

AIRCRAFT YEAR BOOK, 1921

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INTRODUCTION

In presenting the Aircraft Year Book for 1921, the third of the series, the editors and publishers wish to acknowledge the help provided by the various Governmental services having to do with aeronautics.

It is desired particularly to express appreciation for the assistance given by Major H. M. Hickam, Chief of the Information Group, U. S. Air Service; Lieut. Commander R. E. Byrd of the Naval Aviation; the Flying Section of the Marine Corps; officials in charge of the Air Mail; the National Advisory Committee for Aeronautics; the Forestry Service, the Coast and Geodetic Survey, the Weather Bureau, the Bureau of Fisheries, the Bureau of Standards and the Bureau of Foreign and Domestic Commerce. Chapter XIII, which deals with the technical development of aircraft, was contributed in its entirety by Commander J. C. Hunsaker, of the Bureau of Construction and Repair, U. S. Navy, who is recognized as an authority on aeronautical design.

MANUFACTURERS AIRCRAFT ASSOCIATION, INC.

New York City, January 1st, 1921.

AIRCRAFT YEAR BOOK

CHAPTER I

THE COMMERCIAL AIRPLANE TRIES ITS WINGS; NOTABLE ACHIEVEMENTS OF THE YEAR; AMERICAN AERONAUTICS ENCOUNTERS OBSTACLES; MORE THAN 15,000,000 MILES FLOWN IN THE UNITED STATES

THE year 1920 will stand unique in the history of aeronautics, particularly in the United States. In 1919 there was the acute stimulus of popular curiosity in one of the mysterious elements which won the war. But in 1920 came the readjustment and consequently the necessity for flying to demonstrate its usefulness in peace.

If established business experienced difficulty in shifting from extraordinary activity to normal levels, what a task, then, for aeronautics, peculiarly developed as a military adjunct, to challenge the age-long beliefs of time and space, and to share with the older forms of transportation the honor of greatly reducing the one and minimizing the other!

In examining the record of the last twelve months, one is impressed with the brilliant promise and the sober want. Great things have been accomplished — great first flights by the Wright Brothers were made only seventeen years ago. But whatever has been achieved has been due rather more to individual vision and courage than to general support.

This was particularly true of our own country, where the art had its birth. Here possibly the greatest opportunities were presented; and here, too, the severest handicaps were encountered. Yet in defiance of obstacles and discouragements, American aeronautics during 1920 proved itself worthy of a more liberal acceptance as a commercial factor and as a necessary element in the national defense.

If spectacular flights, such as the crossing of the Atlantic by airplane and airship, were recorded in 1919, to 1920 were reserved certain achievements which, if not so likely to astonish, were more certain to advance the art.

INTERNATIONAL PROGRESS IN AERONAUTICS

The great nations of the earth, with more or less fixedness of purpose, endeavored to progress along lines aeronautical. Belgium,

Italy, France and Great Britain quickly enacted codes based upon the International Aerial Convention, laid out aerial routes and took such other steps as seemed wise in order to develop civil transport in the air as a measure of future safety, and economic growth. And to each came very definite honors. Thus Belgium won the international balloon race and France the international airplane race for the Gordon Bennett trophies. Italy successfully completed the 10,000-mile flight from Rome to Tokio and England opened and traversed the aerial highway spanning Africa from Cairo 5,000 miles to the Cape.

In actual accomplishment it would appear at first that the United States led the world. An American excelled the altitude record made by another American in 1919 by reaching the stupendous height of 33,114 feet. The famous N.C.-4, first to fly across the Atlantic, made an 8,000-mile flight around the Atlantic and Gulf coasts and up the Mississippi river. Four Air Service planes "blazed" a new trail through the uncharted Northwest, flying 9,000 miles from New York to Nome, Alaska, and return. A squadron of F.-5-L's accompanied the Atlantic fleet on a 13,000-mile cruise through the West Indies and withstood hardships of wind and water better than many of the surface craft. In the Pulitzer race, on Thanksgiving day, the planes taking first and second places, both American designed and built and powered with American designed and built engines, set new speed records.

And, finally, at Le Mans, France, there was unveiled a monument to the memory of Wilbur and Orville Wright — a testimonial to the Americans whose patient, practical experimentation on the sand hills of Kitty Hawk, N. C., showed man how to fly and thus made all these things possible.

Within the United States and insular possessions it is estimated that 15,250,000 miles were flown during 1920, divided as follows:

Army Air Service	6,250,000
Naval Aviation	1,500,000
Aerial Mail	1,500,000
Civilian	6,000,000

It is believed that approximately 225,000 passengers were carried by the civilian machines, in addition to many tons of freight. The year witnessed the establishment of pioneer transport lines, hopeful that Congress would shortly enact an aerial code, making easier credits and more satisfactory insurance rates possible and provide otherwise for the encouragement of the art.

HANDICAPS EXPERIENCED IN AMERICA

But the true picture of the year can not be painted wholly in brilliant colors. There was a gloomier aspect which was due partly to the fact that commercial flying was new and in many respects untried and partly to the fact that the national consciousness, reacting from the war, was inclined to forget all arms and to be more or less indifferent to the early struggles of an art which, although it captivated the fancy, did not — could not — add forthwith to the wealth of the world. And in this situation some saw a reflection of the state of mind which first ridiculed, then doubted, then enthusiastically utilized the steamboat and the railroad.

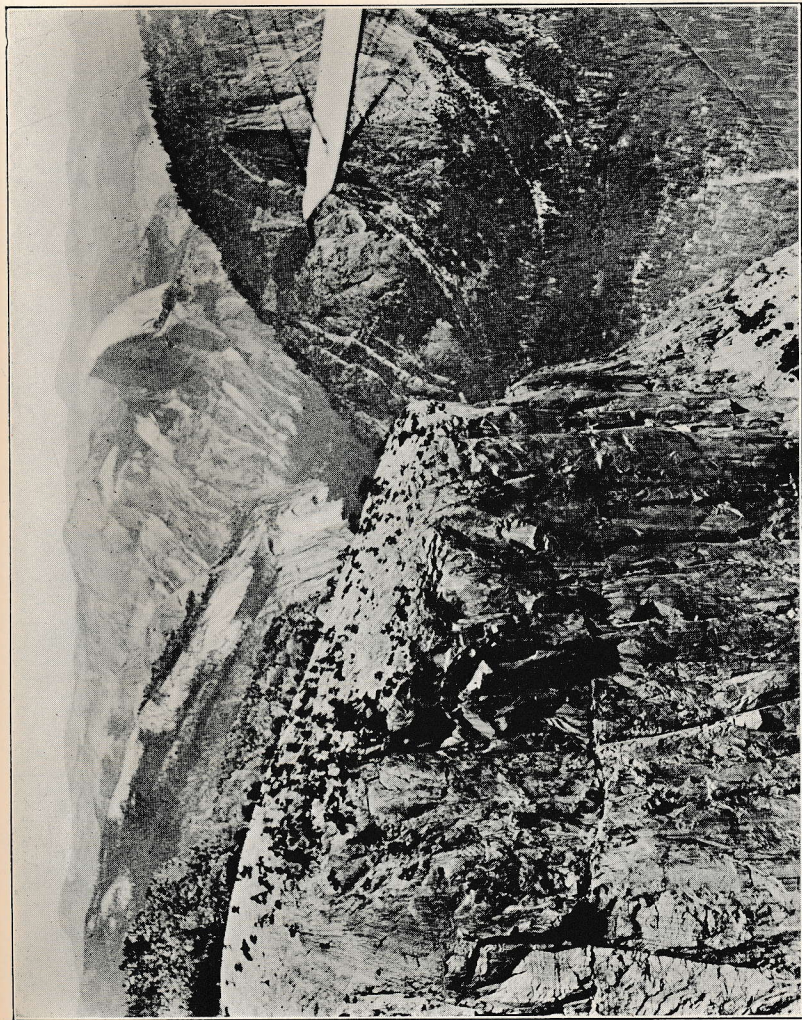
National neglect was manifest, on the one hand, in the depleted aeronautical establishments of the Army and Navy and the shrunken industry, to which the national defense must look for men and matériel. On the surface it would appear that the government activities have covered the entire field and in a sense they have, but there is now apparent an increasing tendency to believe that greater progress will obtain if there is worked out some proper organization to centralize many of these activities and to specialize in the development of civil and commercial aeronautics. By actual count, at the close of 1920, there were twenty-one official or semi-official services, bureaus or agencies dealing with the art, each faithfully endeavoring to be of assistance. These activities are:

U. S. Army Air Service.....	Organizes and maintains air forces for the military establishment.
U. S. Navy.....	Aviation activities, scattered among various departmental bureaus, carried on for naval establishment.
U. S. Marine Corps.....	Organizes and maintains aviation units for expeditionary service.
The Aeronautical Board.....	Organized to co-ordinate Army and Navy aeronautics.
The Helium Board.....	Organized to facilitate gas development by Army, Navy and Bureau of Mines.
National Advisory Committee for Aeronautics.....	Conducts scientific investigations.
U. S. Post Office Department.....	Maintains flying corps for carriage of mails.
Forestry Service.....	Maintains Aerial Forest Patrol, in cooperation with U. S. Air Service.
Forest Products Laboratory.....	Carries on scientific research.
Bureau of Entomology.....	Utilizes aircraft in scientific crop work.
Weather Bureau.....	Carries on aerological work.
Bureau of Mines.....	Develops helium and utilizes aircraft in mine rescue work.
Coast Guard.....	Maintains flying corps for life and property saving at sea and for transportation.

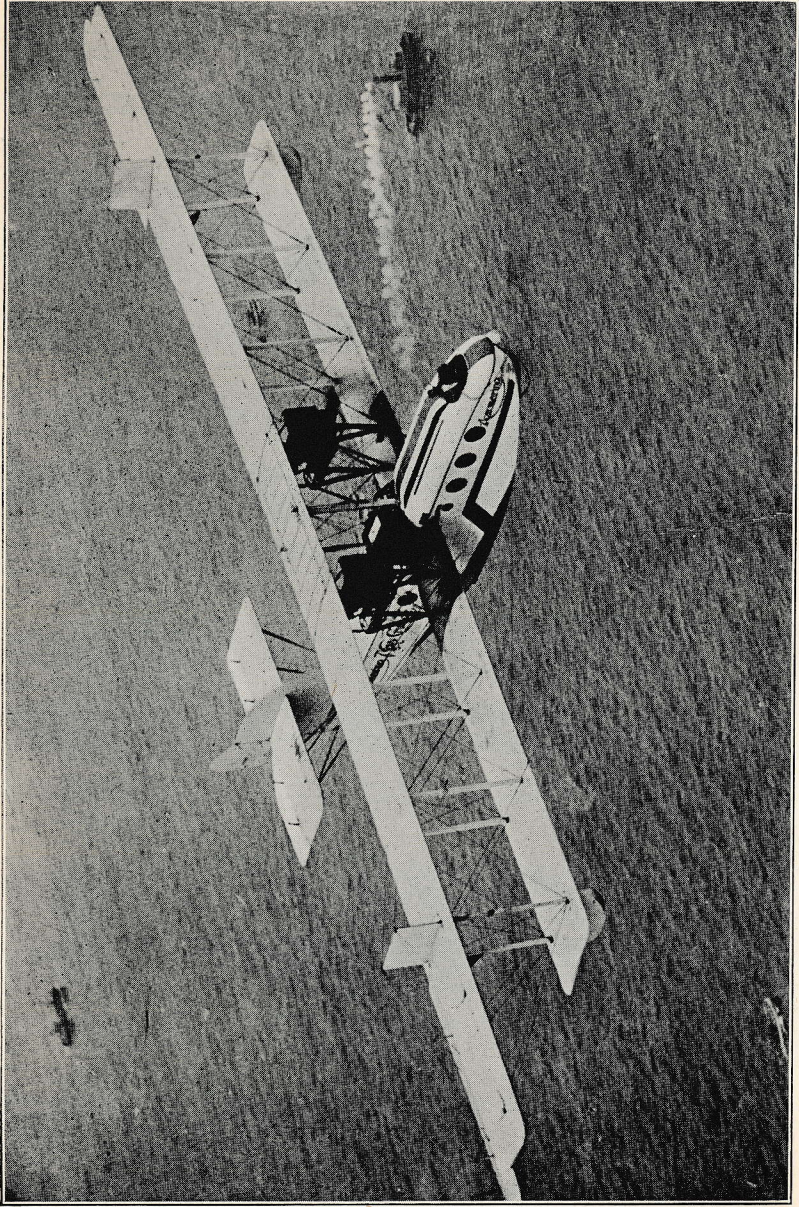
Public Health Service.....	Controls clearance from and entrance into U. S. ports of aircraft.
Coast and Geodetic Survey.....	Utilizes aircraft in correcting existing charts and making new maps.
Bureau of Fisheries.....	Developing utilization of aircraft in fish-spotting.
Bureau of Foreign and Domestic Commerce	Gathers aeronautical information abroad.
Bureau of Standards.....	Conducts aerodynamical research work.
Sub-Committee on Commercial Aviation of Economic Liaison Committee on Foreign Trade.....	Designed to co-ordinate aeronautical contact among State, War, Navy, Commerce, Post Office and other departments.
Board of Surveys and Maps.....	Promotes use of aircraft in mapping.
Interdepartmental Committee on Meteorology	Designed to prevent duplication of meteorological work by Army, Navy and Weather Bureau.

In gathering data for this Year Book the editors have been impressed with what is really a remarkable record. And it is all the more notable because of the lack of a clearly defined national policy and programme. Those whose privilege it is to aid in the development of an art which promises so much encouragement in man's constant effort to eliminate space and secure dominion over inertia, not unnaturally have ever in mind the prospect of what can be accomplished with handicaps removed.

Therefore the following chapters are written with a two-fold purpose: First, to portray truthfully what has been done, and Second, to indicate how best we may advance.



General View of Yosemite Valley. Photograph from Curtiss-Standard, first airplane to penetrate National Park.—Photo, Earl P. Cooper, Airplane and Motor Company.



Acromarine West Indies Airways Passenger Mail Boat Between Key West and Havana, Cuba

CHAPTER II

AERIAL TRANSPORT; ONE THOUSAND AIRCRAFT PUT TO BUSINESS USES; LINES ESTABLISHED OVER THE WATER; LAND PLANES MEET NEED WHERE RAIL AND ROAD TRANSPORTATION IS INADEQUATE

ALL aeronautical activity, in the last analysis, is aerial transport, for aircraft, to be useful in commerce, must carry either people or matériel. Regarded thus, aerial transport includes, not only the transportation of passengers, but all the peacetime activities to which aircraft may be put. Among these are the Aerial Mail of two and one-half years' successful operation; the Aerial Forest Patrol, which is credited with saving a larger amount in standing timber than was appropriated for the entire Air Service; the employment of planes in newspaper, motion picture and advertising work; aerial photography in its many ramifications; map making and surveying; exploration; timber cruising; fish spotting and the saving of life and property at sea.

That part of aerial transport, which has for its chief aim the fulfillment of transportation demands not met by the railroad train or the steamship, is destined within the next few years to be the most important feature of aeronautics. Therefore it is given precedence in the present volume, although it has scarcely had time as yet to be established.

ONE THOUSAND COMMERCIAL AIRCRAFT

In the absence of any Federal system of registration it is extremely difficult to estimate closely the number of commercial aircraft in operation in the United States and Canada. It is believed that there are about one thousand, this approximate number being fixed through manufacturers' reports and data gathered by the Air Service.

The Manufacturers Aircraft Association prepared and distributed a questionnaire in an effort to obtain information from the operators of commercial planes. But due to the itinerant nature of much of the flying it has been impossible to trace and record the activities of more than one-half of the estimated number. Accepting the returns

to these questionnaires as typical, generalizations for the entire one thousand have been arrived at.

The accompanying table gives what is believed to be a fair sectional picture. It shows eighty-seven companies or individuals, of permanent location, engaged in commercial aerial transport. These are scattered all over the United States and Canada and, as far as can be learned, they operate from 365 to 425 machines of varying capacity and of both land and water types. All have terminal facilities of some sort and many possess well-equipped air ports. Still others operate from fields obtained through the interest and courtesy of municipal authorities.

By far the greater mileage was recorded in short demonstration flights of from 10 to 15 minutes, for which an average fee of \$12.50 was charged. There was an increasing demand for transportation between cities and toward the close of the year considerable flying of this nature was being done, the average charge for such service being 65 cents a mile.

On practically all inter-city flights, baggage or freight was carried, the quantity limited only by the capacity of the craft, reports showing an aggregate of 41,390 pounds.

During the flying season, which varied according to the region, these eighty-seven organizations carried 115,163 passengers and flew a total of 3,136,550 miles.

Accidents there were, and forced landings, but, according to the signed reports, in all the 3,000,000 miles flown, not a single person lost his life. Altogether, there were 222 forced landings and 88 accidents without fatalities. There have been fatal accidents in other instances, but so far as records show, most—if not actually all—of them happened in the course of stunt or exhibition performances, or under circumstances indicating that undue risk had been taken. It should be emphasized that, in the commercial business reported, not a fatal accident occurred, a fact in itself indicative of the comparative safety of travel through the air.

THE GYPSY FLYERS

Before proceeding further with the analysis it is well to review the progress of aerial transport in its application to the ordinary course of business. The first spring after the signing of the Armistice, thousands who had been engaged in military aeronautics, either in operation or production, turned to commerce. There was the airplane—new, mysterious—for the sight of which hundreds of thousands were eager. The first pilots to be released from the service were quick to take advantage of this popular curiosity. And so there sprang into full-fledged being, a new race—the gypsy

flyers. Equipped, for the most part, with Army or Navy training planes, they flew from point to point, picking up a gradually increasing trade, some of them realizing considerable profit. At first they operated from cow pasture to town lot and then, when local interest abated, flew on to other communities. Some of these men, more ambitious than cautious, came to grief — and carried others with them — leaving behind fear and misunderstanding. Many, however, leased or purchased terminals, and some assumed incorporate responsibility, and thus established themselves as pioneers. It is to them that the art owes much.

In the late winter of 1918 it was a distinction to have had a close-up view of an airplane. By the summer of 1919 a few hundreds of civilians, here and there, had experienced the sensation of flying. At the close of 1920, these hundreds had multiplied into thousands, many of whom flew no longer for "thrill," but for business or the sheer pleasure of dominion which powerful motion and exalted height alone can give. But gypsy flying continues and will continue so long as there are fairs or small-town expositions to attract curious folk from remote districts and consequently provide business for the alert and wandering pilot.

This accounts for the inability to trace all commercial activity and is the basis for estimating that, during 1920, the one thousand machines believed to be in actual use, carried some 225,000 passengers and flew about 6,000,000 miles.

PROOF OF FLIGHT IN THE TRANSITION PERIOD

The transition period between itinerant and permanent flying has been particularly interesting, inasmuch as one experiment has led naturally to another and both have combined to produce further activity along practical lines. Thus the gratification of pleasure instincts through the patronage of "joy rides" or "excursions" has led to the establishment of aerial transport lines with increasing patronage between cities. And the ever-present desire of modern business for advertising has afforded opportunity for aircraft to demonstrate also their package or freight-carrying capabilities.

Typical instances of the former are the success of the Aeromarine Sightseeing and Navigation Co.; the Aeromarine-West Indies Airways, Inc.; the America Trans-Oceanic Co.; and Aero Limited, all on the Atlantic coast, and the Mercury Aviation Co., of Los Angeles.

The most convincing demonstrations of aerial utility were made either in sparsely settled regions where rail or road transportation was inadequate, or in more congested areas where the pressure of demand offset the sharp competition of established modes of convey-

ance. The experiences of the three big Atlantic coast companies, dealt with more fully later on, indicate the excellent opportunities for aircraft in centers of population. In the middle west, southwest and Pacific regions specific examples also may be cited.

On one occasion, when the railroad schedules were interrupted, the President of an oil company, with headquarters at Tulsa, used a Curtiss "*Oriole*" for a two-thousand-mile inspection trip in Texas and Oklahoma. By train or motor this would have required at least a fortnight, with many inconveniences. But by air it was accomplished in two days. As a result of this experience zone maps for aerial service are to be found in all the oil company offices; and inspection tours by airplane are becoming the rule rather than the exception.

Again, a grain company in Nebraska found itself in a desperate situation when a sleet and wind storm halted wire communication. Negotiations were pending in Wyoming, Montana and Idaho, on the immediate completion of which (due to the state of the market) depended profit or severe loss. The company chartered a Curtiss "*Oriole*," visited all the points desired and by this quick move was able to close every deal successfully.

A rice grower in California made a hurried trip by air. His idea was transportation, but as he passed over his fields the whir of the propeller startled wild ducks which rose in clouds from the grain crop on which they had been feeding. The idea of utilizing the airplane to patrol his property occurred to the planter. And now thousands of acres of rice lands are protected by flyers.

AIRCRAFT UNIQUE IN ADVERTISING

In advertising, aircraft are unique. They are not only the publicity medium — they are also the means of moving the goods. They are not alone the means of attracting attention, they carry the very individual or article which it is desired to advertise. The aircraft companies incidentally advertise themselves even while they operate and when employed to advertise other activities, they must, perforce, continue advertising themselves.

What hint of the quick transportation of perishable foodstuffs is contained in the performance of an Aero Limited boat which flew to New York from Florida in sixteen hours with a cargo of grapefruit at a time of year when that delicacy was rare to even the choice menus of the north?

And the traveling salesman who took a sample case in an Aero-marine flying boat up the Hudson, thus getting the jump (or the hop) on his competitors, surely was the first of a long line of "flying drummers."

Ice cream has risen in popularity and in fact since prohibition was enacted. And it was the airplane that did it! Who ever heard of shipping frozen food hundreds of miles in the middle of summer without the aid of salt or ice? A Dayton Wright "*Aerial Coupe*" did the trick, flying high amid the cool winds between Cleveland and Washington with a special container of cream which later had the place of honor at a banquet of the Retail Ice Cream Dealers' Association.

Mention of Washington calls attention to the Air Service, which is by no means insensible to the benefits to be obtained from letting the people see what an Army plane and flyer can do. The Air Service has probably obtained more constructive publicity out of a certain Glenn L. Martin twelve-passenger transport, which is in constant demand for the quick transfer of high officers, than out of many squadrons of strictly military types of machines.

Aerial advertising has a double appeal. Today it is the airplane that is seen by all eyes on earth. Tomorrow, when many more thousands are flying and thinking of ordinary travel in the vernacular of three dimensions, that which is on the earth will be seen by all in the air. Today we have "flying billboards"—aircraft with signs on wings and fuselage. Tomorrow we certainly shall have signs on roofs and highways and— who knows?—hillsides and pastures sown to advertise some commodity. And when that tomorrow comes who will deny the possibility of the family group at ease on the furnished or gardened housetop watching the sky parade, even as we now sit on the front porch and watch the ceaseless stream of motor cars?

Alfred Decker & Cohn of Chicago; the William J. Wrigley, Jr., Co.; the Brandram-Henderson Co. of Montreal; the Simmons Hardware Co.; and the Dayton Co., dry goods house of Minneapolis, have established "stables" of Curtiss aircraft which serve the double purpose of advertising and transportation of salesmen and packages for urgent delivery. The Vivadou Co., filling an order for Mrs. Wilson, astonished even Washington, accustomed as it is to aircraft, by delivering the goods from New York almost to the gates of the White House in a Gallaudet "*Liberty Tourist*."

POLITICS, RELIGION AND TRAVEL

Aircraft have sometimes combined the three functions of publicity, passenger and cargo carrying. In the last national campaign the Republican, Democratic, Farm-Labor and Prohibition parties and the Non-Partisan League all utilized airplanes. "Vote for ——" was the legend painted on them—the candidates ranging from a citizen of Queens Borough, New York, who aspired to be sheriff, to

Harding and Cox. Some of the candidates themselves traveled by air, while from every plane were dropped circulars appealing for support.

Religion, too, has taken to wing, not as symbolic of that state which it may sometime achieve, but as a practical matter of present day business, as Edward Hungerford wrote in *Harper's Magazine*:

"I rode over Portland, Oregon, in a propaganda airplane. It belonged to a new-old religious cult, the Apostolic Faith, which is gaining both members and money — and is exerting the last to gain the first. It has printing presses, motor cars, motor trucks, and the airplane in which I rode. This last is called the 'Sky Pilot' and has the cross and crown painted on the under surface of the plane. Literally it carries the gospel to the far corners of Oregon; the Dominie is a war-graduate aviator and speaks with the force which comes from real experience."

In reviewing aerial transport in 1920 or forecasting its future, the influence of beauty is seen to be ever present. Only those who have flown can fully appreciate the grandeur and novelty of travel at a height of three to four thousand feet. Earth, ocean, air, are seen in new and more charming aspects and under conditions which invite the feeling of mental dominion and power even while impressing the traveler with a sense of his own physical impotence.

This was particularly true of operations on the Pacific Coast, and more especially over the National Parks. The gray harbor and green hills of San Francisco, the golden-blue mosaic of Los Angeles and San Diego, the rough picturesqueness of Seattle's mountains and sea can never be seen in such loveliness as from the air.

Three flights were peculiarly commanding. The Earl P. Cooper Airplane and Motor Co. of San Francisco sent a Curtiss-Standard training plane into Yosemite Valley. It has been but a dozen years or so since the only transportation to the park was by stage 90 miles from Raymond, the end of the railway spur. The trip required two or three days. Then the motor car was admitted and later a new railway carried the tourist to within ten miles of the reservation. And now the airplane! The pilot was Dan Davison, and to reach the valley he had to attain an altitude of 11,000 feet, descending steeply to a diminutive sward beside the roaring Merced river. It was truly a historic entry.

Lake Tahoe, perhaps the most beautiful water in the Sierra available to vacationists, is now accessible by air. It was thought to be so high that no seaplane could operate on it, yet, late in 1920, Charles T. Stoffer, with a passenger, took off his Curtiss Wright-engined pontoon machine from the river at Sacramento, soared 11,500 feet over the divide and came to rest on the calm waters of Tahoe.

What is more, he did a thriving business in scenic flights and at the end of the season flew back to the valley.

Herbert Munter, of the Aerial Tours Co., Kent, Wash., was the first to "discover" Mount Rainier from the air. In his three-place Boeing — christened the "*Mount Rainier*" on that trip, by the way — he reached an altitude of 16,000 feet and circled low over the summit, which towers almost 15,000 feet, far above its white-crested neighbors in the Cascades and Siskiyou. It was a superb sight, the fame of which has since attracted many aerial tourists.

"It gave us a peculiar feeling," wrote Mr. Munter, "to look over one side of the plane, into the very fountain head of the Rainier glaciers, but a few hundred feet beneath us, and then, looking over the other side, to see Paradise Inn, nestled thousands of feet below in beautiful Paradise Valley."

THE EASTERN TRANSPORT COMPANIES

The aerial transport companies operating along the Atlantic coast have found that, with the exception of such resorts as Atlantic City, which claims thousands of strangers each season, something more interesting than short flights must be offered in order to justify permanent existence.

It has been indicated that most of the commercial flying in the United States dates from the spring of 1919. There is, however, one notable exception, the America Trans-Oceanic Company, which was formed in 1916, when Glenn H. Curtiss, Rodman Wanamaker and others were working on the flying boat "*America*" in the hope of crossing the Atlantic. Immediately on its formation the company established seaplane stations at Port Washington, L. I., and Palm Beach, Fla. During 1916 operation was carried on for pleasure and sport purposes, but the demand was not sufficient to warrant great expansion, even if the war had not intervened.

Soon after the signing of the Armistice, the America Trans-Oceanic Co., many of whose flyers had served in Naval Aviation with distinction, took over a number of Curtiss H.S. and H.-16 flying boats, the former being rebuilt into five and six place commercial craft and the latter into fourteen or sixteen place long-distance carriers. Curtiss "*Seagulls*" and the M.F. type were used on the shorter trips. Since the fall of 1918 continuous service, according to the season, has been maintained between Florida coast towns and points in the West Indies, such as Havana, Nassau and Bimini; and between New York and Atlantic City, Newport, Bar Harbor, New London, Boston, Saratoga Springs, Lake George, Albany and Norfolk. It is the proud record of the company, during the five years of its operations, covering a total distance of approximately 300,000

miles, and the carriage of from 4,000 to 5,000 passengers, that not a single accident has happened to either its passengers, pilots or mechanics.

On July 26, 1919, the Aero Limited was formed, being one of the first, if not actually the first company organized on a corporate basis after the close of the war. The company at once established a regular transport line between New York and Atlantic City, operating two three-place Aeromarine boats powered with the Wright engine. The experience thus gained—it is more than 100 miles each way—enabled the company to enlarge and to add six passenger rebuilt H.S. boats to its equipment.

In the fall of 1919, Aero Limited flew south and for three months operated out of Miami, carrying during this time a total of 2,200 passengers an aggregate distance of 100,000 miles. Forty round trips to Nassau, Bahamas, 210 nautical miles east of Miami, many special charter flights to Havana and more than 100 flights to Bimini were included. During this time Aero Limited carried the first United States and British mail from American to British West Indian ports, located sponge beds and schools of fish, gave assistance to Federal agents endeavoring to block smuggling, and provided the "stage" for an aerial wedding.

In the spring of 1920 Aero Limited transferred its activities to the North, operating air lines, especially on charter trips, between New York and many Atlantic Coast, Hudson River and Chesapeake Bay points. During the four months of this season 2,176 passengers were carried, of whom 747 were booked in August.

Aero Limited is believed to have been the first to open general passenger offices. The agents in charge consequently had opportunity for original observations. They report, for instance, that more than 70 per cent of the passengers carried on the short demonstration flights were women. Many brought their children with them, one even carrying an eight-months' old babe. The remaining 30 per cent were men who frequently came along because they had to.

But it was different when long trips were concerned. Here the women hesitated and the men were eager. The women flew for the novelty; the men wanted a reason, and if business required them to go from one point to another, and transportation was quickest by air, not one hesitated or thought of the expense or possible risk. One case was of a man who desired to get north, as quickly as possible. As he had never been up a trial flight was offered, but this he refused: "My interest," he said, "is in getting to New York and nothing more." And they flew him there.

WATER AIR PORTS AVAILABLE

The significance of successful commercial flying over the water must be apparent. In a seaplane, wherever there is water, there, too, is a possible place to alight. But not so with a land plane, the operation of which in regular service has been seriously retarded by the absence of proper terminals.

The growing patronage of flying boat lines impelled a study of the immediate equipment needs. Chief of these, it was felt, was for a carrier capable of making long sustained flights and of such capacity as to cut to a minimum the per capita cost of operation. The Aeromarine Plane & Motor Co., which later acquired practically all the Navy surplus, was the first to appreciate the possibilities of the F.-5-L. This flying boat of distinctly American origin, powered with two 400 h.p. Liberty engines, had proven its remarkable endurance during the war and it was possible to utilize every flying and seaworthy quality, at the same time installing all the comforts and conveniences required by the paying traveler. The entire hull was enclosed and two mahogany fitted cabins built, fore and aft, in which were placed upholstered chairs for eleven passengers, in addition to the crew of three. Protected from wind and weather, electric lights affording illumination after night had thrown into obscurity the view through the ports at each chair, the passengers received the assurance of ease and security unsurpassed, it is believed, by any other mode of transportation.

The first of these boats was launched at Keyport June 22, 1920, and was christened the "*Aeromarine Navy Cruiser*" by Governor Edwards of New Jersey. It was taken over at once by the Aeromarine Sightseeing and Navigation Co., and placed in the suburban excursion service around New York. Trips were made regularly up to October 1 to Southampton, L. I., Atlantic City, Newport, Spring Lake, N. J., etc. During the International Yacht Races the "*Aeromarine Navy Cruisers*" carried passengers over this greatest of marine sporting events when spectators on surface craft were inconvenienced by inclement weather or handicapped by limited vision. Altogether, in these excursion services, some 800 persons were transported.

The approach of winter, which impelled the usual migration of many northerners to the south, impelled the Aeromarine Sightseeing and Navigation Co. to consider a similar course. But in the meantime another large company had been organized for transport service between Florida and the West Indies and a merger was effected under the name of Aeromarine West Indies Airways, Inc. Mail contracts were obtained from the American and Cuban governments

and on October 23, two "*Aeromarine Navy Cruisers*"—the "*Santa Maria*" and the "*Pinta*" taking their names from Columbus caravels—were dedicated at the Columbia Yacht Club, New York City, and within the hour were winging their way to Key West, the company's terminal in the United States.

This flight down the Atlantic Coast was of romantic interest, for the first stop out of New York was made on the island of Roanoke, off the North Carolina coast. Here on the sand hills of Kitty Hawk, Wilbur and Orville Wright made the first flights in the history of the world, and here rested, on their maiden voyage, the first units of the first extensive overseas American air fleet.

The Aeromarine West Indies Airways, Inc., is successfully operating daily between Key West and Havana. Travelers arriving at the peninsular terminus need no longer wait eight hours for the Cuba boat and then spend the night on the turbulent channel. They step from parlor car to parlor flying boat and an hour and a quarter later are on the quay at Havana. An increasing preference for the air route is manifest.

PROPHETICAL OF THE FUTURE

These experiences are typical of what has been attempted and prophetic of what should be accomplished as limitations are diminished and the art demonstrates its further usefulness.

The year cannot be looked upon as phenomenal; neither can it be viewed as a disappointment. And in reviewing the record one is impressed with the analogy which this first year of commercial aeronautics bears to the first twelve months of our recent war. Something of the same imagination which burned in 1917 at the thought of launching clouds of fighting machines upon the enemy, again kindled, in the spring of 1920, at the contemplation of peaceful heavens filled with wingéd argosies.

And, just as what we *did* accomplish in war—the production of nearly 15,000 aircraft in eighteen months—would have been impossible without aiming high and expecting much, persevering against odds and ultimately achieving, so, too, the preservation of any part of the industry and the first commercial trials would have been unlikely had there not been faith and persistency attributable only, in the absence of great, immediate rewards, to the fascination which the new art holds for those engaged in it.

AERIAL TRANSPORT

COMMERCIAL AIRCRAFT OPERATING COMPANIES IN THE UNITED STATES AND CANADA

Name of Company	Address	Aircraft	Air Port Facilities	Charge Short Flight	Charge Pas-mile Inter-city Flight	Passengers Carried	Freight Carried	Miles Flown
1 Aerial Tours Co.	Seattle, Wash.	1 B.B.-1, † 1 J.N.-4	Field (rented) and hangars at Kent, Wash. Terminal at 86th St. & Hudson River.	\$15.00	\$1.00	1,700	0	31,500
2 Aeromarine Sighting & Navigation Co. (merged with Aeromarine West Indies Airways, Inc.)	86th St. & Riverside Drive, N. Y. City.	2 F.-5-L Navy Cruis- er Flying Boats; † 2 50-B.-2 Flying Boats			.83	800	0	7,000 (est.)
3 Aeromarine West Indies Airways, Inc.	Key West, Fla.	6 F.-5-L Navy † Cruisers (14 passen- ger)	Terminals in harbors at Key West & Palm Beach, Fla.; Havana, Cuba; Bimini and Nassau.		\$75 bet. Key West and Hav.	300		7,200
4 Aero Limited	20 W. 34th St., N. Y. City.	15 5-passenger H.S.- 2-L Flying Boats	Air ports (owned) at Flushing and Miami.	10.00 to 25.00	.60	4,376	1,500 lbs.	200,000
5 Air Service, Inc.	536 Broad St., Newark, N. J.	1 Canadian J.N.-4 OX5 motor	Field 1500 x 3000' (leased); 1 hangar under construction.	10.00	.85	1,473		13,800
6 Air Transport & Photographic Co.	302 Sloan Bldg., Cleveland, O.	1 Canadian J.N.	Field (leased); test hangar; hangar for 10 machines and repair shop.	10.00	.46	4,000		un- known
7 America Trans-oceanic Co.	505 Fifth Ave., N. Y. City.	1 H.-16; 1 H.S.; 3 Seagulls; 1 F Boat.	Pt. Washington, L. I.; Palm Beach and Miami, Fla.; Bimini & Nassau, Bahamas	10.00 to 15.00				80,000 (est.)
8 Augusta Aircraft Co., Inc.	Augusta, Ga.	2 J.N.-4-D's.	Field (owned); hangar and supply depot.	10.00	1.00	1,000		15,000
9 Beary Aviation Co.	Dallas, Tex.	2 J.N.-4-C's.	Field (owned) at East Dallas, end Gaston Ave., Dallas, Tex.; shop and repairs.	10.00	.40	515		6,120
10 E. B. Bridges	Anderson, Ind.	1 J.N.-4-H.†	Field (rented) 32 acres; tent hangar, sup- ply depot.	15.00	\$50.00 (an hour)	278	240	8,100
11 Canadian Aerial Services, Ltd.	Hempstead & St. Lawrence Blvd., near Montreal, Canada.	1 504-K 1 J.N.-4-C	1 hangar at Hempstead for 2 machines; 1 hangar at St. Lawrence Blvd. for 1 ma- chine. Fields at both (rented).	10.00	.75	445		9,280
12 Canadian Aircraft Co., Ltd.	Winnipeg, Canada	3 504-K's; 2 Cana- dian J.N.-4's.	Field with hangar and shop at St. Charles, Winnipeg.	10.00	1.00	1,500	600	12,000 (est.)
13 Cassell Motor Co.	Santa Fe, N. M.	1 J.-1.†	Field (owned) with 1-shop hangar, equipped with repair shop, gas and oil facilities.	12.50	1.00 per min.	200	200 lbs.	10,000
14 Chattanooga Auto Co. (Aerial Depot)	Chattanooga, Tenn.	3 Canadian J.N.'s 2 J.N.-4-D's; 1 J.-1; 1 Oriole K.-6.	Field (leased), hangar, supply shop.	15.00	.75			

COMMERCIAL AIRCRAFT OPERATING COMPANIES IN THE UNITED STATES AND CANADA — Continued

Name of Company	Address	Aircraft	Air Port Facilities	Charge Short Flight	Charge Passenger Inter-city Flight	Passengers Carried	Freight Carried	Miles Flown
15 Checkerboard Airplane Service	Forest Park, Ill.	7 Canadian and American J.N.'s and J-1's.	Field (owned), 1 hangar, 8-plane capacity, service depot complete.	\$10.00	\$.50 to .70 p. mi.	2,000 (est.)		25,000 (est.)
16 Chenoweth Aviation Co.	Richmond, Ind.	2 OXX6 J-1's; 1 float.	Field (owned), with hangar for 3, shop and supply depot.	10.00 to 15.00	1.00 per min.	300		3,500 (est.)
17 Chester R. Clark Aerial Service Co.	1563 Franklin St., Oakland, Calif.	2 Canadian J.N.'s.	2 fields (owned); 2 hangars (one under construction).	1.00 min. 15.00	1.00 per min.	1,476		15,000 (est.)
18 Cincinnati Aircraft Co.	Duck Creek Rd., Cincinnati, O.	1 J-1	Field (owned) 2680 x 2900 ft.; hangar 50 x 125 ft.	12.50	.50	400		4,000 (est.)
19 Colorado Aviation Corp.	Glenwood Springs, Colo.	1 monoplane*	1 field (leased).			1,500		28,000 (est.)
20 Concord Aircraft Co.	65 N. Main St., Concord, N. H.	1 Canadian J.N.	1 field (rented) with hangar, shop, office.	10.00	.80	500		10,000
21 Connecticut Aerial Navigation Co.	886 Main St., Bridgeport, Conn.	1 504-K. Seagulls M.F. Boat.	Seaplane base (leased) with hangar and storage facilities etc. Black Rock Harbor, Bridgeport; landing field 3 mi. east of Bridgeport.	1.00 per min.	1.00	582		7,000
22 Curtiss Aeroplane & Motor Corp. (Main Company)	Mitchel Field, Mineola, L. I., New York.	Orioles, J.N.'s, J-1's, Seagulls, Eagles.	Field (owned) mile square near Mineola; hangars, supplies, etc.	15.00	1.00	1,000		25,180
23 Curtiss Aeroplane & Motor Corp. (Western Branch)	30 N. Michigan Blvd., Chicago, Ill.	Orioles, Seagulls, J.N.-4-D's, Canadian J.N.'s, J-2's, Eagles.	2 fields (leased) at (1) Sheridan Rd., north of Waukegan; (2) Roosevelt Field at Des Plaines River.	10.00		125		1,600
24 Curtiss Eastern Airplane Corp.	130 S. 15th St., Philadelphia, Pa.	4 Orioles; 1 Seagull 2 J.N.-4-D's.	Landing field with 2 large hangars, repair shop, office, etc., at Pine Valley, N. J.	\$10.00 to 15.00	\$.75	1,000		102,000
25 Curtiss Exhibition Co.	Kenilworth Field, Buffalo, N. Y.	2 Orioles; Canadian J.N.; 4 J.N.'s; 2 K-6 J-1's; 1 OX J-1.	1 field (rented) n. e. of Buffalo, with 2 hangars, shop, etc.	15.00	1.00	1,035		18,000
26 Curtiss Flying Station	Atlantic City, N. J.	1 C-6 Seagull 1 K-6 Seagulls 2 J.N.'s 1 K-6 Oriole	Seaplane base at inlet and airport (both owned); 1 seaplane hangar, 200 x 100; 2 field hangars 8-machine capacity, shop, etc.	15.00	1.50	2,700		30,000

AERIAL TRANSPORT

COMMERCIAL AIRCRAFT OPERATING COMPANIES IN THE UNITED STATES AND CANADA — Continued

Name of Company	Address	Aircraft	Air Port Facilities	Charge Short Flight	Charge Pas.-mile Inter-city Flight	Passengers Carried	Freight Carried	Miles Flown (est.)
27 Curtiss-Humphreys Airplane Co.	Denver, Colo.	5 Orioles 3 J-1's	Field (leased), hangars, shops.	\$12.50	\$1.00	3,500		35,000 (est.)
28 Curtiss-Indiana Co.	Kokomo, Ind.	20 to 30 planes; J.N.-4-D, Canadian J.N., J-1, Orioles, Bomber.** 4 Orioles 6 J.N.'s	80 acre field (leased), 1/4 mile s. e. Kokomo, with hangars, shops, etc.	15.00	.50 to .75	12,000 (total)		500,000
29 Curtiss Iowa Aircraft Corp.	Fort Dodge, Ia.	16 planes; Seagulls, Orioles, J.N.'s, J-1's.	63 acre field (owned) Ft. Dodge; 160 acre field (leased) Des Moines; hangars, shops, service stations both fields.	10.00				
30 Curtiss-New York Aircraft Corp.	319 Main St., Buffalo, N. Y., & 505 Fifth Ave., N. Y. City	6 J.N.-4-D's, 6 J-1's, 3 Orioles.	Fields (owned) N. Y. City (Mineola, L. I.) and Buffalo, N. Y.					
31 Curtiss Northwest Airplane Co.	707 Metropolitan Bank Bldg., Minneapolis, Minn.	3 K-6 J-1's 2 K-6 Orioles 5 OX5 J-1's 6 J.N.-4-D's 4 Canadian J.N.'s 3 Orioles; 2 J-1's; 1 J.N.-4-D.	Field (owned) 880 x 440 yds., bet. Minneapolis & St. Paul; cor. Snelling & Larpenneur Aves.; 2 hangars for 8 ships & 4 ships respectively; 2 shops.	10.00	.80 to 1.00	3,000	800	250,000
32 Curtiss Southwest Airplane Co.	Tulsa, Okla. Ft. Worth, Tex. Dallas, Tex. Houston, Tex.	3 K-6 J-1's 2 K-6 Orioles 5 OX5 J-1's 6 J.N.-4-D's 4 Canadian J.N.'s 3 Orioles; 2 J-1's; 1 J.N.-4-D.	Terminals at Tulsa & Ft. Worth, 160 acres ea. with hangars, shops, supply depots (both owned); fields (leased) with supply depots at Dallas and Houston.	10.00		1,500 (est.)	8,400 (est.)	25,000 (est.)
33 Earl P. Cooper Airplane & Motor Co.	San Francisco, Calif.	1 J.N.-4-D; 1 Cand. J.N.; 1 tractor.**	Field (leased).	10.00	1.00	944		40,500
34 Earl S. Daugherty	Long Beach, Calif.	1 J.N.-4-D; 1 tractor.**	Field (owned) with 3 hangars and supply depot.	10.00	.75	4,300		45,000 (est.)
35 Dayton Wright Co.	Dayton, O.	1 K.T. 1 O.W. 4 Canadian J.N.'s	Field (owned) with hangars, supply depot, shops, etc., at Moraine City, Dayton, O.	10.00		250		10,800
36 DeLuxe Air Service, Inc.	Deal, N. J.	4 Canadian J.N.'s	Fields (rented) at Deal & Spring Lake, N. J.; hangar and shop at Deal.	10.00 to 15.00	.75	500		20,000
37 Dixie Flying Corp.	Birmingham, Ala.	J.N.'s	Field (owned), hangar, etc.	10.00	1.00	400		4,500 (est.)
38 Eastern Aircraft Corp.	340 First St., Boston, Mass.	J.N.-4's	Fields (rented) at Boston & Springfield; latter station fully equipped.	10.00				30,000 (est.)

COMMERCIAL AIRCRAFT OPERATING COMPANIES IN THE UNITED STATES AND CANADA — Continued

Name of Company	Address	Aircraft	Air Port Facilities	Charge Short Flight	Charge Pas.-mile Inter-city Flight	Passengers Carried	Freight Carried	Miles Flown
39 Finger Lakes Air Service, Inc.	Auburn, N. Y.	1 H.S.-2 Flying Boat				235		2,000 (est.)
40 Ft. Wayne Aviation Co.	Ft. Wayne, Ind.	2 J.-1's	Field (owned) 80 acres, with hangars, supplies, etc.	\$15.00	\$.80	150		1,500 (est.)
41 L. D. Frint Aeronautical Co.	Milwaukee, Wisc.	1 J.N.-4-D 1 Canadian J.N.	Field (rented) and large hangar.	10.00	.75	500		15,000 (est.)
42 Valentine Gephart, Inc.	Kansas City, Mo.	16 planes; J.N.-4's, J.-1's.**	Field (owned) 100 acres, hangar 100 x 200 ft., shops, etc.	10.00 to 15.00	1.00			420,000 (est.)
43 Goodyear Tire & Rubber Co.	Akron, O.	1 Pony Blimp, 3 place.	Airship stations (owned) at Akron, Los Angeles & Avalon, Catalina Islands.	10.00		400 (est.) (at Los Angeles)		6,000 (at Los Angeles)
44 Green Bay Aero Club	Green Bay, Wisc.	1 J.N.	Field (owned) and hangar with supply depot.	10.00		500 (Angeles)		5,000 (est.)
45 Gulf States Aircraft Co.	Shreveport, La.	4 planes: J.-2's and J.N.'s.	Use State Fair Grounds, Shreveport, La	10.00	.75	1,000		20,000 (est.)
46 Fred'k. H. Harris	Brattleboro, Vt.	1 J.N.-4-D.	Uses Fair Field one mile north of Brattleboro.	15.00	1.00	100		2,000
47 Heddon Aviation Co.	Dowagiac, Mich.	2 Canadian J.N.'s 1 Swallow. ^o	Field (leased), 40 acres, with hangar and supply depot.	10.00				6,500
48 Holbrook & MacLeod	Hanna, Atlanta, Ga.	1 J.N.-4.	Field (leased) at Hanna, Atlanta, Ga.	10.00	.75	1,200		40,000
49 Hubbard Air Transport Co.	Seattle, Wash., & Victoria, B. C.	2 B.-1 Flying Boats.	Harbor terminals at Seattle and Victoria.	15.00	1.50	25		1,700
50 Jaquith Flying Station, Inc.	317 Guarantee Trust Bldg., Atlantic City, N. J.	2 Model 50-B Flying Boats.	Platform, office, etc., at Madison Ave. and Boardwalk.	10.00	1.00	50		30,000
51 O. K. Jeffery Airplane Co.	Wilcox Bldg., Portland, Ore.	504-K and J.-1's.†	Field and hangars (owned) at The Dalles and Bend, Ore.	10.00	.75	1,500		500
52 LaCrosse Aerial Co.	LaCrosse, Wisc.	1 J.N.-4-D.	Tent hangar (owned).	10.00	.45			15,000 (est.)
53 LaGrande Aircraft Co.	LaGrande, Ore.	3 J.-1's.†	Fields (rented) at LaGrande, The Dalles and Bend, Ore. Permanent station at LaGrande.	10.00				
54 Leschi Aerial Taxi Co.	Seattle, Wash.	Model C Twin float seaplane.	Harbor terminal at Seattle.	15.00		600		9,000

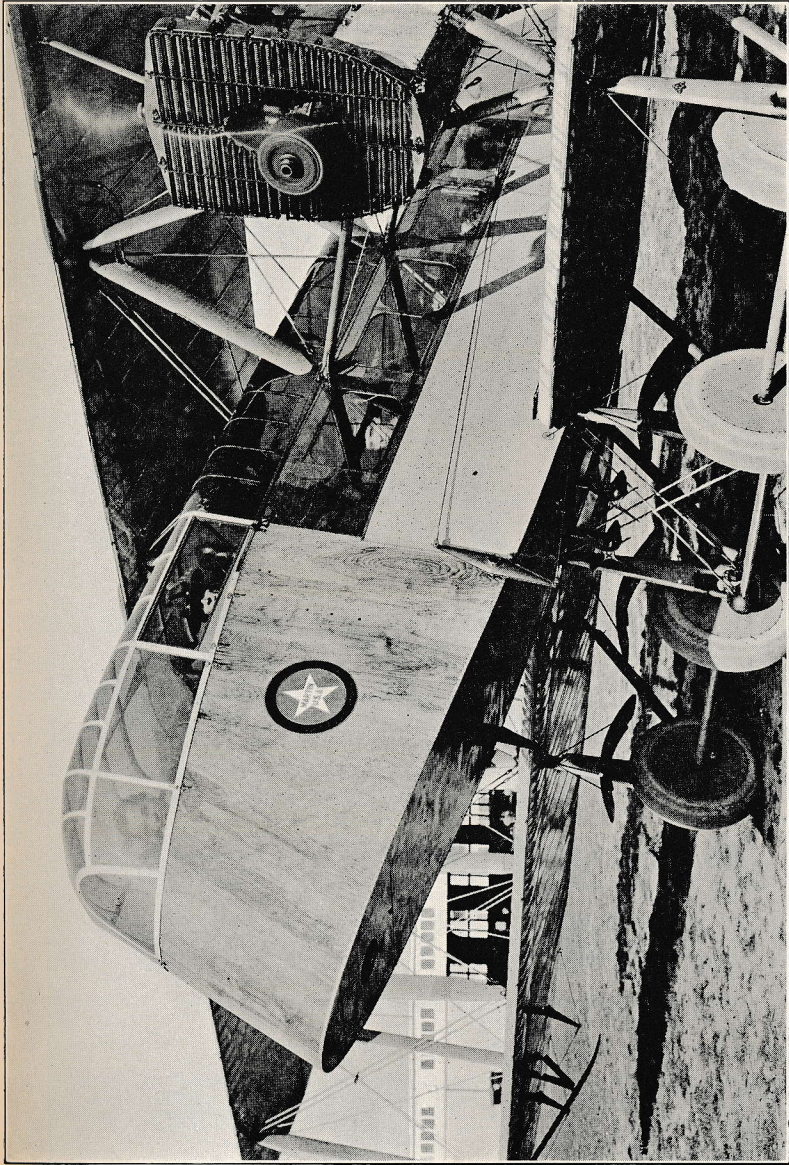
AERIAL TRANSPORT

COMMERCIAL AIRCRAFT OPERATING COMPANIES IN THE UNITED STATES AND CANADA — Continued

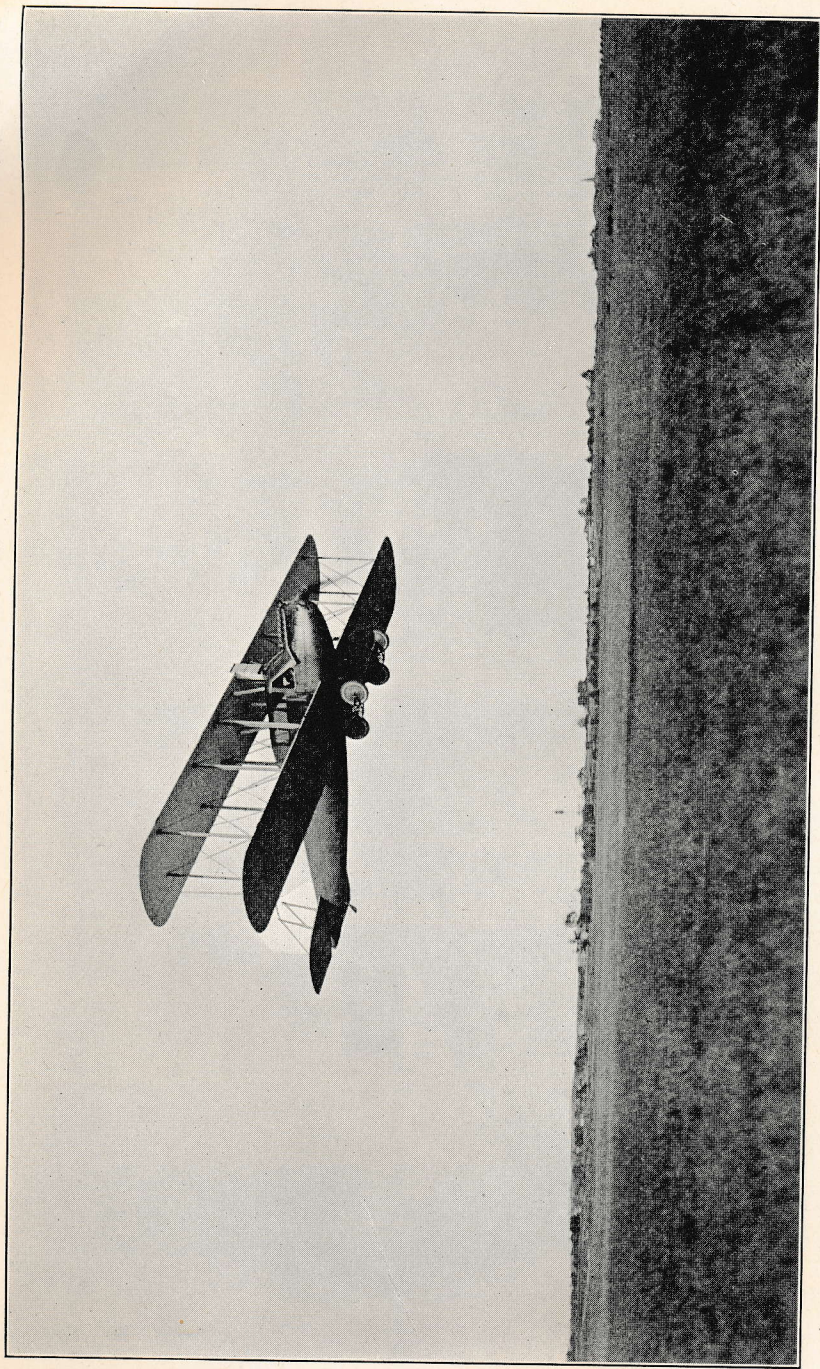
Name of Company	Address	Aircraft	Air Port Facilities	Charge Short Flight	Charge Pas-mile Inter-city Flight	Passengers Carried	Freight Carried	Flown Miles
55 David B. Lindsay	Marion, Ind.	3 Curtiss J.N.-4-D's.	Field (rented), with temporary hangar, etc., ½ mile so. of Marion.	\$15.00	\$.75	927		12,400
56 Floyd J. Logan Aviation Co.	Cleveland, Ohio.	2 Canadian J.N.'s. 1 J.N.-4-D.	Field (leased) on Linndale Rd near Cleveland; 3 canvas hangars for 10, phone, shop, supply, etc.	15.00	1.00	100		10,000
57 Lynchburg Air Service Corp.	Lynchburg, Va.	2 J.N.-4-D's, Orioles, J.-1's.	2 fields (rented) near Lynchburg; one hangar and shop.	15.00		200		3,500 (est.)
58 A. G. McMann	Bettendorf, Ia.	1 J.N.-4-D.	Field (owned) east of Bettendorf with hangar and shop.	15.00		500		5,000 (est.)
59 Martin-Sweet Motor Co.	Denver, Colo.	3 J.-1's†	Field (owned), 40 acres, with 3 plane hangar and shop.	\$15.00		1,000		20,000
60 Mercury Aviation Co.	Hollywood, Calif.	7 J.N.-4-D's, 2 J.-1's† 2 J.L. mono-planes.	3 fields (leased); 2 at Hollywood, 1 Pasadena; 3 hangars at Hollywood, 1 Pasadena; repair shops.	5.00		15,000 (total)		475,000
61 Morrow Aircraft Corp.	Charlotte, N. C.	1 Oriole, 1 J.N.-4-D, 1 Canadian J.N.	Field (owned) at Charlotte, N. C.	15.00		500		7,500
62 National Airway Service Co.	217 Walsh Bldg, Akron, O.	2 J.N.-4's.	Field (rented) at Akron, O., with hangars, repair shops and supply depot.	10.00		300		5,000
63 New York Aircraft Exhibition Corp.	Troy, N. Y.	1 Canadian J.N.	Field (rented) at Troy, N. Y.	15.00		100		8,000
64 Northwest Aircraft Corp.	Newell, S. Dak.	1 J.-1.	Field (owned), hangar and shop; 30'x 50'.	10.00	\$.50	586		3,450
65 Ohio Flying School & Transport Co.	53 Central Office Bldg, Akron, O.	5 J.N.-4's.	Field (owned) 8 mi. n.e. of Akron, 80 acres; hangars, supply depot, shops.	15.00	1.00	3,852	25,000	74,000
66 Oregon, Washington & Idaho Airplane Co.	Portland, Ore.	3 Orioles 2 Seagulls 4 F Boats	Terminals at Portland, Astoria, Seaside, Vancouver, Marshfield, Salem, Eugene, The Dalles; 12 hangars, shops, offices, etc.; Portland hangar accommodates 18 airplanes	10.00				
67 Orlando Aerial Co.	Orlando, Fla.	5 J.N.-4-D's; 1 J.-1.	Portland hangar accommodates 18 airplanes	15.00				4,500 (est.)
68 Osgood & Stickney	Springfield, Vt.	2 J.-1's 1 J.N.-4-D.	Field (owned) 2 mi. west of Orlando. Springfield	15.00		3,000		(est.) 30,000
69 Rankin Aviation Co.	Walla Walla, Wash.	1 J.N.-4, OX motor; 1 J.-1, OX motor.	Field (rented) with hangar and supplies at Walla Walla. Emergency field at Walla Walla.	1.00 min.	.50	862		30,000 (est.)
70 Foster Russell Aviation Co.	Spokane, Wash.	1 Oriole; 1 J.N.-4-D, 1 J.-1.	2 fields (leased), one at Spokane and other at Walla Walla.	10.00	.50	1,500		

COMMERCIAL AIRCRAFT OPERATING COMPANIES IN THE UNITED STATES AND CANADA — Continued

Name of Company	Address	Aircraft	Air Port Facilities	Charge Short Flight	Charge Pas-mile Inter-city Flight	Passengers Carried	Freight Carried	Miles Flown
71 Saginaw Aviation Co.	Saginaw, Mich.	1 J.N.-4-D, 2 J.-1's 3 J.-1's	Field (leased), Saginaw East Side, 1 mi. from city; hangars, shop, supplies.	\$12.50	\$.50	1,450		15,000 (est.)
72 Santa Maria Aviation Co.	Santa Maria, Calif.	3 J.-1's	Field (leased), at Santa Maria, Cal., ½ mile square; 1 hangar.	15.00				
73 Security Aircraft Co.	Minneapolis, Minn.	Orion; J.N.'s; J.-1's; 504-K's	Field (owned), Minneapolis; hangars, shops, etc.	15.00	1.00	3,000		12,000
74 Service Aviation Training & Transportation Co., Inc.	Wabash, Ind.	11 Canadian J.N.'s.	Field (owned) at Wabash, Ind.; hangar 120' x 65', shop, etc.	10.00 to 15.00	.75	9,355		90,000 (est.)
75 Miss Neta Snook	828 Wilson Ave., Ames, Iowa.	1 J.N. biplane.	Air terminal at Ames, Ia.; hangar, supply station.	10.00 to 15.00		882	480	2,900
76 Starkey Battery Co.	Muskogee, Okla.	2 under construction.	Field (owned) west of Muskogee.	10.00		2		20 (est.)
77 Southern Aero-plane Co.	11 S. Church St., Charlotte, N. C.	3 F.-40 & F.-46.	Terminal at Charlotte, N. C., and Fairmont, W. Va. (one owned, one leased); hangar and supplies at Charlotte.	15.00	1.00	1,249	1,100	20,000
78 Southern Wyoming Aircraft Co.	Cheyenne, Wyo.	1 J.-1.	Use municipal field, all supplies available.	15.00	2.00	500		15,000
79 Syracuse Aero Corp.	239 Union Bldg., Syracuse, N. Y.	3 J.N.-4-D's.	Field (rented) n.e. of city; hangar for 6 planes, service station.	15.00	.75			
80 Tahoe Aviation Co.	Lake Tahoe, Calif.	1 N.-9 seaplane,† 1 J.N.-4-D.	Fields (owned) at Lake Tahoe and Honolulu; hangars and runway (under construction) at Honolulu.	10.00		130	2,000	2,000 (est.)
81 W. S. Stoddard Aviation Co.	1803 3rd Ave., Utah.	4 J.-1's.	Field (owned) with 8-plane hangar, supplies, etc.; 1 min. from city.	10.00	1.00	551		11,000
82 Uvan Airplane Co., Inc.	343 S. Main St., Salt Lake City, Utah.	1 Oriole.	Field (rented), Salt Lake City.	12.50 to 15.00	.75	275	150	8,000
83 Vancouver Island Aerial Service	Comox Harbor, B. C.	1 J.N.-4-D converted to seaplane.	Use harbor floating-hangar and shop.	10.00 to 15.00	.75	283	600	11,000
84 Walter T. Varney Aeroplanes	832 Post St., San Francisco, Calif.	6 J.-1's; 2 J.N.-4-D's; 1 Tourer.°°	Field (owned) at Redwood City, Cal., 2 mi. x ½ mi.; hangars and supply depot.	15.00		800		45,500



The Glenn L. Martin Twelve-passenger Commercial Plane



Curtiss Ten-passenger Liberty-motored "Eagle"—"The Aerial Pullman."

COMMERCIAL AIRCRAFT OPERATING COMPANIES IN THE UNITED STATES AND CANADA — Continued

Name of Company	Address	Aircraft	Air Port Facilities	Charge Short Flight	Charge Pas.-mile Inter-city Flight	Passengers Carried	Freight Carried	Miles Flown
85 Waterloo Aero Transportation Co.	Waterloo, Ind.	1 Canadian J.N.	Field (rented), 1-plane hangar, shop.	\$10.00	\$.75	350		3,500 (est.)
86 Western Aeroplane & Motor Corp.	Casper, Wyo.	1 J.N.-4; 2 Orioles; 2 J.-1's.	Field (leased); hangar for 5 planes, complete shops, etc.	10.00 to 15.00	1.00	500	800	4,000
87 Yakima Aviation Co.	Yakima, Wash.	1 J.N.-4-D; 1 J.-1.	Field (owned), at 3rd St., So. Yakima, Wash.; 1 hangar, shop, etc.	15.00	1.00	2,520		12,000
88 Zenith Aviation Co., Inc.	Santa Barbara, Calif.	2 Canadian J.N.-4's.	Field (leased) with hangars, supplies, shop, etc., at Ocean Blvd.; seaplane landing dock.	5.00	.50	1,400		20,000
Total		365 to 425	128	\$12.50 (av.)	\$.65 (av.)	115,163	41,390 lbs.	3,136,550

KEY TO AIRCRAFT AND ENGINE TYPES

50 and 50-B-2, three-place flying boats, Aeromarine engine; F-5-L Navy Cruiser, fourteen-place flying boats, Liberty engine; built by Aeromarine Plane and Motor Company, Keyport, N. J.
 B.B.-L., three-place land plane, Hall-Scott engine; B.-1, two or three-place flying boat; C, twin float seaplane; built by Boeing Airplane Company, Seattle, Wash.

J.N.'s of the various types, two-place land planes; Oriole, three-place land plane; Seagull, three-place flying boat; F, and M.F., two and three-place flying boats; Eagle, ten-place land plane; H.S. and H-16, six to sixteen-place flying boats; OX, K and C engines; Liberty engines in larger types; built by Curtiss Aeroplane and Motor Corporation, Garden City, L. I., New York.

K.T., two-place land plane; O.W., three-place land plane, Liberty engine; built by Dayton Wright Company, Dayton, O.

J-1 and J.-2, two and three-place land planes built by Standard Aircraft Corporation, Elizabeth, N. J., and rebuilt by Curtiss Aeroplane and Motor Corporation or others.

† indicates Wright engine built by Wright Aeronautical Corporation, Paterson, N. J.

‡ indicates Liberty engine built by Packard Motor Car Company, Detroit, Mich.

§ indicates engine built by Hall-Scott Motor Car Company, Berkeley, Calif.

F-40 and F-46, French Farman; J.L. monoplane, German Junker; 504-K, British-Avro; * Lark monoplane; ** French Breguet; *** Daugherty tractor; ° Laird landplane; °° British Bristol.

The operating companies report a total of 222 forced landings and 88 accidents.

(The above is based upon statements made to the Manufacturers Aircraft Association, Inc., in response to questionnaires sent to all known operators of aircraft. No opportunity has been available to determine the accuracy of the information and no responsibility is taken for the data except for the care with which the figures and facts are reported and the manner in which the summary is presented.)

CHAPTER III

MAIL AIRCRAFT FLY 8,000 MILES DAILY; LINES LINK UNITED STATES WITH CANADA AND CUBA; TIME BETWEEN ATLANTIC AND PACIFIC REDUCED BY 42 HOURS; MANY EXTENSIONS PLANNED

THE United States Air Mail, which started with the New York-Washington route May 15th, 1918, now operates daily between New York and San Francisco, St. Louis, Minneapolis and St. Paul, and New York and Washington, a total of 3,460 miles.

Private aircraft companies are transporting the mails by contract between Seattle and Victoria, B. C., and between Key West and Havana, Cuba, a combined distance of 174 miles.

Thirty-five or more cargo-laden Air Mail planes are actually in the air each day, flying a grand total, in round trips, of approximately 8,000 miles.

The Post Office Department has recommended to Congress the extension of Government-operated routes between Boston and Detroit, by way of Buffalo; between Chicago and Los Angeles, by way of Kansas City; between St. Paul, Minneapolis and Seattle, and between St. Louis and New Orleans by way of Memphis, these routes aggregating 4,770 miles, one way.

Contracts have been let for mail transport services from Pittsburgh to St. Louis by way of Columbus, Cincinnati and Indianapolis; from New York to Atlanta, by way of Washington, Raleigh and Columbia; from New York to Chicago by way of Harrisburg, Pittsburgh and Fort Wayne; and from Cleveland to Detroit. These contract routes, with a total mileage of 2,260, were expected to be in operation by the Spring of 1921.

If the plans under contemplation go through, the United States should witness, late in 1921, the operation of a gigantic Air Mail system with terminals in most of the larger cities, and with aircraft flying more than 20,000 miles every day.

The first eight months of the Air Mail Service, between May 15 and December 30, 1918, 119,006 pounds or 4,760,240 letters were carried. The next twelve months, or during the calendar year of 1919, 471,762 pounds, or 18,870,480 letters were transported by mail

planes. The extension of the transcontinental system, operating from Coast to Coast early in September, 1920, so added to the quantities of mail flown between terminals that an approximate total of 2,800,000 pounds or 103,000,000 letters were transported during the twelve months of 1920.

HOW IT SAVES TIME AND MONEY

The longest Air Mail route at present is that between New York and San Francisco, operated in relays by way of Cleveland, Chicago, Omaha, Cheyenne, Salt Lake City and Reno. From 400 to 1,000 pounds, or from 16,000 to 40,000 letters are carried each way daily between each division point.

By co-operating with the railroads and making train connections, the Air Mail advances mail east and west from 24 to 42 hours. About 16,000 letters are advanced daily into San Francisco and New York by 42 hours and approximately 40,000 letters are advanced daily between these terminals by 24 hours. The saving in time over trains on this cross-country route is about three days, when actual delivery is considered.

The Aeromarine and West Indies Airways, Inc., flying the 90 miles between Key West and Havana differs in its operation, though it saves even more time when distances are compared. Aeromarine flying cruisers leave Key West immediately on the arrival of the northern trains and land the mail in Havana in one hour and thirty minutes. On account of boat schedules it formerly required a night and almost a half day.

Many days, sometimes a fortnight, can be saved in the movement of American-Asiatic mail by the operation of Edward Hubbard's Boeing seaplanes, 84 miles each way, between Seattle and Victoria, B. C. Transpacific steamers clearing from the Canadian port make far better time to the Orient than those from San Francisco. Heretofore all of the Seattle-Vancouver mail was carried by a Puget Sound steamer. Frequently the trains from New York arrived late in Seattle and the consignments of letters missed the ferry and consequently had to lay over for the next sailing to the Orient. The seaplanes, unlike the surface boats, wait for the mail, cut down the time between terminals to about one hour and make the desired connections.

QUICKENING OF COMMUNICATIONS

One can scarcely grasp the tremendous significance of the Air Mail in its relations to world communications until the mind runs back for a moment through the development of the postal service.

On first learning to write, man's foremost desire was to get his message delivered as quickly as possible. Thus in the ancient civilizations of Africa and Asia, runners carried clay tablets from city to city, and galleons skirted coasts or threaded rivers with cargoes, of which the inscribed word was a precious feature. In the progress of transportation we may trace the influence of the mails. Runners were succeeded by horsemen or coaches, packets by steamers, coaches by trains — and now enters the airplane.

The establishment of the transcontinental Air Mail September 8, 1920, provided a picturesque and startling contrast to the Pony Express and the tortuous sailings around the Horn. It has quickened written communication and relieved the over-burdened older forms of transportation. Within the memory of some now living it once required six months to transport a letter from New York to San Francisco with a charge of \$10.00 an ounce. The perfected operation of the Air Mail will make it possible to send a letter from Coast to Coast in from thirty-six to fifty hours, at the usual two-cent rate.

When the Air Mail was started it had comparatively few supporters. Only those in the department, the air services or the industry who possessed vision, could foresee other than failure, and even many of them were skeptical. The rapid growth of the system is due to the peculiar adaptability of aircraft, to devotion to duty on the part of the personnel and to the help which the Army provided in the early days during the war when the Post Office Department first prepared to fly the mails.

HOW THE ARMY HELPED

In the beginning the Army Air Service turned over for this work six Curtiss J. N.-4-D. training planes and detailed six lieutenants to fly them back and forth between New York and Washington. The newspapers made much of the event, but regarded it rather as an experiment. It was proposed to carry 200 pounds of letters for an average non-stop flight of three and a half hours. The Air Mail and Army pilots worked night and day. Unsatisfactory terminal facilities, mechanical difficulties and inexperience with adverse weather conditions were handicaps to be overcome. And they were overcome, for from the very start the "experiment" proved a success.

The pilots navigated through snow and rain storms, sleet and fog. One pilot in particular persisted in taking out the mails when his plane was the only machine aloft. He conducted all sorts of experiments in compass navigation. Knowledge thus gained enabled

him to fly on a comparatively straight course even in the fiercest storm and thickest fog.

During this period the service was operated by the Army. Three months before the Armistice it was turned over to the Post Office Department. Six other planes equipped to fly for an hour longer than the training machines were added to the first squadron until November that year, when the department formally took over the service. In addition to the twelve machines, it received from the Army Air Service six Curtiss R.-4 planes powered with Liberty motors.

There was much speculation regarding the Liberty engine at that period, but the Air Mail worked them steadily and demonstrated their worth. The six original machines, Curtiss training planes, are still in daily service between St. Louis, Chicago and Twin Cities. The first one to carry mail had flown more than 25,745 miles up to October 1, 1920. Five of the Curtiss R.-4's are still operating on the New York-Washington and New York-Cleveland routes.

AIR PATHS ACROSS THE CONTINENT

The transcontinental route was planned that first year. In September two pilots made pathfinding flights from New York to Chicago, flying one way each day. After the Armistice the War Department turned over one hundred De Haviland-4 machines and the Air Mail Service endeavored to place them in operation between New York and Chicago. It was then found that alterations had to be made.

While the department was seeking commercial planes, the L. W. F. Engineering Company set to work reconstructing one of the Army surplus D. H.-4's. Longerons were made firmer by sheathing in nickel steel. Steel tubes strengthened the landing gear. Axles were set ahead a bit, thus reducing to a minimum the tendency to nose over on landing. The pilot was transferred to the rear seat. The test flight of this machine, witnessed by Government officials and representatives of the industry, proved the soundness of the policy guiding the alterations. Many of these planes are now carrying mail.

Incidentally it was their successful use that led the Army Air Service to make similar modifications. These machines have become one of the favorite types with pilots in both services. Considerable numbers have been reconstructed by the Aeromarine, Boeing, Dayton Wright, Gallaudet, Thomas-Morse and other companies.

The Cleveland-Chicago route was opened with the first dozen of these planes. Regularly scheduled flights commenced on May 15th,