

Place	Pilot	Plane	Engine	Time	Speed	Cash Prize
1st	Vern Roberts	Monocoupe	Warner	21:01	142.74	$500.00
2nd	S. Quimby	Monocoupe	Warner	22:49.4	131.44	300.00
3rd	B. Stevenson	Monocoupe	Lambert	26:22.3	113.76	200.00

For Efficiency

				Cu. In.	Lbs.			
1st	Stewart Chadwick	Bellanca	J-5	788	1,142	489.25	$500.00
2nd	B. Stevenson	Monocoupe	Lambert	266	262	336.15	300.00
3rd	C. B. Burmood	Monocoupe	Lambert	266	262	323.95	200.00

EVENT NO. 40—SPORTSMAN PILOT'S RACE—350 CU. IN.—CANCELLED—NO ENTRIES

EVENT NO. 41—SPORTSMAN PILOT'S RACE—450 CU. IN.—OPEN SHIPS—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Motor	Time	Cash Prize
1st	A. Hardgrave	Inland Spt	Warner	12:34.1	Trophy
2nd	W. G. Houston	Inland Spt	Warner	12:34.9	
3rd	M. C. Meigs	Inland Spt	Warner	14:56.9	
4th	Wm. R. Boyd	Fleet	Warner	15:11.0	
5th	R. A. Carr	Gt. Lakes	Cirrus	16:33.4	

EVENT NO. 42—SPORTSMAN PILOT'S RACE—650 CU. IN.—OPEN SHIPS—5 LAPS 5 MILE COURSE

Place	Pilot	Plane	Motor	Time	Cash Prize
1st	C. B. Allen	Ken Royce	Cont. A 70	13:38	Trophy
2nd	Hoot Gibson	Swallow	Axelson	13:43.7	
3rd	C. B. Burmood	Monocoupe	Lambert	14:28.8	
	J. B. Hinchey	Monocoupe	Lambert	Disqualified	

EVENT NO. 43—SPORTSMAN PILOT'S RACE—800 CU. IN.—OPEN SHIPS—5 LAPS 5 MILE COURSE CANCELLED—LACK OF ENTRIES

EVENT NO. 44—SPORTSMAN PILOT'S RACE—1,000 CU. IN.—OPEN SHIPS—CANCELLED—NO ENTRIES

EVENT NO. 45—SPORTSMAN PILOT'S RACE—275 CU. IN.—OPEN SHIPS—CANCELLED—NO ENTRIES

CHICAGO-CLEVELAND MIXED DOUBLES RACE—CANCELLED—NO ENTRIES

EVENT NO. 46A—AMPHIBIAN RACE

Place	*Pilot*	*Plane*	*Motor*	*Time*	*Cash Prize*
1st	A. Caperton	Sikorsky	Wasp	22:01.8	Trophy
2nd	R. B. Gast	Sikorsky	Wasp	22:32	
3rd	A. O. Johnson	Savoia Mar	Kinner	4:02.34	
4th	Homer Berry	Sikorsky	W sp	Did not bring dummy in	

GLIDER CONTESTS

Event No. 46—Primary Duration

August 24th

Place	*Pilot*	*Time*	*Cash Prize*
1st	W. H. Harris	42 3/5 sec.	$20.00
2nd	P. C. Skeels	32 4/5 "	12.00
3rd	A. Ballard Bradley, Jr.	32 2/5 "	8.00

August 25th

1st	W. B. Brunken	50 1/5 sec.	$20.00
2nd	F. W. Westphal	39 "	12.00
3rd	E. Fugelstead	37 1/5 "	8.00

August 26th

1st	W. B. Brunken	1 M 2/5 sec.	$20.00
2nd	E. Fugelstead	54 "	12.00
3rd	F. W. Westphal	46 2/5 "	8.00

August 27th

1st	W. B. Brunken	1 M .4 1/5 sec.	$20.00
2nd	E. Fugelstead	1 " .3 "	12.00
3rd	F. W. Westphal	1 " .2 4/5 "	8.00

August 28th

1st	F. W. Westphal	1 M 21 2/5 sec.	$20.00
2nd	W. B. Brunken	1 " 13 "	12.00
3rd	E. Fugelstead	1 " 1 3/5 "	8.00

August 29th

1st	W. B. Brunken	1 M 58 1/5 sec.	$20.00
2nd	E. Fugelstead	1 " 12 "	12.00
3rd	F. W. Westphal	1 " 7 2/5 "	8.00

August 31st

Place	*Pilot*	*Plane*	*Engine*	*Cash Prize*
1st	W. R. Brunken		1 M 24 1/5 sec.	$20.00
2nd	F. W. Westphal		1 " 14 3/5 "	12.00
3rd	E. F. Engstrom		1 " 14 4/5 "	8.00

September 1st

1st	F. W. Westphal		1 M 28 2/5 sec.	$20.00
2nd	W. R. Brunken		1 " 27 "	12.00
3rd	E. Fugelstead		1 "	8.00

Event No. 47—Secondary Duration

August 26th

Place	*Pilot*	*Time*	*Cash Prize*
1st	Ivan Stoughton	1 M 56 sec.	$20.00
2nd	J. K. O'Meara	1 " 40 4/5 sec.	12.00
3rd	E. D. Palmer	1 " 13 "	8.00

August 28th

1st	J. K. O'Meara	2 M 53 sec.	$20.00
2nd	E. D. Palmer	1 " 52 "	12.00
3rd	Ivan Stoughton	1 " 37 "	8.00

August 29th

1st	J. K. O'Meara	2 M 24 3/5 sec.	$20.00
2nd	E. D. Palmer	1 " 18 4/5 "	12.00
3rd	Ivan Stoughton	1 " 16 3/5 "	8.00

Event No. 48—Soaring Duration

August 25th

Place	*Pilot*	*Time*	*Cash Prize*
1st	J. K. O'Meara	1 M 38 sec.	$20.00
2nd	W. H. Harris	1 " 14 "	12.00
3rd	E. D. Palmer	58 "	8.00

August 26th

1st	P. C. Skeels	2 M 1 3/5 sec.	$20.00
2nd	Ivan Stoughton	1 " 54 3/5 "	12.00
3rd	W. H. Harris	1 " 41 2/5 "	8.00

August 27th

Place	*Pilot*	*Plane*	*Engine*	*Cash Prize*
1st	P. C. Skeels		2 M 16 sec.	$20.00
2nd	W. H. Harris		1 " 48 1/5 "	12.00
3rd	J. K. O'Meara		1 " 42 1/5 "	8.00

August 28th

1st	J. K. O'Meara		2 M 53 sec.	$20.00
2nd	W. H. Harris		2 " 25 "	12.00
3rd	P. C. Skeels		2 " 22 "	8.00

Event No. 49—Secondary Spot Landing

August 24th

Place	*Pilot*	*Cash Prize*
1st	J. K. O'Meara	$20.00
2nd	Ivan Stoughton	12.00
3rd	E. D. Palmer	8.00

August 26th

1st	J. K. O'Meara	13 ft. 2 inches	$20.00
2nd	Ivan Stoughton	37 " 10 "	12.00
3rd	E. D. Palmer	80 " 8 "	8.00

August 28th

1st	Ivan Stoughton	41 ft. 8 inches	$20.00
2nd	W. H. Harris	67 " 7 "	12.00
3rd	P. C. Skeels	184 "	8.00

August 29th

1st	J. K. O'Meara	21 ft. 6 1/2 inches	$20.00
2nd	Ivan Stoughton	26 " 8 "	12.00
3rd	P. C. Skeels	53 " 5 1/2 "	8.00

September 1st

1st	P. C. Skeels	3 ft. 1 1/4 inches	$20.00
2nd	W. H. Harris	28 " 5 1/4 "	12.00
3rd	Ivan Stoughton	79 " 7 "	8.00

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, 1930

WORLD RECORDS	AMERICAN RECORDS
CONFIRMED BY FEDERATION AERONAUTIQUE INTERNATIONALE	CONFIRMED BY CONTEST COMMITTEE NATIONAL AERONAUTIC ASSOCIATION OF U. S. A.

AIRPLANES—CLASS C

RETURNING TO POINT OF DEPARTURE WITHOUT REFUELING

Duration (Closed Circuit) (Italy)—U. Maddalena and F. Cecconi, Savoia-Marchetti S-64, Fiat A-22 T, at Montecelio, Rome, May 30–June 2, 1930. Time, 67H, 13M.	Duration (Closed Circuit)—William Brock and Edward Schlee, Bellanca, Wright Whirlwind 220 HP, at San Diego, Calif., September 29, 30, October 1, 1928. Time, 59H, 19M, 15S.
Distance (Closed Circuit) (Italy)—U. Maddalena and F. Cecconi, Savoia-Marchetti S-64, Fiat A-22 T, at Montecelio, Rome, May 30–June 2, 1930. Distance, 8,188.80 Kilo. (5,088.27 Miles).	Distance (Closed Circuit)—Lts. Kelly and Macready, U. S. A., T-2, Liberty 375 HP, at Wright Field, Dayton, O., April 16, 17, 1923. Distance, 4,050 Kilo. (2,516.55 Miles).
Distance (Airline) (France)—Coste and Bellonte, Breguet 19, Hispano-Suiza 600 HP, Le Bourget to Coulart, China, September 27, 28, 29, 1929. Distance, 7,905.140 Kilo. (4,912.799 Miles).	Distance (Airline)—Clarence D. Chamberlin, Bellanca Wright, J-5 200 HP, Roosevelt Field, L. I., N. Y., to Isleben, Germany, June 4, 5, 6, 1927. Distance, 6,294 Kilo. (3,911 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).	World and American Record.
Maximum Speed (France)—Warrant Officer Bonnett, Ferbois monoplane, Hispano-Suiza 550 HP, at Istres, December 11, 1924. Speed, 448.171 KPH (278.480 MPH).	Maximum Speed—Lt. A. J. Williams, U. S. N., Curtiss Racer R-2-C-1, Curtiss D-12a 500 HP, at Mitchel Field, L. I., N. Y., November 4, 1923. Speed, 429.025 KPH (266.59 MPH).

SPEEDS FOR SPECIFIED DISTANCES WITHOUT PAY LOAD

Speed for 100 Kilometers (United States)—Lt. Cyrus Bettis, U. S. A., Curtiss R3C-1, Curtiss V-1400 600 HP, at Mitchel Field, L. I., N. Y., Oct. 12, 1925. Speed, 401.279 KPH (249.342 MPH).	World and American Record.
Speed for 500 Kilometers (France)—Sadi-Le-Cointe, Nieuport-Delage, Hispano-Suiza 500 HP, at Istres, June 23, 1924. Speed, 306.696 KPH (190.567 MPH).	Speed for 500 Kilometers—Lt. Alex Pearson, U. S. A., Verville Sperry R-3, Wright 350 HP, at Wright Field, Dayton, O., March 29, 1923. Speed, 270.06 KPH (167.80 MPH).
Speed for 1,000 Kilometers (Czechoslovakia)—Adjutant Chef Vojtech Svozil, Aero A-42, Asso 800 HP, on the Praha Nave Benatky Ripa-Praha Course, September 25, 1930. Speed, 274.094 KPH (170.313 MPH).	Speed for 1,000 Kilometers—Lt. Harold R. Harris, U. S. A., and Ralph Lockwood, DH-4L, Liberty 400 HP, at Wright Field, Dayton, O., March 29, 1923. Speed, 205.06 KPH (127.42 MPH).
Speed for 2,000 Kilometers (France)—Fernand Lasne, Nieuport-Delage 42C-1, Hispano-Suiza 500 HP, at Etampes, September 12, 1924. Speed, 218.759 KPH (135.930 MPH).	Speed for 2,000 Kilometers—Lt. Harold R. Harris, U. S. A., DH-4L, Liberty 375 HP, at Wright Field, Dayton, O., April 17, 1923. Speed, 183.83 KPH (114.22 MPH).
Speed for 5,000 Kilometers (France)—Commandants Girler and Weiss, Breguet, Hispano-Suiza, 600 HP, at Etampes, May 24, 25, 1929. Speed, 188.097 KPH (116.822 MPH).	Speed for 5,000 Kilometers—(No Record).

CLASS C—WITH PAY LOAD OF 500 KILOGRAMS

(1,102.31 Lbs.)

WORLD RECORDS	AMERICAN RECORDS
Duration (France)—Coste and Codos, Breguet 19, Hispano-Suiza 600 HP, at Istres, January 17, 18, 1930. Time, 23H, 22M, 49S.	Duration—Lt. H. R. Harris, U. S. A., Douglas DT-2, Liberty 400 HP, at Wright Field, Dayton, O., June 28, 1924. Time, 9H, 11M, 53.4S.
Distance (France)—Coste and Codos, Breguet 19, Hispano-Suiza 600 HP, at Istres, January 17, 18, 1930. Distance, 4,361.980 Kilo. (2,710.40 Miles).	Distance—Lt. H. R. Harris, U. S. A., Douglas DT-2, Liberty 400 HP, at Wright Field, Dayton, O., June 28, 1924. Distance, 950 Kilo. (590.3 Miles).
Altitude (France)—J. Burtin, Breguet 19, Farman 500 HP, at Toussus-le-Noble, August 23, 1929. Height, 9,374 Meters (30,654 Feet).	Altitude—Lt. H. R. Harris, U. S. A., 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-308 H, Pratt & Whitney 450 HP supercharged, at Jacksonville, Fla., February 18, 1930. Speed, 298.510 KPH (185.49 MPH).	World and American Record.
Speed for 500 Kilometers (Czechoslovakia)—Captain Joseph Kalla, Letov S-516, Asso 800 HP, on the Praha Nave Benatky Ripa-Praha Course, October 12, 1930. Speed, 276.375 KPH (171.731 MPH).	Speed for 500 Kilometers—Leland F. Shoenhair, Lockheed Vega Executive monoplane NC-308H, Pratt & Whitney 450 HP supercharged, at Jacksonville, Fla., February 18, 1930. Speed, 275.580 KPH (171.24 MPH).
Speed for 1,000 Kilometers (Czechoslovakia)—Captain Joseph Kalla, Letov S-516, Asso 800 HP, on the Praha Nave Benatky Ripa-Praha Course, October 12, 1930. Speed, 275.269 KPH (171.043 MPH).	Speed for 1,000 Kilometers—(No Record).
Speed for 2,000 Kilometers (France)—Coste and Codos, Breguet 19, Hispano-Suiza 600 HP, at Istres, January 17, 18, 1930. Speed, 214.553 KPH (133.32 MPH).	Speed for 2,000 Kilometers—(No Record).
Speed for 5,000 Kilometers—(No Record).	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	AMERICAN RECORDS
Duration (France)—Coste and Codos, Breguet 19, Hispano-Suiza 600 HP, at Istres, February 15, 16, 1930. Time, 18H, 1M.	Duration—Lt. J. S. Macready, U. S. A., Curtiss (Martin) Bomber NBS 1, 2 Liberty 400 HP, at Wright Field, Dayton, O., Oct. 2, 1924. Time 2H, 13M, 49.6S.
Distance (Closed Circuit) (France)—Coste and Codos, Breguet 19, Hispano-Suiza 600 HP, at Istres, February 15, 16, 1930. Distance, 3,309.900 Kilo. (2,056.672 Miles).	Distance (Closed Circuit)—(No Record).
Altitude (France)—J. Burtin, Breguet 19, Farman 600 HP, at Toussus-le-Noble, July 26, 1929. Height, 8,089 Meters (26,538 Feet).	Altitude—Waldo Waterman, Bach, Wright J-6, at Los Angeles, Calif., 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-308 H, Pratt & Whitney 450 HP supercharged, at Jacksonville, Fla., February 20, 1930.
Speed, 283.250 KPH (176 MPH).

World and American Record.

Speed for 500 Kilometers (United States)—Leland F. Shoenhair, Lockheed Vega Executive Monoplane NC-308 H, Pratt & Whitney 450 HP supercharged, at Jacksonville, Fla., February 20, 1930.
Speed, 270.800 KPH (168.27 MPH).

World and American Record.

Speed for 1,000 Kilometers (Czechoslovakia)—Adjutant Chef Vojtech Svozil, Aero A-42, Asso 800 HP, on the Praha Nave Benatky Ripa-Praha Course, September 25, 1930.
Speed, 252.380 KPH (156.821 MPH).

Speed for 1,000 Kilometers—Leland F. Shoenhair, Lockheed Vega Executive monoplane NC-308H, Pratt & Whitney 450 HP supercharged, at Jacksonville, Fla., February 20, 1930.
Speed, 245.750 KPH (152.70 MPH).

Speed for 2,000 Kilometers (Germany)—Herman Steindorff, Rohrbach-Roland, 3 BMW 230 HP ea., at Staaken, July 31, 1927.
Speed, 205.407 KPH (127.632 MPH).

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

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

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

CLASS C—WITH PAY LOAD OF 2,000 KILOGRAMS

(4,409.24 Lbs.)

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS

Duration (Germany)—J. Risztics, Junkers G-24, Junkers 280 HP, at Dessau, June 20, 1927.
Time, 13H, 1M, 12.8S.

Distance (Germany)—Herman Steindorff, Rohrbach-Roland, 3 BMW 230 HP, at Staaken, July 31, 1927.
Distance, 1,750.469 Kilo. (1,087.68 Miles).

Altitude (Italy)—Demonico Antonini, Caproni CA-73, 2 Isotta Fraschini 500 HP ea., at Cascina Malpensa, May 26, 1927.
Height, 6,262 Meters (20,544 Feet).

AMERICAN RECORDS

Duration—Lt. H. R. Harris, U. S. A., and Mechanician Doug. Culver, Barling Bomber, 6 Liberty 400 HP ea., at Wright Field, Dayton, O., October 3, 1924.
Time, 1H, 47M, 10.5S.

Distance—(No Record).

Altitude—Lt. H. R. Harris, U. S. A., Barling Bomber, 6 Liberty 400 HP ea., at Wright Field, Dayton, O., October 25, 1923.
Height, 2,049 Meters (6,722 Feet).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (United States)—Leroy Manning and Carl Wenzel, Ford Transport, 3 Pratt and Whitney Wasps 420 HP ea., at Dearborn, Mich., September 29, 1930.
Speed, 264.620 KPH ,164.432 MPH).

World and American Record.

Speed for 500 Kilometers (Germany)—Herman Steindorff, Rohrbach-Roland, 3 BMW 230 HP ea., at Staaken, July 28, 1927.
Speed, 215.378 KPH (133.828 MPH).

Speed for 500 Kilometers—(No Record).

Speed for 1,000 Kilometers (Germany)—Herman Steindorff, Rohrbach-Roland, 3 BMW 230 HP ea., at Staaken, July 28, 1927.
Speed, 214.855 KPH (133.504 MPH).

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

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

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

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

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

CLASS C—WITH PAY LOAD OF 5,000 KILOGRAMS

(11,023 Lbs.)

World Records	American Records
Duration (Germany)—Wilhelm Zimmerman, Junkers J-38, 2 Junkers L-55, 600 HP ea., 2 Junkers L-8 400 HP ea., at Dessau-Leipzig, April 10, 1930. Time, 3H. 2M.	Duration—(No Record).
Distance (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. Distance, 501.590 Kilo. (311.672 Miles).	Distance—(No Record).
Altitude (France)—L. Bossoutrot, Super Farman-Goliath, 4 Farman 500 HP ea., at Le Bourget, November 16, 1925. Height, 3,586 Meters (11,765 Feet).	Altitude—(No Record).
Speed for 100 Kilometers (Germany)—Wilhelm Zimmerman, Junkers J-38, 2 Junkers L-55 600 HP ea., 2 Junkers L-8 400 HP ea., at Dessau-Leipzig, April 10, 1930. Speed, 184.464 KPH (114.62 MPH).	Speed for 100 Kilometers—(No Record).
Speed for 500 Kilometers (Germany)—Wilhelm Zimmerman, Junkers J-38, 2 Junkers L-55 600 HP ea., 2 Junkers L-8 400 HP ea., at Dessau-Leipzig, April 30, 1930. Speed, 172.950 KPH (107.466 MPH).	Speed for 500 Kilometers—(No Record).
Speed for 1,000 Kilometers—(No Record).	Speed for 1,000 Kilometers—(No Record).
Speed for 2,000 Kilometers—(No Record).	Speed for 2,000 Kilometers—(No Record).
Speed for 5,000 Kilometers—(No Record).	Speed for 5,000 Kilometers—(No Record).

AIRPLANES—CLASS C—WITH PAY LOAD OF 7,500 KILOGRAMS

World Records	American Records
Duration (Italy)—Cav. Domenico Antonini, Caproni Ca 90 biplane, 6 Isotta-Fraschini Asso 1,000 HP ea., at Cascina Malpensa, February 22, 1930. Time, 1H. 31M.	Duration—(No Record).
Altitude (Italy)—Cav. Domenico Antonini, Caproni Ca 90 biplane, 6 Isotta-Fraschini Asso 1,000 HP ea., at Cascina Malpensa, February 22, 1930. Height, 3,231 Meters (10,597 Feet).	Altitude—(No Record).
Distance—(No Record).	Distance—(No Record).

SPEEDS FOR SPECIFIED DISTANCES

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

CLASS C—WITH PAY LOAD OF 10,000 KILOGRAMS

World Records	American Records
Duration (Italy)—Cav. Domenico Antonini, Caproni Ca 90 biplane, 6 Isotta-Fraschini Asso 1,000 HP ea., at Cascina Malpensa, February 22, 1930. Time, 1H. 31M.	Duration—(No Record).
Altitude (Italy)—Cav. Domenico Antonini, Caproni Ca 90 biplane, 6 Isotta-Fraschini Asso 1,000 HP ea., at Cascina Malpensa, February 22, 1930. Height, 3,231 Meters (10,597 Feet).	Altitude—(No Record).
Distance—(No Record).	Distance—(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 5,000 Kilometers—(No Record).

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	AMERICAN RECORDS
(Italy)—Cav. Domenico Antonini, Caproni Ca 90 biplane, 6 Isotta-Fraschini Asso 1,000 HP ea., at Cascina Malpensa, February 22, 1930. Weight, 10,000 Kgs. (22,046 Lbs.).	Lt. H. R. Harris, U. S. A., Barling Bomber, 6 Liberty 400 HP ea., at Wright Field, Dayton, O., October 25, 1923. Weight, 2,000 Kgs. (4,409 Lbs.).

AIRPLANES—CLASS C—REFUELING IN FLIGHT

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS	AMERICAN RECORDS
Duration (United States)—John and Kenneth Hunter, Stinson Detroiter, Wright-Whirlwind 300 HP, at Northbrook, Ill., June 11, 1930–July 4, 1930. Time, 553H, 41M, 30S.	World and American Record.
Distance (United States)—Lts. Smith and Richter, U. S. A., DH-4-B, Liberty 400 HP, at Rockwell Field, San Diego., Calif., August 27, 28, 1923. Distance, 5,300 Kilo. (3,293.26 Miles).	World and American Record.

AIRPLANES—CLASS C—WOMEN'S CATEGORY

WORLD RECORDS	AMERICAN RECORDS
Duration (France)—Madame Maryse Bastie, Klemm, Salmson 40 HP, at Le Bourget, September 2, 3, 4, 1930. Time, 37H, 55M.	Duration—(No Record).
Distance (Airline) (France)—Mademoiselle Lena Bernstein, Caudron, Salmson 40 HP, Istres to Sidi Baramy, Egypt, August 19, 20, 1929. Distance, 2,268 Kilo. (1,409.27 Miles).	Distance (Airline)—(No Record).
Altitude (United States)—Miss Ruth B. Alexander, Barling N. B. 3, Warner Scarab, Jr. 90 HP, at San Diego, Calif., July 11, 1930. Height, 6,583 Meters (21,598 Feet).	World and American Record.

LIGHT AIRPLANES—CLASS C—FIRST CATEGORY

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

WORLD RECORDS	AMERICAN RECORDS
Duration (Closed Circuit) (Italy)—Renato Donati and M. Capannini, Fiat A. S. 1, Fiat A-50, at Montecelio, Rome, January 19, 20, 1930. Time, 29H, 4M.	Duration (Closed Circuit)—(No Record).
Distance (Closed Circuit) (Italy)—Renato Donati and M. Capannini, Fiat A. S. 1, Fiat A-50, at Montecelio, Rome, January 19, 20, 1930. Distance, 2,746.200 Kilo. (1,706.405 Miles).	Distance (Closed Circuit)—(No Record).

WORLD RECORDS	AMERICAN RECORDS
Distance (Airline) (Switzerland)—Capt. Hans Wirth and Melle Erika Nauman, Klemm-Daimler, Mercedes-Daimler 20 HP, Boblingen Airport to Mieschkance, Poland, October 16, 1928. Distance, 1,305.5 Kilo. (811.10 Miles).	Distance (Airline)—(No Record).
Altitude (Germany)—Woldemar Voigt and K. H. Gaule, Akademische Fliegergruppe Darmstadt D-18, Armstrong Siddeley Genet Major 100 HP, at Darmstadt, April 21, 1930. Height, 7,521 Meters (24,672 Feet).	Altitude—Willfred G. Moore, Inland Sport, Warner 110 HP, at Kansas City, Mo., September 30, 1929. Height, 5,652 Meters (18,543 Feet).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (Germany)—Rudolf Neininger and Kurt Stark, Akademische Fliegergruppe Darmstadt D-18, Armstrong Siddeley Genet Major 100 HP, at Darmstadt, April 23, 1930. Speed, 214.848 KPH (133.49 MPH).	Speed for 100 Kilometers—(No Record).

CLASS C—SECOND CATEGORY

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

WORLD RECORDS	AMERICAN RECORDS
Distance (Closed Circuit)—(No Record).	Distance (Closed Circuit)—(No Record).
Altitude (Germany)—Madame Margaret Fusbahn and M. Fusbahn, Klemm L-25, Salmson 40 HP, at Boblinger-Wartemberg, April 11, 1930. Height, 4,614 Meters (13,137 Feet).	Altitude—(No Record).

SPEEDS FOR SPECIFIED DISTANCE

Speed for 100 Kilometers—(No Record).	Speed for 100 Kilometers—(No Record).

CLASS C—THIRD CATEGORY

Single seaters weight empty 200–350 Kgs. Inc. (440–771 Lbs.)

WORLD RECORDS	AMERICAN RECORDS
Duration (France)—Madame Maryse Bastie, Klemm, Salmson 40 HP, at Le Bourget, September 2-4, 1930. Time, 37H, 55M.	Duration—(No Record).
Distance (Closed Circuit) (France)—Pilot Laulhe, Albert, Salmson 40 HP, at Le Bourget, September 4, 5, 1930. Distance, 2,714.400 Kilo. (1,686.646 Miles).	Distance (Closed Circuit)—(No Record).
Distance (Airline) (United States)—D. S. Zimmerly, Barling NB-3, LeBlond 60 HP, Brownsville, Texas, to Winnipeg City, Canada, July 17, 1929. Distance, 2,655 Kilo. (1,650 Miles).	World and American Record.
Altitude (Germany)—Woldemar Voigt, Akademische Fliegergruppe Darmstadt D-18, Armstrong Siddeley Genet Major 100 HP, at Darmstadt, May 23, 1930. Height, 8,142 Meters (26,712 Feet).	Altitude—D. S. Zimmerly, Barling NB-3, Lambert R-266 90 HP, at 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 Stag Lane, August 24, 1927. Speed, 300.1 KPH (186.47 MPH).	Speed for 100 Kilometers—(No Record).

CLASS C—FOURTH CATEGORY

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

WORLD RECORDS	AMERICAN RECORDS
Duration (France)—G. Fauvel, Maubaussin Peyret A. B. C. Scorpion 34 HP, at Le Bourget, September 12, 1930. Time, 12H, 3M.	Duration—(No Record).
Distance (Closed Circuit) (Hungary)—Ing. Arpad Lampich, "Roma" Comte de Thoroczkay 18 HP, at Matyasfold-Monor, June 14, 1930. Distance 1,033.368 Kilo. (642.104 Miles).	Distance (Closed Circuit)—(No Record).
Distance (Airline) (France)—G. Fauvel, Maubaussin Peyret, A. B. C. Scorpion 34 HP, at Le Bourget, September 12, 1930. Distance 1,258.800 Kilo. (782.156 Miles).	Distance (Airline)—(No Record).
Altitude (France)—G. Fauvel, Maubaussin Peyret A. B. C. Scorpion, at Le Bourget, September 5, 1929. Height, 5,193 Meters (17,037 Feet).	Altitude—(No Record).
Speed for 100 Kilometers (United States) Clarence O. Prest, Prest Baby Pursuit, Szekely 40 HP, San Bernandino Co., Calif., May 28, 1930. Speed, 162.21 KPH (100.79 MPH).	World and American Record.

SEAPLANES—CLASS C2

RETURNING TO POINT OF DEPARTURE WITHOUT REFUELING

WORLD RECORDS	AMERICAN RECORDS
Duration (United States)—Lts. Arthur Gavin and Zeus Soucek, Navy PN-12, 2 Wright R-1750 525 HP ea., at Philadelphia, Pa., May 3, 4, 5, 1928. Time, 36H, 1M.	World and American Record.
Distance (France)—Mermoz, Latécoère 28, Hispano-Suiza 600 HP, at Marignane, April 11, 12, 1930. Distance, 4,308.340 Kilo. (2,677 Miles).	Distance—Lts. B. J. Connell and H. C. Rodd, PN-10, 2 Packard 600 HP ea., at San Diego, Calif., August 15, 16, 1927. Distance, 2,525 Kilo. (1,569 Miles).
Distance (Airline) (France)—Mermoz, Darby, and Gimie, Latecoere 28, Hispano-Suiza 600 HP, St. Louis, Senegal, to Natal, Brazil, May 12, 13, 1930. Distance, 3,173.200 Kilo. (1,971.731 Miles).	Distance (Airline)—Comdr. John Rodgers, U. S. N., and Lt. B. J. Connell, PN-9, 2 Packard 1-A-1500 500 HP ea., San Pablo Bay, Calif., to near Hawaii, Aug. 31, Sept. 1, 1925. Distance 2,963 Kilo. (1,841 Miles).
Altitude (United States)—Lt. Apollo Soucek, U. S. N., Wright "Apache", Pratt & Whitney 425 HP supercharged, at Washington, D. C., June 4, 1929. Height, 11,753 Meters (38,560 Feet).	World and American Record.
Maximum Speed (England)—Squadron Leader A. H. Orlebar, Supermarine Rolls Royce S-6, Rolls Royce R-6, at Spithead, September 12, 1929. Speed, 575.7 KPH (357.723 MPH).	Maximum Speed—Lt. Jas. H. Doolittle, U. S. A., Curtiss R3C-2, Curtiss V-1400 600 HP, at Baltimore, Md., October 27, 1925. Speed, 395.439 KPH (245.713 MPH).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (Great Britain)—Flying Officer Atcherley, Rolls-Royce Supermarine, Rolls-Royce R, at Spithead, September 7, 1929. Speed, 533.800 KPH (331.687 MPH).	Speed for 100 Kilometers—Lt. G. T. Cuddihy, U. S. N., Curtiss R3C-2, Curtiss V-1550 700 HP, at Norfolk, Va., November 13, 1926. Speed, 388.944 KPH (241.679 MPH).
Speed for 500 Kilometers (United States)—Lt. R. A. Ofstie, Curtiss Navy C-3, Curtiss D-12 450 HP, at Baltimore, Md., October 25, 1924. Speed, 259.328 KPH (161.14 MPH).	World and American Record.
Speed for 1,000 Kilometers (Germany)—Rolf Starke, Heinkel HE-9, BMW-6 600 HP, at Warnemunde, June 10, 1920. Speed, 222.277 KPH (138.116 MPH).	Speed for 1,000 Kilometers—Lt. R. Irvine, Vought Corsair, Pratt & Whitney Wasp 425 HP, at Hampton Roads, Va., May 21, 1927. Speed. 210.716 KPH (130.932 MPH).
Speed for 2,000 Kilometers (France)—Lieut. de Vaisseau Paris and M. Hebert, Latécoère 28, Hispano-Suiza 600 HP, at St. Laurent de la Salanque, June 23, 1930. Speed, 185.931 KPH (117.396 MPH).	Speed for 2,000 Kilometers—Lts. B. J. Connell and H. C. Rodd, U. S. N., PN-10, 2 Packard 600 HP ea., at San Diego, Calif., Aug. 15, 16, 1927. Speed, 126.567 KPH (78.644 MPH).
Speed for 5,000 Kilometers—(No Record).	Speed for 5,000 Kilometers—(No Record).

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

RETURNING TO POINT OF DEPARTURE

World Records

Duration (France)—Lieut. de Vaisseau Paris and M. Hebert, Latécoère 28, Hispano-Suiza 600 HP, at St. Laurent de la Salanque, June 23, 1930.
Time, 31H, 1M.

Distance (France)—Lieut. de Vaisseau Paris and M. Hebert, Latécoère 28, Hispano-Suiza 600 HP, at St. Laurent de la Salanque, July 17, 1930.
Distance, 4,202.496 Kilo. (2,611.305 Miles).

Altitude (Germany)—Fritz Harder, Junkers W-34, Bristol Jupiter VII 420 HP, at Dessau, November 6, 1928.
Height, 7,458 Meters (27,749 Feet).

American Records

Duration—Lts. B. J. Connell and H. C. Rodd, PN-10, 2 Packard 600 HP ea., at San Diego, Calif., August 15, 16, 1927.
Time, 20H, 45M, 40S.

Distance—Lts. B. J. Connell and H. C. Rodd, PN-10, 2 Packard 600 HP ea., at San Diego, Calif., August 15, 16, 1927.
Distance, 2,525 Kilo. (1,569 Miles).

Altitude—Boris Sergievsky, Sikorsky S-38, 2 Type B Pratt & Whitney Hornets 575 HP ea., at North Beach, Queens, New York, June 15, 1930.
Height, 8,037 Meters (26,368 Feet).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (Germany)—Rolf Starke, Heinkel HD-38, BMW-6 600 HP, at Warnemunde, May 7, 1929.
Speed, 259.927 KPH (161.510 MPH).

Speed for 500 Kilometers (Germany)—Rolf Starke, Heinkel HE-9a, BMW-6 600 HP, at Warnemunde, May 21, 1929.
Speed, 235.941 KPH (146.606 MPH).

Speed for 1,000 Kilometers (Germany)—Rolf Starke, Heinkel HE-9, BMW-6 600 HP, at Warnemunde, June 10, 1929.
Speed, 222.277 KPH (138.116 MPH).

Speed for 2,000 Kilometers (France)—Lieut. de Vaisseau Paris and M. Hebert, Latécoère 28, Hispano-Suiza 600 HP, at St. Laurent de la Salanque, June 23, 1930.
Speed, 185.931 KPH (117.396 MPH).

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

Speed for 100 Kilometers—Lt. S. W. Callaway, U. S. N., Vought Corsair, Pratt & Whitney Wasp, 425 HP, at Hampton Roads, Va., April 23, 1927.
Speed, 236.998 KPH (147.263 MPH).

Speed for 500 Kilometers—Lt. J. D. Barner, U. S. N., Vought Corsair, Pratt & Whitney Wasp 425 HP, at Hampton Roads, Va., April 30, 1927.
Speed, 218.90 KPH (136.023 MPH).

Speed for 1,000 Kilometers—Lts. B. J. Connell and S. R. Pope, PN-10, 2 Packard 600 HP ea., at San Diego, Calif., July 8, 1927.
Speed, 142.74 KPH (88.69 MPH).

Speed for 2,000 Kilometers—Lts. B. J. Connell and H. C. Rodd, U. S. N., PN-10, 2 Packard 600 HP ea., at San Diego, Calif., August 15, 16, 1927.
Speed, 126.567 KPH (78.664 MPH).

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

CLASS C2—WITH PAY LOAD OF 1,000 KILOGRAMS (2,204.62 Lbs.)

World Records

Duration (France)—Lieut. 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)—Lieut. de Vaisseau Paris and M. Hebert, Latécoère 28, Hispano-Suiza 600 HP, at St. Laurent de la Salanque, June 22, 1930.
Distance 2,854.244 Kilo. (1,773.603 Miles).

Altitude (United States)—Boris Sergievsky, Sikorsky S-38, 2 Pratt & Whitney Hornets 575 HP ea., at Bridgeport, Conn., July 21, 1930.
Height, 8,208 Meters (26,929 Feet).

American Records

Duration—Lts. Zeus Soucek and Lisle J. Maxson, Navy PN-12, 2 Wright R-1750 525 HP ea., at Philadelphia, Pa., May 25, 26, 1928.
Time, 17H, 55M, 13.6S.

Duration—Lt. A. W. Gorton and Chief Boatswain E. E. Reber, U. S. N., PN-12, 2 Pratt & Whitney 525 HP ea., at Philadelphia, Pa., July 11, 12, 1928.
Distance, 2,150 Kilo. (1,336 Miles).

World and American Record.

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (United States)—Boris Sergievsky, Sikorsky S-38, 2 Type B Pratt & Whitney Hornets 575 HP ea., at North Beach, Queens, N. Y., March 13, 1930.
Speed, 266.71 KPH (165.73 MPH).
World and American Record.

Speed for 500 Kilometers (Germany)—Rolf Starke, Heinkel HE-9a, BMW-6 600 HP, at Warnemunde, May 7, 1929.
Speed, 235.941 KPH (146.606 MPH).

Speed for 500 Kilometers—Lts. B. J. Connell and S. R. Pope, PN-10, 2 Packard 600 HP ea., at San Diego, Calif., July 8, 1927.
Speed, 145.68 KPH (90.52 MPH).

Speed for 1,000 Kilometers (France)—Lieut. de Vaisseau Paris and M. Hebert, Latécoère 28, Hispano-Suiza 600 HP, at St. Laurent de la Salanque, June 23, 1930.
Speed, 190.004 KPH (118.085 MPH).

Speed for 1,000 Kilometers—Lts. B. J. Connell and S. R. Pope, PN-10, 2 Packard 600 HP ea., at San Diego, Calif., July 8, 1927.
Speed, 142.74 KPH (88.69 MPH).

Speed for 2,000 Kilometers (France)—Lieut. de Vaisseau Paris and M. Hebert, Latécoère 28, Hispano-Suiza 600 HP, at St. Laurent de la Salanque, June 23, 1930.
Speed, 185.931 KPH (117.396 MPH).

Speed for 2,000 Kilometers—Lt. A. W. Gorton and Chief Boatswain E. E. Reber, U. S. N., PN-12, 2 Pratt & Whitney 525 HP ea., at Philadelphia, Pa., July 11, 12, 1928.
Speed, 130.427 KPH (81.043 MPH).

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

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

CLASS C2—WITH PAY LOAD OF 2,000 KILOGRAMS (4,400.24 Lbs.)

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS	AMERICAN RECORDS
Duration (United States)—Lt. A. W. Gorton and Chief Boatswain E. E. Reber, U. S. N., PN-12, 2 Pratt & Whitney 525 HP ea., at Philadelphia, Pa., July 11, 12, 1928. Time, 16H, 39M.	World and American Record.
Distance (United States)—Lt. A. Gorton and Chief Boatswain E. E. Reber, U. S. N., PN-12, 2 Pratt & Whitney 525 HP ea., at Philadelphia, Pa., July 11, 12, 1928. Distance, 2,150 Kilo. (1,336 Miles).	World and American Record.
Altitude (United States)—Boris Sergievsky, Sikorsky S-38, 2 Pratt & Whitney Wasps 425 HP ea., at Stratford, Conn., August 11, 1930. Height, 6,074 Meters (19,928 Feet).	World and American Record.

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (United States)—Boris Sergievsky, Sikorsky S-38, 2 Type B Pratt & Whitney Hornets 575 HP ea., at North Beach, Queens, N. Y., March 13, 1930. Speed, 231.38 KPH (143.77 MPH).	World and American Record.
Speed for 500 Kilometers (France)—Prevot Latécoère 28, Hispano-Suiza 650 HP, at St. Laurent de la Salanque, March 5, 1930. Speed, 202.092 KPH (125.573 MPH).	Speed for 500 Kilometers—Lts. B. J. Connell and S. R. Pope, PN-10, 2 Packard 600 HP ea., at San Diego, Calif., July 8, 1927. Speed, 145.68 KPH (90.52 MPH).
Speed for 1,000 Kilometers (Germany)—Richard Wagner, Dornier Superwal DR-142, 4 Gnome-Rhone-Jupiter 480 HP ea., at Frederickshaven-Lindau, February 2, 1928. Speed, 177.279 KPH (110.155 MPH).	Speed for 1,000 Kilometers—Lts. B. J. Connell and S. R. Pope, PN-10, 2 Packard 600 HP ea., at San Diego, Calif., July 8, 1927. Speed, 142.74 KPH (88.69 MPH).
Speed for 2,000 Kilometers (United States)—Lt. A. W. Gorton and Chief Boatswain E. E. Reber, U. S. N., PN-12, 2 Pratt & Whitney 525 HP ea., at Philadelphia, Pa., July 11, 12, 1928. Speed, 130.427 KPH (81.043 MPH).	World and American Record.
Speed for 5,000 Kilometers—(No Record).	Speed for 5,000 Kilometers—(No Record).

CLASS C2—WITH PAY LOAD OF 4,000 KILOGRAMS (8,818 Lbs.)

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS	AMERICAN RECORDS
Duration (Germany)—Richard Wagner, Dornier Superwal DR-142, 4 Gnome-Rhone-Jupiter 480 HP ea., at Fredericks-haven-Lindau, February 5, 1928. Time, 6H, 1M, 56S.	Duration—(No Record).
Distance (Germany)—Richard Wagner, Dornier Superwal DR-142, 4 Gnome-Rhone-Jupiter 480 HP ea., at Fredericks-haven-Lindau, February 5, 1928. Distance, 1,000.160 Kilo. (621.468 Miles).	Distance—(No Record).
Altitude (Germany)—Richard Wagner, Dornier Superwal DR-142, 4 Gnome-Rhone-Jupiter 480 HP ea., at Fredericks-haven-Lindau, January 23, 1928. Height, 2,845 Meters (9,334 Feet).	Altitude—(No Record).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers (Germany)—Richard Wagner, Dornier Superwal DR-142, 4 Gnome-Rhone-Jupiter 480 HP ea., at Fredericks-haven-Lindau, January 20, 1928. Speed, 209.546 KPH (130.105 MPH).	Speed for 100 Kilometers—(No Record).
Speed for 500 Kilometers (Germany)—Richard Wagner, Dornier Superwal DR-142, 4 Gnome-Rhone-Jupiter 480 HP ea., at Fredericks-haven-Lindau, February 2, 1928. Speed, 179.416 KPH (111.483 MPH).	Speed for 500 Kilometers—(No Record).
Speed for 1,000 Kilometers (Germany)—Richard Wagner, Dornier Superwal DR-142, 4 Gnome-Rhone-Jupiter 480 HP ea., at Fredericks-haven-Lindau, February 2, 1928. Speed, 177.279 KPH (110.155 MPH).	Speed for 1,000 Kilometers—(No Record).
Speed for 2,000 Kilometers—(No Record).	Speed for 2,000 Kilometers—(No Record).

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

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS	AMERICAN RECORDS
Duration—(No Record).	Duration—(No Record).
Distance—(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).	Altitude—(No Record).
Speed for 100 Kilometers—(No Record).	Speed for 100 Kilometers—(No Record).
Speed for 500 Kilometers—(No Record).	Speed for 500 Kilometers—(No Record).
Speed for 1,000 Kilometers—(No Record).	Speed for 1,000 Kilometers—(No Record).
Speed for 2,000 Kilometers—(No Record).	Speed for 2,000 Kilometers—(No Record).
Speed for 5,000 Kilometers—(No Record).	Speed for 5,000 Kilometers—(No Record).

CLASS C2—WITH PAY LOAD OF 7,500 KILOGRAMS (16,535 Lbs.)

RETURNING TO POINT OF DEPARTURE WITHOUT REFUELING

WORLD RECORDS	AMERICAN RECORDS
Duration—(No Record).	Duration—(No Record).
Distance—(No Record).	Distance—(No Record).
Altitude—(No Record).	Altitude—(No Record).

SPEEDS FOR SPECIFIED DISTANCES

Speed for 100 Kilometers—(No Record).	Speed for 100 Kilometers—(No Record).
Speed for 500 Kilometers—(No Record).	Speed for 500 Kilometers—(No Record).
Speed for 1,000 Kilometers—(No Record).	Speed for 1,000 Kilometers—(No Record).
Speed for 2,000 Kilometers—(No Record).	Speed for 2,000 Kilometers—(No Record).
Speed for 5,000 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	AMERICAN RECORDS
Duration—(No Record).	Duration—(No Record).
Distance—(No Record).	Distance—(No Record).
Altitude—(No Record).	Altitude—(No Record).

SPEEDS FOR SPECIFIED DISTANCES

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

CLASS C2—GREATEST PAY LOAD CARRIED TO AN ALTITUDE OF 2,000 METERS (6651.7 Feet)

WORLD RECORDS	AMERICAN RECORDS
(Germany)—Steindorff, Rohrbach Romar, 3 BMW 500 HP ea., at Travemunde, April 17, 1929. Weight, 6,450 Kgs. (14,220 Lbs.).	Lts. B. J. Connell and H. C. Rodd, U. S. N., PN-10, 2 Packard 660 HP ea., at San Diego, Calif., August 18, 1927. Weight, 3,504 Kgs. (7,726 Lbs.).

CLASS C2—LIGHT SEAPLANES—FIRST CATEGORY

Two seaters weight empty less than 600 Kgs. (1,322 Lbs.)

WORLD RECORDS	AMERICAN RECORDS
Duration (Germany)—Alfred Grundke and Gottlieb Pfeiffer, Junkers J 50-W, Armstrong Siddeley Genet 85 HP, at Dessau, June 6, 1930. Time, 8H, 27M.	Duration—(No Record).
Distance (Closed Circuit) (Germany)—Alfred Grundke and Gottlieb Pfeiffer, Junkers J 50-W, Armstrong Siddeley Genet 85 HP, at Dessau, June 6, 1930. Distance, 900.180 Kilo. (599.344 Miles).	Distance (Closed Circuit)—(No Record)
Distance (Airline)—(No Record).	Distance (Airline)—(No Record).
Altitude (Germany)—Wilhelm Zimmerman and Schinzinger, Junkers J 50-W, Armstrong Siddeley Genet 85 HP, at Dessau, June 4, 1930. Height, 4,614 Meters (15,137.765 Feet).	Altitude—(No Record).
Speed for 100 Kilometers (Germany)—Alfred Grundke and Gottlieb Pfeiffer, Junkers J 50-W, Armstrong Siddeley Genet 85 HP, at Dessau, June 6, 1930. Speed, 164.309 KPH (102.096 MPH).	Speed for 100 Kilometers—(No Record).

CLASS C2—LIGHT SEAPLANES—SECOND CATEGORY

Two seaters weight empty less than 350 Kgs. (771 Lbs.)

WORLD RECORDS	AMERICAN RECORDS
Duration—(No Record).	Duration—(No Record).
Distance (Closed Circuit)—(No Record).	Distance (Closed Circuit)—(No Record).
Distance (Airline)—(No Record).	Distance (Airline)—(No Record).
Altitude—(No Record).	Altitude—(No Record).
Speed for 100 Kilometers—(No Record).	Speed for 100 Kilometers—(No Record).

CLASS C2—LIGHT SEAPLANES—THIRD CATEGORY

Single seater weight empty between 250 and 437.5 Kgs. (551–963 Lbs.)

WORLD RECORDS	AMERICAN RECORDS
Duration (Germany)—Pilot Alfred Grundke, Junkers J 50-W, Armstrong Siddeley Genet 85 HP, at Dessau, June 13, 1930. Time, 16H, 29M.	Duration—(No Record).
Distance (Closed Circuit) (Germany)—Pilot Alfred Grundke, Junkers J 50-W, Armstrong Siddeley Genet 85 HP, at Dessau, June 13, 1930. Distance, 2,100.420 Kilo. (1,330.97 Miles).	Distance (Closed Circuit)—(No Record).
Distance (Airline)—(No Record).	Distance (Airline)—(No Record).
Altitude—(No Record).	Altitude—(No Record).
Speed for 100 Kilometers (Germany)—Pilot Alfred Grundke, Junkers J 50-W, Armstrong Siddeley Genet 85 HP, at Dessau, June 13, 1930. Speed, 165.44 KPH (102.80 MPH).	Speed for 100 Kilometers—(No Record).

CLASS C2—LIGHT SEAPLANES—FOURTH CATEGORY

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

WORLD RECORDS	AMERICAN RECORDS
Duration—(No Record).	Duration—(No Record).
Distance (Closed Circuit)—(No Record).	Distance (Closed Circuit)—(No Record).
Distance (Airline)—(No Record).	Distance (Airline)—(No Record).
Speed for 100 Kilometers—(No Record).	Speed for 100 Kilometers—(No Record).
Altitude (Germany)—Wilhelm Zimmerman, Junkers J 50-W, Armstrong Siddeley Genet 85 HP, at Dessau, June 4, 1930. Height, 5,652 Meters (18,543.269 Feet).	Altitude—(No Record).

CLASS A—BALLOONS

FIRST CATEGORY (600 CUBIC METERS)

WORLD RECORDS	AMERICAN RECORDS
Duration (France)—G. Cormier, August 10, 11, 1924. Time, 22H, 34M.	Duration—(No Record).
Distance (France)—Georges Cormier, July 1, 1922. Distance, 804.173 Kilo. (499.69 Miles).	Distance—(No Record).
Altitude—(No Record).	Altitude—(No Record).

SECOND CATEGORY (601–900 CUBIC METERS)

Duration (France)—Jules Dubois, May 14, 15, 1922. Time, 23H, 28M.	Duration—W. C. Naylor and K. W. Warren, "Skylark", Little Rock, Ark., to Crawford, Tenn., April 29, 30, 1926. Time, 19H.
Distance (France)—Georges Cormier, July 1, 1922. Distance, 804.173 Kilo. (499.69 Miles).	Distance—W. C. Naylor and K. W. Warren, "Skylark", Little Rock, Ark., to Crawford, Tenn., April 29, 30, 1926. Distance, 660 Kilo. (410 Miles).
Altitude—(No Record).	Altitude—(No Record).

THIRD CATEGORY (901–1,200 CUBIC METERS)

Duration (United States)—E. J. Hill and A. G. Schlosser, Ford Airport to Montvale, Va., July 4, 5, 1927. Time, 26H, 46M.	World and American Record.
Distance (United States)—S. A. U. Rasmussen, Ford Airport to Hookerton, N. C., July 4, 5, 1927. Distance, 920.348 Kilo. (571 Miles).	World and American Record.
Altitude—(No Record).	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.
World and American Record.

Distance (United States)—S. A. U. Rasmussen, Ford Airport to Hookerton, N. C., July 4, 5, 1927.
Distance, 920.348 Kilo. (571 Miles).
World and American Record.

Altitude—(No Record).

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., Sept. 10, 11, 12, 1927.
Time, 49H.

Duration—E. J. Hill and A. G. Schlosser, Gorden Bennett, Detroit to Baxley, Ga., Sept. 10, 11, 12, 1927.
Time, 47H, 55M.

Distance (United States)—Lt. T. G. W. Settle and Ensign W. Bushnell, Pittsburgh, Pa., to Savage Harbor, Prince Edward Island, Canada, May 4, 5, 6, 1929.
Distance, 1,351.768 Kilo. (952 Miles).
World and American Record.

Altitude—(No Record).

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., Sept. 10, 11, 12, 1927.
Time, 49H.

Duration—E. J. Hill and A. G. Schlosser, Gorden Bennett, Detroit to Baxley, Ga., Sept. 10, 11, 12, 1927.
Time, 47H, 55M.

Distance (United States)—Lt. T. G. W. Settle and Ensign W. Bushnell, Pittsburgh, Pa., to Savage Harbor, Prince Edward Island, Canada, May 4, 5, 6, 1929.
Distance, 1,351.768 Kilo. (952 Miles).
World and American Record.

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

Seventh Category (3,001–4,000 cubic meters)

Duration (France)—Georges Blanchet and Dr. Geo. LeGallee, Gordon Bennett, Detroit to Waverly Hall, Ga., Sept. 10, 11, 12, 1927.
Time, 49H.

Duration—E. J. Hill and A. G. Schlosser, Gorden Bennett, Detroit to Baxley, Ga., Sept. 10, 11, 12, 1927.
Time, 47H, 55M.

Distance (United States)—Lt. T. G. W. Settle and Ensign W. Bushnell, Pittsburgh, Pa., to Savage Harbor, Prince Edward Island, Canada, May 4, 5, 6, 1929.
Distance, 1,351.768 Kilo. (952 Miles).
World and American Record.

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

Eighth Category (4,001–5,000 cubic meters)

Duration (Germany)—H. Kaulen, December 13-17, 1913.
Time, 87H.

Duration—C. B. Harmon, St. Louis to Edina, Mo., October 4, 1909.
Time, 48H, 26M.

Distance (Germany)—Berliner, February 8-10, 1914.
Distance, 3,052.7 Kilo. (1,896.9 Miles).

Distance—A. R. Hawley, St. Louis to Lake Tschotogama, October 17-19, 1910.
Distance, 1,887.6 Kilo. (1,172.9 Miles).

Altitude (Germany)—Suring and Berson, June 30, 1901.
Height, 10,800 Meters (35,424 Feet).

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

CLASS B—AIRSHIPS

RETURNING TO POINT OF DEPARTURE

WORLD RECORDS	AMERICAN RECORDS
Duration (Germany)—Dr. Eckener, "Graf Zeppelin", 5 Maybach, from Lakehurst, N. J., to Frederickshaven, Germany, November 29, 30, 31, 1928. Time, 71H, 7M.	Duration—Ens. Maytham, Navy A-236, at Miami, Fla., December 24, 25, 1918. Time, 40H, 26M.
Distance (Germany)—Dr. Hugo Eckener, "Graf Zeppelin", 5 Maybach, Lakehurst, N. J., to Frederickshaven, Germany, November 29, 30, 31, 1928. Distance, 6,384.5 Kilo. (3,967 Miles).	Distance—(No Record).
Altitude (France)—Cohen, at Conte, June 18, 1912. Height, 3,080 Meters (10,102 Feet).	Altitude—(No Record).

SPEEDS FOR SPECIFIED DISTANCES

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

GLIDERS

WORLD RECORDS	AMERICAN RECORDS
Duration (Germany)—Ferdinand Schulz, glider "Westpreussen", Rossitten Field, May 3, 1927. Time, 14H, 7M.	

GREATEST DISTANCE OVER CLOSED COURSE

Distance (Germany)—Ferdinand Schulz, glider "Westpreussen", Rossitten Field, May 3, 1927.
Distance, 455.8 Kilo. (283.22 Miles).

GREATEST DISTANCE IN A STRAIGHT LINE

Distance (Austria) — Robert Kronfeld, "Wien" Rhon-Rossiter, Lienlas, July 30, 1929.
Distance, 149.420 Kilo. (92.845 Miles).

SPEED OVER A CLOSED COURSE

Speed (Germany) — Ferdinand Schulz, glider "Westpreussen", Rossitten Field, May 5, 1927.
Speed, 54.545 KPH (33.892 MPH).

ALTITUDE ABOVE STARTING POINT

Altitude (Germany) — Robert Kronfeld, "Wien" Rhon-Rossiter, Lienlas, July 30, 1929.
Height, 2,589 Meters (8,494 Feet).

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