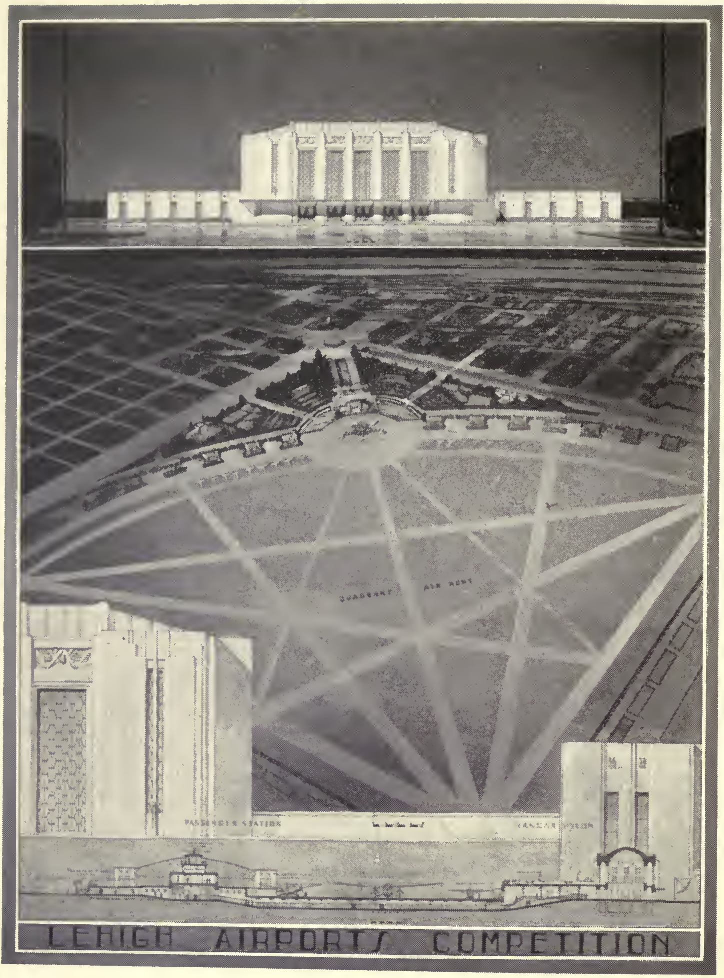
# *Aviation's Place In Tomorrow's Business*

By the Same Author

THIS MAN HOOVER

LINDBERGH FLIES ON




First Prize of $5,000 in the Lehigh Airports Competition Won By A. C. Zimmerman and William H. Harrison, Associated Architects and Engineers of Los Angeles, California

# *Aviation's Place In Tomorrow's Business*

*By*

EARL REEVES

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## INTRODUCTION

"ETANA the shepherd" tended his flocks on the plains near Ur in a day that lies beyond the dawn of history.

Just how far beyond, we do not know. But the tale already was old some fifteen hundred years before the birth of a man named Abraham, in a house in the goldsmith's quarters in Gay Street, caused the name of the Sumerian capital to come down to us.

Etana lived and the metropolis thrived as an economic unit built upon agriculture, river commerce, and certain industries, while Egypt still struggled through the dark ages of barbarism.

And one day he flew to heaven on the back of an eagle, but when he had almost reached his goal he was cast down to earth again.

There, as recorded in cuneiform characters on baked bricks, is the earliest tale of flight by man. Etana was no kingly hero, no warrior seeking to emulate the gods: the Etana of this myth was a lowly shepherd, and bound upon a purely commercial venture. His flocks were sterile; and it was well known that in the heavens above the Euphrates the gods of Sumer grew a certain herb which was the source of all life. Etana would prosper greatly, could he but bring back to earth a slip of that herb and plant it in his own fields.

For more than 6,000 years following the age of Sumer flight remained a myth.

Only yesterday, when the various islands of the Hawaiian group were knitted more closely together by airways, a new legend came to light. In the days before the white men came to Oahu — and therefore, one supposes, before the native stalwarts were softened by civilization — courageous young men played a game which consisted of launching forth on a wicker platform to glide from clifftop to the sea. These frail craft they balanced skilfully, and with them landed as gracefully as a seagull.

This was heroic sport, Etana's venture was "commercial aviation"; but they were alike, and similar to other tales of flight in this — through the ages flight always appears to have been accomplished by earlier, sturdier, more god-like forbears of the peoples who cherished the tale.

Now that we have brought it finally into the Present, as a thing *achieved,* and by our contemporaries, there remains about it a halo almost mystical, a glamour sometimes blinding.

Great pilots take on heroic stature; and the followers of Etana, those who strive to make of aviation a "gainful pursuit," sometimes are assumed to have almost magic powers. *They* would be the first to proclaim that at no altitude has that herb which is the source of life been discovered. It might have given a Midas touch to the business of the shepherd of Ur; but *the business of aviation must be built, bit by bit, with* *meticulous care and exactness, and by hard-headed men, guided by lessons learned.*

In so far as is practicable, this book endeavors to look at this gigantic task-in-hand through the eyes of those who are building for tomorrow.

Here and there through the following pages these men speak of their visions or reveal fragments of the lessons learned. Those lessons will mean much to business as a whole. No one can say how much, as yet, or exactly what. Nor can one profess to write any complete, scholarly, or profound dissertation on the subject of commercial aviation — now.

Writing about aviation is like building aviation in that: you build with what you have and know, and you write of what exists and is known. That thing which is may be scrapped tomorrow, and the thing you know may no longer be true. Very well, then, rebuild — and rewrite.

Out in Indiana we used to say that two men were needed to describe the passage of a certain crack train.

One to say, "Here she comes."

Another to say, "There she goes."

Aviation is faster than that.

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# CHAPTER I

## *Aviation Becomes An Industry*

Careful and studious men created the aeronautical science. These cautious experimenters were the first to fly. The first pilots were pioneers in the field of knowledge. As a necessary evil, they became builders and operators for profit; but that phase of it occupied an obscure fraction of their interest, and attracted less public attention.

Men without fear followed. Men gifted with unusual physical attributes, quick of eye, with abnormal reflexes, and a muscular joy in speed, dexterity, daring. These made of the airplane a stunt, a weapon, an aid to exploration, a vehicle of deadly contests.

The designers continued to struggle toward greater efficiencies. War added rewards as well as pressure. But it also gave false stimulation, and was followed by almost disastrous retrogression.

It was the "birdmen" who held public interest: the builders struggled without cheers and were scantily rewarded. These last knew only too well that they survived only because the new plaything was a weapon of war.

The turn has come only within the last 2 or 3 years.

Essentially, the corner has been turned only in the United States. Elsewhere, aviation remains "in the air," a thing without strong tap roots, partially owned by governments or having as a major support a national subsidy. Here, aviation is beginning to walk with its feet on the ground.

Aviation has become an industry.

It is an industry of perplexing problems, the complexity of which is increased by the fact that it operates in a new element. A re-education of the public is involved: the builders of aviation campaign to make us "air minded." New standards of precision are set up; new processes, new metals, new fuels demanded; finer problems arise to confront the engineer.

Aviation is industry, transportation, and commerce; and the establishment of it quickly on a gigantic scale offers a problem in finance such as seldom, if ever, has been met in the past.

It should be apparent, therefore, that any approach to the subject brings us face to face with fluid situations, with processes in experimental stages. Aviation is an unfinished story — a story scarcely begun. Perhaps, in the minds of some, a thing about which no definite account can be compiled as yet. But already it touches us so closely; it beckons to our youth and to our dollars; it is beginning to have its effect on the older industries and businesses, and far-sighted men strive to foresee the growing magnitude of that contact. A survey of aviation as it is, an industry in a formative stage, should be useful beyond the confines of the industry itself. A study of the foundations being laid points the way to the future. A look at the men who are building may give guidance, in many ways, to those who are considering aviation as a vocation, to investors, to the business men generally who will be using a new vehicle. Guided by such considerations, this survey is attempted.

The Wrights first flew at Kitty Hawk, December 17, 1903, at a speed of 40 miles per hour. Speeds in excess of 300 miles have been attained. That first plane weighed 750 pounds and was driven by a 12-horsepower engine. There are planes in standard production today very little heavier, which have 50- to 100-horsepower engines and speeds of 90 to 100 miles per hour.

Every hour of every day such as these are going aloft, each with its load of one or two venturers — seekers of new experience, who become potential customers of the newest infant industry.

At the other extreme, Europe experiments with 100-passenger giants; while in the United States, planes are in standard production for 20, or even 30 passengers.

Industrial progress may be measured by the fact that there occur constantly new contests, not for the exceptional plane, for the stripped and doctored racer, but for planes plucked off the assembly line — for standard models. One such spans the continent in

17½ hours. Another remains aloft 420 hours. We have here the "stock-car" performance records all over again; and, as in the automotive field, the feat is followed by advertising and selling campaigns.

But there are feats less widely advertised which constitute measurements of progress and forecast the future:

Hermann Steindorf, at Travemunde, Germany, takes a temporary place in the sun by establishing a new record for pay load carried to 2,000-meter altitude: his trimotored Rohrbach rises to a 1¼-mile elevation carrying more than 7 tons.

In France, Commandants Girler and Weiss, flying a Briguet plane, speed at 117 miles carrying a 5½-ton pay load.

Soon these may appear as pigmy feats, but today they are prophetic. Of our standard "big planes" of today, 4 have a pay-load capacity of around 2 tons, and their speed range runs from 122 to 150 miles an hour.

Willi Neuenhofer, a German Flyer, permits our own Apollo Soucek to hold the altitude record for just 16 days: he soars to 41,794 feet — 8 miles.

Beyond the zone of public attention, "lesser affairs" of this sort move forward. Literally, scores of records are striven for, recorded, and their lessons studied. Doubling or tripling the pay load may mark the margin between life and death of an industry such as this. To most of us 8 miles in air would seem to have scant significance; and yet passengers are carried daily in the United States at an altitude of approximately $2\frac{1}{2}$ miles, and when the engineers have juggled their equations a while longer it is very probable indeed that they will be shooting us through space at a much higher altitude than that, regularly, not merely to skim the crest of a mountain range, but as a matter of swift, comfortable, economical flight.

Such things give us a glimpse "around the next corner." The commonplace achievements of tomorrow will be proved to have foundations reaching downward through years of ceaseless and careful experiment and test.

Looking backward, one of the foundation stones of commercial aviation, of aviation as an industry, is to be seen in a now almost forgotten event which occurred on May 29, 1910.

After the Wrights first proved that man could fly, a period ensued in which the new art seemed all but to mark time. New experimentation was in progress. The riddles of those first attempts had to be read. Then, after a few years, there was a flutter of activity by several pioneers. A passenger was carried. It seemed to be a miracle. A woman went aloft, and the public heard of it in amazement. In Europe, Orville Wright established an "endurance record" of 1 hour in the air. Then Wilbur flew 94 miles.

Bleriot won the *Daily Mail* prize by flying across the Channel, faintly suggesting that the day of Britain's safe isolation was drawing to a close.

Over here a prize of $10,000, offered by the New

York *World,* beckoned the pioneers to an Albany-New York flight, and for many months had beckoned in vain.

Finally, Glenn Curtiss prepared for that attempt. Aero Club officials and dozens of reporters foregathered for the event. But day after day a stiff wind blew up river, and day after day Curtiss looked over the weather conditions and postponed the flight. A Poughkeepsie newspaper suggested that Curtiss caused "a pain in the neck" as he didn't intend to fly, but merely sought publicity. The whole nation was on the alert, and restless, watching this little journey with an interest like that bestowed, 17 years later, on the preparations for the Paris flight.

At 7:02 on the morning of May 29, Curtiss started in his *Hudson Flier.* The Aero Club representatives and newspaper men started southward aboard a special train. Curtiss said later:

> I kept a close lookout for the special train, which could not get under way as quickly as I had, and pretty soon I caught sight of it whirling along the tracks next to the river bank. I veered toward the bank and flew along even with the locomotive for miles.
>
> It was no effort at all to keep up with the train, which was making 50 miles an hour. It was like a real race and I enjoyed the contest more than anything else during the flight.

He had no difficulty keeping up with the train! That was the fact which was sent home to the millions who read that day's newspapers. A stop of 1 hour was made for fueling, but the 152 miles was flown at an average of 56 miles per hour!

This was a notice to America that the new wonder machine of the Wright brothers one day might be expected to take its place as "transportation." Here was the modern prototype of that historic race between one of the first steam engines and a horse and carriage. As history, it was in no way of Kitty Hawk magnitude, but certainly the flight ranks as aviation's first great transportation milestone. Like the Lindbergh flight, this early achievement served as an "awakener."

The chief pioneer builders, then, were the Wrights, at Dayton; Curtiss, who was located at Hammondport, N. Y.; and Glenn Martin, who was building some planes for the government at Los Angeles.

However, the airplane continued to be a curiosity. Management of an "air circus" or two became a necessary part of the functions of airplane builders. Daredevil fliers were on the staff and were sent about the country to perform at fairs and similar events. The income from this side line was, in all probability, greater than from manufacturing in most cases.

The World War found a few airplanes in the armies of the belligerents, the general idea being that the plane would be able to act as eyes for advancing armies.

Before the war ended, it will be recalled, the plane had won recognition as a fighting machine. The cry was for speed, for pursuit ships, and for carrying capacity, in bombers. We know that hundreds of our young men went aloft in training ships — which were not very good. Nevertheless, there were giants which picked up 1,000-pound loads of bombs, and the aces battled in planes which seemed to us to be of an incredible swiftness. Out of some wedding of the two would come, no doubt, a vehicle of some real import to the millions in peace.

Out of our cooperative industrial effort in the war was born a production schedule of amazing size: 16,000 airplanes, with motors, delivered; 25,000 separate motors delivered; a rate of 4,000 motors per month, on a schedule which was to have grown to 10,000 motors per month by March, 1919; and as the war ended, a single order for 5,000 pursuit planes, as the result of a design contest won by Grover Loening!

All these things implied that the gift of the Wright brothers had reached a state of perfection in which it would begin serving us in commerce. Moreover, our organizing and manufacturing genius had provided the productive channel.

When the World War ended, Europe, aware that her map had been shrunk ominously and that individual national isolation was a thing of the past, cast about for means of keeping this air weapon burnished. By gigantic subsidies, European nations tried to put the airplane to peaceful work; while, at the same time, building new military reserves in aeronautical equipment.

At the end of the war, it became evident that we were all but finished with the airplane. War contracts had to be adjusted. Huge war surpluses existed — a threat over the heads of the manufacturers. Automotive plants had helped build airplane engines, and these turned to the regular lines. Federal economy was a necessity of the hour. Among the designers, there was a difference of opinion: Loening concluded that already the war planes were all obsolete and would have to be replaced, and he went into the business of building for the war services; whereas the Curtiss plant, while maintaining its military divisions, sought a postwar outlet in "jitney-ride" planes.

It is the judgment of leaders now that it was just as well that there was no blossoming of commercial aviation at that time. Government and public alike were indifferent to the supposedly "magnificent" possibilities in peace of the planes which had been developed for war. From this vantage point, that equipment does not seem so marvelous: it was, in fact, not fit for commercial use.

Looking backward now we can surmise that in all probability the longest way around will prove to have been the shortest way home.

It was a very rough way around, in the years immediately after the war. Only the *Gypsy* flew in America, while giant transports were beginning to shuttle the main routes of Europe. A few plane and engine plants were kept alive by spasmodic army and navy orders, but the greater number disappeared. The survivors were "investigated" by congressional bodies at frequent intervals: there were some 20 investigations in all.

In 1925, a committee appointed by Secretary of Commerce Herbert Hoover also "probed" aviation; but for the first time a governmental pronouncement came forth which dealt solely with commercial phases, and constructively.

Hoover contributed a foreword in which he said:

> The element of time saving in transportation has a large economic importance. Today the airplane is the fastest means of transportation.
>
> It is evident that during the last few years the development of aviation in this country has been steadily approaching the point of self-supporting application through private initiative in commercial transportation. It is not necessary that the government should subsidize commercial aviation in this country, but it is highly necessary that it should provide certain services which are essential as a basis for its development. The government has rendered such services for over a century in connection with ocean navigation, and there should be created without further delay a Bureau of Civil Aeronautics in the Department of Commerce through which the government shall make possible the development of commercial aviation by providing navigational aids and regulation.
>
> The United States leads the world in railway and motor transportation. It will undoubtedly make rapid progress in the commercial use of airplanes.

The second great landmark of that year was the Dwight Morrow report. He had headed a fact-finding committee appointed by President Coolidge. The findings resulted in the Air Commerce Act, the Five-year Programs of the Army and Navy, the Aeronautics Branch in the Department of Commerce, and the coordination of air efforts through undersecretaries for aviation in the departments of Commerce, War, and Navy.

Among the many constructive provisions — including establishment of airways, lighting, licensing, inspection, etc. — it imposed upon the Secretary of Commerce the "duty of fostering the development of the air commerce of the United States."

The man upon whom that duty fell now sits in the White House, while the author of the report attains further fame by becoming the father-in-law of Col. Charles A. Lindbergh.

While this Magna Charta of American aeronautics was being written, the engineers were winning new victories, though silently, and many of the disabilities which would have made any blossoming of commercial aviation in 1919 impossible and disastrous had been removed from the airplane and its power plant.

The heroic feats of 1927 awakened us to the fact that aviation was *here,* next door, a near neighbor — no longer a thing beyond the horizon of our everyday reckoning. But daring young men did not risk their lives out of any sudden whim, or merely because there was a prize awaiting the winner of a trans-Atlantic race. That prize had been posted and waiting for several years.

Young men came out of the dim hinterlands of airmail route and testing field into the seaboard publicity glare at that time because the silent engineers finally had worked out power plants and planes which had something more than a Chinaman's chance of spanning the Atlantic.

From a mechanical standpoint somehow that longest way around had proved to be the shortest way home — to real aeronautical achievement — as the subsequent records showed.

Through 10 long and troublesome years, also, we appear to have traveled a shortest route to aeronautical commercial supremacy.

Gianni Caproni, eminent Italian designer, says:

> The United States is the only country in the world which possesses a really great aeronautical industry, strong financially and adequately equipped not only economically but commercially. The aeronautical industry there stands on its own feet.

Our foundations are sound; those of Europe are built on subsidy.

That Europe still leads has been a popular belief, and a fallacious one.

During 1928:

Our air transports carried more pay load than those of Germany.

Our planes flew on scheduled routes almost as many miles as were flown by the transports of Germany and France combined.

During 1929:

We were passing Germany in volume of passenger traffic.

We had 180 airplane factories listed, of which 55 were on production basis, as against 71 aircraft factories in all the other countries of the world.

We had in operation 7,100 commercial and civil airplanes, as against an indicated 3,000 for all the rest of the world.

Aviation has become an industry.

## CHAPTER II

### *When Lindbergh Awakened Us*

For purposes of comparison, the situation which existed immediately following the epochal flights of Lindbergh and of Byrd and Chamberlin, in 1927, is of interest.

It was a year of great flights, a year of stunt bedecked skies; and there were some familiar with the lean years that had gone before, who, very soon after the Paris flight, began scanning the situation of that portion of aviation which walks with its feet on the ground.

"When will aviation walk up to the banker's window and demand and receive the same accommodations now extended to the older and more firmly established industries?" was a question put to the writer. An exposition of the answer was desired as a magazine article.

It was, in that dim day, rather a daring question — and especially so as having been put by the *Journal* of the American Bankers' Association. The survey then made led to a suggestion that aviation might swoop down upon us as a banking problem with all the speed of the fastest pursuit plane.

Some fragments of basic fact considered noteworthy at the time were:

An airplane engine, in a factory test, had been run 300 hours, full speed, without stopping; and that was considered to be the equivalent of a 30,000-mile nonstop flight.

Mail planes, 1 each day, were crossing the continent in 31 hours, with a record of 95 per cent of the trips completed on time.

There were only 8 companies carrying passengers through the air; but 1 of these had a record of almost 500,000 miles flown, without a fatality.

In military service, including hair-raising tests and tactical manoeuvres of the most dangerous sort, the fatalities had been reduced to 1 in 273,510 miles of flying.

America already had the longest commercial air line in the world — National Air Transport, which operated over 1,726 miles, between New York and Dallas.

Insurance companies had "recognized" aviation, and were beginning to write air insurance covering all risks in a single policy.

The great express companies were just beginning to negotiate contracts for 100-miles per hour service, via the air route, for high pay loads.

And to this summary, add a little item which is rather important for its size: the mere addition of wheel brakes to landing gear had cut in half the length and speed of landing glide, vastly reducing the hazard.

Secretary of Commerce Herbert Hoover had said in an interview:

> Mail transportation is here and express transportation is in sight. It is doubtful if a passenger service will pay now, and that is why at this time we should concentrate on express and mail.

Similar views were expressed to the writer by Gen. John F. O'Ryan, who had a double claim to fame as commander of a famous division in France and head of one of the first big air lines of the East, Colonial Air Transport. General O'Ryan said:

> We operated a Fokker trimotor plane, with 8-passenger and baggage capacity, 140,000 miles without property loss or fatalities, but we have withdrawn it from passenger service for the present. It did not pay.
>
> The passenger charge per person, between Boston and New York is $30 — in other words, 20 cents per pound or less; the express rate is 80 cents, and the contracted mail rate $3 per pound.
>
> The plane cost $40,000, and operating costs were correspondingly high. The insurance charge alone — giving protection to the plane and contents, to passengers and crew; and covering damage that might be done to public and property below in case of a crash — was $8,400 a year.
>
> You will see readily that passengers pay a relatively lower rate and necessitate a much higher mileage cost of operation.
>
> A good quality, single-motor plane, fully equipped, costs $14,000 and has a carrying capacity of 800 pounds. Under present conditions, such a plane should average a return of about $1 per pound for a moderately long trip.

Manufacturers of planes — and this is by way of a parenthetical remark — had figured that sound operation in the air demands that a plane be sure of gross takings five to ten times the cost of equipment. General O'Ryan continued:

> The air-mail contract situation presents an amazing paradox. The rate was fixed by law at "not more than $3 per pound," the intent being to pay $3 in order to help develop lines for reasons of war strategy. But after certain contracts had been let and lines were in successful operation, bidding started. I know of an instance where the government, instead of giving an indirect subsidy to aviation, pays $1.24 per pound for air haul and collects $3.20 per pound from the public in air-mail charges. Instead of being supported by the government, aviation actually is helping to support the government.

As to the obstacles which then stood between aviation and general extension of banking facilities: *First,* the natural conservatism of bankers: that had to be overcome. *Second,* aviation had relatively no background on which to base forecasts. *Third,* what was needed was *traffic.*

General O'Ryan concluded:

> If we get a steady mail load, air express, and finally passengers, then we shall be able to establish ourselves on a sound business basis.

Engine and plane manufacturers were agreed that money then was forthcoming for manufacturing purposes, if not directly from banks, then frequently from bankers as individuals and from business men.

Anthony Fokker said:

> A year ago, if a meeting of American business men had been asked to consider the wisdom of putting money into commercial aviation the project would have been scorned. Now money is available for every new and reasonably planned enterprise of this sort.

J. F. Prince, treasurer of the Wright Company, builder of "Whirlwind" motors which had flown the Atlantic, said:

> I am certain that there are manufacturers of engines and planes today who would have no difficulty in obtaining commercial loans if needed. It so happens that in our own company we have had no need for such financing; we have been able to finance ourselves. But the business of selling engines, for instance, is conducted along automobile lines. With the bill of lading for each engine shipment goes a sight draft. Automobile companies do this even with their established dealers. There may come a time when a credit system will come into the picture; but, generally speaking, no engine or plane manufacturing concern today has the organization necessary to check up on every customer.

There was even then, however, at least one manufacturer of finished planes who was selling "on tick." You could buy a plane in 1927 for a 30 per cent down payment — but you had to show this manufacturer that you had "traffic" in sight sufficient to support a plane in the style to which it was accustomed, including adequate mechanical grooming at proper intervals.

In manufacturing both engines and finished planes, you will observe, the imponderable elements were beginning to grow less. More than half the aviation concerns — all kinds — that were in existence at the close of the war had disappeared.

Prince explained:

Aviators and engineers jumped into the business. They were good designers, but untrained business men. They have learned business, or they have disappeared. On the other hand, several businesses which showed promise but which were cluttered up with stockholders' loans and inefficiently managed have been reorganized, new capital coming in and sound financial men taking charge.

The business of actually flying for a profit — as distinct from manufacturing the flying vehicles — was in a more chaotic condition, though important men saw a basis for optimism.

Airplanes flew almost 50,000,000 miles in the United States in 1926, Secretary Hoover estimated, and, of this total, roughly one-half was civilian or commercial flying. By the end of 1927, according to his forecast, the monthly total of miles flown in the United States was destined to be but 25,000 miles behind the total for all of Europe! "We are going to have a real air service in the United States," he declared.

Also firm in the belief that we were going to have a real air service in the United States was a man who was then planning to take a fraction of the millions extracted from copper mines and offer it to aviation on a bankers' loan basis.

Aided by a board of directors, including men prominent in aviation, Harry Guggenheim was direct-ing the activities of the Daniel Guggenheim Foundation for the Promotion of Aeronautics, and had a fund of $2,500,000 with which to work. He said:

We propose to extend to established air lines which are of proved soundness and which will go into the passenger-carrying business, credit with which to buy equipment. We will do it on precisely the same basis on which banks operate in loaning railways money with which to buy rolling stock. It will be necessary for the applicant company to have capital in hand sufficient to carry them over the initial period of operating at a loss — we consider loss inevitable in almost all cases until the lines have become established and recognized by the public — and sufficient to establish ground plant.

An airplane line needs no right of way, no franchise, no expensive terminals — the cities will furnish the landing fields — but each airplane needs its ground crew, its hangar, its machine shop; and proper provision must be made for these.

A bank, putting out equipment loans, might loan up to 60 per cent of the value of the equipment; and it may be that that will become a normal practice in aviation financing ultimately, but I think it likely that in the beginning at least the Fund will loan 100 per cent, and the interest rate will be low. We are not in this to make money, of course, but to encourage or promote aviation — and particularly passenger-carrying lines. We want to get people into the air: that will "sell" aviation.

There will be provision for writing off these loans quickly — say in 2 or 3 years. Airplanes have a high rate of depreciation, naturally, but a higher rate of obsolescence. There is no reason why a plane need wear out in 2 years; but my guess is that the best passenger plane manufactured today will be obsolete 2 years from now.

These planes, seating 10 or 12 passengers, will have the latest heating and ventilating system, lavatory accommodations, a large degree of insulation against noise, and the last word in safety devices. They will cost $30,000 to $50,000 each, being trimotored, and able to operate with 1 motor disabled. Two or three such planes would be necessary for the start of an airline, and the ground plant necessary for their care would cost, perhaps, $50,000. An air line of this type, then, might mean an initial investment of something like $300,000 to $500,000.

An equipment trust loan applied to an airplane has certain advantages, even, over the usual certificate which has railway rolling stock as security behind it; it is very difficult in practice to seize railway equipment in case of default and to realize by transferring it to another road, but if an airplane doesn't pay on one route it is very simple indeed for us to take it over and transfer it to an air route of proved popularity or established management.

Guggenheim had certain simple convictions. Get people into the air and they would want to fly. If enough people want to fly, traffic becomes available. Available traffic would take care of financial needs very quickly. Money would become available.

To prove itself, and win financial and popular support, Aviation needed History, a proved record. The Guggenheim "equipment loan" project was conceived as a means of bridging the gap, helping air transport over a difficult stretch, giving it a performance record. It proved to be an important aid to the establishment of passenger transport, as shall appear.

Various phases of our "awakening" appear in their proper places in the chapters which follow. For a concrete measurement of what happened in the 2 years following the Lindbergh Paris flight, the writer sought employment figures from 2 of the biggest employing groups.

In the Curtiss plant at Buffalo, in May, 1927, were 575 employees: in March of 1929, there were 1,815.

In the Curtiss Garden City plant the figures were 402 for May, 1927, and for April, 2 years later, 975.

The Boeing Airplane Company, Seattle, had 714 employees when Lindbergh landed in Paris, and 1,345 in May, 1929.

The Pratt and Whitney score was 257 and 1,100 for the same months.

Wright, Fairchild, Travel Air, Waco, and others could tell a similar story. Translate this increase in men at workbenches and before machinery into vehicles, each of which calls into activity men who fill a variety of new jobs — pilots, mechanics, hangar helpers, ground men, airport builders, traffic and airport managers, etc., etc. — and you have a picture of the ever-widening ripples of influence of that flight upon our economic life.

Essentially, these first two chapters have sketched a general background. Since this is not a history, but a survey of civil aviation as it is and promises to be, treatment from this point on only vaguely follows a chronological pattern. Item by item, different phases of the development of commercial aviation will be taken up and examined, described by the writer, or out of the mouths of the pioneer builders who are making aviation history; and, wherever possible, the lesson of what has happened will be pointed out, concisely and without embellishment. If this causes any loss in graceful continuity, that will be more than outweighed by gain in vitality.

# CHAPTER III

## *The Airplane's First "Job"*

The first man in the United States to give the airplane what might be termed a commercial job was Sherman Fairchild.

After the war there were "jitney-ride" pilots, scattered widely, seldom at fixed posts, usually barnstorming across country during the milder months. And military flight continued.

Aside from these things, a waiting expectancy. The airplane had proved to be a wonderful machine. There were those who predicted for it a dominant place in warfare, and that it would rewrite the books of the war colleges.

It was also potential lightning-fast transportation. Just around the corner of tomorrow great things were to be expected of it commercially. But this proved to be a movable tomorrow of which aviation enthusiasts spoke.

The jitney pilots drummed up trade for county fairs by their stunt flights. Some, like Lindbergh, staked their war-surplus "Jennies" down against sudden storms, swung hammocks under wings, and so slept with all their worldly goods in the cow pastures from which, during the day, they flew the air-curious at $5 the ride.

An occasional sleek racer came out of its hangar with such as "Casey" Jones at the stick, to do a rush job of carrying pictures of prizefight or disaster some hundreds of miles in order that they might be slapped into newspaper forms more quickly.

But these occupations of the airplane were too spasmodic to be ranked as steady, or standard, commercial projects. Neither had a very serious tie-in with industry or commerce, as a whole; and until this new implement was somehow added to the older implements of trade and manufacture, and became of standard usefulness, not much could be expected of it.

Through a beginning which dated back to boyish experimentation with photography, Sherman Fairchild gave the airplane a job which has proved to be of use alike to industry, commerce, and transportation.

Son of the late George W. Fairchild, Congressman and founder of the International Business Machines Corporation, Sherman Fairchild inherited many millions, but not until he had established his aerial photography venture as an independent going concern of nation-wide magnitude.

Toward the close of the World War, he, then twenty-one years old, had invented a new type of aerial camera. This was of the type having what is known as a "between the lens shutter," and it became the official type for United States Army and Navy use.

Fairchild made his first flight when the camera was tested at Washington. Later he became a pilot; and, finally, in order that he might push forward with his plans more intelligently, he compressed into a year's study a full course in aeronautical engineering — this as a side line to his regular business routine.

A survey of the uses of aerial photography reveals one phase of the story of aviation's importance to business, today and tomorrow.

In the analysis which follows, Fairchild himself surveys the new industry he has created:

Toward the end of the World War, when the first aerial pictures came back to America, they appeared in various magazines and newspapers. They attracted attention merely because they were new. That these photographs, or others taken from the air, could be valuable for commercial use was not thought possible except by a few enthusiasts who were firm in their belief that a new use had been found for aircraft in times of peace.

Plant executives are naturally vitally interested in any methods by which their factory's operation, development, and supervision can be expedited and modernized. Aerial photographs are assisting hundreds of capable business men in organizing and visualizing their plants. An aerial photograph combines in one master unit every advantageous feature of a ground photograph — a "bird's-eye view," drawn by an artist, and a map — and simultaneously eliminates the inaccuracy and disadvantages of both.

Executives are able to grasp the entire functionings of their plant at a glance. Routing of material, new building sites, suggested improvements, transportation difficulties, fire hazards, all are dramatized before them on the desk.

Permission Fairchild Aerial Surveys, Inc.

New York City from Three Miles High.

Advertising authorities have found that aerial photographs possess unusual attention — focussing-power, which brings with them a great sales value.

Aerial views are being utilized by hotels for illustrating their central locations, accessibility to transportation lines, theaters, stores, and shopping districts.

Real-estate operators use them for visualizing location and development of property. In this case, the aerial photograph is equivalent to an actual trip to the property and immediately arouses the prospect's interest as no other form of illustration can.

One of the largest and most important financial houses in New York adopted the aerial view as the type of advertising illustration in a large list of national publications. This campaign was largely educational. The aerial photograph, first, attracts attention; second, shows an important part of the city whose municipal bonds are suggested, or an easily recognizable part of the bonded industrial or public utility company; and, third, impresses upon the reader and prospective buyer that there is real concrete value behind the piece of paper called " a bond." No other form of illustration could serve all of these ends.

Still another new use of views from the air is by the publishers of insurance atlases. The old map of many colors and dimensions is still employed, but to supplement and visualize the true conditions, oblique or perspective views taken from the air are added. These present to those of us who have difficulty in reading maps the true condition as we see a faithful reproduction in perspective.

The majority of the above uses refer, of course, to the perspective type of air photograph, which has become more or less familiar to everyone through the rotogravure sections of our city newspapers.

There is, however, another and more important type of aerial photograph called the vertical view. This is taken with the camera pointed directly down towards the earth's surface and usually in series or overlapping. The oblique view is usually a single exposure made with the camera pointed at an angle and towards the horizon. These vertical photographs are often referred to as map views, for by matching them together an exact picture plan can be obtained, showing large sections or areas of the earth's surface. When this compilation or matching is completed and is controlled by a small amount of ground surveying, the resulting picture can truly be called a photographic map.

In the insurance field, aerial photography is recommended to municipalities for fire prevention by the Underwriters' Laboratories. This organization is a non-commercial one associated with the National Board of Fire Underwriters in the testing of materials and devices designed to eliminate fire hazards.

Railroad officials have found views from the air useful in planning changes in terminals. A few years ago the Mayor of Chicago authorized the Terminal Improvements Commission of that city to study in conjunction with railroad officials a plan to straighten the Chicago River and improve the various railroad terminals. A possibility of diverting commuters' traffic from the LaSalle Street Station and combining it with the Rapid Transit System was under consideration as well. New York Central officials gave a contract for the photographing of a section 8 miles long and ¾ mile wide, to include the LaSalle Street Station. The completed map was on a scale of 400 feet to 1 inch. Sitting in their offices in New York, a thousand miles away, New York Central executives were able to visualize, discuss needed changes, and plan improvements with as exact knowledge as if they were seeing the area from the cabin of an airplane flying over the terminal in Chicago, or standing at the top of a very high tower.

Photographing from the air of railroad terminals, etc., does not appeal particularly to the imagination, but in a certain type of engineering work, namely, aerial surveying of forests, one quickly realizes the tremendous saving of time. One has only to think of the labor necessary in carrying out surveys across the desert, in country where mountains are abundant or in the practically unknown wastes of Canada, and of the toil and time which these entail, to realize that the aerial photograph has provided a great relief.

Ellwood Wilson, Civil and Forestry Engineer of Canada, declares that it takes a party of 8 or 10 men a month to survey 50 square miles. These men must have had long experience in this particular kind of work in order to get it done in that short time. It is now possible to do all this work in a day. Under the old type of forest surveying, the men were frequently attacked by such swarms of insects that it was absolutely impossible for them to make correct notes. Under aerial surveying, several thousand feet in the air, this condition is obviated. For years, engineers have dreamed of ways to overcome these handicaps. Engineers who have had experience in timber cruising by the "strip method," which is the old way of making forest surveys, know that even where the cruise lines are located a half mile apart a swamp, lake, or burn which runs parallel to this line may be lost entirely. It has been found extremely difficult to scale the boundaries of types, as they merge into one another almost imperceptibly on the ground. The aerial eye in the sky, however, notes the different types of timber very easily, even individual species being readily differentiated — poplar, birch, larch, Jack pine, and white pine. But spruce cannot be distinguished from balsam fir.

In making these surveys a sample area which seems to be a fair average is laid out on each type. All the trees are counted and an estimate made of their height and quantity of timber per acre. In the old method of ground cruising it was possible to determine the number of trees per acre with fair accuracy. According to Mr. Wilson the strips are run with a compass and their length is obtained by pacing. The width of the strip estimated is practically always determined by the eye so that there is quite a chance of error, and where the areas of burns, blow downs, and other types are determined by pacing distances along cruise lines or by scaling, there is a great likelihood of error. With the aerial photograph, however, the areas to which the average per acre is to be applied are almost invariably accurate and the number of trees as stated before can be actually counted.

A few years ago more than 30,000 miles were sketched from the air in northern Ontario. Mr. Wilson asserts that the complete practicability and commercial usefulness of aerial photography for timber surveying has been proven conclusively.

Engineers in planning right of way for high-tension transmission lines have also found aerial photographs accurate and a great help in their work.

Executives and the largest operators in power development and transmission-line work, who were exceedingly skeptical when aerial photography was first suggested, have, after a preliminary trial, refused to make surveys by the old ground methods.

In the projection of transmission lines, the power company knows only the two terminal points of the line to be built. Naturally, the cheapest route to follow in theory would be a perfectly straight line between these two points. Strange as it may seem, however, there are so many obstacles to such a plan that in most cases a longer and more indirect line proves the more economical. On account of the high voltage carried it is imperative that the line be kept a reasonable distance away from farm houses, barns, and other buildings. The law does not permit building such a line across or over a cemetery. Areas which are heavily timbered also must be avoided if possible, as the cost of clearing the right of way and damages for timber destroyed are considerable items. These features can be taken care of very easily through the photographic map.

The old method of ground surveys allowed of no secrecy. This made negotiations with property owners more difficult because they naturally tried to obtain as high prices as possible for any property rights, but when the air method is followed, the property owners are naturally unaware of what is going on. These secret aerial surveys and the projection of the right of way in the company's office obviates a gathering of neighborhood property owners and a sudden increase in prices of land over the area to be considered.

In order to better illustrate the usefulness of these air photographs, let us suppose that right-of-way men are to be sent out over a certain area. They carry with them the aerial views which have been taken at the authorization of the power company. It is surprising the amount of actual time saved in conversation with the farmers. If the right-of-way men had carried the line map or blue prints the farmer would have immediately grown suspicious when confronted with such a map or plan. The aerial map is new to him and arouses his interest because it visualizes his property in a way he has never seen it before. The farmer will quickly understand the photograph and will probably say, "Why that is the field in which I planted corn last year." Naturally, antagonism to the right-of-way man is reduced and generally a favorable decision results because the farmer can readily understand what is wanted. In the case of one of the power companies, wherever the land owners appeared obstinate a "parlor stereoscope" and stereogram of his farm was given him. This naturally pleased the farmer and his family and when the right-of-way man made his second call a week later, he found a cordial welcome awaiting him.

The greatest recognition of the value of aerial photography was the contract for the complete aerial mapping of

Greater New York — a territory of approximately 625 square miles, taking in 5 boroughs — Manhattan, Bronx, Queens, Brooklyn, and Richmond. About 3,000 miles were flown and 2,000 exposures were necessary to cover this large area. Three planes were over the city whenever there was a good photographic day. For this work the company had 15 engineers and surveyors checking controls and assembling the maps, operating in conjunction with an inspector from the City Engineer's office. The map portrays the city in minutest detail. It shows every structure from the contractor's temporary toolshed to the skyscraper, backyards, gardens, and parks with every tree and bush visible; avenues and alleys, streets and unrecorded footpaths; big-league ball parks, waterfront clubs, with their yachts and motor boats; the boardwalk of Coney Island, and crowds of people appearing like small black dots. Even the congestion of traffic on busy thoroughfares is clearly shown.

Two distinct photographic maps were made. The first included the area of approximately 400 square miles within the official city limits on a scale of 1 inch to 600 feet; delivered in 140 sections, each section about 14 by 21 inches. These sections assemble in groups of 4, to correspond with the 35 sectional-plan maps as laid out by the Board of Estimate and Apportionment. If made in 1 section, this map would measure approximately 22 by 24 feet. The second map, on the scale of 1 inch to 2,000 feet, covers an area of about 625 square miles, including the city proper as in the first map and also parts of the counties of Westchester and Nassau in New York State, and that part of the state of New Jersey contiguous to the city as shown on the official line maps of the city of New York. The completed map of this small scale measures 10 by 8 feet. If this larger area were mapped on the scale of 1 inch to 600 feet the dimensions of the map would be about 27 by 30 feet.

Few days are suitable for photographic mapping work as there must be little haze and no clouds. Prints with clouds and cloud shadows are rejected. The shore line of New York City had to be photographed at low tide. This proved a difficult task as the low tide could not be later than 2 P.M. on a day when other conditions were favorable. In one instance, there was a wait of several weeks for a suitable day to get part of the shore line. It was also imperative that flying be completed before snow set in.

Some of the work for the map mosaic was done at 16,000 feet altitude, too high for the plane to be seen with the naked eye. For this work a short-focal-length camera was used to take photographs at a very small scale for checking controls.

The start of each photographic flight was made from Garden City. Many times the photographic squadron started out on days that seemed suitable, only to be compelled to return without pictures on account of haze or cloud formation.

Air mapping calls for the greatest accuracy in detail work. Negatives showing very small degrees of tilt have to be adjusted in the printing process so that the tilt is corrected. All prints have to be brought to the required scale and in order to do this a different ratio of enlargement and reduction is required for practically every point. This necessitates a fine calibrated adjustment of the enlarging camera.

The basic principle underlying the development of aerial photography is that of engineering and surveying. In any aerial photographic concern, highly trained photographic experts as well as skilled aviators are required. While certain types of trucks are suitable for one kind of work such as light loads, etc., and other types are used for the heavy shipments, so certain types of airplanes have to be used in the taking of aerial photographs. On some particular contract, high-altitude work is necessary, and a plane has to be used which is equipped particularly for photographic mapping from heights of 10,000 to 16,000 feet or more.

In this new and rapidly growing industry the selection of personnel is extremely difficult. The enthusiastic and care-free disposition so necessary to the aviator must be encouraged yet curbed to secure precision in flying and holding to his course. He must be balanced by the trained engineer whose chief concern is always precision and accuracy. The best results can only be obtained by the closest supervision and cooperation.

## CHAPTER IV

### *Building the Air Mail*

NOT long since, the pilots of the night air mail were figures of romance. They are still that, in reality; but we have come to accept and forget them. We only know that we buy a special kind of stamp, costing a nickel, and almost before the clerk has our letter filed in the proper spot a circuit of some thousands of miles has been made and here is the detailed reply before us.

We have all but forgotten that laconic crew whose lives are dedicated to a creed that the mails must go through, but we have not ceased being surprised at the speed of this new means of communication.

However, it is not the pilots alone who are romantic figures. There is romance also — stirring business romance — in the struggle which has built up a vast air-mail network to serve the nation's commerce and industry.

Herbert Hoover was a figure behind the scenes, doing some of the bedrock thinking, urging that an air-mail system could be made at once the foundation of a thriving aeronautical industry and a thing building toward adequate air defense. A great industrialist, Henry Ford, and an eminent rail transport expert, Gen. W. W. Atterbury, helped round out the conception. Among the first "investors" in air mail — and they looked upon it as an act of patriotism, rather than a fling at something new, spectacular, and financially hazardous — were William A. Rockefeller, Jr., T. Philip Swift, Philip and Lester Armour, Philip K. Wrigley, Marshall Field, John Hays Hammond, George M. Reynolds, Howard Coffin, W. K. Vanderbilt, Cornelius Vanderbilt Whitney, Harold Pitcairn, Edsel Ford.

Among the "operators" were men who had been "jitney pilots," cow-pasture entrepreneurs who had advanced to the ownership of three- or four-plane taxi services. At the other extreme, perhaps, Ford and Pitcairn might be placed. Edsel Ford's backing was, of course, practically limitless; Pitcairn's very considerable, since he was the son of the founder of Pittsburgh Plate Glass. And midway between were such men as W. E. Boeing, men already established in older lines of industry who risked great sums in the most venturesome project that had arisen during their lifetimes.

No denying the lure of this sort of pioneering. No denying, either, the sheer drudgery, the plodding, the painstaking detail. The men who mastered the countless problems which arose in building the air mail deserve great credit. Theirs was a romance of achievement.

The Post Office Department made a recommendation to Congress in 1912 that $50,000 be appropriated for an experimental air-mail route. Congress refused the sum. But so keen was the department's interest in the project, that 31 orders for special air-mail flights were issued in 16 states during 1912, all without expense to the department.

Funds finally were made available for airplane mail service, but out of the appropriation for "Steamboat or Other Power-boat Service." Bids were asked on a route in Massachusetts and on several in Alaska. No bids were received. Prospective bidders could not buy suitable aircraft.

Congress finally appropriated $100,000 for the fiscal year ending June 30, 1918, to be used in the establishment of an experimental air-mail route.

On May 15, 1918, the first air-mail route in the United States was established between New York City and Washington, D. C., with a stop at Philadelphia. The 218-mile route was flown each way daily, except Sunday. Equipment and pilots were supplied by the War Department, which acted as overseer of operations, while the Post Office Department handled the mail and traffic problems. In August of the same year the Post Office Department took over the entire responsibility.

The experiment resulted in finding that flights could be made under adverse weather conditions, and that schedules could be maintained. The department began to lay plans for the extension of the service, and some men played with the idea of a transcontinental route from ocean to ocean — New York to San Francisco.

On May 15, 1919, the first section of this historic airway was established between Cleveland and Chicago. The second leg, Cleveland to New York City, went into operation on July 1 the same year. Planes operated on this route in relaying railway mail gave a saving of about 16 hours on mail to parts of the Middle West, and 24 hours on mail to the Pacific Coast. A saving of 16 hours was effected on mail to New York and New England.

Exactly 1 year after the first plane flew on the transcontinental route, the third division, Chicago to Omaha, was established. During 1920, also, two other government routes, one between Chicago and Minneapolis and one between Chicago and St. Louis, were inaugurated.

San Francisco still remained as an objective, and on September 7, 1920, Ray Little, a young ace of the U. S. Air Service overseas, took off from the old Marina airport, San Francisco, with 400 pounds of mail, and disappeared over the Sierra Nevada "Hump" to make connections with other divisions through Salt Lake City and Cheyenne to Omaha, completing the transcontinental air-mail route. The ship he flew was an old Liberty-motored war surplus De Haviland, of 400 horsepower, and yet able to lift but 400 pounds. Boeing mail planes now flying the same route have 525 horsepower and carry 1,600 pounds at 140 miles per hour. Little, as it happened, recently

Permission Transcontinental Air Transport

Interior of Luxurious Transcontinental Air Transport Station at Albuquerque, New Mexico.

sat behind the controls on another flight. He flew a huge trimotored Boeing transport plane eastbound on the night of May 1, 1929, with the first night mail from San Francisco and the Pacific Coast, on a new double schedule. Since then only a single business day has separated the East and West coasts in the air-mail schedule. A local account read:

On September 8, the day following Little's take-off from the Marina with the first eastbound mail, the first westbound came roaring over the Mississippi slopes, climbed over Sherman Hill, where the highest airway beacon in the world now stands, battled the boiling winds of the Great Salt Desert, vaulted the Sierra Nevada "Hump" through Emigrant Gap, where another trail had been blazed three-quarters of a century earlier, and coasted down to San Francisco, thus completing the first transcontinental cycle. That first westbound relay from Reno to the Bay was flown by E. E. ("Monty") Mouton, now Department of Commerce aircraft inspector for the western division, with offices in San Francisco.

At last the West Coast was on the air-mail map.

In 1921, due to necessity for economy, and because Congress had not specifically authorized them, the New York-Washington, Chicago-St. Louis, and Chicago-Minneapolis routes were discontinued.

To quote from a Post Office Department report:

In order to further demonstrate the possibilities of the airplane as a factor in the transportation of the mail, arrangements were made for a through flight from San Francisco to New York. On February 22, 1921, an air-mail plane left San Francisco at 4:30 A.M., landing at New York at 4:50 P.M. February 23. The total elapsed time for the trip, including all stops, was 33 hours and 21 minutes. Actual flying time was 25 hours and 16 minutes, and the average speed was 104 miles per hour over the entire distance of 2,629 miles. This flight was made possible by flying at night between Cheyenne, Wyo. and Chicago.

For the first time in the history of the world air mail had been carried at night on schedule.

The department, on August 20, 1920, issued orders for the installation of radio stations at each field where this service could not be provided by Navy Department stations. By November 1, 10 of these stations were in operation, and, later on, stations were established at all of the remaining fields except Rawlins, Wyo., making in all 17 over the entire transcontinental route. From that time on all plane movements were made on information as to weather conditions obtained by radio.

During the spring and summer of 1923, construction of a lighted airway between Cheyenne and Chicago was being rushed with a view to constructing experiments to determine the feasibility of night flying on a regular schedule. At that time, there were no lighted airways in existence. Beacons were installed between Chicago and Cheyenne, planes were equipped with landing lights, intermediate fields were prepared, lighted, and marked.

In 1925, a total of 2,045 miles from New York City to Salt Lake City had been lighted for night flying. This was a tremendous task, a romance of achievement. Pilots flying the route at night could see the revolving beacons as far as 100 miles ahead in clear weather.

It was the U. S. Post Office Department which taught the world how to fly by night. Europe learned her night flying lessons here.

The standard airway lighting system may be summarized as follows: 500,000,000-candlepower rotating beacon on a 50-foot tower at each regular landing field, revolving at the rate of three times a minute, and set at an angle slightly above the horizon, to be seen on clear nights from 130 to 150 miles; 5,000,000-candlepower beacons, revolving six times per minute and visible from 60 to 75 miles, for each intermediate landing field. These beacons are also set at a slight upward angle to meet the eyes of pilots.

Terminal fields are equipped with BBT flood lights, of approximately 3,500,000 candlepower, with a lens spread of 180 degrees to throw light in a fan shape over the field. These lights give pilots a nearly daylight perspective when landing at night. The light will illuminate an area of about 1 square mile.

The boundaries of both terminal and intermediate fields are marked with ordinary incandescent lights spaced at 150 to 300 feet, thus outlining distinctly the field area.

Obstructions, such as poles, ditches, fences, buildings, are marked with red lights.

The best approaches to the field are indicated by green lights, so placed as to resemble a gateway entrance.

Commercial electric current is used if available; if not, batteries and Delco lighting plants are placed at intermediate fields and beacons. The Delco equipment is housed in a shack at the foot of the tower, where a caretaker lives.

Small gas "blinker" lights are located at intervals of about 3 miles along the airway, to supplement the revolving beacons. They flash at the rate of sixty times a minute, and are fed from cylinders of acetylene gas, which must be renewed every 5 or 6 months. At the start of the service, these lights flashed day and night, but, during the last few years, a sun-valve invention was installed on each blinker to shut it off at sunrise and turn it on at dusk.

The total cost of the airway, from New York to Salt Lake City, was $542,000 — certainly a very insignificant figure when compared with the cost of a highway or railroad of equal length.

In the spring of 1926, Congress passed the Air Commerce Act of 1926, which, briefly stated, ". . . imposed upon the Secretary of Commerce the duty of fostering the development of commercial aviation in the United States." It authorized the Secretary of Commerce, among other things, to designate and establish airways, in so far as funds were made available by Congress from year to year, and to establish, operate, and maintain along such airways all necessary lights and emergency landing fields. It also provided that:

> . . . at such time as the Postmaster General and the Secretary of Commerce by joint order should direct, the airway under the jurisdiction and control of the Postmaster General, together with all emergency landing fields and other air facilities used in connection therewith, would be transferred to the jurisdiction and control of the municipalities concerned under arrangements subject to approval by the President.

The Postmaster General concluded that the time was rapidly approaching when the transcontinental air-mail route might be turned over to private contractors and operation successfully and profitably carried on by them.

The initial air-mail contracts were:

New York-Boston, operated by Colonial Airways, Gen. John F. O'Ryan, president. The vice president in charge of operations was Juan T. Trippe, later president of Pan-American Airways, first big international air-transport system of the Western hemisphere.

Chicago-St. Louis, operated by the Robertson Aircraft Corporation, Maj. William B. Robertson, president. He was later the employer of Capt. Charles A. Lindbergh, air-mail pilot, and a prime mover in Universal Air Lines.

Chicago-Dallas, operated by National Air Transport. Col. Paul Henderson, who had directed the federal operation of air mail and is sometimes called the "Father of the Air Mail," was general manager.

Howard E. Coffin was president and C. M. Keys, chairman of the executive committee.

Los Angeles-Salt Lake City, operated by Western Air Express, Harris M. Hanshue, president — a pioneer passenger line, and subsequently leagued with Fokker and General Motors.

Other lines followed as bids were awarded and equipment made available, but the major aviation interest centered in the great transcontinental route, which would be the backbone of air mail in the United States, and, it was believed, in some future day a financial prize worth having.

On November 15, 1926, advertisements were issued for proposals for service on the transcontinental route in two sections: San Francisco and Oakland to Chicago and Chicago to New York City. A satisfactory bid was received on the western section from the Boeing Airplane Company and Edward Hubbard, of Seattle, Wash., later incorporated as the Boeing Air Transport.

On July 1, 1927, in accordance with the contract, Boeing Air Transport had a fleet of 25 special air-mail, express, and passenger planes in readiness at the various division headquarters. These planes, first of the type to be designed, had a capacity of 1,600 pounds, including 2 passengers in a cabin, their baggage, and 1,200 pounds of mail and express in metal compartments fore and aft.

In designing these ships, Boeing Airplane Company engineers point out, they had in mind the rigorous conditions under which they would have to operate. Loads of 1,600 pounds had to be lifted from airports ranging from sea level at Oakland airport, to 6,400 feet at Rock Springs, Wyo. They must take off from all kinds of fields; hard, smooth runways; runways covered with drifted snow; soft, rain-soaked sod; cinders; sand. They must perform with agility, not only in the dense air at sea level, but in the rare atmosphere 10,000 to 18,000 feet altitude over mountain ranges such as the Sierra Nevada, Ruby, Wasatch, and Rockies, sometimes covered by clouds and storms which forced the pilots up. Reserve speed must be available to maintain schedules against headwinds, which are usually from the west. Temperatures ranging from 130 degrees over torrid deserts to 50 below over the snow-covered mountains would put the motors to a crucial test.

This route has been called the "greatest air transport laboratory in the world": 2,000 miles of varied and extreme conditions.

Passenger service was announced 1 month after inauguration of the route. On September 1, several leading air lines of the country entered into a contract with the American Railway Express Company for the transportation of air express, with the regular pick-up and delivery service of the express company.

On the same date, September 1, 1927, National Air Transport, having been the successful bidder for the New York-Chicago section of the old transcontinental route, went into operation, thus completing ocean-to-ocean air-mail, express, and passenger service under private industry.

The western link of the privately operated "Transcontinental," as has been noted, was virtually a one-man project, in so far as ownership was concerned.

National Air Transport, on the other hand, was a cooperative effort. Col. Paul Henderson, assistant Postmaster General in charge of air mail, had tried, as early as 1924, to interest Gen. W. W. Atterbury, president of the Pennsylvania Railroad, in air mail under private operation. It was thought that the time was not ripe.

A year or so later, the project was discussed at a gathering of aeronautical men in Detroit, and, after a series of conferences, the National Air Transport was organized with an authorized capital of $10,000,000 — a giant of the aeronautical field. Daniel M. Sheaffer, vice president of the Pennsylvania Railroad, made an "office car" of the road available for the eastern men who participated in the organization, and accompanied the aviation leaders, but the Pennsylvania did not become financially interested in aviation at that time.

In 1925, there was no thought that the venture could be profitable for years to come. The men who invested were, in effect, "doing their bit" for aeronautical history; moreover, they considered that the founding of transcontinental air mail was of strategic importance. Subscription for the first $2,000,000 worth of stock was limited to a minimum of $10,000 and a maximum of $100,000, and allotments were divided between New York, Chicago, Detroit, St. Louis, and Cleveland. Subsequently, another million was collected, but held as a reserve and never used.

The first "flying stock" purchased for National Air Transport lines was a fleet of 10 Curtiss "Carrier Pigeons," which had 1,000-pound load capacity.

Of interest in connection with the "public spirit" motive behind the original subscriptions is a recent compilation which shows that National Air Transport did not "turn the corner" until the middle of 1928.

The growth of National Air Transport is shown by the following table, giving the air-mail poundage carried by the company and the net earnings:

| 1928 | *Pounds* | *Earnings* | |
|---|---|---|---|
| First quarter........ | 157,500 | $ 82,693 | Loss |
| Second quarter...... | 195,105 | 334 | Loss |
| Third quarter....... | 330,039 | 146,654 | Profit |
| Fourth quarter...... | 449,323 | 214,444 | Profit |
| 1929 | | | |
| First quarter........ | 425,800 | 135,626 | Profit |
| Second quarter...... | 487,300 | 187,767 | Profit |

In the beginning — during the period of governmental operation — the postal rate on air mail was 24 cents an ounce. Later reductions were to 16, then to 6 cents. Due to lack of patronage of the service, the special air-mail rate was discontinued, and no extra charge was made for the transportation of letters by air. The post office simply sent out to the airport as much first-class mail as the plane would carry, and away it went. Later, it was decided to charge air-mail postage at the rate of 8 cents an ounce for each zone transported, the route being divided into 3 zones, namely, New York to Chicago, Chicago to Cheyenne, and Cheyenne to San Francisco.

On February 1, 1927, a new flat rate of 10 cents per half ounce was established. Both the Post Office Department and the air-mail contractors believed that a lower rate would pay in increased traffic and promote aviation in general. Accordingly, on August 1, 1928, the rate became 5 cents for the first half ounce, and 10 cents for each additional ounce. The higher rate for additional ounces was intended to confine the air-mail service, in so far as possible, to correspondence and other light matter. Increasing mileage flown at night on the air-mail system made the 5-cent air-mail letter more nearly equivalent to the night telegram.

The response of the business world is indicated by the following summary showing growth of traffic:

| 1928 | *Pounds* |
|---|---|
| First Quarter | 471,600 |
| Second Quarter | 581,400 |
| Third Quarter | 1,057,600 |
| Fourth Quarter | 1,427,200 |
| 1929 | |
| First Quarter | 1,427,400 |
| Second Quarter | 1,689,500 |

It was this "5-cent air mail" also which accounted for the National Air Transport's turn from loss to profit.

# CHAPTER V

## *Lessons of the Model Air Line*

The race for greatness as between two California cities gave us the first organized passenger transport through the air.

The great transcontinental route, over which government flyers whipped the mails through from coast to coast, had as a western terminal San Francisco. Leading business men of Los Angeles contended that this gave to the northern California metropolis an unfair advantage.

San Francisco firms and financial institutions, by grace of direct air-mail dispatch, were closer to the great Middle West and to the eastern markets. They could send forward their bank exchange more rapidly than could the banking institutions of Los Angeles. Bills of lading and important documents of all kinds could be handled more rapidly by San Francisco houses.

It was to meet this situation that leading business men of Los Angeles organized Western Air Express and contracted with the government to transport mail from Los Angeles to Salt Lake City, where connection would be made with the transcontinental air-mail route. This latter route was at that time still under government operation, and, in all, only three private mail contracts had been let by the Post Office Department.

The story of Western Air Express, pioneer in mail and passenger transport, has a very important bearing on the development of air transport throughout the United States.

The Los Angeles-Salt Lake City air-mail service was established in April, 1926. There was no real anticipation that it would pay expenses, but it was felt that any loss sustained would be more than offset by the good done commercial and financial interests of Los Angeles and southern California. To the surprise of all concerned, the line paid expenses the first day and it continued to pay expenses and to show profit. The result was that Western Air Express, conceived as a civic project, became the first air transport operation in the world to be placed on a definitely profitable foundation.

Within 30 days after the air-mail line had been established between Los Angeles and Salt Lake City, Harris M. Hanshue, president of the operating company, made the announcement that passengers would be carried over the line. The passengers rode in the air-mail ships and the service was not de luxe, but it was maintained daily and thus, on May 23, 1926, there was inaugurated the first regular air passenger transport service in the United States.

Airplanes flying over this route, during 3 years, covered approximately 1,500,000 miles. Not a passenger or pilot had been killed, not an ounce of mail had been lost or damaged, no plane had been wrecked, and an on-time schedule of better than 99 per cent had been maintained.

It is interesting to note that the three pilots who pioneered this run are still on the payroll of Western Air Express. All of them have perfect performance records and each has an individual record of his own:

Maury Graham flew 187,000 miles without even being late.

Fred W. Kelly, during the year 1928, flew 115,760 miles in 1,150 hours — the greatest distance covered by any commercial pilot in the United States.

Charles ("Jimmie") James, on April 5, 1929, made the trip from Los Angeles to Salt Lake City, 600 miles, in 4 hours, a record for the trip.

Air-mail dispatch over this line has shown a remarkable increase:

| | |
|---|---|
| 1926 .............. | 2,856,560 pieces |
| 1927 .............. | 8,122,000 pieces |
| 1928 .............. | 15,804,000 pieces |

This ratio of increase is being maintained during 1929. During the first 15 days of April, 1928, mail carried over this line totalled 432,640 pieces; in the first 15 days of April, 1929, the total was 1,009,120 pieces. The increase here shown is about 250 per cent.

It was the success Western Air Express had established with its Salt Lake line, both from the operations and financial standpoint, that led to the company being designated by the Daniel Guggenheim Fund for the Promotion of Aeronautics to establish the de luxe air passenger service between Los Angeles and San Francisco.

Before the inauguration of this service, in May, 1928, a careful survey was made of air transport systems in Europe. Leading aircraft manufacturers were consulted in regard to the type of airplane best suited for the proposed service. General specifications for the airplane were then prepared and submitted to various manufacturers. The result was that an order was placed with Anthony H. G. Fokker of the Atlantic Aircraft Corporation for construction of three of the proposed ships. The Atlantic Aircraft Corporation has since become known as the "Fokker Aircraft Corporation of America."

Early in May, delivery of three of the airplanes was made to the Guggenheim Fund, which turned them over to Western Air Express under an equipment trust contract. They had been constructed at the Fokker factory at Hasbrouck Heights, N. J., and their trip across the continent to California was made a goodwill tour that attracted nation-wide attention. The tour was arranged under the direction of the California Development Association, which is representative of all the chambers of commerce of California. Each of the 3 airplanes followed a different route across the continent and more than 40 cities were visited. This was a gesture to interest the people of the nation in air transportation.

The planes were of the type now generally known as Fokker F-10. They were built to carry 12 passengers, 2 pilots, and 500 pounds of cargo. Each ship was powered with 3 Pratt and Whitney "Wasp" motors developing a total of 1,275 horsepower. In tests, the planes developed a cruising speed of 125 miles per hour and a maximum speed of better than 150 miles per hour. A climbing speed of 1,400 feet per minute was registered at sea level and a ceiling of 19,500 feet was reached. It was demonstrated that any one of the 3 motors would sustain the plane in flight and it could climb to an elevation of 7,000 feet with any 2 motors.

Actual service on the Los Angeles-San Francisco route commenced May 26, 1928. There was no particular ceremony at either terminal. The ships were brought on the line and sent away without the traditional bottle breaking or any such celebration. The intention was to conduct the line as a business proposition and it was believed this could be accomplished by performance, not by ballyhoo.

With the ships in operation, there began an elaborate investigation of the weather bureau service most desirable for air travel. This investigation was carried on by experts of the Guggenheim Fund in cooperation with the U. S. Weather Bureau. The conclusion was that the direct airway between the two terminals should be covered by weather reports showing atmospheric conditions to a distance of 40 miles on either side of the airway. The pilot could thus be informed of any storm, fog, or wind drifting toward the airway and could take necessary precautions to avoid the disturbance.

At the same time, there were installed instruments and balloons for the determination of wind conditions up to an altitude of 17,500 feet. The value of knowing the prevailing air currents can be illustrated by citing the fact that once the southbound plane from San Francisco to Los Angeles took advantage of a heavy tail wind at an altitude of 9,000 feet and made the flight, 365 miles, in 1 hour and 59 minutes, an average speed of 183 miles per hour, and with the actual saving of 52 gallons of gasoline, while the northbound ship, leaving at the same time and flying at a lower altitude, encountered only a mild headwind and made the trip on schedule time.

Various radio experiments were also made, and the lessons learned have generally been made available to all interested in aviation.

At the start, the passengers were chiefly persons seeking the adventure or thrill of flight and a few of whom some emergency demanded rapid transportation. But as the days passed, and the big airplanes continued to fly regularly and true to schedule, there came a change in the passenger lists. Business men and women to whom time was valuable began to make use of the airplane. There were some who became regular patrons, making the trip once or twice a month as business conditions justified, travel became more steady in volume and the way was paved for the financial success of the venture.

In May, 1929, at the conclusion of the first year of operations of this line, Western Air Express issued a report showing:

That its passenger airplanes operating between Los Angeles and San Francisco had flown 304,662 miles during the year.

They had carried 3,038 paid passengers.

They had maintained an average cruising speed of 123 miles per hour.

They had maintained an on-time schedule of better than 99 per cent.

No passenger or pilot had been injured.

No plane had been damaged.

As to lessons learned:

Experience has shown that the airplane passenger expects a full return for his money; not only does he want speed and a comfortable chair, but he demands every courtesy that can be extended.

The airplane passenger does not want to carry his own baggage, even for a few feet.

He wants to ride to and from the airport in a limousine.

He wants reading matter and appropriate stationery.

On the other hand, it has been demonstrated that the business man or woman making use of airplane transportation does not object to making an early start on the journey. To them time is money and the quicker they get started the sooner they will reach their destination.

It has also been noted that passengers enjoy eating while they are in the air. The flight between Los Angeles and San Francisco takes 3 hours, or less. It is probable that all persons who board the morning plane have breakfasted. But 1½ hours later, when luncheon is served, they are ready to eat again. And it is not just the novelty of the thing, for the experienced air travelers prove just as hungry as the first-timers.

When Western Air Express began operations, in 1926, it had 5 planes and 20 employees. In July, 1929, it had 40 planes and 180 employees.

It started with one line. Now it operates seven. It is said to operate the most diversified air service of any air transport company in the United States.

In December, 1927, it took over the operating of the air-mail line between Cheyenne, Denver, Colorado Springs, and Pueblo. This line has been built up until it is the second heaviest carrier of air mail, population considered, being exceeded only by the Los Angeles-Salt Lake line. The Colorado route, which is over the backbone of the continent with an average ground elevation of 5,000 feet — the highest air-mail line in the world — operated with Stearman planes carrying mail, express, and 1 passenger.

In May, 1928, the Los Angeles-San Francisco passenger line was established.

In June, 1928, the company absorbed Pacific Marine Airways operating seaplanes between Wilmington, on the Los Angeles harbor, and Avalon, Catalina Island. This equipment has since been augmented with cabin amphibian planes which fly direct from the Western Air Express airport in Los Angeles to the waters of Avalon Bay. The performance record has been perfect. In January, 1929, the company began the operating of big Fokker planes between Los Angeles, Tia Juana, and Agua Caliente.

On May 15, 1929, daily passenger service was established between Los Angeles and Albuquerque, with intermediate stops at Holbrook and Kingman. On June 1, 1929, this line was extended through to Kansas City with an intermediate stop east of Albuquerque at Amarillo. The service is being maintained daily. A plane leaves Kansas City each morning at 8:30 o'clock and another plane leaves Los Angeles each morning at 6 o'clock. The flight of 1,425 miles is made in approximately 13 hours.

On May 31, 1929, the company also inaugurated a summer passenger schedule between Los Angeles and Lake Arrowhead, a mountain lake resort 70 miles distant. The trip, 70 miles, is made in an amphibian plane in 45 minutes.

Over all its passenger routes, involving purely land travel, the company operates 14-place, trimotored Fokker F-10 monoplanes. To Catalina and Lake Arrowhead it operates amphibians.

There is now under consideration an extension of the Cheyenne-Pueblo line south to connect with the Kansas City line at Albuquerque.

The operating schedules are:

Los Angeles to Salt Lake City, 600 miles, 6 hours.

Cheyenne to Pueblo, 200 miles, 3 hours.

Los Angeles to San Francisco, 365 miles, 3 hours.

Los Angeles to Catalina, 45 miles, 35 minutes.

Los Angeles to Tia Juana, 120 miles, 1 hour.

Los Angeles to Kansas City, 1,425 miles, 13 hours.

Los Angeles to Lake Arrowhead, 70 miles, 45 minutes.

Planes operating in and out of the company's main terminal at Los Angeles have flown more than 2,500,000 miles. No passenger or pilot has been killed, no passenger plane has been wrecked, no mail has been lost or damaged.

An official points out that:

> Since its inception, Western Air Express has never held a public stock sale nor issued a bond. No brokerage or commission on stock sales has been paid. Six regular quarterly dividends have been declared. Net earnings for the year 1928 approximated $700,000.

This line, Herbert Hoover, Jr., joined as radio engineer, and while this book was in preparation, he obtained from the Federal Radio Commission a license for an aircraft radio station at Chicago, an action forecasting the pushing of the Western Air Express lines eastward.

Prophetic also was a 1929 Western Air Express investment of about $2,000,000 in airports and hangars, the latter of hexagon shape with doors 126 feet wide. These offer servicing facilities, at the San Francisco and Los Angeles terminals, for 6 ships bigger even than the 20- and 30-passenger giants then beginning to go into limited production. Also, 2 storage hangars, 420 feet long by 85 feet deep for Los Angeles, and storage capacity for 35 large planes at San Francisco, reveal a measurement of future equipment needs.

## CHAPTER VI

### *How the Air Mail Serves Business*

The tempo of American business has been increased by office equipment and office method; by advertising; by trade association exchange of facts, the broadcasting of short-cuts; by coining hindsight into forethought for tomorrow, and quickly; by a habit of alertness, of ready receptivity to new ideas.

There is less flurry in business, more speed with less haste. How will aviation help this trend? That can be answered most pointedly by collection of the bits which show what aviation has learned already about helping the established lines of commerce and industry.

At least one great airplane manufacturing company, not content with sales publicity, already has a department devoted to a study not only of the United States, but of the earth's surface, searching out places, industries, businesses in which an airplane can be put to work. Having discovered a new potential market, it is this manufacturer's theory that he should then carry the story forward by being prepared to show how, where, and when a plane may be put to a new use, at what cost, and with what addition to customer's income.

The first great gain to business of course lies in what the airplane has done by way of scoring another victory over time. Rapid communication is relatively more important to us than it has been to most industrial nations of history, since our distances are so much greater.

Progress in transporting mail between the Atlantic and Pacific Coast cities is illustrated in the following:

In 1850 — 3 days by rail and 21 by stage.
In 1860 — 2½ days by rail to St. Joseph, Mo., and then 8 days by Pony Express.
In 1876 — 100 hours by special train.
In 1928 — 85 hours by train (extra fare).
In 1929 — 32 hours by air mail (twice-a-day schedule).

Men now living can recall the time when it cost $10 to send a letter between New York and San Francisco.

Ten dollars for 24-day delivery!

For 5 cents, today, an office-to-office delivery time of 2 nights and 1 day — actual transport in 31 hours.

Other time-saving comparisons are of interest:

| | Train | Air Mail |
|---|---|---|
| New York to San Francisco.. | 83 hours, | 31 hours |
| Chicago to New York...... | 20 hours | 9 hours, 20 minutes |
| St. Paul to Dallas.......... | 37 hours | 17 hours, 45 minutes |
| New York to Atlanta...... | 24 hours | 10 hours, 17 minutes |
| Boston to Cleveland....... | 16 hours, 20 minutes | 8 hours |
| Los Angeles to St. Louis.... | 60 hours | 26 hours, 15 minutes |
| Youngstown to Des Moines. | 20 hours | 8 hours, 25 minutes |
| St. Louis to St. Paul....... | 18 hours | 8 hours, 25 minutes |
| Los Angeles to San Francisco | 12 hours | 4 hours |

Each night the transcontinental air mail carries $24,000,000 worth of interest-bearing securities, checks, and financial documents. It is estimated that capital arriving in New York by air in a single year exceeds $8,000,000,000. The gain of from 1 to 3 days over rail transit is said to involve a saving which runs into the millions.

The Boeing Company has made a check-up of traffic which results in a declaration that the present users of the air mail and express rank in importance as follows:

1. The motion-picture companies, distributing films to chains of theaters across the country.

2. Banks and bond houses, which save vast sums in interest charges.

3. The jewelry industry, the product being of high value and small package form.

4. Advertising agencies sending out copy for national distribution.

The following instances of uses of the air mail have been compiled by air-mail companies:

Handling of all correspondence between offices where a saving in time can be made over train mail.

Announcements about new products.

Soliciting new accounts.

In place of night telegrams (with special delivery stamp also).

Saving interest charges on funds in transit.

Rush shipments of samples and "out-of-stock" merchandise.

Emergency shipment of spare parts.

Mail requiring Saturday morning delivery instead of Monday delivery by ordinary mail.

Collecting slow accounts.

Price quotations and specifications.

Maintaining closer contacts with branch offices and salesmen.

All form and important communications to agencies, dealers, jobbers, customers, etc.

Filing tracers by traffic department.

Some random instances tell a concrete story of the ever-widening influence of aviation upon the nation's business:

A Milwaukee manufacturer recently sold a cargo of locks in the New York market. By shipping via air, 1,000 miles away, he put his locks down in New York as fast as his competitors could have delivered them from New England.

Shippers of oil from California to the Atlantic Coast save thousands of dollars in interest by forwarding bills of lading by air.

Retail stores throughout the country are using air transport regularly to replenish stock of lightweight articles.

A printer in Moline, Ill., broke an essential part on the press he was running 24 hours a day. He telegraphed a Connecticut manufacturer for a spare part which had a value of $3, and in 12 hours air mail had delivered the part and he was saved $300 that a shutdown would have cost.

A Michigan manufacturer made a product in his factory which was near his chief market. He was accustomed to make small shipments to his branch factories. Overnight, he received a big rush order from a distant territory near one of his plants. He loaded the original tools for making these goods into a plane, and delivered them to the distant plant within 24 hours. He saved freight amounting to many times the flying cost and pleased the customer by prompt delivery.

Publishers are availing themselves of the opportunity of sending newspapers, magazines, and photographs by air.

California honey producers sell their surplus stock by air mail. Citrus growers use air mail in place of telegraphy for sending manifests.

Apple shippers in Oregon use air mail for selling orders, bills of lading, car tracers, and supplies orders.

Vaccine was rushed by air to halt an outbreak of anthrax on the West Coast. Snake serum is dropped from airplane in the Canal Zone.

Florists find air transportation of value in shipping cut flowers to exhibitions.

Rare drugs and baby chicks are other items entrusted to the air mail.

Alert buyers scour the New York market for the latest in fashion, and each night the westbound plane from New York carries models of hats, gowns, and lingerie.

There are spare parts for a threshing machine in

Nebraska to save the payroll an idle crew would receive; a present from a forgetful husband who delayed purchase of friend wife's birthday gift until too late for the regular mail; a belated package for a traveler about to board ship for a foreign port; photographs of important news events.

An Oakland manufacturer recently sold his product in the New York market. By shipping via air, 1,000 miles away, he put his lightweight product down in New York as fast as his competitors could have delivered it from New England.

A consignment of flowers was flown to New York, so that they might arrive with the bloom of California still upon them.

In 1 month, shipments out of Chicago included commodities ranging from bread and ice cream to pawn tickets and jewelry, and the air express carried a 317-pound casting needed by a firm in Wichita, Kan.

Several national concerns have already made plans to effect drastic changes in their methods. One Middle West concern purposes to abolish a mountain state distributing office. It will mail its lightweight parcels by air transport when it receives air-mail orders from the West, direct from its main factory, thus doing away with keeping double stocks, two sets of books, and working other economies.

Use of the air mail by advertising agencies in blocking out or changing an advertising campaign is, of course, only another long step in the crusade to shorten the gap between raw product and the con-sumer. This campaign tends to serve the public, which is the market, because it reduces inventories, the cost of operating capital, and the danger of disastrous overstocking.

Many advertising layouts are sent out in which are blank spots for insertion of the latest timely material, the remainder to follow by air.

The following are extracts from a circular issued by the Chamber of Commerce of the United States:

### Principal Articles Sent by Air by Banks

Checks, drafts, and notes for collection and credit, saving interest charges on funds in transit.
Advices of payment of drafts, etc.
Important and rush letters.
Letters to connect with mail to Europe and other foreign destinations.
Shipping documents.
Securities.
Urgent correspondence with foreign mails.

### Principal Articles Sent by Insurance Companies

Letters, including authorizations, releases, etc.
Applications for various contracts, and proofs of loss.
Daily reports, card records, monthly accounts, and statistical statements.
All policies to distant offices.
Small and urgent supplies to agents.
Checks for claims, policies, lost, etc.
Surety and contract bonds, legal papers, farm mortgages, and occasional securities.
Reinsurance claims.

### Principal Articles Sent by Business Houses

Contract and credit letters, documents, and sales promotion material.

Advertising proofs and copy of proofs for approval.

News pictures and photographic mats.

Small packages.

Repair parts.

Articles urgently needed at destination.

Announcement of new products.

Rush shipments of samples and "out-of-stock" merchandise.

### What Some Users Say

The banks say air services made funds available readily.

A Middle West bank saves 2 days by sending items to New York by air instead of through the Federal Reserve Bank. Pacific Coast bank states it requires 2 days for clearance with New York by air, as compared with 5 days through Federal Reserve Bank.

Saving 1 to 2 days', and in some cases, 3 days' interest, 8 cents per day per $1,000, to credit to bank customers. Saving reported by different banks range from $125 to $5,000, monthly. A certain bank considers it good policy to send by air items of $100 and over.

Another bank mentions saving in rate by air express as compared with air mail, and 1 bank reports 1 hour earlier delivery by air express than by air mail.

The insurance companies emphasize the saving in time. Special mention is made of:

Benefit in gaining goodwill.

Ability to settle losses early.

Quick delivery of court documents, identification papers, and other matters which could not be sent by telegram, due to their character and nature of their contents.

Better supervision over companies' affairs at distant points.

### Air Express Service

Shipments by air express include: general express traffic of most every kind, single pieces not over 200 pounds, 60 inches long, 19 inches wide (4 inches in depth if over 40 inches long), and 106 inches in combined length and breadth.

Shipments up to $5,000 in value, including money and jewelry.

Perishable goods, when properly packed; moving picture films; wearing apparel; mercantile commodities; retail supplies; small machine parts; etc.

C.O.D. shipments are made and special delivery service is rendered.

Any mailable matter, except perishable material liable to damage by freezing, may be sent by air mail.

That the United States has been shrunk to the size of Texas has become a commonplace. That the firm which does business "in the old geography" of a 3,000-mile continent and 35-mile transportation is not in pace with the times and is likely to be out-distanced is a creed of the air-mail pioneers. They began by playing a shoestring, they are beginning to get volume of traffic, and around the corner they vision aviation becoming transportation on a big scale.

## CHAPTER VII

### *What the Ford "Laboratory" Teaches*

BY contract signature, on the books Colonial Airways garnered Contract Air-Mail Route No. 1 honors, but it was Henry Ford who was first in the air with the mails.

He also plunged into aviation as a "laboratory experiment" in sundry other ways.

He first used an air line as a private business enterprise, devoted exclusively to the service of his own industrial plants.

He built the first modern airport, with station facilities and concrete runways.

He pioneered in all-metal plane construction, and in seeking quantity production methods which would apply to airplane building.

In other ways he was a patron of the young and struggling aeronautical industry. But few things could have been more heartening than the delayed announcement, on August 8, 1929, that,

> The Ford Motor Company became a manufacturer of airplanes July 31 by purchasing all stock and assets of the Stout Metal Airplane Company. . . . The Stout plant and

manufacturing equipment were purchased by the Ford Company for the purpose of accelerating airplane development by backing the work with the diversified resources and experience of the Ford organization. The scope of the experimental operations will be widened, while the manufacture of the present type, which has proved highly successful in the Ford freight service, will be continued on a larger scale. . . . The Stout plane was selected as being the most highly developed type in America, and because it appealed to Mr. Ford as the most logical, dependable, and safe.

Ford's participation came as the result of his son Edsel's interest in the struggles of William B. Stout, who had followed the airplane from early experiments with models, through a period of aeronautical editing into the precarious business of designing new types of airplanes.

A "bat-wing" plane was followed by an internally trussed, thick wing, metal "torpedo plane," built for a test by the U. S. Navy. The plane was destroyed while landing from that test, but the designer was convinced of the practical nature of his plan and pressed ahead, scantily financed, to build an "air sedan" and, later, an "air Pullman" model.

Edsel Ford's interest in aviation had led to an invitation to Stout to move his plant to Dearborn where a modern factory devoted to research in aviation was to be built, and where the now famous Dearborn airport began to take shape.

Five "Air Transports" were bought by the Ford Company, and on April 3, 1925, the Detroit-Chicago freight line was opened. On July 31, the Detroit-

FORD AIRPORT AT DEARBORN, MICHIGAN.

Cleveland service started, and on that day, also, the all-metal plant became all-Ford as well.

The Fords, father and son, had established an airport, started a freight line through the skies, and bought an airplane factory. They then became mail carriers, contracting for the routes known as Contract Air-Mail Routes 6 and 7, linking Chicago, Detroit, and Cleveland. This service, started February 15, 1926, was delayed because of the $500,000 fire which destroyed the airplane plant. Ford said:

> Anything that can cut down the time of operations in the work-a-day world is just so much more added to the credit side of business and life in general. . . . The pioneering in plane building and operation is past. It now remains for men of business to take hold.

At a meeting in Philadelphia in that year, C. M. Keys, head of the Curtiss Company said:

> Mr. Ford was first in the air. His whole operation has been public spirited and generous and was, in fact, the starting point of organized commercial aviation in this country.

On the anniversary of the freight line there was made the first traffic report showing more than 1,000 trips, and *more than 1,000,000 pounds of freight* carried.

The historic detailed story is tabulated on the following page.

During 5 months, from August to December, 1926, there were 657 passengers carried on Ford lines. During the next year, no passengers were carried, but

| | *Chicago-Detroit* | *Detroit-Cleveland* |
|---|---|---|
| Trips undertaken | 650 | 443 |
| Trips completed | 635 | 439 |
| Miles flown | 161,925 | 54,353 |
| Hours in the air | 1,745 | 645 |
| Pounds carried | 625,568 | 408,381 |
| Trips cancelled, account bad weather | 21 | 10 |
| Forced landings | 39 | 11 |
| Due to motor trouble | 11 | 7 |
| Due to bad weather | 28 | 4 |

on the industrial routes, the freight total mounted to 2,302,264 pounds. During 1928, passenger carrying was resumed and a total of 5,640 carried, or more than 10 per cent of the total for the nation.

Ford freight carrying justified itself because there was routed over the air transport line parts and materials necessary to the operation of assembly plants and subsidiary factories. He "cut across lots" — to use his own phrase — just here and reached a conclusion regarding aviation's usefulness to industry and commerce many months, even years ahead of other business leaders. In fact, it probably is quite safe to say that he had evolved clear ideas about what aviation had to sell business long before most of the leaders of that infant industry had begun to think themselves through to prospects of commercial solvency.

His announcement, that the figures showed that air transport "paid its way," even for the types of heavy materials which he shipped, came as a tacit blessing upon the whole aeronautical group. He said, in effect, that this new thing was economically sound.

No one else has dared follow in his footsteps — spending millions "in the laboratory manner" — but he blazed a trail as regards *use* of air transport which others have followed.

Ford's $2,000,000 airport likewise became a model studied by municipalities and individuals interested in airport construction, though it was 2 or 3 years before even the richest municipalities, though they be situated by destiny at an air axis, could begin to think of ground facilities on any such terms.

Now the bigger cities think about airports, like Ford, in million-dollar units.

The Ford airport consists of some 600 acres of turf where trees once stood. Runways are 2,800 and 2,600 feet, mostly of concrete. There are hangars 300 feet long, a mooring mast for airships which is more than 200 feet high. Adjoining is a model factory — Ford style in brains and prearrangement — which replaces hand labor at every possible point.

Similar forethought went into the passenger station, which is equal to a railway station in its completeness.

All the lessons of Ford manufacture and operation of airplanes are not known. In that research laboratory some things have been started which were not finished; and others have been started, no doubt, whose results will appear before us all in due time.

Ford may have a handhold on the dominant factor which will insure success of passenger air transport. The point at which air transport operation can be attacked most tellingly, in all probability, is in the very considerable item labelled "depreciation" in the budget of operations.

Elsewhere in this volume are operations figures showing that of the all-operations total on a certain transport, depreciation alone accounts for more than 40 per cent. Planes will be more durable, of longer life, no doubt, but quantity production methods, making reduction in price possible, probably will do more to bring the depreciation figure down.

Such items as supplies, personnel, maintenance, and insurance can be whittled down bit by bit, through keen management — but only by a matter of margins.

Fordized assembly lines within the airplane plants may cut the pennies off the passenger-mile rate and give aviation its chance to go after the volume of traffic which alone can insure profits.

While Ford engineers tackled the problems of production, transportation, and airport management, he was engaged in yet another "laboratory experiment." He set out to see whether he could help make us "air minded" by use of the advertising columns which he had for so long foresworn.

A typical advertisement strikes a keynote, and moreover describes a condition. The text of it follows:

### Are We Air Minded?

You might never have heard of Medford, if the people of Medford had not seen a vision in the sky above the mountains of Oregon, west of Lake Klamath. . . . That was the day they realized a new map of the world is being drawn in invisible lines across the heavens! . . . That was the day they determined that Medford should be known in the skies as a harbor . . . open to the commerce of the world!

Medford established the first municipal airport in the state of Oregon in 1922. By 1926, it was a regular port of call for the Pacific Air Transport. In 1928, a fleet of 26 ships arrived, including 3 trimotored Ford planes. Medford began to feel cramped!

When a vote was taken on a bond issue for a Class A airport, it was the largest ever polled at a special election in Medford, and the bond issue carried by a majority of 2,248 to 182!

This awareness of the small towns and cities of the West to the great significance of commercial aviation is worthy of serious consideration. For the town that ignores the possibilities of reaching the world through the sky is deaf to the call of real opportunity.

In the course of the next few months you will see new names come into prominence, names that are little known today. You will hear of Waynoka as an air-mail junction . . . of Clovis as a terminal of importance . . . of others, north, east, south, and west. . . .

From an economic viewpoint, this year will be one of the most important in the development of the new transportation. Great transportation lines will be inaugurated, tying city to city, ocean to ocean, continent to continent, by routes that will be measured not in miles, but in terms of time. *Already it is possible for an airplane to take off in St. Louis and reach any part of the United States within 24 hours.*

As the development of the automobile depended upon the extension of good roads, so the general usefulness of the airplane depends now upon the establishment of adequate landing fields, lighted routes, and town-markers visible from the sky.

It is noteworthy that over 5,000 cities and towns, with populations from 1,000 to 50,000, have placed aerial guides upon their roofs, both to identify themselves and to assist in the navigation of the air. Some face the sky conspicuously. Some vaguely. *But an overwhelming majority of American towns and cities are virtually blank spaces from the sky!*

With cities like Oakland, Miami, Cleveland, and a score of others actually operating and profiting by air terminals, just as they do by railroad stations and shipping wharves, it seems extraordinary that there are still so many neglecting their opportunities.

Many great corporations like Ford and Standard Oil make it a practice to mark their properties, to be clearly identified from above. For the ships of the air are already vital factors of commerce, looking always for new harbors and new markets!

That is Fordized aeronautical publicity.

## CHAPTER VIII

### *The Empire Builders and Their Realms*

THE Harrimans, Hills, and Goulds of the aviation industry now are beginning to be discernible.

In the public mind, Wright, Curtiss, and Lindbergh are the names which have stood for aeronautical achievement. But after the pioneer comes always the builder.

Of the "empire builders of the air," three stood head and shoulders above all the others, early in 1929. They were:

C. M. Keys, who was a financial editor.

Richard F. Hoyt, a banker.

W. E. Boeing, a lumber baron of the far Northwest.

Keys headed up the various Curtiss interests. Hoyt was chairman of the Wright Aeronautical Corporation, and partner in the banking house of Hayden, Stone and Company. Boeing had come into aviation through the manufacture, during a dozen years, of airplanes, chiefly for government use.

Around the Curtiss plants at Garden City, Long Island, and Buffalo, N. Y., the Wright engine unit at Paterson, N. J., and the Boeing airplane factory at

Seattle, Wash., these three have built what are in effect "vertical trusts," with units active in many phases of aeronautical industry, commerce, and transportation.

The mergers which followed, in the race for continental honors, brought to the fore other units:

W. Averill Harriman, as chairman, and Robert Lehman, as chairman of the executive committee, headed up Aviation Corporation which started with a $40,000,000 issue of an authorized $200,000,000 capital. The chief industrial unit was Fairchild and the major transport company was Universal Aviation Corporation.

A fifth group had moved eastward from the coast. Western Air Express, under the leadership of Harris M. Hanshue, had expanded and assumed control of the Fokker Aircraft Corporation of America. James A. Talbot, of Richfield Oil, became chairman of the board. Later, General Motors acquired a 40 per cent interest in Fokker Aircraft and planned wide expansion. Western Air Express pushed a transcontinental line eastward, while Fokker engineers built a plant at Glendale, W. Va., and designed one for Los Angeles, and the General Motors program was to include plants in many other cities.

In August, 1929, the industrial interests headed by Richard F. Hoyt and C. M. Keys were merged in a 12-company consolidation, the Curtiss-Wright Corporation. In this corporation were units then having an aggregate market value of more than $220,000,000. Transport units were not included.

In the present rapid progress of aviation, no description of alignments can be rated as of lasting value. Nevertheless, a rough delineation of these new business empires becomes significant. A sort of tabloid survey of these big units is attempted in what follows:

Boeing-Rentschler-United — The National City Bank helped to organize and participate in financing of United Aircraft and Transport, for which 1,000,000 shares of $50 par, A stock was authorized; as well as a common stock issue of 2,500,000 shares. Outstanding, in August, 1929, were 240,000 A shares and 1,557,308 shares of no-par common stock.

Chief United units were:

Boeing Airplane Company of Seattle, which had a floor area of 300,000 square feet and additional units under construction. Boeing Air Transport operated air-mail and passenger lines, Seattle to Los Angeles, 1,080 miles, San Francisco to Chicago, 2,018 miles.

Pratt and Whitney Aircraft Company, manufacturer of "Wasp" and "Hornet" air-cooled engines, located at Hartford, Conn.

Chance Vought Corporation, of Long Island City, N. Y., leading manufacturer of military planes.

Hamilton Metal Plane Company, manufacturer of metal planes.

Sikorsky Aviation Corporation, pioneer builder of amphibians.

Stearman Aircraft Corporation, of Wichita, Kan.

Stout Air Services, Incorporated, which was a development of the Ford-Stout plane building and transport operating experiments.

HOYT-WRIGHT. — Richard F. Hoyt, headed up as chairman.

Wright Aeronautical Corporation, builder of the famous "Whirlwind" engines and of the latest "Cyclone" models.

Aviation Corporation of America, which owns Pan-American Airways, the first big international air transportation system of the Western hemisphere.

Keystone Aircraft Corporation, of Bristol, Pa., lately builder of an overwhelming majority of the army bombers, as well as of the 20-passenger "Patrician" transport.

Travel Air Manufacturing Company, plane builder of Wichita, Kan., which has forged to the front in quantity production of open and closed models.

Moth Aircraft, manufacturer of light sport and training planes.

Aviation Credit Corporation, which underwrites time payments.

New York Air Terminals, Incorporated.

CURTISS-KEYS. — The Keys group includes engine and plane manufacturing, sales and service, transportation and finance. The central company is the Curtiss Aeroplane and Motor Company, Incorporated.

A subsidiary, Curtiss-Robertson, of St. Louis, manufactures an enclosed model commercial plane.

Curtiss-Reid Aircraft Company, Ltd., operates an airplane factory, an airport, and sales organizations in Canada.

Curtiss-Caproni acquired American rights to and proposed to build seaplane models designed by Gianni Caproni, the Italian designer and constructor.

The Sperry Gyroscope Company produces gyroscopic, mechanical, electrical, and aeronautical equipment.

Curtiss Flying Service operates on 35 fields and sales agencies and schools, selling planes manufactured by Curtiss and other makes as well.

Curtiss Aero Export Company handles foreign sales for the various units.

National Air Transport operates the air mail for New York to Chicago and Dallas. Transcontinental Air Transport operates the New York-Los Angeles air-rail route, of which the rail links are furnished by the Pennsylvania and the Santa Fe railroads.

In this corporation also are finance companies; the biggest of these being North American Aviation, a $30,000,000 concern.

CURTISS-WRIGHT. — Of the foregoing groups the following are included in the Curtiss-Wright Corporation by exchange of stock: Curtiss Airports, Curtiss Flying Service, Curtiss Aeroplane Export Company, Curtiss-Caproni Corporation, Curtiss-Robertson Airplane Manufacturing Company; Wright Aeronautical Corporation; Keystone Aircraft Corporation; Moth Aircraft Corporation; New York and Suburban Air Lines; New York Air Terminals and Travel Air Manufacturing Company.

AVIATION CORPORATION. — In this group are the various Fairchild companies, devoted to manufacturing planes, building aero cameras, and operating photographic services, and aerial surveys. Fairchild has built various plane models and for some time was the leading builder of enclosed planes. He is now concentrating on a seven-passenger transport.

A subsidiary, Krieder-Reisner Aircraft Corporation, of Hagerstown, Md., manufactures a line of open cockpit planes.

Aviation Corporation owns a heavy interest in Advance Aircraft Company of Troy, Ohio, builder of "Waco" models, and, in point of numbers, the biggest builder of open planes during the last few years.

Transport units owned by Aviation Corporation include Universal Aviation Corporation, Colonial Airways Corporation, Southern Air Transport, Interstate Air Lines, and Embry-Riddle Aviation Corporation. These lines include air-mail contracts over 4,675 miles and they operate a combined air-mail–passenger mileage of 9,128 miles, servicing 62 cities. Aviation Corporation owns and operates six airports.

Several western units were consolidated in Detroit Aircraft Corporation, which had an authorized capitalization of 2,000,000 no-par shares of which 887,769 were outstanding.

Several accessory units were grouped in Bendix-Aviation in which General Motors was a heavy owner. This corporation had a 3,000,000 share authorization of which more than 2,000,000 shares had been issued soon after its formation.

A list of the leading aviation corporations of the country, or of those which had attained such financial importance that their shares were listed on various exchanges, is given in the following tables.

Aviation Companies, Capitalization, August, 1929

(As compiled by B. H. Cram)

| Name of company | Capitalization | | Par | Listed | Type of company |
|---|---|---|---|---|---|
| | Stock authorized | Stock issued | | | |
| Aeromarine Klemm | 326,00C | 242,000 | $5 | O.C. | M |
| Aeronautical Industries | 500,000 | 100,000 | No | N.Y.C. | I |
| Aero Supply "A" | 25,000 | 25,000 | No | N.Y.C. | A |
| Aero Supply "B" | 500,000 | 379,000 | No | N.Y.C. | A |
| Aero Underwriters | 250,000 | 141,297 | No | N.Y.C. | I |
| Air Investors | 1,500,000 | 158,255 | No | N.Y.C. | I |
| Air Investors (Pfd.) | 250,000 | 90,000 | No | N.Y.C. | I |
| Airstocks, Inc | 250,000 | 100,000 | No | O.C. | I |
| Alexander Industries | 500,000 | 304,617 | No | N.Y.C. | M |
| Alexander Industries (Pfd.) | 6,000 | 5,850 | $100 | O.C. | A |
| Allied Aviation Industries | 500,000 | 110,000 | No | O.C. | D |
| American Aeronautical Corporation "A" | 150,000 | 105,000 | No | O.C. | M |
| American Aeronautical Corporation "B" | 500,000 | 287,000 | No | | |
| American Eagle | 2,000,000 | 200,000 | No | O.C. | M |
| Aviation Corporation [4] | 10,000,000 | 3,035,603 | No | N.Y.S.E. | M and T |
| Aviation Corporation of America | 1,000,000 | 228,333 | No | N.Y.C. | I |
| Bach Aircraft | 1,000,000 | 850,000 | No | L.A. | M |
| Bellanca Aircraft | 500,000 | 175,000 | No | N.Y.C. | M |
| Bendix Aviation | 3,000,000 | 2,250,000 | No | N.Y.S.E. | A |
| Berliner-Joyce Aircraft "A" | 50,000 | 40,000 | No | O.C. | M |
| Berliner-Joyce Aircraft "B" | 40,000 | 37,918 | No | | |
| Brunner Winkle Aircraft | 250,000 | 70,000 | No | O.C. | M |
| Central Airport, Inc | 500,000 | 206,250 | No | O.C. | D |
| Cessna Aircraft [1] | 50,000 | 27,500 | No | O.C. | M |
| Consolidated Aircraft | 750,000 | 550,000 | No | N.Y.C. | M |
| Consolidated Instrument | 200,000 | 192,000 | No | N.Y.C. | A |
| Curtiss Aero Export (Com.) [1] | 100,000 | 75,000 | No | N.Y.C. | ES |
| Curtiss Aero Export (Pfd.) [1] | 50,000 | 37,000 | $10 | O.C. | |
| Curtiss Aero and Motor [1] | 600,000 | 348,896 | No | N.Y.S.E. | M |
| Curtiss Airports Corporation [1] | 5,000,000 | 2,500,000 | No | N.Y.C. | D |
| Curtiss-Caproni Corporation [1] | 1,000,000 | 400,000 | No | O.C. | M |
| Curtiss Flying Service Inc. [1] | 2,000,000 | 750,000 | No | N.Y.C. | S |
| Curtiss-Reid Aircraft (Com.) [1] | 300,000 | 100,000 | No | O.C. | M |
| Curtiss-Reid Aircraft (Pfd.) [1] | 50,000 | 50,000 | $30 | O.C. | |
| Curtiss-Robertson Airplane Co. [1] | 100,000 | 60,000 | No | O.C. | M |
| Curtiss-Wright Corporation "A" [1] | 2,000,000 | 1,050,000 | No | O.C. | I |
| Curtiss-Wright Corporation "B" [1] | 10,000,000 | 6,500,000 | No | | |
| Dayton Airplane Engine | 100,000 | 100,000 | No | N.Y.C. | ME |
| Detroit Aircraft Corporation [2] | 2,000,000 | 887,769 | No | N.Y.C. | D |
| Douglas Aircraft | 1,000,000 | 345,000 | No | N.Y.C. | M |
| Fairchild Aviation "A" [4] | 750,000 | 700,895 | No | N.Y.C. | M |

| Name of company | *Capitalization* Stock authorized | Stock issued | Par | Listed | Type of company |
|---|---|---|---|---|---|
| Fokker Aircraft (Com.) | 1,000,000 | 949,900 | No | N.Y.C. | M |
| Fokker Aircraft (1st Pfd.) | 40,000 | 30,144 | $25 | O.C. | M |
| Great Lakes Aircraft "A" | 500,000 | 200,000 | No | C.S.E. | M |
| Great Lakes Aircraft "B" | 500,000 | 300,000 | No | O.C. | |
| Inter-Allied Aeronautics | 1,200,000 | 300,000 | No | O.C. | I |
| Irving Air Chute | 300,000 | 200,000 | No | N.Y.C. | A |
| Keystone Aircraft [1] | 300,000 | 287,572 | No | N.Y.C. | M |
| Lincoln Aircraft | 125,000 | 112,500 | No | O.C. | M |
| Lockheed Aircraft [2] | 150,000 | 138,500 | No | O.C. | M |
| Maddux Air Lines [5] | 265,000 | 155,000 | No | O.C. | T |
| Mahoney-Ryan Aircraft [2] | 100,000 | 45,000 | No | O.C. | M |
| Moth Aircraft "A" [1] | 100,000 | 30,000 | No | O.C. | M |
| Moth Aircraft "B" [1] | 100,000 | 65,000 | No | O.C. | |
| National Air Transport | 2,000,000 | 650,000 | No | N.Y.S.E. | T |
| National Aviation | 500,000 | 211,660 | No | N.Y.C. | M |
| New Standard Aircraft | 200,000 | 64,000 | No | O.C. | M |
| North American Aviation | 6,000,000 | 2,000,000 | No | N.Y.C. | T |
| Pollack Manufacturing | 100,000 | 100,000 | No | N.Y.C. | A |
| Sikorsky Aviation [3] | 500,000 | 220,000 | No | N.Y.C. | T |
| Southern Air Transport | 1,000,000 | 300,000 | No | O.C. | T |
| Standard Steel Propeller | 350,000 | 129,000 | No | N.Y.C. | A |
| Stearman Aircraft [3] | 100,000 | 75,000 | No | O.C. | M |
| Stinson Aircraft | 150,000 | 123,905 | No | Det. | M |
| Swallow Airplane Company | 100,000 | 49,000 | No | O.C. | M |
| Transcontinental Air Transport [5] | 1,000,000 | 525,000 | No | N.Y.C. | T |
| Travel Air Company | 100,000 | 97,940 | No | N.Y.C. | M |
| United Aircraft and Transport Corporation [3] | 2,500,000 | 1,557,308 | No | N.Y.S.E. | M and T |
| United Aircraft and Transport "A" [3] | 1,000,000 | 240,000 | $50 | N.Y.S.E. | M and T |
| Universal Aviation [4] | 500,000 | 321,564 | No | N.Y.C. | I |
| U. S. Air Transport | 150,000 | 120,000 | No | O.C. | T |
| Waco Aircraft Company | 200,000 | 145,000 | No | N.Y.C. | M |
| Warner Aircraft | 500,000 | 400,000 | No | O.C. | ME |
| Whittelsey Manufacturing "A" | 500,000 | 240,000 | No | O.C. | M |
| Whittelsey Manufacturing "B" | 1,000,000 | 420,000 | No | O.C. | |
| Wright Aeronautical [1] | 1,500,000 | 600,000 | No | N.Y.S.E. | ME |

*Code.* — N.Y.S.E., New York Stock Exchange. N.Y.C., New York Curb Market. O.C., New York Over-the-counter Market. C.S.E., Chicago Stock Exchange. L.A., Los Angeles. Det., Detroit. A, Accessories. D, Development. ES, Export Sales. I, Investment. M, Aircraft Manufacturer. ME, Engine Manufacturer. T, Transport. S, Sales.

[1] Part of Curtiss-Wright group.
[2] Part of Detroit Aircraft group.
[3] Part of United Aircraft and Transportation group.
[4] Part of Aviation Corporation group.
[5] Part of Transcontinental Air Transport group.

The chief air transport "empires" are shown in the following summarizing tables.

THE AVIATION CORPORATION PASSENGER SYSTEM

| *Route* | *Mileage* | |
|---|---|---|
| | *Route* | *Total* |
| Colonial Airways Corporation: | | |
| New York-Boston | 191 | |
| New York-Montreal | 332 | |
| Albany-Cleveland | 443 | |
| Buffalo-Toronto | 62 | 1,028 |
| Universal Aviation Corporation: | | |
| Cleveland-Garden City | 1,082 | |
| Cleveland-Louisville | 316 | |
| Chicago-St. Louis | 287 | |
| Chicago-Kansas City | 503 | |
| Kansas City-Omaha | 165 | |
| Kansas City-Wichita | 191 | |
| Kansas City-Oklahoma City-San Angelo | 681 | |
| Wichita-Tulsa-Wewoka-Dallas-Fort Worth | 417 | |
| Tulsa-Oklahoma City | 100 | |
| Oklahoma City-Wewoka | 67 | |
| Oklahoma City-Amarillo | 241 | 4,050 |
| Embry-Riddle Aviation Corporation | | |
| Chicago-Indianapolis-Cincinnati | 270 | 270 |
| Interstate Air Lines: | | |
| Chicago-Evansville-Atlanta | 640 | |
| Evansville-St. Louis | 145 | |
| Evansville-Louisville | 100 | 885 |
| Southern Air Transport: | | |
| Dallas-Galveston | 292 | |
| Waco-San Antonio-Brownsville | 435 | |
| Dallas-Fort Worth-Abilene-El Paso | 575 | 1,302 |
| Additional mail only routes | | 1,593 |
| Harriman total | | 9,128 |

CURTISS-KEYS GROUP

| Route | Mileage | |
|---|---|---|
| | Route | Total |
| National Air Transport: | | |
| New York-Chicago | 718 | |
| Chicago-Dallas | 995 | |
| Ponca City-Tulsa | 76 | |
| Toledo-Detroit | 45 | 1,834 |
| Transcontinental Air Transport: | | 1,974 |
| Pitcairn Aviation: | | |
| New York-Atlanta | 769 | |
| Atlanta-Miami | 622 | |
| Tampa-Daytona Beach | 129 | 1,520 |
| Maddux Air Lines: | | |
| San Francisco-Los Angeles | 378 | |
| Los Angeles-Phoenix | 414 | 792 |
| Keys total | | 6,100 |

HOYT–PAN-AMERICAN

| | |
|---|---|
| Miami to Nassau, Miami to Cuba, Haiti, Dominican Republic, Mexico, British Honduras, Honduras, Nicaragua, Costa Rica, Panama, Canal Zone, Colombia, Ecuador, Peru, Chili, Windward and Leeward Isles, Trinidad, Dutch Guiana, British Guiana. | |
| Operation, September, 1929 | 12,400 |
| Santiago, Chili, to Buenos Aires, Argentina, and Montevideo, Uruguay | |
| Optioned and in preparation | 950 |
| Hoyt total | 13,350 |

(Under survey, 2,500 miles.)

BOEING-UNITED AIRCRAFT AND TRANSPORT

| | | |
|---|---|---|
| Boeing Air Transport: | | |
| Chicago-San Francisco | 2,018 | |
| Seattle-Los Angeles | 1,080 | 3,098 |
| Stout Air Services: | | |
| Detroit-Cleveland | 134 | |
| Detroit-Chicago | 252 | |
| Detroit-Buffalo | 218 | 604 |
| Boeing total | | 3,702 |

HANSHUE-WESTERN AIR EXPRESS

| | | |
|---|---|---|
| Los Angeles-Kansas City | 1,425 | |
| Los Angeles-Salt Lake City | 600 | |
| Los Angeles-San Francisco | 365 | |
| Cheyenne-Pueblo | 200 | |
| Los Angeles-Tia Juana | 120 | |
| Los Angeles-Lake Arrowhead | 70 | |
| Los Angeles-Catalina | 45 | |
| Hanshue total | | 2,825 |

A detailed table covering all air transport will be found in the Appendix of this volume.

# CHAPTER IX

## *Forming a Vertical Trust*

It has been less than 2 years since the writer, interviewing Harry F. Guggenheim, of the Guggenheim Foundation for the Promotion of Aeronautics, listened with amazement to a declaration that this foundation hoped to arouse such an interest as would bring $150,000,000 to $200,000,000 into the industry in a few years.

What young industry ever had moved that fast?

But Lindbergh focussed attention far more successfully than even Guggenheim dreamed possible; so that, today, on an average, three new airports are being opened each workday; engine factories are doubling, even quadrupling capacity; airplane plants are expanding, and many new ones are being built; and scores of new passenger transport routes are opening.

As to the total investment in aviation it is difficult to say. Adequate figures are not available. But, the units of a single group, the one headed by C. M. Keys, had a market value in April, 1929, of $175,000,000. That is to say, one man controlled aviation money in a sum as great as the sum which Guggenheim hoped to attract to the entire industry.

This group has been built around the Curtiss Aeroplane and Motor Company, whose shares were worth $654,000, in 1920, and $55,000,000 during the summer of 1929.

By 1928, the Keys-Curtiss interests had taken such a dominant position in the aviation picture that the Pennsylvania Railroad elected to tie-up with Keys in Transcontinental Air Transport, the first air-mail, coast to coast system.

He then won further public attention as "Lindbergh's boss" — when the Colonel became chairman of the technical committee of the Transcontinental Air Transport, of which Keys is president.

But these two events were as window dressing: they made Keys a public figure, to be sure, but they did not mark his "arrival." He had "arrived" long before, and with a foot-pound of impact which cannot even yet be calculated.

This ex-newspaper man today heads up as chairman, president, managing director or chairman of the finance committee — federated aviation interests which are in effect a "vertical trust" — with ramifications through the fields of industry, commerce, and transportation.

The chief companies directed by Keys, as chairman, president, managing director, or chairman of the finance committee, are as follows:

| *Company* | *Capital at Market Prices* (Early Summer, 1929) |
|---|---|
| Curtiss Aeroplane and Motor Company, Inc. . | $55,000,000 |
| Curtiss Flying Service, Inc. | 17,000,000 |
| Transcontinental Air Transport, Inc. | 12,500,000 |
| National Air Transport, Inc. | 13,500,000 |
| Curtiss-Caproni | 12,500,000 |
| Curtiss Aeroplane Export Corporation | 3,500,000 |
| Curtiss-Robertson Airplane Mfg. Company | 1,500,000 |
| Curtiss-Reid Aircraft Company, Ltd. | 1,500,000 |
| National Aviation Corporation | 15,000,000 |
| North America Aviation, Inc. | 35,000,000 |
| Aviation Securities Company | 3,000,000 |
| Miscellaneous | 5,000,000 |
| | $175,000,000 |

He will talk readily of aviation, in one of the quietest voices in New York, but of facts about his personal history relatively little comes to light. It embarrasses him to have to yield up personal information. He confesses that he even found it embarrassing in the old days of reporterdom to have to interview men for the material "success stories" are made of.

He is living a more striking "success story" than he ever wrote. A Canadian by birth, graduate of Toronto University, teacher of classics in Ridley College, St. Catherines, Ontario, for 2 years, Keys came to the United States and became a financial reporter.

Mr. Keys explains:

I took that step deliberately, as a matter of training. It seemed to me that when young men enter finance by way of the bond houses, selling securities, they absorb the necessary background of financial knowledge — but with the slight bias of the seller's enthusiasm. On the other hand, the financial reporter must see clearly, without bias; no self-interest colors the opinions which he forms. As a financial writer, I thought I would learn to size up companies and financial issues clearly. During a period which was so critical that we actually had to *cut* wages, the soundest of our policies was put into effect. *Never* was the engineering budget reduced so much as a nickel. Those of us who could get along without them drew no salaries; but as rapidly as we could we increased the research budget.

As a result of this, we were able to break the world's speed record for 4 successive years; and we brought every major aviation record back to the United States.

Keys considers that he merely adapted to aviation the General Electric policy of letting the research laboratory "run" the business — in that technical experts decide what shall be manufactured, and how.

"Put on the market the product which excels in quality and from an engineering standpoint and domination of the market is assured," is the way Keys phrases this rule of success in industry. He states further:

Since that time, we have been doing, step by step, what seemed necessary; meeting the problems of aviation's needs as they arise. I do not like "high lights" in any description of what we have done; I had rather see it described in matter-of-fact style. There are no colorful gestures; we are having to build a business vehicle — new, from the ground up — *but,* on a plan very nearly identical with the plan which has carried other industries forward.

As regards financing, aviation has differed from earlier "infant industries." There grew up in this country a theory that since the general trend of business development is *forward* in America it is better to own an equity in a business than merely to own a token of indebtedness; it is better to own a part of an industrial concern than to be owed money by that concern; it is better to own stocks than bonds. I am not prepared to go all the way with this theory, as to its general applicability; but it was a trend of thought which had arrived, to which the public was coming to subscribe.

Aviation met this trend, and the result was financing admirably suited to the needs of a new and rapidly growing industry. There are no bonds outstanding against any of our companies. Except in two cases where spending for development work made it advisable for us to guarantee a part of the investment, there are no preferred shares in Curtiss companies. We are financing aviation pioneering wholly on a common stock basis. In no prospectus of ours does the word "investment" occur. This is no business for widows and orphans; it is a business man's proposition.

And, in so far as the Curtiss interests are concerned, all the capital raised has been a clear contribution to new development of aviation. We have made clear the purpose for which any stock issue was intended — and that money and the use of it has been "visible." Money is raised and it is spent to develop engine-producing capacity, a new airplane plant, an air line, a new service.

Another method of raising capital for new industries has consisted of the underwriting of new capital issues, the proceeds of which are exchanged for stock in going concerns desired for consolidation purposes. In last analysis, nothing new comes into the industry in such cases — excepting new ownership of old things.

I think that our policy is sound, that it *builds* — and that is what I am interested in.

We have a greater degree of freedom, of manoeuvre ability, because of our one-class capital. The business is not underwritten by "investors"; it is underwritten by business men, ready — yes, and apparently eager — to take a business risk. Generations ago young railroads frequently were braked by their mortgage liabilities, often thrown into court by their bondholders. Aviation faces no such danger. We are free to experiment and write off our losses quickly, so that we may move forward again, profiting by the lessons learned.

Too many glowing words are written and uttered about aviation, its growth, its future. This romantic element had obscured somewhat the fact that *building* aviation is a difficult business task, to be done by business men, using the best business principles.

Air lines are plotted only after the most exhaustive studies regarding routes, weather factors, present and future traffic, equipment tests, statistics. There is no "guess" in a real air-line plan; there must be none; every detail must be thought out before a propeller turns.

The designing of an airplane engine factory and carrying it forward to operation is more difficult than the building of a factory for the manufacture of automobile engines. Precision demands are greater, higher tests required throughout.

A successful airplane plant must be built around superior designers, and with trained workmanship. The aviation art is advancing so rapidly that sound manufacturing progress can be made only if the ablest of pioneering engineers determine designs. The mere "copyist" soon will be left behind.

The safety factor puts a greater premium on workmanship. Aviation therefore is confronted with a personnel problem of an intensity seldom met with in industry.

In that connection, different types of men are required for different branches of the business.

We formed Curtiss Flying Service, as a separate entity, because there must be some division of our business devoted to *use* of planes, as distinct from manufacturing or air-line operation. Men of different temperament were needed. Curtiss Flying Service is sales agent for our product; operates schools, in order that the pilot personnel may be built up; and operates a taxi service, which is a business in itself, as well as a day-by-day demonstration of the various commercial uses to which a plane may be put.

When it became apparent that there would be an increased demand for relatively small closed commercial planes, it was considered advisable to make of this a separate division, which would not encroach upon our engineering, war-plane or engine-building facilities. Curtiss-Robertson, of St. Louis, was the result. It is a production company; our aerodynamic laboratory at Garden City — conceded to be one of the finest of its kind in the country — prepares the designs, and Curtiss Flying Service offices, in all cities of 150,000 inhabitants and upward, will be distributors.

Curtiss-Reid, Ltd., of Canada, and the Curtiss Aeroplane Export Corporation were formed for duties which their names indicate.

National Aviation was formed as a holding company during the summer of 1928 while I was in the West on Transcontinental Air Transport business; and on my return I was asked to head it as chairman, and I consented. It is small, the original issue being $3,000,000.

North American Aviation, the original issue of which was $30,000,000, takes rather a different place in the picture. It is not merely a holding company. It will buy and sell aviation securities, to be sure, but it has a wider charter, one which permits it to seek out new inventions, pioneer in development phases of the industry, buy plants outright and operate them if desired. As I visioned its field of usefulness, North American Aviation should be similar on a small scale to the du Pont de Nemours Corporation. If an absolutely new type of aviation development wants financing and direction — neither of which can be spared from the standard divisions of industrial activity — North American Aviation is in a position to underwrite the necessary venture.

Recently, a group of men came to me and asked if our companies would agree to avail themselves of a newly offered partial payment system. When I had looked into its plan and had considered its backing, I was glad to give them the assurance they desired. Another aviation business channel had been opened, and one which, I suspect, the general public considered to be a thing far in the future.

These things I cite to indicate to business men, generally, that we are working ourselves forward gradually, step by step, using sound business methods.

Transcontinental Air Transport is merely another form of railroading. Actual railroad standards are impressed upon it by the heavy Pennsylvania Railroad ownership, and by the fact that the same implication regarding completion of a journey on schedule must apply alike to rail and air-mail tickets sold at Pennsylvania Railroad ticket windows.

The principles on which we have built and are building are simple: Let the best engineering brains design the product. Develop different personnel units for different tasks. Develop a distributor system which is also educational — through schools and through service to the business world. Create an opportunity for the airplane to demonstrate itself. In building air lines, use multiple-engined transports, 2 pilots, provide constant radio communication, to include such a complete meteorological service as will keep the pilot informed of weather conditions over a 100-mile radius — in short, eliminate necessity for forced landings. Build a transcontinental trunk line, and let the " feeders " grow according to traffic demands. And for every part of the industry, provide for constant research, and have ready at hand means of financing a pioneering effort.

That, I think, explains the program on which I have worked with the Curtiss companies. We have met each new problem as it arose, as intelligently as we could, and trying to see as far forward as we could. We are adapting to use by a new industry the things older industries have learned.

Across almost the entire width of the far wall of the Keys office there is a map of the United States. One wonders what he sees on that map, gazing into the future. He does not tell. He decries glowing prophesies, as detrimental to the sound progress of aviation. He is working in the present, meeting the next problem as it arises, and keeping his feet on the ground and his head clear.

## CHAPTER X

### *A Master Builder Looks Ahead*

AMONG the world's leading original thinkers on the subject of aeronautics, Anthony H. G. Fokker must be ranked.

He was born in Dutch Java, but spent his boyhood in Holland. When he was twenty years old, he had designed a new type of airplane and built the ship with the aid of a young mechanic. As he had never flown a plane, he began, by a series of hops, to teach himself to fly.

He thought of this as a sport plane; but when sportsmen did not appear in sufficient numbers to insure a commercial production, he endeavored to demonstrate the military value of his model.

Holland decreed that the invention "had no military value." England turned a cold shoulder, as did Russia. Germany then contracted with the young Hollander to teach some officers to fly, and also gave him an order for two planes.

When the World War broke out he was in Germany and the war orders piled up; although, in the beginning, the boards of strategy had but the vaguest ideas of how the airplane could be used in wartime.

Planes were loaded on trucks and moved from place to place. Then they were flown as ordered; but the purpose of this flight was vague in the minds of the pilots themselves. They recall the beginning of "aerial warfare" as a series of joy-rides.

It is recorded that a pilot one day rigged up a piece of gas pipe in his plane in such a way that he could touch off powder in it. There would follow, then, a flash, and very impressive smoke. The device caused consternation, but no damage.

Fokker, later, was the inventor of the synchronizing device which permitted the firing of a machine gun through the revolving blades of the propeller, thus making the plane a deadly weapon of warfare.

The Armistice terms wiped out a Fokker plants investment of several million dollars. He returned to Holland and began immediately to build passenger transport ships which were put into operation on air lines in some 25 countries.

He came to America at the invitation of the government to confer over the possibility of building planes here. He established a plant here and became an American citizen.

During the year of great passenger expansion, there were only Fokkers and Fords available in the trimotor class, and the engineers of the transport lines fairly clamored at Fokker's door for the F-10-A, the latest of the fifty-odd airplane models which he had designed and put into production during nearly 20 years as a master builder.

Other models which have since followed include his 30-passenger air liner, and an air yacht for the millionaire's pocketbook.

In answer to a series of constructive questions by the author, Fokker, whose plants in Holland, Germany, and the United States have built 10,000 airplanes, mixed hard-headed caution and optimism in an interview which is quoted as follows:

Aviation is *arriving* in the United States at a pace few realize. But this does not mean that progress will be smooth, swift, or easy.

When I am asked to forecast the future of aviation, I speak with reluctance. Always in the past my estimates have been exceeded two or three times over. The future of aviation I believe to be literally beyond comprehension. The opportunities and demands upon us will be limitless. Nevertheless, I curb my enthusiasm, at least for interview purposes.

When I first came to the United States, I predicted 1-day trips to Europe. It was only a statement of a commonplace. But I was bombarded immediately with inquiries as to the detailed descriptions of the planes which would make 1-day trans-Atlantic trips. I had to reply, finally, that if I knew the minute detail of such a plane I'd have flown to America instead of coming by boat.

The things which are around the corner in aviation will not be conjured out of a hat; they will be worked out laboriously, carefully, by men who *know*. By men, I might add, who do not think they know all that is to be known. By men who know that they will make mistakes and learn from those mistakes.

The aviation industry has reached a stage in which men believe things to be easy. A group of business men start an airplane factory, and have no conception of design. Engineers by the score gain some little experience and break away to start companies of their own. They have a smattering of what aerodynamic knowledge they need, perhaps, but no business experience or judgment. A pilot attains fame, and heads a company, and he may have neither engineering nor business preparation. But aviation holds public interest, and capital is readily available.

However, these enterprises which have not proper foundation cannot survive for long. They will not keep up with the pace of development and improvement. Aviation offers great opportunities, but more millions will be lost in aviation within the first few years than are made from it. And a great many of the millions which are made will be made in Wall Street by men who are more concerned with forming companies than in building airplane factories or working out the economics of air transport.

My plants in Holland and in Germany I built up out of earnings. I was independent. There was a gain, during that formative period, in this financial isolation, since it permitted me to act quickly, without reference to stockholders or boards of directors. When I came to America, there was an advantage in taking in local capital. I had partners, but I remained in control — and independent. I have been asked why, since I had built 10,000 planes as an independent, I now have decided to tie-up with General Motors. My reasons constitute an exposition of my point of view about the aviation industry. Decisive considerations included:

First: The need for more capital. A time had come when it would be necessary to pass through what would be 10 years of normal development, in 1 year or 2. Expansion was so rapid that earnings would not furnish the necessary capital. Also, three great groups were growing up in the aviation industry; and a competitive period approached in which it would be wise to be backed by very great capital.

Second: The need for drafting trained personnel. It was no longer a one-man business. I could not be designer, manufacturer, salesman — everything. To meet the demands for planes, it will be necessary to build, equip, and man many new plants, and to put into operation, in each, quantity production methods which it has been impossible, heretofore, to apply to airplane production. The automotive industry is best able to teach us how to do this.

Third: Quantity production involves quantity sales, preferably through established channels, since they are ready to function and do not have to be built up at great cost. General Motors not only distributes to every town in this country, but on a rapidly increasing scale in all foreign countries as well.

Fourth: Greater research facilities are necessary and these now become available. This will be a very great advantage.

All this measures my conviction about the future of aviation. If I say that in Fokker plants we expect to be producing, in 5 years, at the rate of 20,000 planes annually, then in all probability the figure will prove to be nearer 50,000.

The total production in the United States 5 years hence should be at least 150,000 planes annually. It seems a great number when you think of them in one place. But it will be only about 1 plane to each 1,000 persons, whereas we have 1 car to 6 persons.

At a recent air show there was a trend of argument, I understand, to the effect that the real future of the airplane lies in transportation lines. That is to say, that the big transport is the important thing, and the private plane is to find scant market. I do not believe this. Thus far I have built, for commercial purposes, only big transports. But plans are completed for production of small planes, soon, when the time is ripe, and plants finished. The public will be ready to fly, solo. The demand will be such that production will have to be enormous.

On the other hand, probably a fallacy exists regarding the bigness of future planes. I do not know how large the biggest plane should be. No one knows. But I am very certain that the 100-passenger planes being built abroad are too big — for the present. When you increase the size of an airship, the efficiency rises. That is, lifting power increases much faster than does the weight. The contrary is true of an airplane. As the size increases, the weight factor climbs much faster than does the area of the lifting surface. The bigger plane is less efficient. The problem is one of finding a " balance " as between the various factors, such as power, load capacity, stability, speed, and economical production.

As I say, I do not know what is the limit. We are building a 32-passenger plane. That may be the present scientific limit, or it may be a plane which can carry 50, or even 60 passengers. But for bigger planes, we will have to see some radical improvement in power plants and transmissions.

From the point of view of operations, the big plane may be considered at a disadvantage anyway. Since they are not produced in quantities, the investment cost is too high; they require such large fields, including emergency fields along all routes. Power plant difficulties are augmented. Huge hangars are necessary.

The "Twentieth Century Limited" may be run in 4 sections of 15 cars each, but never as a 60-car train. Freight trains 80 cars long may be handled, but passengers are never carried in units of such sizes. Air transport is quite likely to develop in the same manner. A " transcontinental air express " may consist of several " sections " — planes of 12-, 24-, or 32-passenger capacity leaving at few minute intervals. All this will be worked out by *actual* trial. In America we are not trying to leap from 12- to 100- passenger air transports overnight.

The small private plane is near, the greatest giants may be farther away than is popularly supposed; and, as a third point, I would emphasize the fact that the airport is here to stay.

Some engineers have forecast that the use of harbors and rivers which are alongside nearly all great cities, as well as many towns, soon will relegate landing fields to museums for extinct species. Operations from water has many disadvantages. Especially is this true in the case of salt water. There corrosion is rapid, upkeep difficult and expensive; additional water equipment becomes necessary, and, at the same time, there must be hangars and machine shops on land. That is to say, the seaplane or amphibian requires more service, and is in itself less efficient. Economic considerations will prevent rivers and harbors from supplanting flying fields.

Many of the hundreds of airplane builders who have launched bravely in business "on a shoestring" pay me the compliment of copying my models. But they are not content to copy outright; they must copy and then try to disguise the fact and "improve" upon my design. Too often they lose sight of essential details. It is *correct detail* which makes a plane *right*.

When I launch a new model, I fly it again and again, testing and studying it, tuning it up, rebuilding parts where necessary, casting the whole thing overboard if I have been wrong. *That* is airplane designing. That is the sort of work which will bring progress in aviation. Anybody can tell you how to do a thing — on paper. But it is making mistakes and correcting them and learning not to make the same mistakes again which teaches one how to do things in actual practice. I have a knack for invention. I do not know what it is, or how I get it. It is there. But even if I did not have that I would have a certain advantage over these newcomers, who appear so confident of their ability to "improve" my models, because I have in my head the lessons learned from the mistakes made in the development of nearly 60 different types of airplanes. This may explain why General Motors elected to tie-up with the Fokker interests.

Soon, we will be erecting many new plants, in different cities, each designed to manufacture *one* type of plane. This means that Fokker plants will have in production a *complete line* of airplanes — varied in price range, size, and use — designed to meet all needs, the exact nature of which we must be able to anticipate.

This plant organization would parallel that of a great automotive combine. The foundation for a "General Motors of the Air" has been laid.

## CHAPTER XI

# *Not Money, Nor Machines — But Men*

"THIS is a sort of necessary evil," Frederick B. Rentschler said, "something to be attended to a day or two a week. Our real job is at the plant."

*This* was an office 31 stories above Wall Street, then headquarters of the United Aircraft and Transport Corporation.

The speaker, its president.

And that statement a revelation of the man.

Across the famous financial street to the south, sat Gordon Rentschler, a brother, president of the National City Bank, America's largest bank.

This bank participated in the organization of United Aircraft and Transport, and that very participation was accepted generally as a sort of notification that aviation had arrived among the big, standard industries.

There has followed, then, a curiosity regarding this financial and blood relationship existing between United and National City; as well as a curiosity regarding the man who emerged as president of United.

He, it may well be set forth in the beginning, is a *manufacturer.* The financial phase of the management of this aeronautical giant is a secondary consideration, something for 1 or 2 days a week. Aviation is not a banker's but a builder's job.

The component parts of United welcomed the financial experience of the new banker-partner, although they had previously financed themselves, and through an expansion period. But National City acquired no control, exerts no dominant influence, and the bank interest in United is much smaller than is generally supposed.

The father of the president of United was G. A. Rentschler, founder of the Hooven-Owens-Rentschler Company. The plant was at Hamilton, Ohio. Its products, through the years, were many; but in the lead were sugar machinery, stationary power plants, and machine tools of various types.

The making of machinery which will make machinery is no static occupation. It moves with the times, presenting constantly new engineering problems.

Into this set-up, and in a family of wealth, Fred Rentschler was born — and stripped to his shirt sleeves as soon as he was big enough to be permitted the run of the plant. He dived into the manufacturing end of the business. He was no front office son. Even then the front office was a sort of necessary evil; where the wheels turned, there was the *real* works. There he spent his holidays, while attending high school and Princeton.

It was not until wartime that the aeronautical phase started. Fred Rentschler joined the Air Force, became a captain, but a wise official somewhere decided that a man of his engineering and manufacturing background was needed more at home than overseas. He was made inspector in the Aircraft Production Division, District of New York.

His job was speeding production and insuring high quality in the air equipment sent to France.

Among plants inspected was that which we know now as the Wright Aeronautical Corporation, builder of engines. Under the handicap of war conditions, this concern had delivered 4,000 engines to the government — no single engine arriving later than the promised delivery date. After the World War, Rentschler became general manager of that plant. In 1920, he was made president.

In 1925, he withdrew to found the Pratt and Whitney Aircraft Company now known as manufacturers of "Wasp" and "Hornet" air-cooled engines. This was then a subsidiary of the firm, Niles-Bement-Pond, with which the Rentschler plants of Hamilton, Ohio had become affiliated.

In the new engine plant in Hartford, back in 1925, Rentschler dared place a heavy bet on the future of aviation, on its engine needs. War stocks of engines had not yet been exhausted. The Transcontinental Air Mail was less than a year old, and a government project, not yet turned over to private enterprise. Of passenger transport there did not even seem to be a distant prospect. Colonel Lindbergh was then a rookie cadet in an army air school in Texas. Harry Guggenheim had not yet begun using copper millions to make us " air minded."

Nevertheless, Rentschler placed his bet on the future of aviation with a 350-horsepower engine, then developed another rating better than 500.

The famous Wright " Whirlwind," that drove the machines which carried Lindbergh, Chamberlin, and Byrd across the Atlantic, was a 200-horsepower motor.

Aviation " grew up to " the size of the Pratt and Whitney motors very quickly. Orders rolled in. A puzzled public viewed with bewilderment the gyrations of an obscure stock called Niles-Bement-Pond.

The period of mergers arrived in the aviation industry. Pratt and Whitney was lopped off the parent company, whose manufacturing activities ranged over a wide territory, and became the engine unit of United Aircraft. The scramble for transcontinental air lines and the campaign of international development followed — with a demand for more and more power.

On this crest Rentschler rode — and the other day one of his lightning calculators announced that, in point of dollar value of product, Pratt and Whitney had become the biggest aeronautical unit in the United States, and, therefore, preeminent in the world.

In recognition of his rising importance, he had been elected president of the Aeronautical Chamber of Commerce several months earlier.

Rentschler would like to contribute to clearer thinking on aeronautical subjects. He says:

In the first place, we owe a great debt to the army and navy. When the war ended, development of commercial aviation was utterly impossible. No one dared go into commercial aviation with the equipment then available.

The army and navy, by demanding constantly better performance, more power, greater speed, reliability, new safety factors, drove us to the development of airplanes which could be used commercially.

That commercial business has grown to be 75 per cent of our total business. Military production remains more costly, and trying; but I would not consider abandoning it.

Military demands created the equipment which made development of commercial aviation possible; and those demands still set the pace for us. Firms which meet army and navy requirements and win orders are prepared for leadership in a business way.

It seems to many of us that certain misconceptions exist which are dangerous to the industry.

First: A great deal of money has come into the industry, and this is not an unmixed blessing. In many ways it is an unfortunate thing.

Money will not build planes or engines. Not even plant capacity will build aeronautical equipment. *Men* are going to build aviation.

Second: Along with new money, men have come into aviation from other industries. Bankers are taking a hand. Railway men are taking an interest. Automotive plants are looking into aviation as a possible source of new income.

All this is taken to mean that aviation has *arrived;* that now, since these older industries are getting into it, we are going ahead fast.

The time has arrived, it is thought, when all we need do is develop plant capacity to produce in quantities; and that this wholesale copying can be arranged by skilled quantity producers of the older lines.

But the whole progress of aviation has been empirical; we build on experience. We know so little. We must feel our way along. Even those of us who have been in it a dozen years must do that; and we know that we are going to have to continue doing that for many years yet. Undue importance has been attached to the participation of automotive, railway, and financial men in the aviation industry. These men cannot learn our lessons by absorption.

Third: From an engineering viewpoint, aviation is far from the point where the job of producing in quantities can be taken over by newcomers.

The learning of new facts, followed by new models, is proceeding so rapidly that it would be impossible, yet, to solidify the process into fixed and immutable assembly lines. The concern which did that would find its products outdistanced quickly. Aviation must remain in a more mobile state for many years.

In our organization we believe that this mobility must be maintained to give quick effectiveness to the findings of our engineers.

In the Pratt and Whitney engineering and experimental department we have about 175 men, in the Boeing and Hamilton airplane plants there are 80 engineers; Chance Vought employs 50, the Hamilton Propeller plant 15. There are, therefore, more than 300 men constantly at work on design. In addition, Boeing Air Transport, Pacific Air Transport, and Stout Air Lines have their engineers whose job is conditioning ships — but these also contribute indirectly to engineering new designs.

No, the day of the copyist has not yet arrived in aviation.

Certain interests now are engaged in learning how to build our engine. They expect to go into the market on a quantity basis. Preparation for that is a long process, and the model which they are copying already is considered by us to be obsolete. By the time these competitors are producing, we will be about two models ahead of them. And the same situation holds good in airplane production.

Fourth: Many have contended that once aviation had acquired new money, new men, and quantity production methods, then price cutting would follow and planes would be cheap — as cheap as automobiles!

There is a considerable difference between an airplane and an automobile, and between driving on a road and flying through the air. In the earlier days, when automobiles had a habit of stopping, you could always get out and walk.

You cannot get out and walk if your plane fails in the air. If there is a structural failure in the plane itself, of course you cannot even be sure of gliding to safety. Entering a new element gives us quality requirements, safety factors to meet such as never have confronted any other industry.

As regards plane construction, military orders are an excellent training since requirements for strength here are two or three times what they are for ordinary commercial planes.

In the engine field an illustration will serve to make the point.

A well-known automobile engine — of a car in a more expensive price range — develops 80 horsepower at 3,300 revolutions per minute and it weighs 1,200 pounds. That is to say, 15 pounds to the horsepower. A " Wasp " engine, on the other hand, develops 500 horsepower at 2,100 revolutions and weighs 650 pounds — about 1⅓ pounds per power unit.

The automobile engine operates, on an average, at about 25 to 35 per cent of capacity; the engine of a plane at 80 to 90 per cent open throttle.

And yet, we have engines running smoothly which are

2,000 hours old. That means they have done a minimum of 200,000 miles of flying.

An average automobile engine which does 50,000 miles at 30 per cent throttle is through. It will still run, but the owner knows it is about finished. And yet, an airplane engine of today does 200,000 miles at almost full throttle — and still flies.

There is a measure of difference in materials, quality, precision, engineering.

Such performance is necessary in the air, and the plane itself must be of a corresponding quality. It is a fallacy to think that the time has arrived, or ever will arrive, when the cheaper materials and less costly manufacturing processes can be used in manufacturing vehicles which are to be used to fly through the air.

Of course there are manufacturers and investors who have rushed into aviation without sufficiently weighing these factors. There are others, in the industry, who have taken advantage of the wave of interest in aviation to sell their properties down the river and step out, having obtained much more than their businesses were worth. Some, also, with the best of intentions, have obtained capital and invested it in designs, plants, and distribution systems, without realizing that they have not *the essential capital, which is expert and experienced aeronautical men.*

Bigness in itself does not confer special advantages. The consolidation which is United Aircraft was not formed merely for the sake of bigness. As certain questions recur repeatedly, I may as well explain our situation as it appears to us.

The thing we sought was a union of leading units of different branches of aviation.

Boeing Air Transport flies *one-third* of the air mail of the country, over the two longest routes in America — those from Chicago to San Francisco and from Seattle to Los Angeles. Its planes fly 10,000 miles a day.

The Boeing airplane plant in Seattle is the biggest factory in the United States devoted exclusively to the manufacture of airplanes. Boeing has been building planes for 12 years, developing 45 different models. Boeing has built single-place planes for the army and navy, and 18-passenger planes for transport lines.

Chance Vought is one of the oldest and largest producers of military aircraft. Hamilton Metalplane, Hamilton Propeller, and Stout Airplanes, all rank as strong pioneers in their fields.

I have been asked about our personnel problems in the face of expansion and the building of such a consolidation as ours. We have taken over the personnel of our units. The owners of the original units still are at the helms of their properties. Essentially, they still own and operate the properties which they founded; they have traded their own stock for United stock, that is all. What we have, and what we feel that aviation needs in any consolidation, is a *federation* of leading pioneers — not so much dollars, or machinery, or buildings, as *men.*


ROUTES OF PAN-AMERICAN AIRWAYS OCTOBER 1, 1929.

# CHAPTER XII

## *Shrinking the Western Hemisphere*

Twenty-five years after Wilbur and Orville Wright bravely launched their little machine from the hilltop at Kitty Hawk, men equally courageous, but in a different way, launched forth in air conquests of the Western hemisphere.

Within the United States four groups raced, as with the spirit of the "Forty-niners," for the honor of founding the first transcontinental air line for passengers. To the casual groundling, who has the idea that an airplane may rise gracefully from any field, anywhere, and go anywhere, the spanning of the continent with a passenger line may appear to be a comparatively trivial task. But aeronautical men know that an airway, like a railroad, is *built*.

A racing plane may cross the continent in 17½ hours without a stop, but that is not transportation, every detail of which is spiked down as surely as are the steel rails of a steam line.

The building of any transcontinental air line is a great feat of engineering.

But of even greater difficulty, perhaps, was the project, attempted and achieved, of uniting the republics of North, Central, and South America with mail and passenger airways which, in ultimate expansion, will touch every capital and every large city of Latin America.

The first big financial support for this dream of peaceful international conquest came from Cornelius Vanderbilt Whitney. Men more experienced in aviation, other men of wealth and older men who had heavy transportation interests, entered the picture and there appeared among the backers of the venture Richard F. Hoyt, who became chairman, W. A. Harriman, Robert Lehman, W. H. Vanderbilt, Sherman Fairchild, William Rockefeller, Harry Walters, dominant in the Atlantic Coast Line, and Florida and East Coast railways; and the W. R. Grace Company, which operates steam lines, banks, trading companies, and plantations along the west coast of South America.

Hoyt, in giving a picture of the project to the writer in December, 1928, admitted that one year earlier he had said it was an impossibility. In December, he hoped for, but did not promise, an operation of 10,000 miles of Latin-American airways before the end of 1929.

The rate of progress on the Pan-American lines is shown by the following table of mileage in operation at the end of each month:

| | *Miles* |
|---|---|
| January 1 .................... | 261 |
| January 9 .................... | 1,901 |

| | |
|---|---|
| February 9 .................. | 3,980 |
| March 9 ...................... | 5,275 |
| April 15 ..................... | 7,590 |
| May 15 ....................... | 8,190 |
| June 21 ...................... | 9,690 |
| August 1 ..................... | 11,075 |

The addition of a route, 1,325 miles long, extending from San Juan, Porto Rico, along the north coast of South America, and of another route, 950 miles long, from Santiago, Chili, Buenos Aires, Argentina, and Montevideo, Uruguay, scheduled immediately to follow, indicated a total of 13,350 miles of established airways.

A route, 2,500 miles long, following the east coast of South America was under survey.

In the first 6 months of 1929, Pan-American planes traveled more than 1,000,000 miles, carried more than 250,000 pounds of mail and about 7,000 passengers.

The line lays proud claim to the highest rate of efficiency of any mail operator under contract with the U. S. Post Office, a record of 99.85 per cent performance.

The significance, to the world of business, of the greatest international aviation achievement of 1929 has been outlined to the writer by Juan T. Trippe, president of Pan-American Airways, in an interview which follows:

The linking of the Americas by faster transport than could be offered by rail or steamer was *demanded* by the economic situation which has grown up in the Western hemisphere during the last few years. Viewed in historic perspective, Pan-American Airways is an economic necessity of the times.

Eight major railroads and two steamship lines cooperate in this first air-rail-steamer tie-up in aviation history. Two railways and one steamship line have heavy financial interest.

Far-sighted rail and steamship men needed no convincing. They know that the American investor's stake in Latin America today is $5,000,000,000, far the greater portion of this being growth since the Panama Canal, improved American steamship service, and Yankee-built railroads speeded up transportation beyond our southern borders.

Both the investor's dollar and the producer's goods have followed the line of faster transportation. Our Latin-American trade has increased six-fold since this century began. We have taken leadership away from Europe, outselling, in Latin America, England, France, and Germany combined. Increasingly, each year, we have relied upon Central and South America for raw materials, buying from these republics about $250,000,000 worth more goods than we sell them annually. This reciprocal trade has increased to almost $2,000,000,000 a year — and we have only begun to tap the possibilities.

I emphasize these background facts as a prelude to discussion of our plans because there has been a tendency to look upon Pan-American Airways as merely "another air-mail route." It is vastly more than that. It is an integral part, and, we believe, an important part, of a new commercial era in which few things will be more vital to the prosperity of the average American than his Latin-American trade.

President Hoover recognized this situation when, during his preinaugural tour, he suggested a conference of officials and aviation leaders of the two Americas to iron out diplomatic, immigration, and customs obstacles, permitting the


Miami Terminal of Pan American Airways.

swiftest intercommunication by air between all the nations of this hemisphere. President Coolidge had taken cognizance of the situation by appointing a commission which worked out the basic plan for a system of air lines to be partially supported by air-mail contracts.

The congressional act governing the award of these contracts departed from routine business lines in two important particulars. It was specified that contracts could be let, first, only to a company or companies capable of operating on such a scale and in such a manner as would uphold the dignity of the United States in the eyes of our Latin-American neighbors; and second, that contracts could be let only to such interests as were *persona grata* to the governments of Central and South America.

In other words, diplomacy had stepped into the air transport business the moment we began to push our lines beyond our own borders. These conditions not only complicated procedure, but forced upon successful bidders the financial obligation of operating through sparsely settled districts on an equipment basis equivalent to that of an air transport line routed through the most densely populated part of the United States. The theory is sound: the departments of State, Commerce, War, Navy, and the Postmaster General's office wished to insure that if the United States fostered any Latin-American airways development, the new lines would add to our governmental trade and transportation prestige.

Point can be given that, perhaps, by an illustration: there will be some cities on our route whose citizens have seen no railway engine; and they will, quite literally, step from oxcart and burro to trimotored, 14-place airplanes.

Such things as that will react to the interest of our trade. French and German governments were before us in using air transport as a trade fulcrum in South America. The French "Aeropostale"—the subsidized transport concern — runs mails to Dakar, the westerly point of Africa, transports them 1,200 miles by naval vessels to Natal, Brazil. There an Aeropostale subsidiary, Latecoeuer, operates along the east coast and to Montevideo and to Buenos Aires. It is probable that in a year or so flying boats will make of this an all-air route, and the first regular trans-Atlantic service.

Kondor, a subsidiary of the great German Lufthansa system, now gives Bolivia and Paraguay air access to the east coast; while Scadta, another subsidiary, operates from the Colombian coast to Bogota, the capital, and to Guayaquil, in Ecuador.

European owned air lines in South America total around 6,000 miles.

Our own immediate plans contemplate the establishment of more than 16,000 miles of air lines throughout the West Indies and Central and South America.

The first objective was the linking of Valparaiso, Chili, to the United States in an 8-day service, to be reduced in time later when more equipment becomes available. Valparaiso is 3 weeks from New York by boat. This is a thrice-weekly service, as against weekly boat sailings; but no cutthroat competition as between airplane and steamer is involved, because the W. R. Grace Company, which operates a 27-ship fleet of passenger and freight ships from United States ports to the west coast of South America, is a heavy owner in our company. We have called the 3,500-mile link extending from Panama southward to Valparaiso, Pan-American–Grace Airways, and are glad to be associated in name and operations with a firm active in Latin America since 1850. The transcontinental route, Valparaiso to Buenos Aires, also will operate under joint name and ownership.

The first services established, Miami-Havana, Miami-Nassau, and the West Indies line, operate in schedule with trains of the Atlantic Coast Line, and Florida and East Coast railroads, and these also have heavy financial interest in Pan-American Airways. In addition to these roads, the Illinois Central, Chicago and Eastern Illinois, Pennsylvania, Louisville and Nashville, and the New Haven railroads already sell air-rail tickets and give routings and connections in their literature.

The Miami-Havana ships have run at capacity load thrice daily; the West Indies route is triweekly; amphibians and land planes make Panama three easy-stage days of travel from Miami, and this service also was planned as triweekly.

The Mexican link, which Colonel Lindbergh inaugurated, shrinks the map, making the Mexican capital 35 hours distant by air from New York, whereas 10-day mail service by rail has not been unusual. Mexico City to Brownsville is 5 hours by air, as against 36 to 48 by train.

The Pan-American Airways map reveals the extent to which the northern portion of the system follows what has come to be known as "the Lindbergh Circle." A route along the north coast of South America to Port of Spain, and a swing northward along the Windward and Leeward Islands to San Juan, Porto Rico, added to the lines first put into operation, makes a Caribbean airways system along the route traveled by the Colonel during his famous "goodwill tour" of a little more than a year ago.

A "Great Circle," projected to the south, will follow most of the coast line of the southern continent; and that will be a "main line" whose spurs eventually will touch all countries and all chief cities.

It is almost impossible to calculate in any concrete fashion the time saved by these various lines. A Central-American official came to us recently with a computation he had made. Capitals which were 2½ and 3 days apart — and days of laborious traveling — he found we had reduced to

$2\frac{1}{2}$ and $3\frac{1}{2}$ hours. But that is a simple computation. The time element becomes almost unbelievable in some instances. In the West Indies, we traverse in a few hours distances which heretofore could be covered "quickest" by the strange process of taking a boat to New York and another one back southward again to another island of the group.

A sales manager reported to us that he has made 6 trips annually to Havana, each trip taking 2 weeks, and that part of his business accounting for one-fourth of his time each year. He was convinced that there was business for him elsewhere in the West Indies, but there were not days enough in the calendar to permit him to canvass that territory, transportation being what it has been. He can visit Havana, Camagüey, Santiago, Port Au Prince, San Domingo, and San Juan, the six chief centers, in about the time his Havana trip has involved.

Another traveler estimated for us the task of reaching Tegucigalpa, capital of Honduras: By boat to Panama, 5 to 7 days; by banana boat up the coast, making many stops, arriving in Tela in 2 weeks; overland, by horse and burro, $3\frac{1}{2}$ days; total $3\frac{1}{2}$ weeks — but, he added, one might have to wait for weeks in Panama to board a banana boat. Tegucigalpa is $1\frac{1}{2}$ days by air from Miami — and there are 3 sailings each way every week.

An important oil man expressed a hope that we would expand our service quickly in Mexico. Why? He has had a conviction for years that about 5 per cent of Mexico's oil resources only have been tapped; but, travel being what it is, he has never been able to spare time from more important interests to make the investigations he wishes to make.

We are not building airways for the sole benefit of oil men, but that illustrates a point. All over Central and South America there are rich opportunities which have been relatively inaccessible. They are, I suppose, what an economist might call "marginal opportunities." Here is a potential market; it costs too much in time and money to sell it. There is a development project which languishes for lack of capital: the only man who has capital and experience making him most likely to put life into the project cannot spare 3 months for a look at it. There is business all through these young republics which remains untapped solely because when an American business man becomes acquainted with the market he also computes the fact that he can devote five or six trips to building up his California business in the time which would be required for a single visit to Valparaiso and Buenos Aires.

Another important factor, as we see it, is this: These Latin-American countries have traded with Europe in earlier generations because they visited Europe and became familiar with European products. Travel has turned to the United States, and we believe that air lines will increase this tendency. Certainly we have had an amazing introduction to the Latin-American's "air-mindedness." The big air transport is a vast improvement over the narrow-gage railway or burro riding the mountain passes. Where we have attempted to open mail lines first, aiming to operate with mail only during some months, we have met a demand which speeded up the offering of passenger facilities. That happened in Peru; and there, incidentally, the first passenger to buy a ticket was the local representative of the United States Steel Corporation.

The average man, perhaps, has attached little economic importance to Central America; and yet some of our far-seeing business men have almost $1,000,000,000 invested between the Rio Grande and Panama. Invested in the West Indies are $2,000,000,000; another $2,000,000,000 in South America. Of these three markets for money and for goods, South America is potentially the greatest. The trend of immigration already is toward South America. Greater populations mean greater business, and in the matter of rail transport, the southern continent is underdeveloped, even Argentina having but 25 miles of railway per 1,000 square smiles of territory, as against 85 miles in the United States. There is, therefore, relatively greater need for the airplane in South America.

We are convinced that Pan-American Airways is going to serve the American business man in a vast territory of growing markets, and that it will perform services for them which railroad and highway never could have performed. The airplane has speeded up business within our borders; the necessity for it is even greater in the newer Americas. There the plane not only will pay its way, but help add a new chapter to the history of the Western hemisphere.

In point of miles spanned and obstacles overcome, Pan-American has been the biggest airway building project yet attempted by any single company. Some indication of the costs is given in the following:

| | |
|---|---|
| Investment in extra engines and spare parts .. | $1,250,000 |
| Cost of flying equipment, approximately ..... | 4,000,000 |
| Development of radio communications, more than .................................. | 1,000,000 |
| Addition of fields, schools, etc., making total plant cost in excess of .................. | 7,000,000 |

Including ships on order, a fleet of 62 transports were to be in the air by the end of 1929. Excepting a few smaller service planes, these were Fokker, Ford, and Sikorsky multimotored planes whose average cost was about $66,000.

On the payroll were 792 persons. Of these, 40 were in the radio communications division.

Pan-American tried and discarded the radio telephone. In its stead, a system of radio telegraphy was developed, which is said to have a range of 1,200 miles, even in the case of sets operating from flying planes.

Radio operators are sent into the air in order to familiarize them with the need for utmost speed in relaying weather information and traffic order. At intervals of a few months every employee of the line is required to "go to school" for 14 days at Miami. The idea behind this is that pioneering in air transport, and especially as between different countries, is creating all the while "new processes." The newest lessons are to be passed on to the entire personnel.

Here also there were presented acute problems in the handling of passengers, since they were of several nationalities and all the "red tape" of government regulations at frontiers had to be superseded by a swifter process which could be handled at the point of departure.

J. M. Eaton, general passenger manager, has given some observations of importance on this subject as follows:

We had no bridges to build or mountains to tunnel but we had an entirely new problem of building an airway. It was necessary to provide equipment suitable for the comfort of passengers hour after hour. Skilled pilots came to us and we sent them to school all over again. We had to establish in distant countries, and amid local difficulties which would not be met with at home, landing fields suitable for the handling of large planes, and passenger terminals which would provide facilities for the comfort and convenience of travelers. Among these conveniences were restaurants, lounging rooms, and observation decks for the friends of passengers.

We have had 8 months in which to observe reactions upon the interest of passengers, their peace of mind, and on the development of our business. Our procedure is:

1. We asked the passengers to congregate either at a central ticket office in the heart of a city, from which we take them to the airport, or at the airport itself.

2. At each airport we have an organized routine, carried out in a passenger station. The size of the station depends upon the amount of travel activity at that point. Regardless of their size, these stations are planned for three purposes:

They must provide comfort and convenience for the passengers.

Each must have adequate facilities for carrying on all necessary paper work and for meeting the local government requirements as regards customs, registration, etc.

Finally, each station is built to suggest the solidarity of the air line.

3. We have found it helps the passengers' frame of mind to have the engines warmed up in the hangar. The ships are brought to the departing platform, ready to go. Departure notice is given, the passengers come out from the station under a covered runway and they step aboard the plane much as they would board a trans-Atlantic liner. This we conceive to be a goodwill factor which is a vast gain over taking passengers on to the field through mud and dust.

4. As the passengers board the plane, a steward finds seats for them, takes their wraps, cameras, etc. They find the decoration of the interior of the plane carried out in modernistic color scheme. They find comfortable, easy chairs and a carpeted floor. By the time the last passenger is seated, the door is closed, the chucks are removed from the wheels and the plane is moving from the departure stage.

The steward sees that all remain seated until after the take-off and until the plane is 1,000 feet or more in the air. This is done by rigid traffic order without the passengers knowledge. As soon as the plane has reached 1,000 feet, the steward moves about supplying the passengers with daily newspapers, little packages of cotton and gum, and lets them know they can move about at will. This breaks any tension which may have been felt by an individual passenger at the time of the take-off; and it is our observation that all show an immediate interest in what is going on, both inside and outside the cabin. During the flight, the steward supplies magazines, describes interesting views, or suggests changes from one seat to another. In the meantime, the radio operator has his instruments working and usually displays a radiogram just received from our next airport. This always captures the attention of the passengers, and lets them know they are really in constant contact with the ground.

5. The element of safety gets first and foremost consideration. Our Operations Department has built up such safety rules as protect passenger and crew alike, and, by the rigidity of enforcement of these regulations, has built a spirit of confidence into the Traffic Department which is felt immediately by the passengers.

Thorough ground inspection is given both plane and motors prior to and again on completion of each trip. Motors are completely overhauled at the end of 250 flying hours.

Each ship carries a crew of four, two pilots, a radio operator, and a steward. The radio operator is in constant communication with at least two of our ground stations and usually with three. The planes are loaded at a stipulated capacity far below the load rating given by their manufacturers. This sacrifice in pay load gives an engine reserve under normal flying conditions and makes certain that flight can be maintained on a single engine.

In response to certain traffic inquiries, Eaton summarized findings as follows:

The Latin American takes to the air with less resistance than the United States American.

About equal percentages of men and women travel.

Passengers are of all ages, including children down to small infants.

Although fares are higher, business men figure that air travel works out as a cheaper form of travel, other savings considered.

Scores who have had no intention of flying make up their minds to do so after watching at our airports the regularity of schedule, the attitude of arriving passengers, and the facilities for caring for passengers and equipment.

At Miami and Havana, particularly, we have had at times thousands of spectators. We supplied observation decks which at hours of arrival and departure are filled with people having meals, tea, or cold drinks. From these daily crowds we obtain air passengers.

The reaction of Latin-American business men has been very gratifying. A banker reported a saving of $15,000 in interest on securities shipments during the first few weeks of Pan-American operation.

Pan-American Airways began operations in the West Indies, followed with a Panama run, and then extended its route on the west coast of South America. A competitor had appeared in "The New York, Rio and Buenos Aires Line, Incorporated" which obtained air-mail contracts from Argentina and Uruguay.

This company had on its board of directors, R. H. Fleet, president of Consolidated Aircraft Corporation, of Buffalo, N. Y., who had bid on some earlier mail contracts; Frank C. Munson, president of the Munson Steamship Line, which operates along the east coast of South America; J. E. Reynolds, president of International Founders Corporation; William B. Mayo, chief engineer of the Ford Motor Company; Edward H. Clark, president of Cerro de Pasco Copper Company; George A. Rentschler, president of General Machinery Corporation, of Delaware; George D. Buckley, vice president of the National City Bank of New York; Col. William J. Donovan and James H. Rand, chairman of the board of Remington-Rand, Incorporated. These men were described as individual backers of the project, their participation, it was said, not indicating ownership of interest by the firms with which they are connected.

A Sikorsky and 2 Ford planes were used in preliminary work on the proposed 8,000-mile route; 2 more Fords were ready for use; 6 Sikorskys had been ordered but the big ship of the line was to be the Consolidated "Commodore," 12 of which had been ordered, rebuilt as air liners to carry 20 passengers and 3,000 pounds of mail and pay load.

## CHAPTER XIII

### *Spanning the Continent*

On July 8, 1929, the so-called "Lindbergh Line" of Transcontinental Air Transport opened for service between New York, Los Angeles, and San Francisco.

The line had been Lindbergh's first job. He was head of the technical committee which planned it. Also, of importance in the annals of aviation was the fact that here a great rail system, the Pennsylvania Railroad, had participated actively and financially in the formation of a transcontinental air line.

There had been a race, finally, for the honor of first spanning the continent. More than a year of preparation had gone into the building of Transcontinental Air Transport. During that time new air units of growing magnitude had shaped up and were ambitious for the fame and the financial opportunity which had accompanied achievement of continental objectives in the railway building era.

Universal Aviation, which operated more than 4,000 miles of airways in the Middle West, entered into a passenger agreement with the New York Central Railroad and Atchison, Topeka & Santa Fé Railway, whereby passengers traveled 1 night by rail between New York and Cleveland, 1 day by air to Garden City, Kan., and 2 nights and 1 day by rail to Los Angeles. This air-rail transcontinental trip, opened on June 14, for a 60-hour performance.

Western Air Express pushed its lines eastward to Kansas City where rail connections to the Atlantic seaboard could be made.

United Aircraft and Transport purchased the Stout air lines, put 12-passenger planes on the San Francisco-Chicago run, and there became available a San Francisco to Cleveland passenger air route.

But of the four lines mentioned, only one, that of the Transcontinental Air Transport, is as yet a modern airway within the meaning that is coming to be given that term. It had been built with a railway precision of plan. Since it did not follow the routes already blazed by the Post Office Department or the Department of Commerce, this airway route had to be built complete from the emergency field and railway siding to radio beacon and meteorological balloon.

As a preliminary, "Casey" Jones was sent to Europe to study foreign passenger routes. Simultaneously, Colonel Lindbergh dropped from public sight, and for months he flew back and forth across a dozen states searching out a route which would be good in all weathers, at all seasons; which would offer railway connections, intermediate stations at proper intervals, division points at morning and evening terminals, and, finally, permit of a speed which could be sold to the public while operating under conditions which would pass muster under the eyes of the critical and conservative-minded executives of the Pennsylvania Railroad.

At each tentatively selected station, flying fields had to be examined, and passed upon as regards their availability for use by 12- and 20-passenger planes. Many were found unfit. As a threat, behind the technical committee — whose most active members were Colonel Lindbergh, as chairman, Colonel Henderson, and "Casey" Jones — there stood a moving aeronautical art which might provide faster transport and bigger ships, or greater cruising range, to alter schedules almost before they were put into operation.

At one time, the purchase of $1,000,000 worth of railway equipment for operation of a short special train on the western night run was considered. After this had been weighed and abandoned, Colonel Lindbergh made another survey, the issue being whether air-Pullmans should be used the second night out from New York.

Equipment available included:

The Fokker F-10, for 14 passengers.

The Curtiss "Commodore," an army bomber, which was to be rebuilt for passenger use.

The Keystone "Patrician," a plane under construction with an indicated cruising speed of 130 miles per hour and 20-passenger capacity.

The Ford Metal Transport.

The Boeing trimotored biplane, seating 18.

The Sikorsky, 18-passenger, twin-engine biplane.

Of these six, which were "in sight," only two were in production or could be made available in the necessary numbers. These were Fokker and Ford transports. Fords were selected as original equipment while further experimental work on the "Condor" continued. As outlined by President C. M. Keys, the capital expenditure contemplated was approximately $1,500,000 for ground equipment and $2,000,000 for planes. As it worked out, the capital investment is said to have been somewhere around $4,000,000. It was the conviction of Keys and W. W. Atterbury, president of the Pennsylvania Railroad, that this route inaugurated a new era in air transport. Among the conditions laid down, were:

Flight in trimotored planes, as a safeguard against motor failure.

Use of two pilots, to guard against personnel failure.

Use of established fields, *if* they were or could be made satisfactory and safe for the biggest transports.

Otherwise suitable land was to be bought and model fields built.

The coupling 2-way radio communications with a system of weather reporting, collected from 82 points of observation and transmitted to planes in transit, so that the pilot may know at all times, not only about weather directly ahead, but about weather conditions for 100 miles on either side of his route.

As insurance against forced landings, therefore, multiple engines, 2 pilots, and such meteorological information that no plane need ever run into dangerous weather, were demanded.

The ground plan provided for the use of municipal fields at Columbus (Ohio), Indianapolis, St. Louis, Kansas City, Los Angeles, and San Francisco; and the building of six fields at Waynoka, Clovis, Albuquerque, Winslow, Kingman, and Barstow.

As to buildings, Transcontinental Air Transport ruled that the day of corrugated sheds and barn-like structures had ended. Many architectural drawings were studied in selecting station and hangar considered to be in keeping with the future dignity of aviation as a transportation unit.

At the rail-end terminals, stations were planned alongside the railroad sidings in order that passengers might awaken from an overnight journey, step to the platform, stroll to modern and complete stations, have breakfast, if they desired, on a terrace, watching the activity of the airport; then board the plane and fly away with a minimum of delay and inconvenience. Both stations and hangars are of larger design at division points. The preparations proved to be slow, and, month by month, the date of operation moved forward.

Gen. W. W. Atterbury says:

We are extremely sensitive about our standing in the transportation world. When you buy a ticket at a Pennsylvania Railroad office, that is looked upon as a guarantee of a journey which will be completed. Our position is that the same guarantee must be recognized by the public which steps up to a railway ticket window to buy a ticket for air-rail transportation.

If the air mail is something more than a 99 per cent performance proposition already — with single-engine planes — then it is still a long way behind the railway, which are 99.99 per cent performance. Transcontinental Air Transport will work toward railroad standards of fulfilment of schedule.

President Keys, out of his background as a railroad editor, " thought like a railroader " about the problems of Transcontinental Air Transport. He would lay down, he said, the best trunk line possible. The anxiety of cities to be included on the route moved him not at all. To this trunk line, as he conceived it, feeders would come in due course, when and as needed. To these feeder lines, as is the case in railroading, this year's equipment may be transferred next year, to make way for something bigger, faster, and more luxurious. The bulk of the travel, as Keys sees it, will not be for the full transcontinental journey. The greater number of passengers will travel on shorter journeys. Though the time may come when even big planes have long range, the dictates of transportation will demand that an air transport system continue to touch ground at intervals of a few hundred miles.

There should come a time, soon, when one or two or three Pullman loads of passengers will debark at port Columbus, and when each passenger plane will carry, by day, all those who have occupied a Pullman by night. Even when night flying links are added between New York and Columbus, and Waynoka and Clovis, a great percentage of the passengers may continue to prefer to do their night traveling by train.

One of the economies of air transport will consist in having airplanes operate in series so that one or two or three planes may depart at intervals of a few minutes, fully loaded, while only the last plane to leave carries an "uneconomic" partial load. There will also be a probable gain here through the fact that the relatively smaller transports can be produced in quantities at a lower capital outlay. A third financial factor is the fact that hangar equipment, runways, and field surfaces would have to be rebuilt if the size of ships increases very much. The fact that a big airplane delivers a landing kick equivalent to three times its weight already is a consideration of importance to airport managers.

The Transcontinental Air Transport line was built *more* than nine-tenths on the ground. It was built, also, with a cost accountant's pencil. All the lessons of National Air Transport, which analyses operations costs down to each repair job and overhaul, were used in estimating the economic structure of Transcontinental Air Transport. Three different men, experienced in air transport, took the columns of figures which described the financial life of National Air Transport and endeavored to translate that into terms of passenger carrying. They had to write into the story the difference between single-motored and tri-motored craft; between air-mail insurance and all the detail of plane, passenger, and public insurance involved in passenger transport; they had to write in and apportion the cost of a big weather bureau and radio system; they had to amortize station, hangar, and field expenses; they had to add up the imponderables of selling and handling the public; and, finally, they had to arrive at a figure which most of us would brand as guess-work. The question first to be answered was:

How much will it cost to operate a multimotored transport, over a newly built airway, giving the public de luxe service, and selling them on a new form of transportation?

When the three men had made their computations, there was a variation of but a few cents per plane-mile in their figures.

An outstanding fact of importance was that whereas operators generally apparently were charging an average of 11 cents per mile, the cost of carrying passengers over this route figured at 13 cents per passenger-mile. Obviously, however, the Transcontinental Air Transport route supports a heavier ground plant percentage than any other line as yet operating.

By spreading the overhead and by other economies, a progressive reduction of cost can be made through additional trips and use of bigger transports, until loading and dispatching two 20-passenger planes for both eastern and western trips each day should result in a passenger-mile cost of approximately 5 cents, or about a first-class rail rate, Pullman included.

There, of course, you have in a nutshell the story of air transport of passengers.

Given bigger planes and volume of traffic, air lines *can* compete with the railroads.

Since units of the Harriman-Aviation Corporation system carried nearly 15,000 passengers during 1928, a similar number during the first 5 months of 1929, and 4 Fokker 32-passenger planes were ordered for Universal Aviation, of that group, sight unseen, from the blue prints, "size" and "volume" may get another economic test.

This system, which published an estimate that it had carried 44 per cent of the air passengers carried in the United States during 1928, has as its outposts Boston and Montreal in the East, Chicago and Atlanta in the central zone, Omaha and Garden City, Kan., in the West, and El Paso and Brownsville in the Southwest.

For "volume" the following table tells the story:

Aviation Corporation System

| | *Passengers* | |
|---|---|---|
| | 1928 | *Five Months*, 1929 |
| Colonial Airways | 3,952 | 3,324 |
| Universal Aviation | 3,430 | 5,210 |
| Embry-Riddle Aviation | 6,068 | 1,487 |
| Interstate Airlines | 69 | 965 |
| Southern Air Transport | 1,322 | 3,854 |
| Total | 14,841 | 14,840 |

As this was written, this system, which has transcontinental possibilities both across the central and southern sections of the map, was flying at a rate of nearly 7,000,000 miles for the year. That is to say, an indicated total of transport flying greater than all of the transport flying in Germany during 1928!

Since the "southern transcontinental" of this group, Southern Air Transport, appears to be setting a pace of a *seven-fold* increase in passenger traffic in a year, questions were put by the writer seeking traffic lessons.

Robert J. Smith, general traffic manager, makes the following summary:

Class of People Traveling — (*a*) *Business Men,* (*b*) *Social Travelers.* To the former, time saving is the essential element, and arrival at destination fresh and clean is important. "Social travelers" include some men and practically all women who travel by air, and represent a class of persons able to pay a little more for whatever they want, and willing to pay for the sake of cool, clean, comfortable travel, particularly during summer months. Included also is the person who will try anything once — the thrill seeker.

We find an increasing number of business men making second and third trips. An attorney made 5 trips with us in 10 days.

The social traveler will become a regular and steady source of income because air travel is de luxe and exclusive and we are able to give attentions and courtesies impossible in other types of transportation where the public is dealt with *en masse.*

The Average Load. — As a goal, 60 per cent, a figure approximating railway and bus averages. To maintain this we would at times meet conditions where dispatch of two planes would be necessary.

Rules for Handling Passengers. — First, the passenger is always right. Our operations department will declare this means, for one thing, careful flying, no steep banks, sudden climbs, or quick descents; but flight at an altitude where the air is smooth and temperature agreeable — this last applying to summer travel.

From a traffic standpoint, first, make available and as convenient as possible complete information as to schedules, fares, airport used, means of getting to airport, reception at airport. It is necessary to have properly trained attendants to handle passengers and baggage, to usher passengers into planes and seat them. A business-like conduct of personnel, whether ground or flying, increases the confidence of the passenger. Conveniences necessary in the planes include cool drinking water, newspapers, magazines, writing material, telegraph blanks, descriptive data.

Tickets are placed in the best hotels and downtown ticket and information offices are being established at towns where we stop. We do not furnish transportation to airports, but arrange for it at a nominal rate.

At each principal point there is a field agent to handle passengers, and a field steward to look after their comfort, attend to baggage, and call attention to the conveniences of the plane.

This general passenger agent's conclusion is that air travel will be more readily popularized by improved service and added conveniences and comforts than by reduced rates. The Southern Air Transport passenger rate is 12 cents per mile.

## CHAPTER XIV

### *The New Night Express*

The thing which now is known, and favorably, in Wall Street as "United Aircraft and Transport" may be said to have started as a hobby.

W. E. Boeing, native of Detroit, left Yale on Commencement Day in 1904 for the wide open spaces of the West. He spent 5 years among the logging camps of Washington and emerged to establish himself in Seattle, where his timber and mining interests continued to grow.

In 1915, he took flying lessons at Glenn Martin's school at Santa Ana, Calif., and bought a plane. In order to have it serviced at intervals, without sending it several hundred miles down the coast, he established a workshop. That led to remodeling and, finally, with some assistance, he built two or three planes which proved very successful.

An award of a government contract caused him to establish a company in July, 1916. The factory and hangar had 6,000 square feet of floor area and 30 men were employed.

During the war, the Boeing Company produced many planes for army use; but during the postwar slump, the little plant at one time turned to the manufacturing of furniture.

In 1921, the Boeing Company was the successful bidder on a 200-plane order from the government. The economies in construction method worked out in the course of meeting that contract, without a loss, laid the foundation for subsequent mass production of airplanes by Boeing.

As the first operator to strike boldly forth on a program of carrying passengers in big transports by night, he is elected to carry forward the story of night flight.

The statement by W. E. Boeing follows:

It is our belief that the air-rail phase of development in aviation is by no means the ultimate in air travel over long distances. The American public accepts night flying, and our experiment in it between Salt Lake and San Francisco indicates that hurrying business men will use night flying planes.

The thing aviation has to sell is speed. In a complete survey of passenger flights by day over our Chicago-San Francisco and Seattle-Los Angeles routes, 75 per cent of the travelers are shown to be business men. They fly to save time, primarily to save *daytime* — to save business days. Our experiments show that business men will fly at night — as they plan train hops overnight — in order to save business days.

The railway made it possible for men to do business in New York one day and in Chicago the next, with the aid of de luxe 20-hour trains. Heavy patronage made these trains of many sections. Already aviation has shrunk the map giving the Middle West and West equivalent contact:

*San Francisco is but 20 hours out of Chicago.*

You can have luncheon in Cleveland today, and dinner in San Francisco tomorrow night. The next step, as quickly as it can be done quite naturally, is a New York to San Francisco all-air route, without intermediate railway links.

Alone among the four aviation groups seeking to establish transcontinental travel, we favor an "all-air" schedule because we believe that aviation should offer the utmost in speed across the continent. That utmost is possible *only by flying all the way.*

Since aviation is a thing built up by a sort of "laboratory experiment" — from *actual experience,* and not by fine theory or guess-work — we began a test of our night flying plans quietly.

For many weeks 12-place planes have been speeding through the night over the route Buffalo Bill traveled as a Pony Express rider — but they pass at fifteen times his speed.

In this experiment we operated on lessons learned in night flying of the mails. Boeing mail, passenger, and express planes fly 10,000 miles daily, and of this total 4,600 miles are flown in darkness. In 2 years of operation, ending June 30, our planes flew 5,600,000 miles, of which 2,500,000 miles represented night flying — a greater distance than was flown at night in all Europe. The proportion of night flying increases.

All this may explain why we are so sure of our position. We are building $1,000,000 worth of equipment for the "overnight" route. Soon 12 planes of 18-passenger and 2-pilot carrying capacity will go into operation. With these we will extend our "divisions" from about 450 miles to nearly 1,000 miles, passengers making but 1 plane-to-plane change between Chicago and San Francisco.

No attempt will be made to run a "sleeper" service, or use the equivalent of Pullman berth equipment. For the present, trips of this length will rank as personal or business emergency trips, travelers being prepared to put up with the very slight inconvenience of a comfortable reclining chair instead of a bed.

A "mail car of the air," however, has been designed, and can be made available immediately mail traffic warrants it. At least 1 of the 18-passenger planes will be altered to carry mail clerks who distribute letters while in flight, exactly as is done in the mail coaches on the railways. At present there is more than an hour's delay in Chicago while the mail from the East is sorted in a ground office.

The conditions which have brought about night flight are of interest. Recently, the Department of Commerce practically completed the lighting of the transcontinental air-mail route between New York and San Francisco — the longest lighted airway in the world. Figures released by the department show that approximately 12,500 miles of airways were lighted on June 30. As to the expense, the transcontinental lighting cost about $850,000.

While operations have not whipped all the obstacles presented by night flying, so many have been overcome that it is fair to say that the words "it cannot be done" have been stricken from the lexicon of the airplane operator and manufacturer.

Lighting equipment falls into four classes:

1. Lighting at Terminals. — There are 16 "ports of call" for the night air mail between New York and Oakland, on San Francisco Bay. Lighting is by the local airports.

2. Lighting at Emergency Fields. — There are 111 such fields on the 2,700-mile span of plain and mountain between the seaboards, and the expense of lighting them averages about $5,000.

3. Lighting between Emergency Fields, Commonly Referred to as Beacon Lighting. — The 24-inch

revolving beacons number 232, costing $2,000 each, installed at approximately 10-mile intervals.

4. Course Markers, Commonly Known as "Blinkers." — On some routes these are at 3-mile intervals. They cost $750 each and there are 529 such lights on the transcontinental route.

The average cost of these various forms works out at about $315 per mile. The effect in clear weather is of a clearly defined "white way" laid out across country; and in the West, a chain of light may be visible, leading to a mountain-top beacon clearly visible 40 miles away.

Night flying has been learned lesson by lesson. Candlepower and position of light must be determined by local conditions. Beacons at closer intervals are better than higher powered beacons at longer intervals. Increasing candlepower fifty times, from 50,000 to 2,500,000, increases the visibility range only 6 miles. Beacons which flash every 10 seconds, it was found, are readily distinguishable from motor or locomotive head-lights, and are not to be confused with the light of a farm house flashing through the trees.

As airways increase to a point where some may cross others, it may be necessary to have beacons which flash a distinctive code. Already the airport beacon is distinguished from other lights by intensity, motion, or color, or combinations of these. A 24-inch beacon delivers approximately 7,000,000 beam candlepower with a 3-degree beam. The rotating motor in the base of such a beacon also acts on a flashing mechanism for "on course" lights, synchronizing their flashes with the beacon, the flashes indicating the beacon's number along the airway.

Certain systems of flood lighting give an airport almost as much light as day. Twin flood-lighting systems now are recommended, so that a pilot may land into the wind without directly facing the light beam.

Changes in equipment have been developed by night flying.

It was necessary to redesign instrument boards to give better visibility.

We found that from a standpoint of cleanness of design, landing lights should be retractable within the wings. By reducing the drag, this added 3 or 4 miles an hour to speed of the plane, and, at the same time, permitted use of larger, more powerful lights. We obtained also separate adjustment, so that one light would shine straight ahead, while the other searches the ground, under the pilot's control. The exhaust pipe was extended, cooling the gases, so that the glare of the exhaust might not constitute a hazard by blinding the pilot. Parachute flares with a special release mechanism, surer and safer, were added.

Recent success with the radiophone marks another step forward in the effort to whip fog, which, with darkness, presents a combination pilots do not like to tackle.

Telephone communication between the pilot and the ground and between planes in flight, long a dream of the aeronautical world, has been perfected by engineers of the Boeing system and is already in use on the western division.

The pilot's radiophone is "tuned to the station." He cuts in by merely flipping a contact lever. He can receive weather reports, dispatching orders, be advised of opening through fog or routes around bad weather, warned against storm zones, receive information about other planes — even while 200 miles distant from ground station. Planes 175 miles apart may be in communication with each other. Pilots can hear the ground operator at 12,000 feet altitude better than at 100 feet because he misses ground absorption.

The radiophone adds to the safety of night flying, reduces the number of emergency landings due to weather uncertainty, increases the number of trips completed on time, and increases the pay load by reducing the amount of excess gasoline previously carried to give ample cruising radius in uncertain weather.

It is a mechanical possibility for a passenger in the air to be connected with his home or any other phone number; but the present Department of Commerce permit stipulates use only for messages concerned with operation of the plane and "protection of life and equipment."

Radiophones and directional beacons make up the "block system" of the air, and put the pilot in *closer* touch with the operations department than are engineers on trains. An even newer factor is the directive radio beacon. A radio beam is broadcast by transmitters known as "equisignal beacons." Transmitters radiate a characteristic dot-and-dash signal. When the dots and dashes blend into a continuous series of dashes, the pilot knows he is on the course. If he hears dot-dash, he is to the left, if dash-dot, he is to the right. In fog or bad weather nearness to an airport may be gaged by the narrowing path of a radio beam, as well as by intensity of signals. A marker, which sends a vigorous signal heard through the course signal, also informs him that he is above the field.

The Department of Commerce plans to have these directional beacons placed every 200 miles.

Some electrical engineers have been optimistic enough to predict that in a few years airplanes can be landed at night and in dense fog, with comparative safety, by radio control. That remains to be seen.

Commercial air transport is only 2 years old. Already a government official has predicted that soon all first-class mail between certain cities will be carried by air, and that all cities of 50,000 inhabitants or more will be in the air-mail network. The linking of major cities with multi-motored passenger transports already is well under way.

The day of large transports for high-class express shipments is not far away.

The passenger transports of the future will be larger, faster, and more comfortable than were dreamed of a few days ago. Transports which will carry 18 to 30 persons are being built and airplanes with operating schedules of 150 miles per hour and more are in the minds of conservative aeronautical engineers.

The American has a complex for speedy handling, not only of his own person, but of his goods. To give him the maximum speed of air transport will require us to make night flying as common and as safe as day flying. We are approaching that goal.

## CHAPTER XV

### *Nine-tenths on the Ground*

IT HAS been said that " only 10 per cent of aviation is in the air; 90 per cent of it is on the ground."

As regards passenger carrying on a transcontinental scale, that probably is an understatement; the ratio between ground preparation and actual flight is likely to be wider than that.

Basic ground preparation includes, as the biggest single item, construction of airports. Aviation is moving so fast that summarizing statistics are of temporary value, but it is worth noting that a responsible aviation magazine arrives at a conclusion — based on a survey — that during 18 months, cities, towns, and private enterprises authorized expenditure of $300,000,000 on airports.

Fortunately all this authorized money has not been spent. This will permit of changes in plan, of an enlargement of the picture of what constitutes an efficient airport. Already, some cities, foreseeing a growth in size and speed of planes and in density of traffic which cannot be measured now, have mapped out their aviation plants in such a way that they can be expanded.

As regards flying fields, there has been a swing of the pendulum. After the war, thinking in terms of fast pursuit planes which had a high landing speed, advocates of the establishment of aviation fields saw these airports as vast in size. But as most of the actual flying then done was in the form of short joy-rides in slow training planes bought at bargain prices from the government, cow pastures became flying fields.

With the development of the air mail, the production of better engines and better planes, capable of throttling down to a safer landing speed, and of rising after a shorter run, popular opinion within the industry favored smaller airports. A financial consideration also entered into the trend toward smaller fields; moderate sized fields could be purchased nearer the hearts of cities, whereas land values ruled out the construction of really big fields within the immediate environs of any city.

Frequently 70- to 100-acre plants were recommended. Even the Department of Commerce established a number-one rating to airports of 160 acres, if the "runways" are properly constructed so as to insure safe landing regardless of wind direction.

But American aviation has progressed beyond the air-taxi or the air-mail plane, of 500- to 800-pound capacity. Even air-mail planes pick up pay loads of nearly a ton. Passenger and express planes are being put into service which pick up 3 tons of "live load," which carry a ton of fuel, and which weigh 15,000 pounds loaded. Bigger giants are just around the corner.

These larger planes cannot land in all winds at many of what might be described as our "leading" airports. Nor could they take-off with safety, fully loaded. In fact, few fields, coast to coast, actually have been suitably planned for even a 10- or 12-passenger plane.

This is the situation which caused Colonel Lindbergh to recommend changes in some fields during the inspection tours along the Transcontinental Air Transport route.

In his own home town he took significant action. He emerged from his retirement to private life to urge that St. Louis pass the $2,000,000 bond issue for purchase and enlargement of Lambert Field. The bond issue passed, 6 to 1, and out of his convictions emerged a plan for a field on which there would be *4 runways of 4,500 feet* — or 4 as long, lacking but 250 feet, as the *only* runway in the East (the one at Roosevelt Field) from which heavily loaded trans-Atlantic planes could take off.

Kansas City then voted $1,000,000 for an airport, to have a 3,000-foot radius in the beginning, but 4,000-foot runways later. Wichita uses a square mile of land; as does Los Angeles, in Mines Field. Clarence Chamberlin plans to give the New York municipal airport two 4,000-foot runways. Portland charted 1 of 6,000 feet, Seattle of 8,000 feet, and San Diego apparently will top the list with a landing strip 2½ miles long.

All this is movement in the right direction; but few American airports have adequate equipment for the care of passengers.

For a look at the "near future" of the air-passenger business, as well as at some of the problems before us, we might profitably consider the Croydon plant in England, Tempelhof Field in Berlin, and the Oakland airport in California.

Despite German ingenuity, 4 years were required for the transformation of the great parade ground into the busiest airport in Europe. Croydon, of course, was an army plant before it became a "passenger station." The most immediately striking thing at either of these great fields is their superior facilities for care of passengers. Our idea of a passenger station on a flying field has been, usually, a roof for protection in case of rain. Lavatory facilities are in the hangars. Food may be had from a lunch wagon or a quick-lunch room.

By contrast, one of the recreation spots in Berlin is the great restaurant and open-air cafe at Tempelhof Field; while Croydon has a new hotel, where guests may be entertained, farewell parties given, and from the roof of which the panorama of the busy port may be viewed.

At Croydon also, there is a new administration building which would almost fill an average city block, being 250 feet across the front, and nearly as deep. Some 20 clock faces, around a central pillar in the passenger hall, mark the arrival and departure times of planes. Along one wall is a route map, on which the latest weather conditions are noted.

From a tower extending two storeys above this building, traffic is directed. The officer in charge is in constant wireless communication with planes in flight. He maps their position from time to time by moving magnetic markers on a steel map. He gives permission for take-offs, and signals for landings; he controls the system of flood lights, boundary markers, and runway lights.

This officer is in touch with the hangars by telephone and with the weather bureau by pneumatic tube. A balcony runs around his glass-enclosed tower room, and above it is a direction-finding aerial.

All this is very impressive. Giants of 130-foot wing spread come and go from Tempelhof to Croydon; whereas our scheduled passenger carrying had been in 10- and 12-passenger planes up to September, 1929, when some 18- and 20-passenger planes came into use.

These European airports load passengers out in the open field; but St. Louis planned a 200-foot covered way between administration buildings — a sort of arched "train shed" — so that two or more planes may load simultaneously, under cover, where passengers will be protected from the weather; and on pavement, so that no women passengers need ruin dainty footgear on rough or damp sod. Tulsa contracted for a similar terminal structure.

The most prophetic of the future, perhaps, among

American airports is the new municipal field at Oakland, Calif. It leaped to prominence in a single year; and since it was new, centrally located for the coast, and for an air-mail division point, it had the special attention of government agencies and of the Guggenheim Foundation.

Oakland was planning the airport when the army flight to Hawaii was organized. About $800,000 had been paid for land. A runway 7,000 feet long was completed in 23 days in order that the start might be from Oakland. As will be recalled, the Dole fliers and the Southern Cross flight to Australia started from the same runway.

The construction of the administration building and hangars was begun late in 1928. A glass-enclosed bay gives the superintendent full vision over the field. Two towers above the office building are for weather observation and plane dispatching. A siren sends all lesser wings scuttling when a giant passenger-mail plane from Chicago arrives, or the passenger ship from Seattle or Los Angeles. The new dining-hall building will seat 150 persons.

A speed-boat channel leads to San Francisco Bay. There is parking space for 3,000 cars. Almost 16,000 persons and more than 5,000 cars visited the airport on an August Sunday.

The 4 hangars give 96,000 square feet of floor space. They are of all steel and concrete construction, and the largest is 300 by 120 feet.

Four meteorologists of the U. S. Weather Bureau and the Guggenheim Foundation are on duty. They receive *hourly reports from 35 stations.* Every day 3 pilot balloons go up and bring down reports regarding the higher air; and 14 other stations make similar reports. The results of all this weather sampling are made available to pilots by signal or wireless; and some of the information is cleared *by printer telegraph machines* over leased wires to key points.

Other equipment includes an 8,000,000-candlepower rotating beacon and a 30,000,000-candlepower flood light.

From all this piled up detail, a picture of a modern airport is gathered; also, the fact that aviation, especially passenger transport, *is more* than nine-tenths *on the ground.*

A report on a 9-month period of operation at the Oakland airport reveals a record of 51,152 plane landings, 32,357 passengers carried, and 6,858 student flights made.

Translated into daily activity, this means 161 planes landing and taking off, 118 passengers carried, and 25 student flights each day. Introduction of larger planes recently has cared for an increase in passenger traffic.

The transport lines centering activities here were:

Boeing Air Transport, Chicago to Oakland, 1,918 miles.

Boeing-Pacific Air Transport, Seattle to Los Angeles, 1,099 miles.

Western Air Express, the Guggenheim Fund's " model " non-stop, Oakland to Los Angeles line.

Maddux Air Lines, Oakland to Los Angeles, with three local stops.

Having been a focal point for the earliest passenger lines, the terminal of the transcontinental air mail, and centrally located on the west coast, Oakland airport has met most of the problems which arise in a pioneering project while cities and private corporations elsewhere were still in the ground-breaking stages of airport development.

Deliberately, therefore, we turn in the following pages to lessons learned at Oakland, presenting them for what they may be worth to cities, corporations, and individuals elsewhere.

The daily mail bag at the office of this airport contains an increasing volume of inquiries from all parts of the country, the core of each letter being:

"How can we make our airport pay?"

G. B. Hegardt, chief engineer and general manager of the Oakland airport, answers that question:

Oakland airport is a municipal airport and, hence, is more concerned with rendering a service to air commerce and encouraging the aviation industry than it is in building up a tremendous income from the money invested. The airport was acquired and developed from the proceeds of a bond issue voted, in 1925, for the purpose of enlarging and improving local port facilities. It is possible for the Board of Port Commissioners to draw upon this money for the building of new facilities at the airport, but this money cannot be used for maintenance. Thus, it is clear that the airport must support itself.

A similar condition prevails in the case of the private airport operator who, let us suppose, has backers who are willing to aid him in the development of his field, but tell him he must work out his own methods of supporting himself once the airport is built.

The aircraft operators bear the major expense of operating the field. In establishing the rates which commercial aircraft operators must pay, several things must be considered. The airport owner must first consider the actual cost of his field, which will of course include the conveniences that he has placed at the field for the general public; these conveniences, in many cases, serve as protection to the airplane operator. Under this category may be listed, the cost of the land, the construction costs of hangars, administration building, weather-bureau quarters, comfort stations, the installation of lighting equipment, roadways, sidewalks, concrete aprons, and fences. To the figure which he obtains by this computation must be added a carefully estimated allowance for the maintenance of the field.

The next step, of course, is to agree upon the time in which the airport owner expects to " write off " his investment and the amount of profit which he believes is due him for his enterprise. This completed, the airport owner has but to divide the total sum by the number of clients which he may reasonably expect and he has arrived at the rate which those who operate from his field would have to pay, provided there were no " extras." There are many ways in which the sum arrived at in this manner may be " pruned," however, thus lightening the load to be borne by the commercial operator and making the field in question more attractive because of its lower rates.

The most important means of reducing the actual operation charges at airports is through the leasing of concessions to outsiders, or, if the airport owner wishes, he may go into these auxiliary lines himself.

Gasoline and food are two commodities which are consumed in great quantities at most airports. At the Oakland municipal airport the question of how much the dispensers of fuel and lubricating oils were to pay was settled by mutual agreement, since this privilege is not an exclusive one. Six gasoline companies and one concern which sells lubricating oils, exclusively, are located at the field. In the interests of safety, all oil trucks were banned from the airport soon after it was opened to commercial operators and all oil companies who desire to engage in business at the field must install fueling pits. The oil companies were allowed a 6-months' rent-free period of operation at the Oakland municipal airport to offset the costs of installing their equipment, after which they began paying 1 cent on each gallon of gasoline sold and 5 cents on each gallon of lubricating oil.

Since it was impossible to have the airport dotted with eating establishments, it was decided that the operation of the restaurant at the Oakland municipal airport should be an exclusive concession, which was awarded to the Interstate Company. This concern obtained its concession through public bidding and offered to pay the port 10 per cent of its gross monthly receipts, with a minimum monthly guarantee of $425.

At the present time, a 37-room inn has been opened at the field, and it is expected that this will be the source of considerable revenue. The building cost about $55,000 and will be operated by the Interstate Company, which was the successful bidder. The company agreed to pay an annual rental totaling 7 per cent of the construction cost of the inn, plus 10 per cent of its net earnings.

In this consideration of the fixing of airport revenue, the airport owner must always bear in mind the importance of his field in the eyes of the aircraft and concession operators. Oakland municipal airport, because of the great part it played in the early days of aviation as the starting point of all the trans-Pacific flights and its present importance as the terminus of the transcontinental and coastal air-mail, express, and passenger lines has become one of the show places of the West. In consequence, concession rights at such a field must have greater value than they would at smaller airports. Nevertheless, I believe that the revenue sources which are listed above are the most important for all airports and are deserving of much consideration by the present or prospective operator of a flying field.

As aviation grows, commercial aircraft operators also are bound to increase in size and importance, and this means that the rental of office space may be made to bring in a worth while return to the airport operator. At the Oakland municipal airport, provision is made for offices in the 20-foot lean-to which adjoins each hangar and which is partitioned off and rented at the rate of 20 cents per square foot per month. The presence of pilots and mechanics also brings with it the need for lockers and tool boxes, for which a monthly rental of $1 may be reasonably expected.

With the completion of the lighting of the airways and the subsequent development of night air travel, provision must be made at all airports of consequence for the special lighting of the field at night. At the Oakland municipal airport, the operators who use the field at night pay for this privilege the exact amount which the current used costs the port management. The charge for the use of the large 30,000,000-candlepower landing light is $3 per hour, while those who make use only of the auxiliary field floods pay $2 per hour. When mechanics or pilots work on their planes in the hangars at night, they pay for the use of the lights therein at the rate of 25 cents per hour.

Another source from which we receive revenue at our field is from a concern which specializes in the washing and servicing of planes. This company pays the port 10 per cent of its gross receipts for its concession rights.

There is one more large item of revenue which comes to mind at the present time and which we have not yet satisfactorily settled at our airport. There is the exclusive rights to operate an airplane repair shop at the airport. This is a question which every airport owner should study carefully before he accepts the proposal of any who may wish to obtain such a concession at his field. Such a concession should be let only to an organization which could be depended upon to employ only the most competent of mechanics and which would so organize its facilities that it could accommodate any and all types of aircraft and engines which might visit the field. The airport owner, too, must assure himself that the firm which holds this concession will not attempt to favor certain manufacturers or products and that a full and varied stock of parts will be maintained at the field at all times.

Before considering the actual charges which commercial airplane operators pay at the Oakland municipal airport, I should like to point out what we are able to guarantee to these pilots.

We can assure the prospective Oakland municipal airport operator that the field will be visited by from 10,000 to 15,000 persons each holiday and Sunday and that the week-day visitors will run into the hundreds. Thus, he has a ready market for his goods, whether they be airplanes or airplane rides.

Furthermore, this interest in the Oakland municipal airport has been effectively sustained by the constant addition of new facilities as they were needed, and ample provision has been made for the comfort and convenience of visitors to the airports. This is a point which the airport owner should not overlook, if he wishes cash return on his investment. If the airport is dirty and dusty, if the roads leading to it are poor, if the parking provisions at the field are not adequate, and if field visitors are not kept behind fences where they will be out of danger, he is doomed to failure.

All of these public conveniences are of a nature which the pilots operating from the field may not see at first glance, but it is imperative that they be made to understand that the money expended in this fashion is as important to their commercial welfare as the building of the airport and its hangars.

Manager Hegardt outlines Oakland charges as follows:

*Section 1.* — The following charges, tolls, and rates for services rendered by the Port Department at the Oakland municipal airport and for the use of the said air terminal of the port of Oakland and its facilities are hereby adopted:

*Item 1. Storage.* — Including use of field for taking off and landing:

| | *Monthly* | *Daily* |
|---|---|---|
| *A.* Hangar | | |
| Less than 1,000 square feet | $40.00 | $2.00 |
| 1,000 square feet to 1,500 square feet | 50.00 | 2.50 |
| 1,500 square feet to 2,000 square feet | 60.00 | 3.00 |
| 2,000 square feet to 2,500 square feet | 70.00 | 3.50 |
| Over 2,500 square feet | 75.00 | 4.00 |
| *B.* Ground | 20.00 | |
| Ground rental over night | ..... | 1.00 |

*Item 2. Commercial.* — Including privilege of carrying passengers for hire or award, the chartering of air craft for special trips, the training of students, demonstrating and sale of aircraft, and of the use of the airport or its facilities for other commercial purposes. (These charges are in addition to those provided for in Item 1.)

| | Monthly | | Daily | |
|---|---|---|---|---|
| | *Summer rates* | *Winter rates* | *Summer rates* | *Winter rates* |
| Two-passenger plane | $43.00 | $30.00 | $25.00 | $15.00 |
| Four-passenger plane | 60.00 | 45.00 | 32.50 | 22.50 |
| Six-passenger plane | 75.00 | 60.00 | 40.00 | 30.00 |
| Over six-passenger plane | 90.00 | 70.00 | 52.50 | 37.50 |

Note: Summer rates shall apply during the months of April to November, inclusive. Winter rates shall apply from December to March, inclusive.

Any person operating an aircraft, for purposes of conducting local flights for carrying passengers for hire, which is not regularly stored at the Oakland municipal airport, shall each day before commencing such operations register at the administration office and pay a daily rate based upon the capacity of the plane as follows:

For a 2-passenger plane, $33; 4-passenger plane, $42.50; 6-passenger plane, $53.50; larger than 6-passenger plane, $69.50.

The commercial charges mentioned in Item 2 of Section 1 shall be applied to local flights only when the aircraft to be employed in such business is stored at the airport on a monthly basis.

Manager Hegardt continues:

At first glance, it will appear that the daily rates for commercial operation, quoted above, are excessive, but they were devised to protect the regular Oakland municipal airport operators and have been used as the basis of rates at other airports. It may be added that the rates are decidedly fair to the itinerant flier who wishes to operate from the field only on Sundays and holidays, for he may reasonably expect to gross many times the fee he pays.

A final word must be written regarding the special negotiations which airport owners may enter into with various operators. These operators now should be in a position to pay their way. The pioneer state of aviation is past, and big business has come into the field. While in the past, some air-line operators have overlooked the fact that the airport operators as well as they were pioneers, most of the aeronautical concerns are now in position to pay their way.

It is better thus, for all those engaged in the industry will now be on a mutual basis of business stability, where good management can show excellent financial returns and airport owners no longer will be asked to subsidize poor business judgment through the granting of excessively low rates to their clients.

Visitors at the 1928 Los Angeles air meet discovered that there were 48 airports in Los Angeles county and that California led the list of states in that regard. But while they were noting these "native son" facts, managers of airports were asking each other so many questions about management that an Airport Section of the Aeronautical Chamber of Commerce was formed, and Maj. John Berry, manager of the Cleveland airport, was made the head of the committee.

"The airport of tomorrow," Berry said, "is a passenger dispatching station and will need the same auxiliaries as are provided by the railway passenger terminal today."

He picked as a "keynote" a problem on which the transcontinental air lines have been working.

The air lines must consider mental as well as physical comfort in planning terminal facilities. They desire stations which will familiarize those who have not flown with the dependability of schedule and safety of flight. Further, they seek airport procedure which will give tacit reassurance to those who are flying for the first time. Out of the watcher a customer of flight is made, and from the ranks of those who fly once for a thrill aviation draws volume of steady traffic.

It it recognized that the basic function of an airport is the landing and embarking of planes, and all the engineering brains are intent on solving the problems of surfacing, drainage, paving, lighting, etc. But, if airplanes are to land and embark in sufficient numbers to make airports pay, then commercial considerations demand that airports "sell" aviation. Many nice psychological factors enter here; and in the face of these the slide-rule of the engineer, the formula of the paving expert, and the calculations of the electrician are of little use.

It is advisable today to build an airport on a basis which permits 100 per cent expansion in the next few years. On the heels of campaigns for "all-weather" runways, permitting landing into the wind at all times, has come a cry for "over-all" airports, all parts of which are safe for landing. Such problems as these things suggest can be solved by engineering skill and money. At the moment, commercial considerations will prevent all but relatively few airport projects being worked out on what are considered the most advanced lines.

The imponderable elements are those into which the human equation enters.

It is conceded that many phases of present airports, or of the vast majority, definitely increase "sales resistance." Airports which are 30 minutes from a business district cut 60 miles of flying time from the advantage which the plane has over railway transport. When planes are loaded in open fields, there is an unconscious comparison by the passenger of this expensive method of transport with the vast and efficient terminal facilities of the railways. The bare meadow itself, with its dust, loses by comparison with a railway station.

Hence, great stress has been laid upon plans for passenger handling. One school of design favors the train-shed type of building, with stations, restaurants, express rooms, and offices; pilots' headquarters, weather bureaus, and radio stations; in buildings on either side, the space between being protected by a vaulted roof above pavement from which the planes are loaded. Another group contend that the railways are abandoning the "shed," and that in any event it is of doubtful value for rapidly growing aviation, since in some day-after-tomorrow a plane will come along which will be too big for the shed. These plan stations which overlook the fields, giving visitors high visibility in order to convert them into passengers; but they replace the "shed" with a covered runway which extends from the station to the door of the airplane. Double the size of the plane and the only station alteration needed is an extension of the canopied passageway.

Separation of hangars from station area is favored. The paving of the areas around hangars and station where constant use precludes the maintenance of turf is suggested. Replacement of iron sheds by permanent concrete and steel hangars of a pleasing design has been urged. Architectural and decorative beauty in stations is sought. Attractive landscaping, it is recognized, is a feature too long neglected. Stunting over transport fields, passenger experts contend, is not very reassuring to sober folk who may be curious visitors in process of adjusting themselves to the new idea of flight. Many managers would put the taxi services in a distant corner, and instruction in another — or even in an entirely different field.

These things are characteristic problems with which airport managers are struggling. They are essentially selling problems.

The airport of tomorrow will be a new type of economic unit, a city of sorts in itself. About some will be sales, service, and manufacturing plants of the aviation industry itself; and beyond the industrial area, homes of the workers in the industry. Others, distant from cities, no doubt will become residential centers from which the commuter departs each morning, leaving his family in far pleasanter and more healthful surroundings than can be found in the near-by environs of cities today. Also, smaller "shuttle planes" will be carrying through passengers from the air liners at the bigger airports to the hearts of cities. Mail already is ferried in this way from the outlying airport to the waterfront at Chicago's front door.

Increasingly, the airport will become a civic center, a place of recreation and entertainment. Such a unit, then, will include athletic fields, swimming pools, restaurants, hotels, boating, and a parkway system such as will make of it a prominent feature in the city plan.

That $500,000,000 has been allotted for airport expenditure during 1929 and 1930 has been estimated. The problem is to spend wisely for tomorrow.

# CHAPTER XVI

## *Battling Transport Costs Downward*

Col. Paul Henderson said:

> If I could be guaranteed a daily traffic of 1,000 passengers, I would sign a contract to move them through the air between Chicago and Kansas City *at railroad rates.*
>
> Air transport of passengers will be on a sound commercial basis just as soon as the manufacturers are able to provide satisfactory 18- and 20-passenger planes.

Would traffic be available to warrant use of the larger planes? Yes, unquestionably the traffic would be waiting.

There you have a pronouncement of historic importance in transportation annals. It is altogether probable that Colonel Henderson knows more about the economics of air transport than any other man in the United States.

Under his direction, the transcontinental air-mail line was built by the government and cost figures demonstrated to a point where he became convinced that private enterprises could take over the task of carrying mails through the air, as the railroads privately carried them on the ground. He also directed the formation and operation of National Air Transport, New York to Dallas air-mail line, whose costs have been analyzed, cent by cent, as if by a railway auditor, since the first propeller turned. The National Air Transport practice in this regard is by no means typical of aviation as a whole, or of air transport.

In the engineering department of a big airplane plant during the summer months of 1929, five engineers of operating lines met with engineers of the manufacturing concern.

They were checking up performance records and seeking lessons which might be written into models then on order by the five lines. Represented were air-mail operators, passenger carriers, a scenic air line and an international line. This constituted a fairly representative cut across the field of air transport, and the concerns represented were important ones; but it developed that only one of the five could turn to a ledger and give the detailed and accurate story of the full cost of operation of a big air transport.

Each had a fairly accurate accounting system on the field cost of operation. Such items as gas and oil and wages and overhaul were tabulated. The story was known to each in greater detail than that, but such items will serve to illustrate the point.

Four of the five had no principle worked out to cover depreciation or overhead.

And when operating with transport units costing around $70,000, which in all probability will be obsolete before they are worn out, there are, quite naturally, very insistent reasons why the theory of writing off depreciation should be solidified into a sound accounting practice.

Four of the five had only the vaguest notion about the true proportion of overhead expense. They "intended to get around to figuring that soon." Some of these operators were among the pioneers in their line, and money makers.

A representative of a sixth line, on another occasion, had explained to the writer an intention to use passenger planes in longer runs, more hours per day. This line was one of the foremost, and the lessons of this shift unquestionably should be important to the industry as a whole, as well as to investors eager to read any sound analysis of operations costs. This man was asked what effect the change would have on rate of writing off depreciation, but he did not know.

The pioneers in transport have had so many difficulties to combat, so many obstacles to overcome, so much experimental technical work to do, that only a very few have had either time or money for the sort of financial analysis which is the very foundation of management in railway transportation. Most are, as yet, in a position analogous to that of the motorbus companies which recently have webbed the country with intercity transport lines. Among the motorbus lines, the successful ones have been those which know their costs to the last item. Those which have a "jitney driver's" vision, and see profits if takings exceed gas and wages, reach a day when equipment balks and no reserve has been accumulated against the contingency — and that usually ends that.

From the air mail, the economists must draw their figures on which to base any bedrock rules about the economics of air transport. But the available data is scant, and also of doubtful value.

The federal government has endeavored to collect information from which base costs may be worked out. Various considerations have made this effort none too effectual.

1. So long as aviation was a struggling industry, ever uncertain of the morrow, the units exchanged information with great freedom. As certain concerns forged ahead, the things they had learned became an important margin of advantage over competitors.

2. A threat of rate revision caused a certain amount of reluctance among operators; one branch of the government was seeking what was in effect confidential cost data, while another branch threatened radical cuts in mail rates.

3. Many mail contracts obtained as the result of keen competitive bidding, on new routes having at best only prospective future importance, operate at an abnormal cost and with a subnormal load. These returns "weight" the complete data in a confusing manner.

4. The overwhelming majority of the routes, cannot have adequate cost accounting systems, and such of their figures as become available do not tell the whole story.

5. Neither overhead nor depreciation is sufficiently taken into account.

One experienced in airway operation has furnished the following data, using single-engined (Wright) planes valued from $12,000 to $14,000.

| | *Cents per Mile* |
|---|---|
| Pilot | 7.5 |
| Mechanic | 2.3 |
| Fields (2) | 2.6 |
| Depreciation | 8.6 |
| Fuel and oil | 5.0 |
| Hangar expenses | 0.6 |
| Hangar and land rent | 0.12 |
| Office | 4.83 |
| Advertising and selling | 2.41 |
| Legal expenses | 0.24 |
| Insurance | |
| Pilot | 0.60 |
| Plane | 0.48 |
| | 35.28 |

The above insurance figures are made up of the following items:

Pilot: 8.1 per cent (state regulations) .. per mile $0.006

Plane:

| | Per Year |
|---|---|
| Fire insurance, 2½ per cent on $85,000 | $2,120 |
| Public liability | 134 |
| Miscellaneous (workman's compensation, etc.) | 146 |
| | $2,400 |

This equals $200 per month or per mile $0.48.

"The estimates which have been made by the operating companies vary from \$0.35 to \$1 per mile for single-engined ships, and from \$1 to \$1.50 for multiple-engined ships," Gen. John F. O'Ryan, president of Colonial Transport, declares, and adds; "I think the tendency has been to under-estimate the costs in many instances."

Survey of more than a year's operation on Colonial resulted in an enlightening comparison, as follows:

| | *Single-engined planes* | *Triengined planes* |
|---|---|---|
| Cost per mile, excluding overhead.... | \$0.33 | \$0.67 |
| Cost per mile, including overhead.... | 0.87 | 1.18 |

The cost per mile of single-engined (200-horse-power) airplanes over a scheduled route has been put at 84 cents by another operator.

Under direct operating costs are included: salaries of operations personnel, gas, oil, materials and supplies, telephone, telegraph, and automobile transportation charges incident to the operation of aircraft, and aircraft and engine maintenance.

Indirect operating costs include aircraft and engine depreciation, aircraft insurance, and forced landing expenses.

General administrative costs consist of executive and general office salaries and expenses, office rentals, telephone, telegraph, postage, stationery, traveling and legal expenses. Summary: —.

| | *Cents per Mile* |
|---|---|
| Direct operating cost | 34 |
| Indirect operating cost | 23 |
| Traffic solicitation cost | 7 |
| General administration cost | 20 |
| Total cost per mile | 84 |

New York-Chicago-Dallas figures as of 1927 were made public as follows:

| | *Cents per Mile* |
|---|---|
| Communication (telegraph, telephone, and radio between fields to keep everyone posted on what the ships are doing and on weather conditions for flying) | 1 |
| Transportation (pilots' pay, gas, oil) | 15 |
| Maintenance of flying equipment | 12 |
| Maintenance and operation of fields (this has nothing to do with the surface of the landing field) | 11.5 |
| Depreciation | 11.5 |
| Total cost per mile | 51 |

The following is quoted from a Department of Commerce report, in its most recent summary:

> Based on incomplete returns from the air transport operators of the United States, for the second 6 months of 1928 the income would appear to total twice that for the whole year of 1927.
>
> Of the 41 operators, 19 reported revenues totaled $3,-858,020 (as against $2,201,150 for the whole of 1927 for 17 operators). Expenses were $2,653,052 for the second 6 months (as against $2,151,340 for 17 of the 21 operators for all of 1927.)

Of the 19 reporting the second period of 1928, 9 had a revenue of $3,238,057; expenses, $1,646,148. The U. S. Mail revenues alone for the 28 mail routes for the period were $5,103,825.

The investment in air routes is not known. Until legislation is passed requiring financial and other statistics from operators it seems unlikely that the department will have adequate data on the state of the transport industry.

Of the 41 operators, 29 reported in use and reserve at the end of the year 268 airplanes valued at $5,226,570, not including those used for air service operations only.

The total personnel employed by 1928 was 1,036, of which 275 were pilots, 499 mechanics, and 262 others.

Pilots' base pay averaged, for 25 operators, $194 a month, with $0.055 per mile for day flying and $0.093 per mile for night flying. The base- and mile-rate averaged $463.51 a month. Each pilot flew an average of 68 hours a month.

The 9 companies reporting profitable operation had a surplus of $1,591,909 over their expenses of $1,646,148.

The cost per mile for the 2,372,165 miles flown by the 9 was $0.694. The lowest cost of this group was $0.291 per mile while the highest was $2.573. Omitting this one high item, which is twice that of the next highest operator, the average would be $0.659. Where new construction or equipment is charged in one year, obviously the mile-rate must suffer and it is obvious that this high figure is an improper one. As in 1927, it appears that the longer routes are generally those with the lower cost per airplane-mile.

Operations of multiengined planes seem to vary from $0.753 to $1.07 while the single-engined 200-horsepower job averages $0.71 for 4 operators.

No new figures are available on depreciation as these data were not called for in the questionnaire.

For the convenience of those interested in any detailed study, the charts for the first and last 6-month periods of 1928 are given in the Appendix.

One federal survey resulted in a finding that 16 per cent of the personnel of air-mail lines were pilots. In other words, for every man in the air, five on the ground. The ratio is widened materially by entry into the business of carrying passengers. Passenger traffic must be sold, it must be serviced, it must be accommodated.

The investor, curious about the economies of this vast new business, has wished for a yardstick by which he could measure the probabilities of profit in any given property. No such yardstick exists. If there were a fixed base figure for air-mail cost per pound-mile, reference to contract rates on any given contract air-mail route, and to the monthly reports on traffic, would offer basis for figuring indicated profits. But among leading air-mail contractors, the cost of operation per plane-mile appears to vary from around 50 to more than 80 cents.

Such a variation is not entirely due to superior operation, although that counts heavily; but, more important is the volume of traffic and length of route which permit the more complete use of equipment and the spread of overhead and plant charges more widely, thus reducing unit costs.

A computation made by the *Wall Street Journal* reveals that the gross income per plane-mile, during May, 1929, varied, over 24 routes, from 14 cents to $3.03. The table is on the opposite page.

| *Route* | *Length* | *Contract rate per pound* | *Per pound per mile* | *May, 1929 gross per plane-mile* |
|---|---|---|---|---|
| New York-Boston | 192 | $3.00 | $0.0156 | $3.03 |
| Chicago-St. Louis | 278 | 2.53 | 0.0031 | 0.50 |
| Chicago-Dallas | 1,059 | 3.00 | 0.0028 | 1.10 |
| Salt Lake-Los Angeles | 600 | 3.00 | 0.0050 | 2.65 |
| Salt Lake-Pasco | 530 | 3.00 | 0.0056 | 1.63 |
| Seattle-Los Angeles | 1,141 | 2.81 | 0.0024 | 0.91 |
| Chicago-Minneapolis | 503 | 2.75 | 0.0056 | 0.59 |
| Cleveland-Pittsburgh | 123 | 3.00 | 0.0244 | 1.84 |
| Cheyenne-Pueblo | 199 | 0.83 | 0.0040 | 0.54 |
| Cleveland-Louisville | 345 | 1.22 | 0.0035 | 0.53 |
| New York-Chicago [1] | 718 | 1.24 | ..... | 1.00 |
| Chicago-San Francisco | 1,932 | 1.50 | 0.0007 | 1.34 |
| New York-Atlanta | 763 | 3.00 | 0.0039 | 1.75 |
| Albany-Cleveland | 446 | 1.11 | 0.0024 | 0.32 |
| Dallas-Galveston | 318 | 2.89 | 0.0090 | 0.72 |
| Dallas-Brownsville | 529 | 2.89 | 0.0054 | 0.71 |
| Atlanta-New Orleans | 483 | 1.75 | 0.0027 | 0.47 |
| Chicago-Cincinnati | 270 | 1.47 | 0.0054 | 0.59 |
| Atlanta-Miami | 736 | 1.46 | 0.0019 | 0.34 |
| Great Falls-Salt Lake | 489 | 2.47 | 0.0050 | 0.44 |
| Bay City-Chicago | 712 | 0.89 | 0.0012 | 0.31 |
| St. Louis-Omaha | 403 | 0.78 | 0.0019 | 0.14 |
| New Orleans-Houston | 319 | 1.00 | 0.0031 | 0.23 |
| Chicago-Atlanta | 785 | 0.78 | 0.0009 | 0.14 |
| Average | 586 | $1.97 | $0.0034 | $0.98 |

[1] Rate varies on load above 1,500 pounds per day.

For use in these pages cost analyses were sought from two leading builders of big transports, from two of front rank in the six-place class, and from two quantity producers of light planes. Fokker tables received were based upon per mile operating costs, and Travel Air estimates were on an hourly basis. They follow on the next page.

Fokker F-14 Mail Plane Flying Time per Year Estimated at 750 Hours

| | |
|---|---|
| **Fuel:** | |
| Gasoline, consuming approximately 26 gallons per hour, 787.5 hours, 20,475 gallons at $0.30 per gallon | $6,142.50 |
| Oil, consuming approximately 1 gallon per hour, 787.5 hours, 787.5 gallons at $1 per gallon | 787.50 |
| Miscellaneous (greases, etc.) | 100.00 |
| | $7,030.00 |
| **Depreciation:** | |
| Plane (estimating life of plane at 2,500 flying hours), 750 hours at $7.54 per hour | $5,655.00 |
| Engine (estimating life at 1,500 hours), 787.5 hours at 5.10 per hour | $4,016.25 |
| **Maintenance:** | |
| Estimated at 3 per cent of equipment, new | $795.00 |
| **Personnel and Miscellaneous:** | |
| Pilot | $7,500.00 |
| Hangar rent | 600.00 |
| Insurance | 5,300.00 |
| Incidentals | 2,000.00 |
| | $15,400.00 |
| Total cost of operation on above basis, per year | $32,896.25 |
| Cost per mile on above basis, estimating cruising speed of plane to be 115 miles per hour, 86,250 miles per year | $0.40 |

The last figure is about analogous to the "direct" and "indirect" operations cost divisions shown on another page of this chapter. In that instance, the operator found that he had to add nearly 50 per cent to the all-operations total in order to take care of administration and selling.

The cost of operation of training or "jitney" planes is shown in a table covering operation of an OX-5 powered Travel Air biplane, as follows:

| | |
|---|---|
| Gasoline, 9 gallons per hour at $0.25 | $2.00 |
| Oil, 2 quarts per hour at $0.25 | 0.50 |
| Depreciation of motor, $750, 750 hours, or $1 per hour | 1.00 |
| Depreciation of plane, $2,350, 2,000 hours, or $1.175 per hour | 1.17 |
| Overhaul of motor, $150, 250 hours, or $0.60 per hour | 0.60 |
| Motor maintenance, exclusive of overhaul, $0.50 per hour | 0.50 |
| Reserve for plane repair, $0.50 per hour | 0.50 |
| Total cost per hour | $6.27 |

In this calculation, pilot's and mechanic's salaries, hangar rent, and field charges are to be figured as "business overhead."

The Travel Air six-passenger plane, widely used in "feeder lines" to the trunk line airways over which multimotored transports fly, is analyzed in more detail. In the computation the power plane is a Wright J-6 "Whirlwind," 300-horsepower engine.

The table follows on the next page.

| Based on 600 Hours or 60,000 Miles | *Cost per Hour* |
|---|---|
| Interest at 6 per cent on $13,000 investment, $780 per year or | $1.30 |
| Depreciation of plane, $8,200, 2,000 hours at | 4.10 |
| Depreciation of motor, $4,800, 1,000 hours at | 4.80 |
| Fuel, 14 to 16 gallons per hour at $0.30 per gallon | 4.50 |
| Oil, 1 quart per hour at $0.30 per quart | 0.30 |
| Repairs, $2 per hour | 2.00 |
| Insurance, fire, theft, public liability, property damage, and tornado. Policy per plane costs $788 per year at $1.31 per hour, assuming that plane flies 600 hours per year | 1.31 |
| Workman's compensation insurance on pilot at $125 per year or $0.21 per hour | 0.21 |
| Pilot's pay at $3,600 per year or $6 per hour | 6.00 |
| Advertising, telephone, telegraph, office rent, etc., at $1,500 per year or $2.50 per hour | 2.50 |
| Mechanics' pay at $1,800 per year or $3 per hour | 3.00 |
| Total expense per hour | $30.02 |

At an indicated cruising speed of 110 miles per hour, this reduces to about 27 cents per mile of flight. This is not a complete figure covering operation in a transport line.

Fokker engineers arrive at approximately the same figure in estimating operation of a six-place model, exclusive of selling costs and administration overhead. Depreciation is written off in that case at the rate of 30 per cent per year on the plane and 50 per cent on the engines.

But the more significant story, in the light of vast expansion of passenger routes which will serve business men, is the financial analysis of a main-line passenger transport. The Fokker F-10-A carries 2 pilots and 12 passengers. At full load the direct and indirect operations total works out at about $5\frac{1}{2}$ cents per passenger-mile. The detailed data follows:

FLYING HOURS PER YEAR ESTIMATED AT 750 HOURS

| | |
|---|---|
| FUEL: | |
| Gasoline, consuming approximately 60 gallons per hour, 45,000 gallons at \$0.30 per gallon | \$13,500 |
| Oil, consuming approximately $1\frac{1}{4}$ gallons per hour, 938 gallons at \$1 per gallon | 938 |
| Miscellaneous (greases, etc.) | 100 |
| | \$14,538 |
| DEPRECIATION: | |
| Plane (estimating life of plane at 2,500 flying hours), 750 hours at \$18.80 per hour | \$14,100 |
| Engines (three), estimated life at 1,500 hours each, 2,250 hours at \$4.56 per hour | 10,260 |
| | \$24,360 |
| MAINTENANCE: | |
| Estimated at 3 per cent of the cost of the equipment, new | \$2,025 |
| PERSONNEL AND MISCELLANEOUS: | |
| Flight mechanic | \$3,000 |
| Pilot | 6,000 |
| Hangar rent | 1,000 |
| Insurance | 5,000 |
| Incidentals | 2,500 |
| | \$17,500 |
| Total cost of operation on above basis | \$58,423 |

| | |
|---|---|
| Cost per mile on above basis, estimating cruising speed of plane to be 118 miles per hour, 88,500 miles per year .................. | $0.66 |

The Keystone Aircraft Corporation makes a similar analysis of operating costs on the "Patrician," 20-passenger plane, on the basis of a cruising speed of 125 miles per hour. Period of obsolescence of the plane is figured at 3 years, or 3,000 hours; of the motors, 1 year, or 1,100 hours.

### Capital Investment

| | |
|---|---|
| Cost of airplane ............................ | $90,000 |
| Extra "Cyclone" or "Hornet" engine ........ | 8,600 |
| Extra propeller ............................ | 300 |
| | $98,900 |
| Less value at end of useful period — plane, $19,000; 4 motors, $12,000 ................ | 31,000 |
| Net investment subject to book depreciation .... | $67,900 |

### Yearly Fixed Costs

| | |
|---|---|
| Interest at 6 per cent ........................ | $4,575 |
| Insurance, full coverage plane and passengers .... | 13,500 |
| Hangar rental ............................ | 1,800 |
| Sinking fund for obsolescence of plane .......... | 22,625 |
| Replacement of motors ...................... | 16,800 |
| Pilots' and attendants' salaries, base pay ...... | 4,800 |
| Flying mechanic's salary .................... | 3,900 |
| General overhead, estimated .................. | 2,000 |
| | $70,000 |
| Daily fixed charge per year of 240 flying days.. | $292 |

VARIABLE COSTS

| | |
|---|---|
| Gasoline — 78 gallons per hour at 25 cents ...... | $19.50 |
| Oil — 12 quarts per hour at 30 cents ........... | 3.60 |
| Pilot's mileage pay, 5 cents per mile ........... | 6.25 |
| Motor repair, $400 per 200 hours .............. | 6.00 |
| Plane repair, $100 per 200 hours ................ | .50 |
| Total variable costs per hour ................ | $35.85 |

Operating 500 miles per day, according to these figures, indicates that "obsolescence" exceeds direct operating costs. In other words, the hourly "wearing out" of flying equipment involves a bigger sum than the total expended for fuel, oil, maintenance, and pilotage.

Assuming an average load of 75 per cent of capacity, the Keystone engineers then figure passenger-mile and pound-day rates in a detailed table as it would work out in "flying days" varying from 2 to 6 hours. Flying but 250 miles per day this ship shows a passenger-mile cost of 9.7 cents, whereas the cost would be but 4.5 cents on the basis of a 750-mile daily average of flight.

The table, showing the effect of spreading fixed charges over more income-earning hours, follows:

| | 2 hour- or 250-mile day | 4 hour- or 500-mile day | 6 hour- or 750-mile day |
|---|---|---|---|
| Fixed charges ......... | $292.00 | $292.00 | $292.00 |
| Variable charges ...... | 71.70 | 143.40 | 215.10 |
| Cost per day .......... | 363.70 | 435.40 | 507.10 |
| Cost per hour ......... | 181.85 | 106.85 | 84.78 |
| Cost per mile ......... | 1.45 | .87 | .68 |
| Cost per pound per day | .128 | .152 | .18 |
| Per passenger per day . | 24.25 | 29.03 | 33.80 |
| Per passenger-mile .... | .097 | .058 | .045 |

The proposed "1,000-mile day" of the new Boeing Air Transport schedule, to be flown by 18-passenger ships, may conceivably result in a passenger-mile figure below 4 cents; although the reader should bear in mind the fact that air transport history is too short to permit of accuracy in depreciation figures.

These are admittedly theoretical performance figures, estimates by the manufacturer. The correction of them by actual performance analyses is extremely difficult. Western Air Express, which has carried passengers longest in 12-passenger transports, was operating on a de luxe basis, as a "laboratory experiment" in connection with researches of the Guggenheim Fund. So many expensive experimental factors were included that nothing which could be regarded as a normal average of operating expense was available. The operator next most likely to be able to give a financial picture of a passenger transport at work was Pan-American Airways. Here, also, pioneering, operating newly established airways, rebuilding and alteration of equipment, and abnormal salary charges due to rigid "schooling" of new personnel made cost deductions difficult. Nor was the result of such analysis a cost figure on air transport.

The men who are venturing air transport of passengers have in columns of figures a skirmish line from which to battle through to profits through reduced costs and volume of traffic.

## CHAPTER XVII

### *Underwriting the Risk*

A WESTERN operator has a standard retort for one of the commonest remarks which he hears:

"I aim to keep at least one foot on the ground," says a visitor. "Well," replies the operator, "if that's all that's worrying you, bring along a box of dirt and keep one foot on it while you fly. You will be as safe as you are on the ground."

The question of safety in aviation has been at the root of every problem of air-transport operation. Through conviction regarding the safety factor the public may be won to air travel.

But even before the public had begun to travel, to any great extent, in the United States the economics of the situation demanded insurance underwriting of the risks.

Another landmark of the year 1926 was the announcement of complete aviation coverage in one contract. This meant that the hazards of fire, lightning, accidental damage, theft, robbery, public liability, passenger liability, storm, and cyclone, all were covered in a single policy. Aviation insurance had been written for more than a dozen years but not as complete coverage.

An important phase of the situation was this:

If a stage had been reached in which insurance underwriters could measure the risk and write policies whose premiums constituted a fixed and known item in operations costs, then operators could go to investors with a fixed budget, clearly showing the possibilities of profit and loss.

Once aviation was underwritten as an insurable risk, all the influence and experience of the insurance companies became arrayed on the side of safe operation. As prospective clients appeared, the underwriter could subject them to a rigorous engineering examination, insist on certain practices, and, if his terms were not met, reject the business.

As to the general question as to safety in the air:

An example frequently cited is that of the British Imperial Airways. In 3 years, these routes were flown 3,200,000 miles without an accident resulting in the injury or death of a passenger. Then a land plane was forced down in the Channel with loss of life. This was a two-engine plane incapable of maintaining flight with one engine, a type which, it is recognized, should not be used in transport service.

In the United States on organized airways using multiengined planes, 44,650 passengers were carried over 2,200,000 miles of airways in 1928 with 1 accident resulting in 3 deaths. This was caused by a "stunting" pilot crashing his plane into the passenger transport.

He was flying in defiance of regulations and obviously the accident was not caused by transport operation.

The relative safety of various methods of transportation is indicated in the following:

During 1928, according to statistics of the Interstate Commerce Commission, 6,500 persons were killed and 85,560 injured as a result of the operation of railroads. During the year passenger trains traveled 521,-349,000 miles and freight trains 601,648,000 miles, making a total of 1,122,997,000 miles traveled. Dividing this figure by the number of persons killed, we have 1 fatality for every 172,768 miles traveled by rail.

Turning now to civil air transportation, the Department of Commerce estimates that planes flew approximately 70,472,000 miles during 1928. The total loss of life in civil aviation was 368, and 672 persons were injured. This means that in flying 1 life was lost for every 191,500 miles traveled, which is a slightly better record than was made by the railroads.

The American Automobile Association estimates that the average car travels 6,750 miles per year, which multiplied by more than 21,202,000 licensed automobiles in the country gives a total of 143,115,477,750 miles traveled by motor in 1928. This tremendous distance is more than 125 times the mileage traveled by rail and is 2,044 times greater than the total airplane travel. The loss of life from automobile traffic is also large, amounting to approximately 23,000 deaths and 700,000 injuries during the last calendar year, but, because of the great distance traveled, the fatalities amount to only 1 for every 6,222,412 miles. This represents the automobile as by far the safest means of transportation in the United States.

It should be noted, too, that there was a sharp reduction of railroad accidents last year, and that the airplane is becoming safer each year. On the other hand, the fatalities from automobile traffic are steadily increasing, doubtless due to greater congestion on the highways. Furthermore, the percentage of injuries from automobile traffic is much higher. In air navigation there are hardly two persons injured for each one killed. On the rails, 13 are injured for every 1 that is killed, but the automobile injures 30 persons for every fatality.

The mounting safety factor is shown by the improvement in miles flown per fatality by air-mail pilots. The score was approximately 100,000 miles 10 years ago, and more than 1,000,000 miles last year.

In a campaign to increase safety of flight, the Guggenheim Fund makes certain recommendations as follows:

> The federal government should provide a comprehensive and intensive weather service for aviation throughout the United States.
>
> The federal government should regulate the operation of airplanes and the movement of visitors at airports, to eliminate collisions and danger to bystanders.
>
> Every state should pass aviation legislation in conformity with the federal laws.

Every community with population of between 1,000 and 50,000 inhabitants should mark its name on at least 1 of the most prominent roofs in the town.

A more pretentious Guggenheim campaign has to do with the establishment of landing fields at 10-mile intervals throughout the entire country.

Harry F. Guggenheim declares:

> We have been asking men to do what, with some rare exceptions, self-respecting birds would not consider for a moment; that is, fly over territory where they could not land with ease and safety, whenever it seemed wise to do so, on account of weather conditions or for other reasons.

Guggenheim's contention is that fields at 10-mile intervals would enable planes to glide to safety from any point. It has been figured that such intermediate landing fields, having 1,200-foot runways, would require, for the country as a whole, the use of only 1,544 square miles of land. The total area occupied by roads and railways in the United States is 50,050 square miles. The Guggenheim proposal, therefore, is for use by aviation of 3 per cent of the area devoted to railroads and highways.

There is no reason today why the public should not fly, with confidence, Guggenheim believes, but, before doing so, they should make sure that there exists in the passenger air transport system to be patronized, the following:

1. Multiengine planes capable of flying on the disability of at least one engine.

2. Two pilots licensed by the federal government.

3. Planes and engines licensed by the federal government.

4. Adequate landing facilities over the route to be flown.

5. Intensive weather-reporting service over the route to be flown.

6. Wireless or at least a visual communication system between the plane and the airway.

7. Last, and most important of all, responsibility of the operators of the air service.

The casual patron of air transport may be quite sure that the insurance premium rates any given company pays will vary in proportion to observance, by that company, of such safety rules as the above.

The whole trend of insurance underwriting is to pile up data enough so that the "guess" can be taken out of underwriting. An enlightening phrase is used. In the older established branches of the insurance business such a mass of past performance figures are available that the risks in almost any contingency have been computed. Underwriting is, therefore, more or less of a routine matter, to be guided by rule of thumb. But new lines of endeavor carrying risks cannot be covered in the statistical tables, or at best the performance records are incomplete and no adequate basis for routine procedure. Then there arises what is appropriately known as "facultative underwriting."

Possibly the thing "farthest north" in facultative underwriting is to be found in aviation insurance.

Horatio Barber, of Barber and Baldwin, leading underwriters, wrote his first aeronautical policy in 1912, in England. He says:

I have been in aviation since the earliest days, and aviation insurance for many years. I have the records of those years, as collected for me and tabulated. In a sense they are my stock in trade. But tomorrow morning a client may walk into my office whose case is such that it is conceivable that I might disregard, completely, what the past records tell me. That is facultative underwriting — a use of the faculties to judge individual cases, and to carry on from the point at which the established rules cease to be of use.

I see three tendencies in the present situation:

1. Operators universally clamor for lower rates.

2. Newcomers in the business, encouraged by the fact that some of us have survived, rush in and cut rates, making an assumption that the business has been very profitable.

3. Some companies, interested in the advertising which they get from an aviation connection, are willing to quote too low and write off any margin of loss as having repaid them in advertising value.

As to the first count, my loss ratio over a long period tells me that the rates are not too high; but at the same time, I agree that means should be taken to reduce them. There have been reductions. At the beginning of 1929, rates were, on the average, some 40 per cent less than at the beginning of 1922. The rates are made by the air operators themselves, since they depend upon the degree of hazard in their operations which are under their control, and not controlled by the insurers.

Lines of protection include various forms of fire coverage, collision, constructive total loss, tornado, and theft up to a limit of $77,000 per aircraft; cargo up to $25,000 per consignment; cargo liability up to $250,000 per aircraft; public liability up to $500,000 per aircraft; passenger liability up to $500,000 per aircraft; property damage up to $500,000 per aircraft; damage to ground property up to $1,000,000 per location; personal accident up to $300,000, any one person; airport and air meet liability up to $500,000, any one airport or meeting; not to speak of compensation and various contingent liability risks arising constantly. The demand for higher limits of indemnity is growing every day and must be met, if satisfactory service is to be rendered. It will be met if the situation remains undisturbed by violent or ill-considered methods.

As regards the second count, it has always been true, when any new field of insurance is opened up, that the fact of survival by pioneer underwriters spreads an impression that the field is very profitable. Inexperienced underwriters follow and cut rates below what the risks warrant. There comes an accounting, which includes failures and a weeding-out process. The unwise concerns disappear, but not before they have caused the newly insured industry to suffer losses. History is repeating itself; aeronautical insurance is being written by some companies at rates below costs.

As regards the third count, an insurance company which permits underwriting at unfair rates, for the sake of the general self-advertisement involved, merely encourages the writing of ruinously low rates, generally; and, indirectly, this has a bad effect for the general public, because it also tends to reduce safety factors.

Despite all these difficulties, all the aviation insurances demanded *are* available, prompt service to agents and the public *is* being rendered, and rates *are* decreasing.

In aviation there is a big field for new insurance-agency business. The average agent has considered aviation insurance as a side line and a nuisance. Moreover, he has considered that the business is spread so thinly over this vast continent that there is not sufficient of it concentrated within any one locality to butter his bread. But I know of agents, some with accounts already over six figures, who have tackled aviation within a year or two. First of all, they scrapped the term " side line " as they discovered that aviation insurance has a remarkable way of thickening here and there, almost over night. Secondly, they made a real study of the forms of coverage and underwriting methods, corresponding with the underwriter on points not clear, and even, in some cases, traveling thousands of miles to discuss with him, thoroughly, the operation of the business. At the same time, they read a few simple, elementary books on aviation and the aviation magazines; joined the local chapter of the National Aeronautical Association, or other organizations supporting aviation; got the aero language into their heads and then visited the local flying field and acquired the aviation atmosphere and requirements by personal contact with air operators, pilots, and others.

Of particular interest to the average individual may be the information that accident insurance covering flight is available in standard practice up to $75,000. The premium rate is determined by an analysis of the answers to a series of 25 questions. If the individual and the transport company are both what might be described as good risks, a policy may be had at the rate of $20 per year per $1,000 of principal, covering death; or $2 per year per $1,000 covering dismemberment. There is also a weekly indemnity coverage. This is the minimum rate, and on different classifications the rate advances to as high as $50 per year per $1,000-policy.

## CHAPTER XVIII

### *Jobs in Aviation*

"How can I get into aviation?" is a question many thousands have asked since Lindbergh flew the Atlantic. And many thousands have found their way into aviation since that historic date.

There is a twofold lure about it. Aviation is the heroic gesture of the moment. Moreover, it is that glamorous new business adventure which beckons many who are tied down to a routine existence. And is there not gold in it for the knowing, and for those who get in on the ground floor?

Where has aviation picked its leaders? Here is a great need for men, in a period of expansion. What type of men does aviation adopt and adapt to her purposes?

The first answer to all these queries of the hour, perhaps, should be that a shoe clerk of today does not become an air magnate of tomorrow; nor does he become a pilot, traffic manager, production expert; no, not even a "grease monkey" merely by a wish, with a deft turn of the wrist. The first thing that strikes the eye in a survey of the leading personnel of aviation is the fact that so many of the "big men" have been for so long in this thing which to the average person seems to have sprung up only yesterday.

All branches of aviation require *preparation*—hard, rigorous preparation. It is an exacting calling.

As engineering, it is constantly moving. As an industry, it involves standards of quality seldom met with in manufacturing. As for selling, there is a virgin field, since sales increasingly will demand discovering and proving new kinds of usefulness; and, moreover, the present sales system is experimental. As for transport, almost the entire book of rules is yet to be written, although certain groups and individuals obviously are making fairly competent drafts of the early chapters.

Efforts are being made to discover the needs of aviation and to adapt high-school, trade school, and college instruction to give the sort of book or manual instruction which will prepare young men at least for intelligent apprenticeship to the various divisions of aviation.

According to some estimates, at least 25,000 persons were learning to fly in June of 1929, but there was a shortage of good welders. Airplane mechanics also were reported in demand, as were engine mechanics. However, in order to obtain a license as an engine mechanic, it was necessary to have had at least 2 years' experience on internal-combustion engines, 1 year of which must have been on aircraft engines.

Traffic agents, advertising men, publicity men, and salesmen usually have a background of aeronautical experience, plus some specialized training in transportation, journalism, or salesmanship in branches not connected with aviation.

Airport designers must not only be engineers, but pilots as well, in order to see their problems "from the air," and thus build soundly for safe and economical operation.

In response to various inquiries, the Department of Commerce drew up an outline of "Aeronautics as a Vocation," which accents rather heavily jobs "in the air"; but it is a valuable summary and is presented herewith:

Aeronautics as a Vocation. — *Air transportation* will, generally speaking, demand personnel in the various occupations now included under railroads and shipping. In transportation by airship, there must be the ship's officers, including navigators and crew, with all the ground personnel at station stops. In airplane transportation, there must be the chief pilot of the craft, and such additional navigators or others as may be required as airplanes grow larger. There must, of course, be ground personnel along the route roughly similar to that of the railroads.

In *air service* operations from a fixed base such as air taxi, sightseeing, aerial photography, mapping, and surveying, and other industrial uses, there must be pilots experienced in their particular lines, together with personnel on the ground.

In *private flying*, there will doubtless be a field for pilots and mechanics of airplanes privately owned and used for enjoyment only.

It is not necessary here to list all the trades and occupations of those employed in the various branches of aeronautics.

ADVANTAGES OF VOCATION. — Confining the vocation to but one field, piloting or navigating, the nature of air travel demands the highest type of personnel. "There is always room at the top" and this may be considered as especially true in aviation and aerostation. But along with the responsibilities are the advantages of positions of honor and trust. The occupation is one of absorbing interest, with rapid changes, and the duties while intricate are not onerous. The pay is comparatively high, and the hours of service are not unreasonable.

DISADVANTAGES. — Disadvantages might be called negligible. On regularly established airplane routes, a portion of the time is spent away from the home location. On an airship route, a still longer time will be spent away. In air service work, these periods might extend over weeks, as in the case of a mapping mission covering a great area.

DEMAND FOR WORKERS. — It is most probable that for many years there will be an unfilled demand for pilots and, perhaps, navigators, in the exceptional class, and perhaps even in the unexceptional but first class. There is no estimating the period of time during which these out-of-the-ordinary opportunities will offer themselves. However, the growth of air transportation lines and the launching of new enterprises, followed by wider acceptance of air transport as a means of travel, must assuredly produce a hopeful outlook for a considerable number of years.

QUALIFICATIONS AND REQUIREMENTS. — A transport pilot — the pilot of an airplane used in regular scheduled passenger air transportation — must be a citizen of the United States or of a foreign country which grants reciprocal privileges, or an alien who has declared his intention to become a citizen. He must have had a minimum of 200 hours of flying, passed a more or less rigid physical examination, and then examinations on engine and airplane mechanics, the fundamentals of meteorology and air navigation, air commerce regulations and traffic rules, and meet certain conditions in actual flight test, under the federal regulations. Pilots for other work must pass somewhat similar tests but need not have as much previous experience in the air.

Training and Preparation Necessary. — The transport pilot must have had at some time in his career the experience necessary for the federal requirements and pass the written examination. To become a transport pilot, without any previous experience in the air or in aeronautics, means a course at a "ground school" for the principle and theory of aeronautics and allied subjects, followed by a flying course.

At the end of 10 hours of flying alone, he may be able to qualify for the private pilot's license. After 50 hours, he may become an industrial pilot, or a limited commercial pilot, and after the 200 hours, a transport pilot.

Unless the aspirant can obtain employment by some company as an industrial or limited commercial pilot, he must obtain his hours in the air by buying an airplane or by renting one at $15, $20 or more an hour. In the course of all these hours, he must have had some cross-country flying, and some night flying, if he is to engage in this work commercially. Even upon the completion of such a course of training and practical experience, he will have to take his place among other transport pilots who have in their years of flying obtained much wider experience in landing and taking off under inconveniences, in meeting emergencies of various kinds, and acquiring those advantages which come only with time and activity.

With the entrance of multiengined airplanes in the air transport industry, some manufacturers are inaugurating schools for service training of selected pilots of such aircraft, in order to insure the maintenance of the reputation already earned by his product.

The airship has not yet been given industrial application in this country and there is, at present, no outlet for experienced personnel in airship operation. It is to be expected, however, that within the near future airships will play an important part in civil aeronautics; and the pursuit of aerostation is a virgin field.

Service to be Rendered. — For long-distance airplane transportation, there will undoubtedly be the pilot, perhaps a navigator, or perhaps the two will be combined in one who will also attend to radio communication. The application of automatic pilots to air transport operations will greatly decrease the actual physical labor of the pilot and he may give his attention to navigation and communication, which otherwise might have to be entrusted to additional personnel.

As air traffic increases, it is not improbable that legislation will require an assistant pilot for the sake of passenger safety. With airplanes traveling still greater distances, there must be reliefs for the commanding officer, for the pilot, for the navigators, and even perhaps for other personnel. In the so-called "local airplane group," one pilot will leave his home station on one day, returning the next, with the following day off, as compared to the long-distance airplane route in which a series of pilots will take turns in flying perhaps shorter standardized distances in each direction, with similar relief days.

In air service work, the photographic pilot will have educated himself along the particular line required and eventually become an expert in this type of work. In other phases of this miscellaneous type of commercial flying, the pilot will become proficient in various narrowed fields.

Opportunities and Rewards. — Aeronautics is no more a golden road to renown and wealth than any other specialized industry. Adequate remuneration will, undoubtedly, keep pace with practical experience, individual initiative and ability adding its own part of the reward. Unquestionably, the present pay for piloting services is above that in analogous lines of work.

There has been discussed only the subject of pilotage. The application of the airplane and the airship to transportation brings in special phases of radio, illumination, power-plant engineering, airport construction, advertising, and profit. There must be aeronautical plane engineers for the design of airplanes and airships, airplane and engine mechanics, metal workers, painters, major and minor executives of every kind, and members of allied trades whose products or experience enter into the construction and operation of aircraft.

The foregoing summary barely nicks a corner of the "vocational field" of aviation.

Many contend that in engineering will lie the greatest opportunities. An important transport man declared to the writer that there were no more than 10 really first-class aeronautical engineers in the United States; and of these, the one he ranked first had gone into manufacturing which had nothing to do with aviation. This was quoted to a manufacturer of note, and was branded as an exaggeration: the manufacturer cut the number to seven.

The Guggenheim Fund sent out a questionnaire, obtaining responses from 8 large transport companies and 43 prominent aircraft manufacturers. The replies indicated a need for engineers; 40 of the manufacturers employed graduate engineers, in number varying from a single graduate to as many as 51 in a very large company.

In but 5 of the 43 companies were the chief executives themselves graduate aeronautical engineers — since no such degrees were being awarded when they passed through their training period — but in about half of those companies reporting there were not only aeronautical engineers in the engineering departments but in executive positions as well.

As to the relative number of openings: the report showed an average of 4 engineers per company, and of ground mechanics, 26.

The Guggenheim report shows:

> There is a shortage of trained men for positions as mechanics and ground engineers. Applicants are preferred who are aeronautically trained mechanics or who have had experience as airplane factory mechanics. Men are also considered for positions who have been trained as automobile mechanics in trade schools. Training in a trade school, if thorough, is considered very desirable.

Woodworkers, metal workers, pattern makers, machine-tool workers, welders — these often are recruited to airplane factories. But welders who are to work with steel tubes .035 inch thick are given 2 to 4 months' training welding small parts at a bench before they are permitted to go to jigs in which the steel skeleton of a plane grows bit by bit. Similar exactness in proficiency is required in many other divisions of an airplane shop. In no manufacturing business is the human element more vital than in the building of an airplane. Not only is the personnel tested, but every item among some four thousand parts and all material which goes into a plane.

Men who can organize airplane production along quantity production lines, safely, might well be considered almost without price. Surely no product ever confronted manufacturing men which presented more obstacles to quantity production.

If really first-rate engineers can be numbered on two hands, perhaps the fingers of one would be more than adequate for the counting of real air transport experts, passenger handling included.

No one is very sure, as yet, what the positions or the opportunities will be, down the line from the top executive. Some salary items from a transcontinental line are both descriptive of jobs in air transport and of the line of advancement.

A "division superintendent" draws $9,000 a year, a pilot approximately $7,200. The pilot's pay is figured on a "base," plus an hourly rate on flying, plus an addition for night flight. If night flying were added, his salary would advance beyond the figure given. A "pilot-mechanic" — the second pilot of a big transport — is listed at $3,600. A cabin-boy at $125 per month.

The rating on a radio engineer is $5,000; an airway superintendent, $4,000; and a senior meteorologist, $3,000.

Radio operators draw $2,400; mechanics, $2,100; teletype operators, $2,100; and engine mechanics the same.

# CHAPTER XIX

## *Assembly Lines and Sales Organizations*

GROVER LOENING described the "birth of an airplane."

With relief, he had withdrawn from industrial management — from the Loening Aeronautical Corporation, manufacturing amphibians — and had returned to aeronautical engineering. In single harness again, he promptly demonstrated his newly invented single-wheel amphibian landing gear.

How long for the development of a new model plane?

"Three months of work before materials are touched," he said. "Six months to build and test your model. Another three to work it over."

And getting it into production?

"Another year," he said. "Two years in all. I find it amusing, sometimes, to speculate on what these various people will be building three or four years from now."

It would seem that there are extant some folks who think you can draw a new type on a piece of paper, throw it out the window — and watch it fly away. But there is sweat of the brow and body in the building of airplanes which will endure to serve us.

There was a commotion at Teterboro Field one afternoon. Chattering mechanics wondered what the Boss would do next. He had a new $40,000 air yacht out there, loaded with men, and was giving it terrific ground treatment.

"I broke the tail skid for them, on purpose," Fokker explained later. "I had told them it was not strong enough. When you sell planes they must be strong enough to stand much rougher treatment than they are ever going to get."

An embryonic production line halted for that — and it was important.

The rebuilding of the Curtiss "Condor" bomber into a giant transport occupied nearly a year. Several keels were laid down for Keystone "Patricians," but they were not rushed through until the first 20-passenger ship of that line had been tested in a continental tour. Transport men, waiting for Fokker F-10 models, saw the F-10-A replace it before their orders could be filled. The Fokker 32-passenger ship lagged many weeks behind the original production schedule. The production rate Ford announced for May 1 was not in full operation in August. The advertising announcement of the Consolidated "Commodore" conversion to passenger use preceded the actual appearance of the ship by some months.

There was nothing unusual in all this. It was "normal." Good planes are not drawn on paper and thrown out the window to fly away — into a golden sunset.

The first necessity is design engineering, so that the plane which is "on paper" today will not be obsolete when it is in production 2 years hence.

Second, a commercial vision is required. A prominent builder started the year with three models. Within a few months two models were cast aside. Building and then destroying assembly lines is not profitable. It can only be assumed that two models did not fit the market.

The production leaders of today have quantity production experience extending back over several years.

In 1927, the leaders in commercial building were:

| | |
|---|---|
| Closed Models: | |
| Stinson | 55 |
| Fairchild | 50 |
| Fokker | 35 |
| Open Models: | |
| Advance "Waco" | 454 |
| Alexander "Eaglerock" | 206 |
| Swallow | 104 |
| Travel Air | 144 |

Of these, during 1928, Waco led with considerably more than a thousand planes; Travel Air scored 749, open and closed models; while toward the end of the year, a new quantity production leader appeared in the closed-model field in Curtiss Robin, builder of 100 planes.

As shown by 3 months, Department of Commerce licenses during the early summer of 1929, the leaders were Waco, Curtiss Robin, and Travel Air. These were closely grouped, but a wide margin separated them from Alexander, Curtiss, Fleet, Fairchild, American Eagle, and Stinson. There are represented here, of course, open and small cabin jobs; the bigger transports were not in such heavy production.

Of those leaders, Advance Aircraft Company of Troy, Ohio, had been producing for 7 years. C. J. Brukner had started with a capital of $8,000, and had built, demonstrated, and sold his product.

Travel Air had been formed in 1924 by Walter Beech, who had been a war pilot, barnstormer, and salesman and engineer for Swallow. Travel Air had started "on a shoestring," with a few thousand dollars capital; and from it Lloyd Stearman and C. Y. Cessna broke away to establish plants of their own. Travel Air, Swallow, Stearman, and Cessna made Wichita the leading producer in the world in point of number of planes.

The "Robin" was the product of the engineering division of Curtiss Aeroplane and Motor Company, produced through Curtiss-Robertson, a subsidiary, at St. Louis.

Aside from those already mentioned, the biggest new plant production units in sight were those of the Great Lakes Aircraft Corporation, at Cleveland, and of Glenn Martin, at Baltimore.

Heretofore, the airplane buyer has walked up to the counter to make his purchases. A prospect arrived, a pilot hastened out onto the field to demonstrate the product, the sale was for cash — and the new owner flew the plane away. The sales and credit problems were very simple indeed.

But times are changing. Far-sighted men have been planning for a day when airplanes must be *sold.*

When Richard F. Hoyt added Travel Air to the group which he heads, it had but a fraction of its present production volume, *but* had an organization of about 130 distributors, said to be the largest organization of its kind in the country. When C. M. Keys plotted the structure which he believed would serve a public newly air minded, he planned the expansion of a pioneer, Curtiss Flying Service, to include 35 fields, schools, and sales agencies at key points, each to become a district channel of sales development. And here was a selling agency ready for the "Robin." United Aircraft's first units in the manufacturing line had made planes chiefly for the government; but with expansion and new additions, schools have been planned and there are reports of a national sales service in formation. Aviation Corporation, serving 62 cities by its air lines, began to work out methods whereby terminal activities might include sales or assist promotion. Furthermore, Fairchild, of the plant division, worked out a dealer system. Brukner couldn't demonstrate planes by the hundred: he passed the selling job on to distributors.

Long before Aviation Credit came into being as a big corporation, Alexander had been selling "on time" to help promote sales. A $4,000 plane could be bought for $1,744 down and $261.60 per month for 10 months.

Curtiss Flying Service, the most pretentious sales organization, operates:

| | |
|---|---|
| Sales agencies | Stockrooms for spares |
| Taxi service | Servicing squads |
| Airports | Storage hangars |
| Machine shops | Ground schools |

Flying schools (with Courses ranging from $600 to $4,500).

It will be seen that one activity helps another; and that the schools turn out not only prospective customers for airplanes, but personnel as well for the allied transportation interests which are headed by Keys in this country and by Hoyt as regards Latin-American territory.

Since Curtiss, Wright, and United leaders have carried forward the story and lessons of commercial aviation frequently in these pages, it is from the fourth big group, Aviation Corporation, and from Sherman Fairchild, pioneer builder of cabin planes, that an "insider's" survey of the selling problems is sought. Fairchild declares:

> There is now an improper ratio between the manufacturing part of the aviation industry and the selling part. Our problem is one of balancing the two.
>
> Planes suited to various needs can be divided into four divisions:

First, there is a training or sport plane of the open cockpit type, a 2- or 3-place ship, priced at $5,000 or less, with an engine rating up to 100 horsepower.

Second, a cabin plane for four or five, for private use, for business firms sending salesmen and executives across the country, and, to a limited extent, for the use of aerial transport operators on short and emergency trips. This plane should range in price up to about $15,000.

Third, a cabin plane of seven or eight places for the commercial transport operator or air mail, and for private corporate owners able to use a plane larger than the second classification. This price should range up to $20,000.

Fourth, a multiengined cabin plane for aerial omnibus service and to be used in competition or cooperation with railroads on long hauls. The price of this plane is limited only by size and power.

These are the planes which the manufacturers are making. What the industry needs is an efficient system of dealers and distributors. Some companies are well on the way toward building such organizations. There is much in common between the methods by which airplanes can be distributed and the methods by which automobiles are being distributed. In fact, in many cases, the automobile dealer is himself especially well adapted to market airplanes.

Exact figures on profits covering a large number of dealers over a long period of time are not available because the industry is so new. However, 11 of our dealers have been working for 9 months on budgets which our company had made out, each dealer investing $75,000 to $100,000. On this investment their earnings have been at the rate of 28 to 30 per cent on a yearly basis. Such figures indicate that there is really a profit in selling airplanes. They indicate, further, that a substantial amount of capital is necessary for a dealership.

At the present time, all the profits of the airplane distributors are not made from the sale of planes. There is at least as much money to be made in servicing planes, training students, taxiing, and sightseeing work. Only by going into all of these related lines can the dealer realize his possibilities for profits to the fullest extent. I should say that right now the most profitable activity is the training of students.

Dealers who do not care to go into all these activities probably can make from 9 to 12 per cent on their investment at the present time.

Dealer organizations, of course, are still new, and even as late as last year *70 per cent* of the 4,700 planes sold in this country were sold to fleet operators. These buy direct from the manufacturer; and as long as they are the principal buyers, the discounts to dealers are eliminated.

Today, planes can be sold faster than the motors for them can be made. There probably will be 12,000 planes sold before this year is out. This, we believe, will be far below the demand for airplanes. Of this number, not more than 30 per cent will be sold to private owners. As the business grows older, however, there will be a steady increase in this percentage, and the time is coming when private owners will own by far the largest proportion. The sooner that time arrives the better it is for the dealer.

There have been virtually no dealers to sell the private individual. If the leading manufacturers had real nationwide dealer systems and were in position to supply in large quantities, the proportion of private owners probably would be 50 per cent of the total this year.

No one knows how many planes can be sold to the general public because no one has asked the public to buy.

In laying out a distribution system, the airplane manufacturer's first consideration is one of territories. This does not mean geographical boundary lines, for such arbitrary distinctions mean little to airplane users. The fundamental thing is to build around an aviation center. Sales territories might include parts of two or three states, or they might overlap.

In each aviation center we have found it well to appoint a key dealer: he would correspond to the distributor in automobile merchandising. It is within his province to appoint subdealers.

A system of dealers and subdealers involves a discount system. Ours, we believe, may well illustrate a distributing system of the future, as a number of manufacturers already have adopted it.

The key distributor receives a discount on each plane. The rate increases with each block of five planes. This increasing rate becomes retroactive on the sixth, eleventh, sixteenth, and so on. At the end of the sales agreement period, usually a year, the distributor gets a bonus discount based upon the number of planes sold in his territory.

Distributors have asked how we are planning to solve the problem of the used plane. So far, we have managed to oppose successfully the trading in of used planes.

# CHAPTER XX

## *The Case for the "Big Ship"*

Harris M. Hanshue was born in Michigan, in 1881. He studied mechanical engineering at the University of Michigan, and on leaving college, in 1902, was employed in an automobile plant in Lansing. Racing was the great demonstrator of motor-car ability in those days, as distance, endurance, and stunt flights demonstrate airplanes today. Hanshue turned racing driver, specializing in cross-country endurance runs.

Racing led to selling, and the Pacific Coast agency for the Apperson car pegged a racing driver to a fixed post.

Hanshue was an automobile distributor at the time he set out to raise capital for an air-mail route which would uphold the civic pride of Los Angeles. About $250,000 worth of stock was sold. After that he "sold" air mail, its service and its advantages, to the merchants of Los Angeles, and it has been said that his air line made a profit from its first day.

Under Hanshue's direction, Western Air Express pioneered in mail carrying, as has been seen, and in


Permission of Fokker Aircraft Corporation of America

FOKKER F-32 TRANSPORT PLANE.

With a wing span of 99 ft., 69 ft. in length from nose to tail and equipped to carry 30 day passengers and 2 pilots or 16 night passengers, this huge airliner, the largest landplane in America, is equipped with 4 Pratt & Whitney 525 h.p. " Hornet " motors, arranged in tandem style.

passenger traffic — now he looks ahead to volume through goods-carrying.

Hanshue, who is also president of the Fokker Aircraft Corporation, outlines theories regarding big ships as follows:

To the average man a new giant plane is a thing of wonder and romance, able to perform veritable miracles.

The imagination pictures each new marvel in some hitherto impossible feat. It may perhaps lap the globe, or carry a hundred persons across an ocean — or shrink a hemisphere to the size of Connecticut. Once aroused, the public imagination races on.

There may, therefore, be a jolt for the reader in the declaration that for the airway operator each new giant of the air rates in significance *in fractions of pennies.*

The single performance means little. The stunt means less. *What we seek is new load capacity, higher speeds, longer range, — and economy.* Of these 4 unromantic things the last is the most important, and is an outgrowth of the others. Every major advance in aviation has been built on the mastery of some basic financial obstacle. Therefore I stress a condition when I say that —

It is the giant plane which will bring aviation within reach of and in touch with millions, WHEN we have mastered the penny-fractions, and not before.

But as that time arrives, giants will perform hourly feats which would seem visionary if I ventured to forecast them today.

If turning a spectacular stunt into an hourly service ranks as romance, then perhaps we can also see some romance in the business of establishing air transportation.

Dr. Dornier has marked a milestone in aviation by proving that a heavier-than-air machine can be built which is capable of carrying tremendous loads. He has made a big stride in the adaptation of power plants to huge air transports.

General Motors, with which we are allied, several months ago bought the American manufacturing rights to Dr. Dornier's models.

Anthony Fokker traveled to Europe to examine the Dornier plane and plans, and to bring home an engineer's and designer's recommendations regarding its manufacture here.

Finally, Dr. Dornier himself came to America late in 1929 to confer with General Motors and Fokker officials.

This series of events, following upon the successful transport of 169 persons in a single plane, is such as to give rise to a popular guess that the aeronautical millenium is again just around the corner, and 150-passenger planes will soon be soaring overhead in direct competition with rail and steamer transport. But no conservative businessman or engineer can, at this stage, measure the exact place of the Do-X, a seaplane of unprecedented size, in the world's air transport system which thus far has been plotted almost wholly over land. Neither for the engineer nor for the air transport expert are there sufficient cost and performance data available.

Some judgment of the stride this ship represents may be gained from recalling that as recently as 3 or 4 years ago there was no airplane in the world which had been *designed* primarily for passenger use. Such passenger planes as were operating were war planes with war equipment removed, and slightly adapted for passenger use. In addition to inefficiencies in the planes themselves, their power plants were built to give a fairly high speed for what might be termed a " springing " distance, but normal cruising speed was very much below this. These planes were not economical. They were not, in reality, *passenger* planes at all.

I can illustrate the place of the big plane in the aviation picture through incidents in the history of Western Air Express, since that is the line I know best, and also since it is a pioneer.

We were, I think, the first to demand the building of a real passenger plane. Two and a half years ago we asked manufacturers to bid on building us a plane which would do 120 miles an hour, carry 2,500 to 3,000 pounds, and have a cruising radius of 5 hours and a ceiling of 16,000 feet. Only Fokker would undertake to build such a ship.

At about the same time Harry F. Guggenheim, of the Guggenheim Fund for the Promotion of Aeronautics, called airline operators into conference regarding the granting of "equipment loans" — similar to those from which railways buy rolling stock — to an operator who would establish a "model" airline as a demonstration of efficiency.

That award was made to us, $150,000 loaned, and three Fokker F-10 planes purchased and put into operation between Los Angeles and San Francisco. The Guggenheim Fund aided us also through the establishment of a comprehensive meteorological service at a cost of another $100,000. That experiment *proved* air transport, and demonstrated the economy of bigger and faster planes.

This Los Angeles-San Francisco route, incidentally, has since become the busiest route in the world. Including the operations of all companies there, 9 planes leave each way each day, and 100 persons per day has been the average travel since June 1. On our own line, during 20 months only one plane turned back because of bad weather.

When that "model air line" was being established — that is to say, more than two years ago — we demanded of Fokker the designing and building of a bigger plane having greater efficiencies, and outlined to him the general specifications and performance requirements. That demand brought the famous Fokker 32-passenger plane of today.

We knew then that the future of aviation depended on bigger planes. Let me deal in transportation terms for a minute and indicate why the big plane is necessary. For purposes of clear thinking, we reduce flight to transportation units; we speak of "*manufacturing transportation,*" and figure that in terms of unit costs.

The most efficient thing in all aviation 3½ years ago was the air mail. The operations cost was $80 per hour. We "manufactured transportation" at the rate of 102,000 pound-miles per hour. That is to say, we carried 1,000 pounds at the rate of 102 miles per hour.

Today, by contrast, Fokker's "biggest land plane" can be operated — all phases of "overhead" included — for $130 per hour, will carry 7400 pounds at 130 mile speed, and thus "manufactures transportation" at a cost of $130 for 962,000 pound-miles per hour.

*Production has increased about 9 times, whereas cost per hour has increased about 60 per cent. Considered in another way, the cost of manufacturing air transportation by using this 32-passenger plane is only 18 per cent of the cost of manufacturing pound-miles per hour units with the best mail planes of 3½ years ago.*

Such a fivefold increase in efficiency is the thing upon which aviation builds and looks ahead; and these statistical figures illustrate what I said in the beginning: that achievement is based on mastery of penny-fractions.

Another factor almost as important as size is that a plane be capable of more constant operation. Someone estimated that transport planes the country over last year operated at a little more than 1½ hours per day. On our line between Los Angeles and Kansas City our planes have averaged nearly 5 hours per day. With bigger, faster planes having longer range, the average of use should increase, thus distributing cost over a greater number of miles of useful performance.

Permission Transcontinental Air Transport

INTERIOR OF THE HUGE 30 PASSENGER FOKKER F-32 AIRLINER.

With every reduction in cost of air transport the number of possible customers increases by progressive stages.

We have pegged down our belief in the big plane with an order of $550,000, for five Fokker 32-passenger planes for use on Western Air Express lines, the first of which should go into service between Los Angeles and San Francisco December 1.

If I point out that this plane has an operating speed of better than 130 miles per hour, and can be operated — including costs of selling transportation, and all overhead — at $1 per mile, this may immediately raise the question whether air transport is not already on a cost basis comparable to the railway fare rate. In theory, if you fill a 32-passenger plane and dispatch it across country, costs work out at about 3½ cents per passenger-mile. But no form of transportation operates at capacity. However, if we could hope to average operations at 40 per cent capacity loads — which would be high — then air travel in giant planes would be coming at least within range of competition with de luxe travel on the railways.

Some such plane as this may span the continent in 24 hours. And with such a plane trans-Atlantic travel is at least a possibility, in thousand mile stages, by way of Labrador and Greenland: whether it is a probability remains to be seen.

Obviously, however, as operators we look forward to a day when, like the railroads, we will have a bedrock foundation to build on in the form of heavy freight or express business.

By removing passenger equipment from the big Fokker transport, it is given a carrying capacity of 4½ tons, or 9,000 pounds. On this basis it would be entirely possible now to establish a $1 per pound transcontinental express rate, which unquestionably could be reduced to 75 cents later. The first figure is six times the rail rate, to be sure, but as against five-day delivery by rail, an air-line could accept a shipment at noon on one day in New York and deliver it in Los Angeles or San Francisco *the following afternoon.*

In a year or so speed will have been stepped up to 150 miles per hour, reducing costs all along the line.

We dream of a ship which will do 200 miles per hour carrying a load of 10,000 pounds. That, I think, might permit us to carry express at a 37½-cent rate, using but one ship each way each day. With an increase in ships the rate might easily be 20 cents — as against 13½ cents by rail.

But then express, or passengers, will travel from New York to Chicago in 3½ hours, and from coast to coast in 12 or 13 hours.

Then indeed will we be "manufacturing transportation" economically, we will have something very important to sell, and we will be in competition with the railroads — able to quote transportation at railroad rates. Aviation's need is for bigger, faster, and more efficient planes.

# CHAPTER XXI

## *Aviation's Importance to Business*

AVIATION will do for business tomorrow what newer and faster means of transportation and communication always have done.

It will speed up business. It will cause adjustments in methods of doing business. It will subtract here and add there. Already it is said to have reduced use of telegraphic "night letters"; but on the heels of that, it becomes possible to twist that same signal box, hand a package to the same messenger boy who called yesterday for a telegram, and have that package delivered in a distant city within a few hours — "like a telegram."

If aviation "adds sufficient value" to a product, then the transmission price will matter very little. A certain "part" which rests on a shelf in a Bridgeport factory's stockroom is worth very little there; but if that missing part could be in Kansas City early tomorrow, it might be worth its weight in gold to a plant whose operation was threatened by the lack of it.

My time may be a total loss to me this morning in New York, but if I could be in Cleveland by three o'clock this afternoon, there might be some thousands of dollars of profit in it. The fare becomes a secondary consideration.

Richard F. Hoyt inspected construction at the Wright plant at Paterson, N. J., and at the Keystone plant at Bristol, Penn., on a holiday afternoon and was at his home on Long Island before dinner time, easily. And he thought of it as a holiday. By train, Bristol to the north shore of Long Island is a long afternoon's work. Hoyt also has *commuted* to New York from his summer home in Massachussetts — by Loening amphibian. Tomorrow's business practice? No reason why not, for those who can afford the luxury.

E. L. Cord added units to his Auburn Motor Company until he could not keep contact — then ordered an air transport. John J. Mitchell, banker, crosses the continent in his own ship. Three Chicago publishers use planes for business and pleasure. Instances such as these can be piled up.

Such men "add value to time" by the use of private planes.

A striking example of adding value to products arises in New Mexico where a firm orders 3 "refrigorator planes" for the transportation of shrimps, value 10 cents per pound in New Mexico and 60 cents in California.

In South America, already supplies for mines and precious metals from them wing their way over passes which heretofore represented many laborious days of expensive transportation. Schools of fish are sighted by plane, fish eggs have been rushed to streams through the air, crops have been sown — and even forests.

These things are suggestive only of where aviation is going.

The most important fact to business is that those behind this new thing are thinking like business men. A single, simple computation is proving to have revolutionary consequences.

How will the airplane make its way as a commercial proposition? Can it ever do so? These questions were asked.

"The airplanes in the United States flew an average of $1\frac{1}{2}$ hours per day last year, no more," a statistician replied, and it has done more to make aviation take stock of itself than any event that has occurred since the Lindbergh flight. Wear planes out in the air, then watch costs fall! If the engines will not stand equal service, then it should be possible to change them quickly. Spread the fixed charges over more miles of useful performance. That is a principle which promises to hasten the day when aviation will be of greater service to business generally.

Another promising factor is cautious progress in the matter of size.

If airways are established which appear to have a theoretical chance for sound commercial operation, and personnel is trained and the "kinks" ironed out of operation, there are certain sober laws of economics which will take care of the future.

We are only *beginning* to build motors. There were 10,000 wartime motors hanging over what there was left of the industry for 7 or 8 years after the war. In Paterson, Hartford, and Buffalo are new "quantity" plants which will prove what volume of production will do to the price of power plants.

Airplanes have been "handmade," almost. Safety factors will prevent their being stamped out like motor-car fenders, no doubt. Nevertheless, machines will be able to do much, and the lost motion of the past will be eliminated. Travel Air, operating 24 hours a day, was reaching toward a 50-planes-a-week objective. Manufacturers are learning: planes will cost less.

If "depreciation," which is original capital cost, is 40 per cent of operation costs, then factory performances soon will be cutting mileage rates on the airways.

Sober men are thinking of 150-mile transport, Boeing declares. Hanshue dreams of a 5-ton cargo in a ship which travels 200 miles per hour. Loening thinks 300-mile planes will make London overnight — in 5 or 6 years.

On the average, we have 100-mile transport now. Move that to 150 miles and the fixed ground charges are spread over 50 per cent more of income-earning performance. The pound-mile rate comes down, and with each drop whole new areas of potential business open up.

If the plant of the New York Central were operated solely that the Twentieth Century Limited might run, the fare from New York to Chicago would be a good many thousands of dollars. There you have an exaggerated but nevertheless significant analogy. Expensive aviation plants had to be brought into being and started with fractional use.

But the next computation of national passenger traffic will be surprising. Of our 1,200 airports, 60, reporting for a week, show the arrival of 1,400 transport passengers, and more than six times as many, or 8,600, were carried on short rides.

That is at the rate of putting 500,000 people in the air in a year!

Decreasing costs, increasing traffic, new uses — herein lies the story of the evolution which faces aviation and which will make of it a sober and serviceable industry.

The public, ever eager for heroes to worship, has transferred to the head of the business man of aviation the halo which was awarded the heroic pilot in the past. This public has believed rather indiscriminately in the business man of aviation, and seen gold in the halo. Money has been ready in abundance for the entrepreneurs of the new air era. Men who did not "get in on the ground floor" when the automobile was young, or who failed to ride to glory on radio, have been able, in more prosperous times, to have their fling with aviation. The commonest admonition fed out to them by the conservative has been a suggestion that they remember that only about 50 companies are in business out of the 1,600 which, at one time or another, set out to make and sell automobiles. That *is* a useful thing to remember. But I doubt whether the money of widows and orphans has come into aviation. Rather, this gigantic venture, which will dwarf all that Europe has attempted, has been financed by men willing to look upon it, not as an investment, but as "a business man's risk."

In this volume will be found information in the light of which aviation efforts may be judged. But the leaders themselves will tell you that they do not *know,* that there is no clear rule for success.

If aviation is moving with what seems a dazzling swiftness, that is because men have thought their way through; tried this, tried that; used slide rule and accountant's pencil; mixed vision with common sense; worked long hours and used courage.

# APPENDIX

## AERONAUTICS TRADE DIRECTORY

(Department of Commerce, June, 1929.)

## AIRCRAFT MANUFACTURERS

### AIRPLANES, AMPHIBIANS, FLYING BOATS, AND SEAPLANES

Acme Aircraft Corporation, Rockford, Ill.

Adams Toman Aircraft Corporation, Aberdeen, Wash.

Advance Aircraft Co., Troy, Ohio.

Aerial Service Corporation, Hammondsport, N. Y.

Aeromarine Klemm Co., 1501 Broadway, New York, N. Y.

Aircraft Industries (Inc.), 931 East Fourteenth Street, San Leandro, Calif.

Akers Aircraft Manufacturing Co., 1438 West Jackson Boulevard, Chicago, Ill.

Alexander Aircraft Co., Colorado Springs, Colo.

Alliance Aircraft Corporation, Alliance, Ohio.

Allison Airplane Co., Lawrence, Kan.

American Aeronautical Corporation, 730 Fifth Avenue, New York, N. Y.

American Aircraft Corporation, Massillon, Ohio.

American Eagle Aircraft Corporation, Fairfax Airport, Kansas City, Mo.

Arkansas Aircraft Corporation, Little Rock, Ark.

Arrow Aircraft & Motors Corporation, Havelock, Neb.

Atlanta Aircraft Corporation, Atlanta, Ga.

Bach Aircraft Co. (Inc.), L. A. Metropolitan Airport, Van Nuys, Calif.

Bellanca Aircraft Corporation, New Castle, Del.

Berliner-Joyce Aircraft Co. (Inc.), Alexandria, Va.

Bird-Wing Commercial Aircraft Co., Mid-America Airport, St. Joseph, Mo.

Bittner Aircraft Co., 4052 West Lake Street, Chicago, Ill. (experimental).

Blondin Aircraft (Inc.), 356 Westminster Avenue, Los Angeles, Calif.

Boeing Airplane Co., Georgetown Station, Seattle, Wash.

Bolte Air-Craft Corporation (Henry Bolte, president), Des Moines, Iowa.

Bone Co., R. O., 415 Industrial Avenue, Inglewood, Calif.

Bourdon Aircraft Co., Hillsgrove, R. I.
Braley School of Flying, Wichita, Kan.
Browning Aircraft, 818 Monroe Street, Gary, Ind.
Brunner-Winkle Aircraft Co., 1–17 Haverkamp Street, Glendale, Brooklyn, N. Y.
Buhl Aircraft Co., Marysville, Mich.
Burlington Airplane Co., 1128 Doemland Street, Burlington, Iowa.
Burnelli, Vincent J., Keyport, N. J.
Butler Aircraft Corporation, Thirteenth Street and Eastern Avenue, Kansas City, Mo.

Capen Aeronautical Corporation, 217½ South Logan Street, Lincoln, Ill.
Capital Aircraft Corporation, Lansing, Mich.
Century Aircraft Corporation, Kansas City, Mo.
Cessna Aircraft Co., Wichita, Kan.
Columbia Air Liners (Inc.), Woolworth Building, New York, N. Y.
Command-Aire (Inc.), Little Rock, Ark.
Commercial Aircraft Corporation, 428 Pacific-Southwest Building, Pasadena, Calif.
Consolidated Aircraft Corporation, 2050 Elmwood Avenue, Buffalo, N. Y.
Continental Aircraft Corporation, Hempstead, Long Island, N. Y.
Courier Monoplane Co., 154 West Slauson Avenue, Los Angeles, Calif.
Crawford Aircraft Manufacturing Co., 305 East Seaside Boulevard, Long Beach, Calif.
Crawford Motor & Airplane Manufacturing Co., Seal Beach, Calif.
Crown Motor Carriage Co. (Inc.), 2500 McPherson Street, Los Angeles, Calif.
Cunningham-Hall Aircraft Corporation, 13 Canal Street, Rochester, N. Y.
Curtiss Aeroplane & Motor Co. (Inc.), Garden City, Long Island, N. Y.
Curtiss-Reid Aircraft Co., Montreal, Canada.
Curtiss-Robertson Airplane Manufacturing Co., Lambert Field, Anglum, Mo.

Davis Aircraft Corporation, Richmond Avenue at Northwest Seventh Street, Richmond, Ind.
Douglas Co., The, (Inc.), Santa Monica, Calif.
Doyle Aero Corporation, 121 South Howard Street, Baltimore, Md.

Driggs Aircraft Corporation, Lansing, Mich.
Dunn Manufacturing Co., Clarinda, Iowa.

Eastman Aircraft Corporation, Detroit, Mich.
Eberhart Aeroplane & Motor Co. (Inc.), 812 East Ferry Street, Buffalo, N. Y. (experimental).
Edo Aircraft Corporation, Avenue A and Second Street, College Point, Long Island, N. Y. (experimental).
Elias, G., & Bros. (Inc.), 965 Elk Street, Buffalo, N. Y.
Emsco Aircraft Co., Downey, Calif.
Eyerly School of Aeronautics, Salem Airport, Salem, Ore.

Fairchild Airplane Co. (Inc.), Farmingdale, Long Island, N. Y.
Federal Aircraft Corporation, San Bernardino, Calif.
Flaggship Aircraft Co., Keokuk, Iowa.
Fleet Aircraft (Inc.), 2050 Elmwood Avenue, Buffalo, N. Y.
Fokker Aircraft Corporation of America, Teterboro Airport, Hasbrouck Heights, N. J.

Gates Aircraft Corporation, Jackson Heights, Long Island, N. Y.
General Aircraft Corporation, Hazleton, Pa.
General Airplane Corporation, suite 1136, Otis Building, 10 South LaSalle Street, Chicago, Ill.
General Airplanes Corporation, Buffalo, N. Y.
Gillis Aircraft Corporation, 48 Barney Street, Battle Creek, Mich.
Golden Eagle Aircraft Corporation, 415 Industrial Avenue, Inglewood, Calif.
Gordon & Stryker Aircraft, Los Molinos, Calif.
Great Lakes Aircraft Corporation, 16800 St. Clair Avenue, Cleveland, Ohio.
Guardian Aircraft Corporation, 2500 Texas Avenue, St. Louis, Mo.

Hall-Aluminum Aircraft Corporation, 2050 Elmwood Avenue, Buffalo, N. Y.
Hamilton Metalplane Division — Boeing Airplane Co., 530 Park Street, Milwaukee, Wis.
Heath Airplane Co., 1727 Sedgwick Street, Chicago, Ill.
Holl Airways Co., Aberdeen, Wash.

International Aircraft Corporation, Cincinnati, Ohio.
Invincible Metal Furniture Co., Manitowoc, Wis.
Ireland Aircraft (Inc.), Garden City, Long Island, N. Y.

Irish Aircraft Corporation, Sandusky, Ohio.
Irwin Aircraft Co., Sacramento, Calif.

Johnson Aircraft Corporation, 900 South Ludlow Street, Dayton, Ohio.
Junkers Corporation of America, 342 Madison Avenue, New York, N. Y.

Kari-keen Aircraft (Inc.), Sioux City, Iowa.
Keystone Aircraft Corporation, Bristol, Pa.
Kirkham Products Co., Garden City, Long Island, N. Y. (experimental).
Knoll Aircraft Corporation, The, Wichita, Kan.
Kreider-Reisner Aircraft Co. (Inc.), Hagerstown, Md.
Kreutzer, Joseph, Corporation, 353 Third Avenue, Venice, Calif.

Laird, E. M., Airplane Co. (Inc.), 4500 West Eighty-third Street, Chicago, Ill.
Lawson Aircraft Co., 1819 Broadway, New York, N. Y.
Lincoln Aircraft Co., 2409 O Street, Lincoln, Neb.
Lockheed Aircraft Co., Burbank, Calif.
Loening Aeronautical Engineering Corporation, Thirty-first Street and East River, New York, N. Y.

McCarthy Aircraft Co., Grand Rapids, Mich.
Mahoney Ryan Aircraft Corporation, Anglum, Mo.
Martin, Glenn L., Co., Baltimore, Md.
Maximum Safety Airplane Co., 5111 Santa Fe Avenue, Los Angeles, Calif.
Metal Aircraft Corporation of Cincinnati, Lunken Airport, Cincinnati, Ohio.
Mohawk Aircraft Corporation, 2600 Delaware Street SE., Minneapolis, Minn.
Monarch Aircraft Co., 92 Ogden Avenue, Riverside, Ill.
Mono Aircraft (Inc.), Moline, Ill.
Moreland Aircraft (Inc.), El Segundo, Calif.
Moth Aircraft Corporation, Lowell, Mass.
Moundsville Airplane Corporation, Moundsville, W. Va.
Murchio Aircraft Corporation, Paterson, N. J.

New Standard Aircraft Corporation, 230 East Sixteenth Street, Paterson, N. J.
Nicholas-Beazley Airplane & Motor Co., Marshall, Mo.

Noran Aircraft Co., 157 Tenth Street, San Francisco, Calif.
Northeast Airways, 18 Elder Street, Schenectady, N. Y.

Overcashier Aircraft Manufacturing Co. (Inc.), 13095 Greely Avenue, Detroit, Mich.

Paramount Aircraft Corporation, Saginaw, Mich.
Parks Aircraft (Inc.), Parks Airport, St. Louis, Mo.
Phantom-Knight Aircraft Co., Oak Park, Ill.
Pheasant Aircraft Co. (Inc.), Fond du Lac, Wis.
Pitcairn Aircraft (Inc.), Bryn Athyn, Pa.
Pospisil, Stanley, Co., 503 Guaranty Trust Building, Detroit, Mich.
Prest Airplane & Motors, Arlington, Calif.
Prudden-San Diego Metal Airplane Co., foot of Juniper Street, San Diego, Calif.

Rearwin, R. A., Salina, Kan.
Remington-Burnelli Aircraft Corporation, 247 Park Avenue, New York, N. Y. (experimental).
Revelation Aircraft Co., 225 West Fifty-seventh Street, New York, N. Y.

Sikorsky Manufacturing Corporation, College Point, Long Island, N. Y.
Simmons Aircraft Corporation, 933 Kenilworth Avenue N.E., Washington, D. C.
Simplex Aircraft Corporation, Defiance, Ohio.
Southern Aircraft Corporation, Birmingham, Ala.
Spartan Aircraft Co., Tulsa, Okla.
Star Aircraft Co., Bartlesville, Okla.
Stearman Aircraft Co., Wichita, Kan.
Stinson Aircraft Corporation, Wayne, Mich.
St. Louis Aircraft Corporation, 8000 North Broadway, St. Louis, Mo.
Storms Aviation Co., Spartanburg, S. C.
Stout Metal Airplane Co., Airplane Division, Ford Motor Co., Dearborn, Mich.
Swallow Airplane Co., Wichita, Kan.
Swift Aircraft Corporation, Thirty-third and Lawrence Streets, Wichita, Kan.
Szekely Airplane & Motor Co., Holland, Mich.

Taft Airplane Corporation, Elizabeth City, N. C.

Taylor Aircraft Corporation, 42 Allen Street, Rochester, N. Y.
Texas Aero Corporation, Temple, Tex.
Thaden Metal Aircraft Corporation, 50 Hawthorne Street, San Francisco, Calif.
Timm, O. W., Airplane Corporation, Glendale, Calif.
Towle Aircraft Co., 261 St. Aubin Street, Detroit, Mich.
Travel Air Manufacturing Co. (Inc.), Wichita, Kan.
Trella Aircraft, 1269 East Grand Boulevard, Detroit, Mich.

United Aircraft (C. C. Baldwin, president), Wichita, Kan.

Van Cleave Airplane Co., Love Field, Dallas, Tex.
Verville Aircraft Co., 4815 Cabot Street, Detroit, Mich.
Vought, Chance, Corporation, Borden and Review Avenues, Long Island, N. Y.
Vulcan Aircraft Corporation, Portsmouth, Ohio.

Wallace Aircraft Co., 4655 Irving Park Boulevard, Chicago, Ill.
W. A. S. P. Airplane Co., 1044 Forty-first Street, Oakland, Calif.
Whites' Aircrafts, Seventeenth and Crocker Streets, Des Moines, Iowa.
Whittelsey Manufacturing Co., Howard Avenue and Spruce Street, Bridgeport, Conn.

Zimmerman, Paul G., 22 Clift Street, Mystic, Conn. (experimental).

## AIRPORT DESIGN, CONSTRUCTION, AND MANAGEMENT

Aero Engineering & Advisory Service (Inc.), Graybar Building, New York, N. Y.
Aeronautical Engineering Co., 527 Fifth Avenue, New York, N. Y.
Airport Construction Corporation, 21 East Fortieth Street, New York, N. Y.
Airport Development Co. of America, suite 504, Crozer Building, Chester, Pa.
Airport Development & Construction Co., 1620 Mitten Building, Philadelphia, Pa.
Airport Engineering Co., Detroit, Mich.

American Airports Corporation, 527 Fifth Avenue, New York, N. Y.

American Airports Corporation of New England, 805 Statler Building, Boston, Mass.

Austin Co., The, 16112 Euclid Avenue, Cleveland, Ohio.

Ballman, William H., Orlando, Fla.

Beretta-Stiles Co. (Inc.), 1203 National Bank of Commerce Building, San Antonio, Tex.

Black & Bigelow (Inc.), 551 Fifth Avenue, New York, N. Y.

Bonforte Airport Engineering Corporation, 33 West Forty-fourth Street, New York, N. Y.

C. A. C. Construction Co. (Inc.), in care of C. E. Ramaciotti, Daytona Beach, Fla.

Continental Airway Terminals (Inc.), 292 Madison Avenue, New York, N. Y.

Delano & Aldrich, 126 East Thirty-eighth Street, New York, N. Y.

Hadden, Gavin, 607 Fifth Avenue, New York, N. Y.

Harrison-Wright Co., Kinney Building, Charlotte, N. C.

International Airports Corporation, 25 Broadway, New York, N. Y.

Interstate Airport Corporation, 110 West Fortieth Street, New York, N. Y.

Jenkins & Co., 100 West Monroe Street, Chicago, Ill.

Keally, Francis, 101 Park Avenue, New York, N, Y.

King, Benjamin, & Associates, 1637 Massachusetts Avenue NW., Washington, D. C.

Langley Corporation, 527 Fifth Avenue, New York, N. Y.

Lewis & Valentine Golf Course Co. (Inc.), 47 West Thirty-fourth Street, New York, N. Y.

Love-Sultan (Inc.), 6625 Delmar Avenue, St. Louis, Mo.

Leonard Macomber (Inc.), 664 North Michigan Boulevard, Chicago, Ill.

Mallon, William H., Co. (Inc.), 285 Madison Avenue, New York, N. Y.

Marlier, Raymond M., Empire Building, Pittsburgh, Pa.
Martin, Ned, Co., 310 Everett Building, Akron, Ohio.
Maryland Metal Building Co., Airport Equipment Division, 300 Fuller Building, Philadelphia, Pa.
Miller, Wendell P., & Associates, 208 South LaSalle Street, Chicago, Ill.

Parks, A. B., Co., Martinsburg, W. Va.

Shaw, B. Russell, & Co., 1064 Arcade Building, St. Louis, Mo.
Sheridan, Lawrence V., 542 North Meridian Street, Indianapolis, Ind.
Showalter-Associates (Inc.), Michigan Theater Building, Detroit, Mich.

Technical Advisory Corporation, 15 Park Row, New York, N. Y.
Thorne, George M., 3000 Harrison Street, Kansas City, Mo.

Union Paving Co., Airport Consultants Division, 123 South Twenty-first Street, Philadelphia, Pa.

Williams, Howard S., 206 West Eighth Street, Atlantic, Iowa.

## ENGINE MANUFACTURERS

Aero Development Co., Cedar Falls, Iowa.
Aeronautical Products Corporation, Naugatuck, Conn.
Aeromarine Plane & Motor Co. (Inc.), Keyport, N. J. (experimental).
Aircraft Engine Co. (Inc.), 1709 East Twelfth Street, Oakland, Calif.
Aircraft Holding Corporation, Culver City, Calif.
Airman Engineering Co., 552 Polk Street, San Francisco, Calif.
Allen Motors (Inc.), Division of Alco Oil Tool Co., P. O. Box A, Compton, Calif. (experimental).
Alliance Aircraft Corporation, Alliance, Ohio.
Allison Engineering Co., Speedway, Indianapolis, Ind.
Axelson Machine Co., P. O. Box 337, Los Angeles, Calif.
American Cirrus Engines (Inc.), Washington Avenue, Belleville, N. J.

Aviation Motors Corporation, 410 West Tenth Street, Indianapolis, Ind. (experimental).

Bittner Aircraft Service, 4052 West Lake Street, Chicago, Ill. (experimental).
Bliss, E. W., Co., Brooklyn, N. Y.
Blue Streak Motors Co., Wichita, Kan. (experimental).
Brownback Motor Laboratories (Inc.), Graybar Building, New York, N. Y.

Consoldiated Motors Corporation, 1354 Fruitvale Avenue, Oakland, Calif.
Continental Motors Corporation, Aeronautical Division, Detroit, Mich.
Curtiss Aeroplane & Motor Co. (Inc.), 74 Kail Street, Buffalo, N. Y.

Dayton Airplane Engine Co., Leo Street and B. & O. Railroad, Dayton, Ohio.

Factory Motor Car Co. (F. C. Dalton), Portland, Ore. (experimental).
Fairchild Engine Corporation, Farmingdale, Long Island, N. Y.
Finklea-Hoffmann, 508 Broad Street, Leland, Miss. (experimental).
Fischer & Jacobs (Inc.), 1641 North Twelfth Street, Philadelphia, Pa. (experimental).

General Airmotors Co., Scranton, Pa.

Hallett Manufacturing Co., Los Angeles, Calif.
Harris Motor Co., Towanda, Pa. (experimental).
Henderson Motorcycle Sales Co., 1116 South Main Street, Los Angeles, Calif.
Hurricane Motor Co. (Inc.), Houston, Tex. (experimental).

Irwin Aircraft Co., Corning, Calif.

Jobel Manufacturing Co., in care of Joe Beeck, Dayton, Ohio.
Johnson Motor Products (Inc.), 518 West Fifty-seventh Street, New York, N. Y.

Kimball Aircraft Corporation, Naugatuck, Conn.
Kinner Airplane & Motor Corporation, Glendale, Calif.

LeBlond Aircraft Engine Corporation, Cincinnati, Ohio.
Lincoln Aircraft Co. (Inc.), Lincoln, Neb.
Lycoming Manufacturing Co., Williamsport, Pa.

MacClatchie Manufacturing Co., P. O. Box 189, Compton, Calif. (experimental).
Marchetti Motor Patent (Inc.), 1204 Russ Building, San Francisco, Calif.
Menasco Motors Co., 6718 McKinley Avenue, Los Angeles, Calif. (experimental).
Metropolitan Development Syndicate, suite 411, Hollywood Security Building, Hollywood, Calif. (experimental).
Michigan Screw Co., Lansing, Mich. (experimental).

National Aero Corporation, 100 East Forty-second Street, New York, N. Y.
Noble & Harris, 2842 West Grand Boulevard, Detroit, Mich.

Packard Motor Car Co., Detroit, Mich.
Pratt & Whitney Aircraft Co., 450 Capital Avenue, Hartford, Conn.

Quick Air Motors Co., Union National Bank Building, Wichita, Kan.

Rinehart-Whelan Co. (M. C. Baumann), Dayton, Ohio (experimental).
Rocky Mountain Steel Products (Inc.), 1346 Wall Street, Los Angeles, Calif. (experimental).

Siemens & Halske, A. G. (Dr. K. G. Frank, American agent), 75 West Street, New York, N. Y.
Spartan Aircraft Co. (agent for Walter engines, Czechoslovakia), Tulsa, Okla.
Superior Tool Co., Kokomo, Ind.
Szekely Aircraft Corporation, Holland, Mich.

Tips & Smith (Inc.), Houston, Tex.

Velie Motors Corporation, Moline, Ill.

Wade Aeronautical Corporation, 211 Kent Building, Long Beach, Calif.

Warner Aircraft Corporation, 4042 West Jefferson Avenue, Detroit, Mich.

Western Enterprise Engine Co., 1000 Alhambra Avenue, Los Angeles, Calif. (experimental).

Wright Aeronautical Corporation, 238 Lewis Street, Paterson, N. J.

Wright-Tuttle Aircraft Motors Corporation, Anderson, Ind.

## HANGARS

### CANVAS

Airships (Inc.), Hammondsport, N. Y.

Baker & Lockwood Manufacturing Co., Seventh Street and Wyandotte Avenue, Kansas City, Mo.

Mills, W. J., & Co., 101 Park Avenue, New York, N. Y.

United States Tent & Awning Co., 701 North Sangamon Street, Chicago, Ill.

### METAL

Allith-Prouty Co., Danville, Ill. (hardware for doors).

American Airports Corporation, 527 Fifth Avenue, New York, N. Y.

American Bridge Co., 71 Broadway, New York, N. Y.

Anchor Corrugating Construction Co., 145 West Forty-first Street, New York, N. Y.

Arch Roof Construction Co. (Inc.), 104 West Forty-second Street, New York, N. Y.

Austin Co., The, 16112 Euclid Avenue, Cleveland, Ohio.

Auto Shelter Co. (Inc.), Burleigh at Thirtieth Street, Milwaukee, Wis.

Baker, Edw. J., & Co., 10 South LaSalle Street, Chicago, Ill.

Belmont Iron Works, Philadelphia, Pa. (structural steel).

Blaw-Knox Co., Pittsburgh, Pa.

Bowman, R. T., Co., 235 East Hanover Street, Trenton, N. J.

Brightmire, L. G., & Co., 1101 North Capital Avenue, Indianapolis, Ind.

Bundy Airplane Hangar, P. O. Box 134, Portland, Ore.

Butler Manufacturing Co., 44 Whitehall Building, New York, N. Y.

Caproni, Leo F., 1056 Chapel Street, New Haven, Conn.
Chas. W. Crall's Sons, Cole Street and Reading Railroad, Trenton, N. J.
Columbian Steel Tank Co., Kansas City, Mo.
Craine, (Inc.), Norwich, N. Y.

Eagle Construction Co., 78 Bishop Avenue, Bridgeport, Conn.
Edwards Manufacturing Co., 529 Eggleston Avenue, Cincinnati, Ohio.
Esline Co., Flanagan Block, Oconomowoc, Mich.

Fire Detecting Wire Corporation, 557 Argyle Road, Brooklyn, N. Y. (fire-alarm systems for hangars).

Gibbons Co., 343 Columbia Street, Brooklyn, N. Y.
Guaranteed Aircraft Hangar Co., 135–04 One hundred and first Avenue, Richmond Hill, N. Y.

Hall Metal Products Co., 1811 Two hundred and thirteenth Street, Torrance, Calif. (ribbed metal roofing).
Hartzell Propeller Co., Piqua, Ohio (ventilating equipment).
Havens Structural Steel Co., Kansas City, Mo.
Herrick Iron Works, Eighteenth and Campbell Streets, Oakland, Calif.

Ingalls Iron Works Co., The, Birmingham, Ala.
International Derrick & Equipment Co., Michigan and Buttles Avenues, Columbus, Ohio.
International Steel & Iron Co., Evansville, Ind. (also doors and steel sash).
Ironclad (Inc.), 817 Fourteenth Street NW., Washington, D. C. (also insulated steel roofing).

Kansas City Structural Steel Co., Kansas City, Mo.
Kinnear Manufacturing Co., 5 Field Avenue, Columbus, Ohio (rolling doors).
Kocher, Geo. T., Co., 226 South Jackson Street, Lima, Ohio.

Lakeside Bridge & Steel Co., North Milwaukee, Wis.
Lockwood Greene Engineers (Inc.), 100 East Forty-second Street, New York, N. Y. (designing).
Love-Sultan (Inc.), 6625 Delmar Avenue, St. Louis, Mo.

McKeown Co., 112 West Adams Street, Chicago, Ill. (structural steel and trusses).
Macomber Steel Co., Canton, Ohio.
Marlier, Raymond M., Empire Building, Pittsburgh, Pa. (designing).
Maryland Metal Building Co., Airport Equipment Division, Fifteenth and Chestnut Streets, Philadelphia, Pa.
Mesker, Geo. L., & Co., Evansville, Ind.
Milliken Bros. Manufacturing Co. (Inc.), 902 Woolworth Building, New York, N. Y.

Notrus Hangar Corporation, 713 Esperon Building, Houston, Tex.

Orange Car & Steel Co., Airport Division, Orange, Tex.
Overhead Door Co. of Pa. (Inc.), Lewistown, Pa. (doors).

Parks, A. B., Co., Martinsburg, W. Va.
Potts, Horace T., & Co., East Erie Avenue and D Street, Philadelphia, Pa.

Richards-Wilcox Manufacturing Co., Aurora, Ill. (overhead carriers and hardware for doors).
Robertson, H. H., (Inc.), First National Bank Building, Pittsburgh, Pa. (asbestos protected metal roofing and sides).

St. Louis Structural Steel Co., Box 1275, St. Louis, Mo.
Spalding Construction Co., 125 East Forty-sixth Street, New York, N. Y.
Standard Erecting Corporation, 551 Fifth Avenue, New York, N. Y.
Standards Manufacturing Co. of Corning, N. Y. (Inc.), Corning, N. Y.
Stefco Steel Co., Michigan City, Ind.

Trachte Bros. Co. (Inc.), Madison, Wis.
Truscon Steel Co., Youngstown, Ohio (also parts for hangars).

Union Iron Works of California, P. O. Box 475, Los Angeles, Calif.

Virginia Bridge & Iron Co., Roanoke, Va. (structural steel).

Wickwire Spencer Steel Co., 41 East Forty-second Street, New York, N. Y. (fencing, chain link, for inclosing buildings).
Wilson, J. G., Corporation, 11 East Thirty-eighth Street, New York, N. Y. (doors).

## LIGHTING EQUIPMENT, NIGHT FLYING

Adams & Westlake Co., Elkhart, Ind.
Aga Auto Lamp Co. (Inc.), Amesbury, Mass.
Airport Lighting (Inc.), 54 Wall Street, New York, N. Y.
American Gas Accumulator Co., Elizabeth, N. J.
Austin, M. B., Co., 108 South Des Plaines Street, Chicago, Ill.

B. B. T. Corporation of America, 810 Atlantic Building, Philadelphia, Pa.
Belden Manufacturing Co., Twenty-third Street and Western Avenue, Chicago, Ill.

Carbic Manufacturing Co., 30 East Forty-second Street, New York, N. Y.
Carlisle & Finch, 229 East Clinton Avenue, Cincinnati, Ohio.
Cooper Hewitt Electric Co., Hoboken, N. J.
Crouse-Hinds Co., Syracuse, N. Y.
Curtis Lighting Co. (Inc.), 1119 West Jackson Boulevard, Chicago, Ill.

Eberhart Aeroplane & Motor Co. (Inc.), 812 East Ferry Street, Buffalo, N. Y. (also parachute flares and other signal lights).
Electric Service & Supplies Co., Seventeenth and Cambria Streets, Philadelphia, Pa.

Federal Aircraft Works (Inc.), 69 South Thirteenth Street, Minneapolis, Minn.
Filer-Perry Machinery Co., Miami, Fla.

Generalair Beacons (Inc.), 41 East Forty-second Street, New York, N. Y.

General Electric Co., Schenectady, N. Y.
Giant Manufacturing Company, Trenton, N. J.

Halophane Glass Co., Newark, Ohio (refractor units).
Hamilton Aero Manufacturing Co., 1400 Bremen Street, Milwaukee, Wis.
Hutchison Engineering Works, 549 Washington Boulevard, Chicago, Ill.

Interflash Signal Co., Equitable Building, 120 Broadway, New York, N. Y.
Irving Air Chute Co. (Inc.), 523 Main Street, Buffalo, N. Y. (parachute flares).

Kilgore Manufacturing Co., Aircraft Signal and Flare Division, Westerville, Ohio.
Kliegl Bros. Universal Electric Stage Lighting Co. (Inc.), 321 West Fiftieth Street, New York, N. Y.
Kohler Co., Kohler, Wis.

Love-Sultan (Inc.), 6625 Delmar Avenue, St. Louis, Mo.
Lovell, F. H., & Co., Arlington, N. J.

National Lamp Works, Engineering Department, Villa Park, Cleveland, Ohio.
National Marine Lamp Co., Aircraft Division, Forestville, Conn.
Neon, Claude, Lights (Inc.), 50 East Forty-second Street, New York, N. Y.
New Jersey Neon Light & Power Corporation, Everett Street, Broadway, and Sixth Street, Camden, N. J.
New Jersey Fulgent Co., 15–17 Shureman Street, New Brunswick, N. J. (parachute flares and other signal lights).
Newman, I. C., Co. (Inc.), 320 Broadway, New York, N. Y.

Parks, A. B., Co., Martinsburg, W. Va.
Perkins Corporation, South Bend, Ind.
Pioneer Instrument Co., 754 Lexington Avenue, Brooklyn, N. Y.
Pollak Manufacturing Co., 576 Davis Avenue, Arlington, N. J.
Prest-O-Lite Co., 30 East Forty-second Street, New York, N. Y.
Pyle National Co., 3509 Grand Central Terminal, New York, N. Y., and 1334 North Kostner Avenue, Chicago, Ill.

Reflector & Illuminating Co., 1401 Jackson Boulevard, Chicago, Ill.
Rome Wire Co., Rome, N. Y. (special underground wiring cable).

Showalter-Associates (Inc.), Michigan Theater Building, Detroit, Mich.

Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn, N. Y.

Victory Sparkler & Specialty Co. (Inc.), Elkton, Md. (pyrotechnic flares and signals).

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

## AIRWAY OPERATORS (SCHEDULED ROUTES)

Ball, Clifford, McKeesport, Pa.
Barnes & Gorst, 5600 Marginal Way, Seattle, Wash.
Boeing Air Transport (Inc.), Georgetown Station, Seattle, Wash.
Braniff, Paul R., (Inc.), 318 Braniff Building, Oklahoma City, Okla.

Canadian Colonial Airways (Inc.), 270 Madison Avenue, New York, N. Y.
Capitol Airways (Inc.), West Thirtieth Street, west of Lafayette Road, Indianapolis, Ind.
Central Air Lines Co., 220 North Waco Avenue, Wichita, Kan.
Colonial Air Transport (Inc.), 270 Madison Avenue, New York, N. Y.
Colonial Western Airways (Inc), 270 Madison Avenue, New York, N. Y.
Commercial Air Transport (Inc.), Everett, Wash.
Continental Air Lines (Inc.), 887 Union Trust Building, Cleveland, Ohio.

Embry-Riddle Co., Lunken Airport, Cincinnati, Ohio.

Ford Airways, Dearborn, Mich.

Gulf Airlines (Inc.), room R, Roosevelt Hotel, New Orleans, La.

Interstate Air Lines (Inc.), 105 West Adams Street, Chicago, Ill.

Maddux Air Lines (Inc.), Grand Central Terminal, Glendale, Calif.

Mamer Air Transport (Inc.), 1044 Paulsen Building, Spokane, Wash.

Midwest Airways Corporation, Aurora, Ill.

Mutual Aircraft Corporation, Los Angeles, Calif.

National Air Transport Co. (Inc.), 5936 South Cicero Avenue, Chicago, Ill.

National Parks Airways (Inc.), Continental Bank Building, Salt Lake City, Utah.

New Orleans Air Line, 824 Poland Avenue, New Orleans, La.

Northwest Airways (Inc.), Merchants Bank Building, St. Paul, Minn.

Pacific Air Transport (Inc.), 593 Market Street, San Francisco, Calif.

Pan American Airways (Inc.), 122 East Forty-second Street, New York, N. Y.

Pan American–Grace Airways (Inc.), 122 East Forty-second Street, New York, N. Y.

Pitcairn Aviation (Inc.), Land Title Building, Philadelphia, Pa.

Rankin Flying Service, P. O. Box 4268, Portland, Ore.

Robertson Aircraft Corporation, Anglum, St. Louis, Mo.

Royal Airways Co., 116 East Washington Avenue, Madison, Wis.

Southwest Air Fast Express (Inc.), Tulsa Trust Building, Tulsa, Okla.

Spokane Airways (Inc.), Standard Exchange Building, Spokane, Wash.

Standard Airlines (Inc.), 107 West Ninth Street, Los Angeles, Calif.

Stout Air Services (Inc.), Dearborn, Mich.

Texas Air Transport (Inc.), Fort Worth, Tex.

Thompson Aeronautical Corporation, 2196 Clarkwood Road, Cleveland, Ohio.

Transcontinental Air Transport, Syndicate Trust Building, St. Louis, Mo.

United States Air Transport (Inc.), 11 West Forty-second Street, New York, N. Y.

Union Air Lines (Inc.), Sacramento, Calif.

Universal Air Lines, 105 West Monroe Street, Chicago, Ill.

Varney, Walter T., 226 Noble Building, Boise, Idaho.

West Coast Air Transport Co., 506 Pittock Building, Portland, Ore.

Western Air Express, 117 West Ninth Street, Los Angeles, Calif.

Wichita Falls Air Transport (Inc.), 1202 Stanley Building, Wichita Falls, Tex.

## MISCELLANEOUS OPERATORS

### TAXI, SIGHTSEEING, AND DELIVERY

ALABAMA:

Birmingham — Glenn E. Messer Co., 1338 South Fifteenth Avenue.
Huntsville — Southeastern Airways, P. O. Box 715.
Mobile — Southern Aerial Service (Inc.), 453 Government Street.

ALASKA:

Anchorage — Anchorage Air Transport Corporation.
Fairbanks — Bennett & Rodebaugh.

ARIZONA:

Stafford — C. W. Mayse.
Tucson — Southwest Air Service (Inc.).

ARKANSAS:

Fort Smith —
Ollie L. Blan, 4020 North Sixth Street.
Fort Smith Aircraft Co., 611 Rogers Avenue.
Little Rock —
Arkansas Aircraft Corporation.
O. W. Hogue, 1112 West Second Avenue.
W. F. Moody and John Carroll Cone.

CALIFORNIA:

Arlington — Prest Airplanes & Motors.
Bakersfield —
Cardiff & Peacock.
R. Peacock.
Carpinteria — Chadbourne-Donze Air Service, Santa Barbara at Carpinteria.

Compton — Ray F. Carpenter, 812 East Laurel Street.
Culver City — Frank Baker Airport, Box 341.
Fresno —
California National Airways, 204 Cory Building.
Center State Air Transport, 4639 Balch Avenue.
Ralph Hall, in care of Richfield Oil Co.
C. Mayling, 2925 Madison Avenue.
Mullins Air Service, Roeding Park.
Glendale —
Glendale Aviation School, 1201 Flower Street.
Wilson Aero Service, Glendale Airport.
Hollister — San Benito Flying School Air Transport, Turner Field.
Hollywood —
Adams Aerial Transportation Co. (Inc.), 1509 North Vine Street.
Associated Aircraft (Inc.), 6040 Hollywood Boulevard.
Huntington Park — J. M. Shannon, 368 South Stafford Street.
Imperial — J. Wallace Stevenson, Box 128.
Kentfield — Don M. Cornell, Box 154.
Long Beach —
Earl S. Daugherty, 431 East Seaside Boulevard; also Municipal Airport.
Ebrite Aero Corporation, P. O. Box L.
Thomas E. Monday, 3108 Colorado Avenue; also Municipal Airport.
William Monday, Municipal Airport.
Theodore Woolsey, 4301 South Hobart Boulevard.
Los Angeles —
Aero Corporation of California, 9819 South Western Avenue.
Ambassador Airways, in care of H. C. Arthur, Jr., Washington at Vermont Avenue.
American Aircraft Corporation, Merritt Building.
Avion Corporation, 4515 Alger Street.
California Airways Co., Ninth Street and Telegraph Road.
Central Airways, 405 South Hill Street.
Dycer Airport, One hundred and thirty-sixth Street and Western Avenue.
Essig Aero Service, 196 East Jefferson Boulevard.
Falcon Fliers, 1008 Financial Center Building.

Santa Maria Air Lines (Inc.), 1100 California Bank Building.
Short's School of Aviation, Main and One hundred and ninetieth Streets.
Harry Sperl Aero Corporation, Figueroa at Venice Boulevard.
Warren Airplane Works, 5837 South Main Street.

Merced — Merced-Wawona Air Lines.
Monterey Park — Callies Fliers, 322 South Garfield Avenue.
Oakland —
Elm Aircraft Co., Central Bank Building.
Royle-Rose Airlines, Advertiser's Building, 324 Thirteenth Street.

Ontario — Ontario Aircraft Corporation, Ontario Airport.
Paradise — Penfield Bros.
Petaluma — William G. Fletcher, P. O. Box 441.
Porterville — W. Lester Lamkin.
Redding — Lassen View Airways.
Redlands —
California Air Service, Hubbard Building, 104 Orange Street.
Ray Air Service.

Sacramento —
Andrews & Nicholson, 3967 D Street.
Ingvald's School of Aviation, R. F. D. 7, Box 1545.

San Diego —
Marty's Service, Seventh and C Streets.
Pacific Southwest Airways (Inc.), 221 Commonwealth Building.
T. C. Ryan Flying Service, 3300 Barnett Avenue.

San Francisco —
Breese Flying Service, 270 Seventh Street.
Pacific Air Transport, 593 Market Street.
Summit Aircraft Co., 1439 Van Ness Avenue.
Varney Airplane Co., 1540 Pine Street.
R. R. Williamson, 87 Naples Street.

San Leandro — Fillmore Flying Field Co.
San Mateo — "Speed" Johnson's Flying School, Box 231.
Santa Ana — Eddie Martin's Airport, South Main and Newport Boulevard.
Santa Monica — K. W. Montee Aircraft Co., Clover Field.
Stockton — Allen-Lane Aircraft Co., Stockton Airport.

Venice — Crawford Airplane Co., 350 Washington Boulevard.
Wilmington — Pacific Marine Airways, Board of Trade Building, 111 West Seventh Street.

COLORADO:

Colorado Springs —
Arkansas Valley Airways (Inc.), 1316 North Weber Street.
Pikes Peak Air Service Co. (Inc.), 121 North Nevada Avenue.

Denver —
Eddie Brooks, Exchange Building.
Mountain Fliers, 524 Exchange Building.
Rocky Mountain Airlines (Inc.), 511 Seventeenth Street.

Lamar — San Isabel Aviation Co., 400 South Fifth Street.
Wray — J. B. W. Vaughn.

CONNECTICUT:

Bethany — Hill & Somers Aerial Service, Bethany Airport.
Bridgeport — Huntington Aircraft Corporation, 1188 Main Street.
Greenwich — Greenwich Air Port School.
Hartford —
Interstate Airways (Inc.), Brainard Field.
New England Aircraft Co. (Inc.), 805 Main Street.

Meriden — Meriden Aircraft Corporation, 54 Grove Street.
New Haven — New Haven Air Terminal (Inc.), P. O. Box 919.
Stonington — Stonington Airways (Inc.).

DELAWARE:

Wilmington — Delaware Flying Service, Box 568.

DISTRICT OF COLUMBIA (*see also* College Park, Md., and South Washington, Va.):

Washington — Congressional Airport (Inc.), 220 Transportation Building.

FLORIDA:

Hialeah — East Coast Aviation Camp, P. O. Box 1.
Jacksonville — Laurie Yonge, 220 West Adams Street.
Kissimee — Kissimee Airplane (Inc.).

Miami —
Cuba-America International Air Line, El Comodoro Hotel Building.
Rogers Air Lines (Inc.), P. O. Box 3608.
Orlando —
Nilson-Mueller Corporation, Municipal Airport.
Orlando Airlines (Inc.), Beacon Hill Airport and Buck Field.
Punta Gorda — Wesley N. Raymond.
St. Petersburg —
American Airways Development Corporation, suite 717, Times Building.
Sunshine Air Services (Inc.).
Sebring —
Otis A. Hardin.
Sebring Airways (Inc.).
Tampa — A. B. McMullen Co., 1710 Mitchell Street.
West Palm Beach — Palm Beach Flying Service, 1209 Harvey Building.

GEORGIA:

Atlanta —
Beeler Blevins (Inc.), P. O. Box 329.
Douglas Davis Flying Service, Wynne-Claughton Building.
Georgia Aircraft Co., Candler Field.
Major Aircraft Co., 712 Candler Building.
D. Mackey Solenberger, 408 Spring Street.
Macon —
Huff-Daland Dusters, Bibbs Building.
S. & W. Airplane Co.

IDAHO:

Boise — Walters Flying Service.
Pocatello — Eastern Idaho Air Service (Inc.), 129 South Arthur Street.
Rupert — Rupert Aerial Service Co.

ILLINOIS:

Blue Island — Modern Airway Transport Co., One hundred and thirty-ninth Street and Western Avenue.

Chicago —

Air Activities (Inc.), 122 South Michigan Boulevard.

American Beauty Aircraft Co., 4215 Armitage Avenue.

Herbert N. Anderson, 5943 North Rockwell Avenue.

Aviation Service & Transport (Inc.), 203 North Wabash Avenue.

Emil Baase, 8022 Saginaw Avenue.

La Pierre Cavender, 4639 Magnolia Avenue.

Central Airways Corporation, 310 South Michigan Avenue.

Chicago Aeronautical Service, 608 South Dearborn Street.

Commercial Aircraft Sales Co., 904 Wrigley Building, 400 North Michigan Boulevard.

Thomas Gordon, Eighty-third Street and Cicero Avenue.

Grey Goose Air Lines (Inc.), 326 West Madison Street.

Roy E. Guthier, 7131 Olcott Avenue.

John L. Huber, 5125 North Ashland Avenue.

Illinois Aeronautical Service, 8824 South Loomis Street.

Illinois Air Service, 226 East Superior Street.

Keller Aerial Service, 4400 West Eighty-third Street.

E. M. Laird Airplane Co. (Inc.), 4500 West Eighty-third Street.

Chance Lossong, 1643 North Albany Street.

W. W. Meyer, 4945 North St. Louis Avenue.

John C. Miller, Jr., 1506 Glenlake Avenue.

N. A. T. Flying Service, Municipal Airport.

Jack Oates (Inc.), 5101 West Madison Street.

Ray L. Olsen, 1917 Humboldt Boulevard.

Ostergaard Aircraft Works, 4305 North Narragansett Street.

Partridge (Inc.), 430 South Michigan Avenue.

Prairie Air Service (Inc.), Municipal Airport.

M. M. Rubner, room 1230, 160 North LaSalle Street.

Sievert Aircraft Corporation, 5934 South Cicero Avenue.

Hart G. Smith, Morton Grove, 5036 Kenmore Avenue.

Western Airplane Corporation, 53 West Jackson Boulevard.

Yackey Aircraft Co., Checkerboard Flying Field.

Chillicothe — Myrle Davis, route 3.

Cicero — Art Roza, 1357 South Sixtieth Street.

Decatur — Robert L. Ward, 724 North Prairie Avenue.

Downers Grove — Arthur C. Chester, 532 Giertz Avenue.

Elmhurst — Fred J. Bouchard, Eagle Flying Field.
Galena — W. W. McBoyle.
La Salle — Max Siber, 814 First Street.
Marion — Egyptian Airways Co.
Moline — Campbell-DeSchepper Airplane Co. (Inc.), 515 Eighteenth Street.
Momence — John L. Brown.
Monmouth — Mid-West Airways Corporation.
Mount Prospect —
F. L. Barchard, Pal-Waukee Airport.
Pal-Waukee Airport, Milwaukee Avenue at Palatine Road.
East Peoria — Varney Aircraft Co., 231 Stewart Avenue.
Peoria — E. B. Cole (Inc.), 125 North Jefferson Avenue.
Peru — Emil Fusiante, 15 East Tenth Street.
Quincy — Quincy Aircraft Co., Field at Thirty-sixth Street and Payson Road.
St. Charles — Swaby Flying Service.
St. Elmo — Ross G. Owen.
Sheldon — Sheldon Air Line (Harold B. Snow).
Springfield —
L. & I. Aerial Service, 401 South Seventh Street.
Earl Smith, 220 North Sixth Street.
Leslie H. Smith, in care of Y. M. C. A.
Tonica — Milo B. Lock.

INDIANA:

Anderson — Farnam School of Flying.
Bedford — Indiana Airlines (Inc.).
Brazil — Watson's Aerial Service, 101½ East National Avenue.
Chesterton — Richard O. Duffy.
East Chicago — Essandee Air Transport Co., Box 38, Indiana Harbor.
Evansville —
Fortner Flying Service.
Garrison Airport.
Fort Wayne —
Sweebrock Aviation Co., 1117 Fairfield Avenue.
Tri-State School of Aeronautics, Farmer's Trust Building.
Frankford — Douglas Airplane Co., Box 214.
Gary —
Atkinson Aviation Co., 406 Washington Street.
Calumet Air Transport Co. (Inc.), 1106 Broadway.

Indianapolis — Weaver Air Service, 353 South Audubon Avenue.
Kokomo — Clyde E. Shockley, route 10.
Lafayette — Shambaugh Airport.
Montezuma — Leonard Wheeler, Jr.
Muncie — Muncie Aerial Co., Twenty-first and Hackley Streets.
Peru — Circus City Flying Corporation, 24 West Second Street.
Richmond — Richmond Airport.
Terre Haute —
    Terre Haute Airways (Inc.).
    Terre Haute Aviation, 705 West Prospect Avenue.

IOWA:

Albia — C. T. Watts.
Ames — Gerbracht Aeronautic Corporation.
Burlington — A. J. Hartman, 1126 Doenland Street.
Cedar Falls —
    Air Taxi Co.
    Cedar Falls Flying School.
    Elmer N. Kane, 1309 Main Street.
Cedar Rapids —
    Hunter Airplane Co., Cedar Rapids Airport.
    Bert Kogle, 519 Fourth Avenue East.
    Paul B. Shaw, 828 Second Avenue East.
Council Bluffs — E. E. Williams, 243 Nicholas Street.
Des Moines —
    Des Moines Airways.
    E. T. Haynes, 1500 Des Moines Street.
    Howard W. Holley, 1325 Carpenter Avenue.
    George D. Lowers, 841 East Seventh Street.
    Miller Eaglerock Airways, 1225 West Twelfth Street.
    Chester Sutherland, 1675 Northwest Drive.
    Whites' Aircrafts, Seventeenth and Crocker Streets.
    Yellow Cab Airways (Inc.).
Iowa City — Ted Finefield.
Mason City —
    G. C. Barrett, Delaware Apartments.
    Mason City Airways (Inc.).
    Pioneer Flyers (Inc.).
Milford — Donaldson Bros.
Ottumwa — Willard F. Bridgeman, 207 East Main Street.

Rock Valley — J. E. Gust, Box 806.
Shenandoah — Freeburg Flying Service, Kiwanis Airport.
Sioux City —
  Interstate Airway Co., Rickenbacker Flying Field.
  Kari-Keen Aircraft (Inc.).
  Claude Oyer, 5121 Military Road.
Waterloo — Hawkeye Air Transport (Inc.), route 5.
Waverly — Douglas Harris.
Winthrop — Ralph Read.

KANSAS:

Abilene — Union Aero Co.
Belleville — Charles H. Blossar.
Caney — Truskett Flying Service, Corporation.
Chanute —
  Aubrey M. Barnes Flying Service, 613 North Washington Street.
  O. E. Dickerhoof, 805 South Santa Fe Avenue.
Culver — George E. Halsey.
Dodge City — C. E. Steele.
Iola — Paul Neff, 917 North Sycamore Street.
Garnet — Heimer Airways.
Larned — Merle E. Johnson.
Lawrence — Allison Airplane Co.
McPherson —
  McPherson Airways Co.
  Lawrence D. Rich, 1122 South Maple Street.
Wichita — Wichita Air Service Provision Co., Municipal Airport.

KENTUCKY:

Clayton — A. E. Fannin (or Farmin).
Jeffersontown — Cardinal Fliers (Inc.), Bowman Field.
Louisville —
  Louisville Aviation Co. (Inc.), 2424 Glenmary Avenue.
  Louisville Aviation Service, 3030 Wilson Avenue.
Paducah — Iseman Flying Field.

LOUISIANA:

Monroe — Huff-Daland Dusters (Inc.), Ouachita National Bank Building.

New Orleans —

Menefee Airways (Inc.), 2111 Burgundy Street.

New Orleans Air Line, 824 Poland Avenue.

St. Tammany Gulf Coast Airways (Inc.), 330 Carondelet Street.

MAINE:

Ashland — Percy M. Snow.

Bath — Kennebec Aircraft Corporation, 109 Front Street.

Cape Elizabeth — Fred L. Williams, 4 Charles Road.

Caribou — George W. Shaw.

Carmel — Francis E. Fahey.

Norridgewick — Archie E. Ricker.

Portland —

Lewis J. Carney, 27 Portland Street.

Clifford Strange, 757 Congress Street.

MARYLAND:

Baltimore —

Chesapeake Aircraft Co., Richmond Market Armory.

Monumental Aircraft (Inc.), 1030 North Calvert Street.

Steinmetz Airways, 717 West North Avenue.

College Park —

National Flying School (Inc.).

Southern Airlines (Inc.).

Easton —

Fred H. Korte.

Tred Avon Flying Service (Inc.).

MASSACHUSETTS:

Atlantic — Dennison Aircraft Corporation, Dennison Airport.

East Boston —

Associated Aircraft, P. O. Box 5.

Bay State Flying Service, P. O. Box 64.

Curtiss Flying Service of New England, Boston Airport.

Skyways (Inc.), Box 112.

North Attleboro — Curtiss Aviation Service (Inc.), Martin Field.

Cambridge — Adolph M. Backstrom, 32 Cushing Street.

Revere — Old Colony Airways Corporation, P. O. Box 285.

Springfield —

Massachusetts Airways Corporation, 1597 Main Street.

Northeastern Aircraft Corporation, 314 Belmont Avenue.

East Taunton — Squawbetty Flying School, King Flying Field.

MICHIGAN:

Highland Park — Aircrafters (Inc.), 75 Ford Avenue.

Battle Creek —

C. W. Clifford, 119 Spring Street.

Davis & Felix Airways, 57 South Jefferson Avenue.

E. A. Goff, Jr., Box 222.

R. K. Moore, 754½ Maple Street.

Cadillac — L. A. Ferris, Cadillac Air Service.

Dearborn — Ford Airways.

Detroit —

Air Taxi Service (Inc.), 1019 Book Building.

William H. Connor, Liversmaine Avenue.

Continental Motors Corporation.

Curtiss-Wright Aeronautical Syndicate, 1234 Mount Elliott Avenue.

Detroit School of Aviation, 3967 Grand River Avenue.

Detroit Aircraft Supply, 23–25 Cottage Grove Avenue.

Holland & Hammill, 4606 Cass Avenue.

Mayco Air Service (Inc.), Fifteenth at Warren.

Overcashier Aviation Co., 8 Arcadia Building, 3513 Woodward Avenue.

Packard Flying Service, Packard Field.

Schlee-Brock Aircraft Corporation, 2007 Fisher Building.

Triangle Flying Service, in care of Ivan C. Kay, 112 John R. Street.

United Aero Service Corporation, 424 Benton Avenue.

United Airways (Inc.), 1020 Book Building.

Williamson Aviation School of Detroit, 2486 Townsend Avenue.

Wolverine Air Lines, 3729 Woodward Avenue.

Escanaba — Upper Peninsula Airways (Inc.).

Fenton — Austin R. Narrin, 1136 West Hillsdale Street.

Flint —

Aircraft Distributors, 2320 North Saginaw Street.

Lovejoy Aviation Co., 2320 North Saginaw Street.

Charles W. Maris, route 2.

Freeland — Kenneth McKellar.

Grand Rapids — John T. Byme, East Fulton Road.

Iron Mountain — Northern Michigan Flying Service.

Jackson — Luthe Flying Service (Inc.), 302 Cooper Street.
Kalamazoo — George E. Tabraham.
Lansing — Foster Airways, 224 South Capitol Avenue.
East Lansing — Michigan Airways (Inc.), 1141 Hillsdale Street.
Niles — Kysor Eaglerock Co.
Owosso — B. T. Hammond.
South Haven —
    J. L. Abbott & Noll.
    Trimble Flying Service.
Spring Lake — Joseph C. Dissette.
Ypsilanti — Knapp Flying Service, Box 388.

MINNESOTA:

Cook — Noel Wien, Box 156.
Duluth — Great Lakes Airways (Inc.), 716 Torrey Building.
Hibbing — R. F. David, 2717 Seventh Aveneue.
Minneapolis —
    Walter R. Bullock, 1219 Second Avenue South.
    Roy A. Crosby, 2553 Fourth Avenue South.
    Edward Middaugh, Box 702.
    Mid Plane Sales & Transit Co., 124 South Ninth Street.
    Minnesota Aircraft Co., 406 Sixth Avenue.
    Northern Air Lines (Inc.), 829 Marquette Avenue.
    United States Air Lines, 322 South Fourth Street.
    J. F. Westover, 1022 Eighth Street South.
St. Paul —
    Northwest Airways (Inc.).
    Pioneer Airways.
    Shank Flying Service, 519 Y. M. C. A. Building.

MISSISSIPPI:

Jackson —
    Mississippi Airways (Inc.). P. O. Box 622.
    Whitaker Flying Service, P. O. Box 233.

MISSOURI:

Columbia — M. E. Durham, Early Apartments.
Higbee — Bryon Heflin.
Joplin — Lee R. Wallace, 3101 Main Street.
Kansas City —
    Airvia Booking Service, Dwight Building.
    Bennett Eaglerock Sales Co., 223 West Twelfth Street.

William Bowman, 1015 Jefferson Street.
Commercial Airways Corporation, 205 East Twenty-second Street.
Russell J. Dick, 1859 East Seventy-eighth Street.
Joseph Hammer, 3728 Main Street.
Kansas City Flying School, 617 Grand Avenue.
John K. LaGrone, 441 Knickerbocker Place.
Porterfield Flying School, 2328 Harrison Street.
Sweeney Aviation School, 200 Union Station Plaza, 2905 Sweeney Building.
B. B. Tuxhorn, 810 Cleveland Avenue.
Waco Sales Co., Richards Flying Field.

Marshall — Nicholas-Beazley Airplane Co., 226 West North Street.
Memphis — Edward Bodeker.
St. Louis —
Missouri Aircraft Co., Paul Brown Building.
Parks Air Lines, 210 Missouri Building.
Robertson Aircraft Corporation, 406 Pine Street.
Von Hoffmann Aircraft Co., 105 South Ninth Street.
St. Joseph —
Bird Wing Commercial Aircraft Co., Mid-America Airport.
Standard Aircraft Co. (Inc.), 2401 South Thirteenth Street.
Webster Grove — John L. Campion, 328 Gray Avenue.

MONTANA:

Billings —
Billings Air Transport (Inc.).
National Parks Scenic Airways, 2313 First Avenue North.
Butte — Butte National Airport.
Dillon — Montana Air Service Co.
Great Falls — Vance Air Service.
Sidney —
W. M. Combes Co. (Inc.).
Earl T. Vance.

NEBRASKA:

Holdrege — Holdrege Airport.
Lexington —
Lexington School of Aviation.
G. R. Morton.

North Platte —
Stover Deats, 221 South Sycamore Street.
Lawrence Enzminger.
Omaha — Overland Airways (Inc.), 4110 Commercial Avenue.

NEVADA:

Wells — Supp Bros. Garage.

NEW HAMPSHIRE:

Claremont — Claremont Aero Service Corporation.
Concord — Concord Aircraft Co., 65 North Main Street.

NEW JERSEY:

Asbury Park — Asbury Park Air Service (Inc.), 244 Main Street.
Atlantic City — Curtiss Air Station of Atlantic City (Inc.), 418 North New Hampshire Avenue.
Jersey City — Robert Cuse, 807 Garfield Avenue.
Lakehurst — Great Eastern Airways (Inc.), Lakehurst Airport.
Lodi — Gates Flying Circus & Aviation Co., 140–150 Main Street.
Madison — Unger Aircraft (Inc.).
Newark —
Atlantic Air Service (Inc.), Federal Trust Building.
Reich Air Transport, 800 Broad Street, and 349 West Grand Street, Elizabeth, N. J.
New Brunswick — Miller Corporation, New Brunswick Airport.
Pine Valley — New Jersey Air Transport Co. (Inc.).
Trenton — Thropp Flying Service (Inc.), Mill and Bloomsbury Streets.
Washington — Warren County Aviation Co. (Inc.), Carlton and Belvidere Avenues.

NEW MEXICO:

Albuquerque — Swastika Eaglerock Airways.
Dawson — A. J. Van Dersal, Box 204.

NEW YORK:

Albany — Albany Air Service (Inc.).
Armonk — Barrett Airways (Inc.), Bedford Road, route 22.

Binghamton — Binghamton Airways (Inc.), 140 State Street.
Brooklyn —
  American Air Services (Inc.), 77 Linden Boulevard.
  Mill Basin Aircraft (Inc.), Mill Basin.
Buffalo —
  Becker Flying Service (Inc.), 250 Franklin Street.
  Colonial Flying Service (Inc.), Buffalo, P. O. Station E.
Cohoes — Cohoes Flying Service, Box 364.
Flushing — Frank Harris, Jr., 5 Delaware Avenue.
Garden City —
  Curtiss Exhibition Co.
  Curtiss Flying Service (Inc.).
  G. S. Ireland Aircraft Co.
Geneva — Finger Lakes Airport, in care of Harold Nester.
Hammondsport — Aerial Service Corporation.
Jamestown — Great Lakes Airways (Inc.), 304 East Third Street.
Lake George — Rogers Air Lines (Inc.).
LeRoy — D. W. Flying Service (Inc.).
Mineola — George A. Wies (Inc.), 250 Jackson Avenue.
New York —
  Aerial Tours Corporation, 1133 Broadway.
  American Air Transport (Inc.), 152 West Forty-second Street.
  Atlantic Airways (Inc.), 44 West Sixteenth Street.
  Atlantic Coast Airways (Inc.), 551 Fifth Avenue.
  Aviation Service Corporation, 12 West Fortieth Street.
  Beacon Airways Co. (Inc.), 103 East One hundred and twenty-fifth Street.
  Colonial Western Airways (Inc.), 270 Madison Avenue.
  Cuba-America Air Line (Inc.), 475 Fifth Avenue.
  Edward G. Delahoussaye, 1 West One hundred and fortieth Street.
  Eastern Air Services, 55 West Forty-second Street.
  F. M. Fairchild Flying Corporation, 270 West Thirty-eighth Street.
  General Airways System (Inc.), 250 West Fifty-seventh Street.
  International Aerial Engineering Co. (Inc.), 25 Broadway.
  International Airways Corporation, 2 Rector Street.
  LaRoe Airways (Inc.), 220 West Forty-second Street.
  Metal Aircraft Express Corporation, 342 Madison Avenue

John F. Miller, 330 West Thirty-fourth Street.

Reynolds Airways (Inc.), 2619 Graybar Building, 420 Lexington Avenue.

Richmond Airways (Inc.), 1 Annadale Road, Green Ridge, S. I.

Skywriting Company of America, 50 East Forty-second Street.

T. D. S. Aerial Service, 35 West Twenty-third Street.

Poughkeepsie —

Harlem Valley Airways (Inc.), Slote Building.

New York Central Airlines, Kingwood Park.

Niagara Falls — Sky-View Lines (Inc.).

Pittsford — Clark-King Flying Service, Brizee Aviation Field.

Port Washington, L. I. —

Lieut. Donald G. Van de Water, 7 Locust Avenue.

Rogers Air Lines (Inc.), P. O. Box 53.

Richmond Hill — Associated Aeronautical Corporation, 10930 One hundred and twenty-second Street.

Rochester —

Flower City Airways (Inc.), 336 State Street.

New York & Western Airlines (Inc.), 342 Granite Building.

Schenectady —

Inter Cities Airways Service, Schenectady Airport.

V. A. Rickard, Schenectady Airport.

Syracuse —

Boise Homesite Co. (Inc.), Aviation Division, 402 Gridley Building.

Perin Flyer's Co., 708 West Brighton Avenue.

Wantagh, L. I. — Wantagh Airways.

Washingtonville —

Hallock & Jessup Flying Service.

William H. Hallock.

Westbury, L. I. — Roosevelt Aero Service.

White Plains — Westchester Aerial Dispatch (Inc.), 78 Central Avenue.

North Carolina:

Asheville — Storms Aviation Co., 20 North Spruce Street.

Lenoir — Aero Engineering Co.

Mathews —

John E. Crowell.

Monroe — H. S. Adams.
Pinehurst — Lloyd O. Yost (in winter).
Raleigh — Raleigh Flying Service (Inc.), Poindexter Field.

NORTH DAKOTA:

Bismarck — Northwestern Aircraft Co.
Fargo — Vernon L. Roberts, P. O. Box 400.
Selfridge — Selfridge Aircraft Co.
Streeter — Salt Lake Flying School.
Towner —
- Bertram Aircraft Co.
- Leach Bros.

OHIO:

Akron —
- Akron Air Transportation Co.
- Babcock Airplane Co., 268 James Street.
- Robbins Flying Service, 316 Berg Street.
- Stow Aviation School, 411 Akron Savings & Loan Building.

Canton —
- Canton Aero Transportation Co., 1910 Mahoning Road NE.
- C. N. Hart, 834 Mahoning Road.
- Sherrick Flyers, 1937 Tuscarawas Street West.

Cincinnati —
- Embry-Riddle Co. (Inc.), Lunken Airport, Station C.
- Watson Airport Co., Grisard Field, Blue Ash.

Cleveland —
- Aero Specialties, room 207, 30 Euclid Avenue.
- Dungan Airways (Inc.), 720 Leader Building.
- Yvon Milre, 1097 Union Trust Building.
- Stewart Aircraft Corporation, Cleveland Airport.
- Willard Parker Flyers, 2400 Euclid Avenue.

Columbus —
- Cherry Aviation Co., 474 North Garfield Avenue.
- Columbus Flying Service, Norton Field.
- Commercial Airways Transit Corporation of Ohio, 1514 Kohr Place.

Cuyahoga Falls — Fred F. Smith, Stow Field, route 1.
Dayton —
- Frank F. Heitz, 103 Warder Street.

Johnson Airplane & Supply Co., 900 South Ludlow Street.
Rinehart-Whelan Co., Moraine Flying Field.
Greenville — Greenville Aircraft Co. (Inc.), Lansdowne Airport.
Lakewood — J. Dunkel, 2125 Halstead Street.
Lima — Superior Aircraft Co., 118 West High Street.
Lorain — William H. Long, Long's Garage.
Mansfield — Mansfield Aerial Service.
Marietta — L. H. Scott, 328 Second Street.
Massillon —
American Aircraft Corporation.
Maurice W. Koehler, 835 West Main Street.
Maurice Kohler, 942 Wooster Street.
Middletown — Palmco Air Service.
Randolph — Thompson Aeronautical Corporation, 2196 Clarkwood Road.
Russell's Point — Indian Lake Aviation Co.
Sandusky — Parker Bros. Airways.
Toledo —
Toledo Aerial Transportation (Inc.).
Westchester Airways (Inc.), P. O. Box 357 C. S.
Willoughby — Sanborn Aviation Co., Euclid Avenue Airport.
Youngstown —
Bernard Air Lines.
Ohio Air Transport (Inc.), Lansdowne Field.
U. S. Aerial Navigation Co., American Bank Building.

OKLAHOMA:
Billings — M. L. Sloan.
Duncan — Duncan Air Service, draw 27.
Guthrie —
O. G. Harned.
Stuart Air Transport Co.
Miami — Miami Aircraft Co., R. F. D. 2.
Muskogee — L. D. Carlson, 116½ North Cherokee Street.
Oklahoma City —
Braniff Airlines, Braniff Building.
R. W. Cantwell, Municipal Air Field.
Southwest Airways (Inc.), Municipal Airport, route 5.
Tibbs Flying School, Municipal Aviation Park, route 5.
Okmulgee — William A. Burke.

Tulsa —

Aircraft Sales Co., of Oklahoma, Box 1525.

Trump Airways (Inc.), Tulsa Municipal Airport, P. O. Box 3212.

Oregon:

Beaverton — Davis-Langman Aircraft Corporation, Watts Airport.

Portland —

Aeronautical Pursuits Corporation, 425 Morgan Building.

Bell Air Lines, Fifth and Salmon Streets.

Mackenzie-Goff Aviation Co., foot of North Twenty-ninth Street.

Rankin Flying Service (Inc.), P. O. Box 4268.

Pennsylvania:

Allentown — Queen City Aircraft & Airways Co., 41 North Tenth Street.

Altoona — W. L. Stultz, Altoona Aero Club.

Bridgeville — Mayer Aircraft Corporation.

Clarion — Cramer Flying Service.

Conyngham — Lloyd O. Yost (in summer).

Essington — Essington School of Aviation.

Gettysburg —

Battlefield Airways.

Doersom's Flying Service, in care of Doersom's Garage, 436 York Street.

Hazelton — Veale Aviation (Inc.), 13–23 East Green Street.

Lancaster — Lancaster Airways (Inc.), Lancaster Airport.

Lansdowne — Victor Dallin, 660 Fern Street.

Lemoyne — Steinhauer Aircraft Sales.

Meadville — Frank J. Pappas, 941 Market Street.

Mifflintown — Herman Alexander, 112 North Main Street.

Newcastle — Newcastle Aircraft Corporation.

Norristown — Brownback Motor Laboratories (Inc.).

Parkesburg — Universal Air Service, Beale Flying Field.

Philadelphia —

Crescent Air Service, room 722, 1011 Chestnut Street.

Eastern Flying Service, 348 East Sharpnack Street, Mount Airy.

Interstate Flying Corporation, Atlantic Building.

W. Wallace Kellett, Atlantic Building.

Ludington Philadelphia Flying Service, Atlantic Building.
Penn Aviation, 2258 North Broad Street.
Pitcairn Aviation (Inc.), Land Title Building.
Smith-Ludington Aircraft, 820 Atlantic Building.

Pittsburgh —

Aircraft Sales Corporation, Standard Life Building.
Beatty & Day, 1239 North Highland Avenue.
Lovejoy Flying School, Bettis Field.
Mo Caw Airplane & Advertising Co., 1635 Beechwood Boulevard.
Morris Flying Service, Rogers Field, Aspinwall.
Pittsburgh Aviation Industries Corporation, 1326 Henry W. Oliver Building.

Punxsutawney — Pennsylvania Aero Service.
Reading — Reading Airways.
Tipton — Altoona Aircraft Corporation, Stultz Field.
Towanda — Clarence B. Coombs.
Wayne — International Air Lines, 135 Runnymede Avenue.

South Carolina:

Cheraw —

Carolina Stinson Airways.
Thomason-Moore Airways (Inc.).

Darlington — Errett Williams, Box 179.

South Dakota:

Belle Fourche — Belle Fourche Air Lines (Inc.).
Huron — Huron Air Lines (Inc.).
Platte — Wilbur Cool.
Pukwana — Stransky Air Lines (Inc.).
Rapid City — Rapid Airlines.

Sioux Falls —

Dakota Airlines (Inc.), 715 South Dakota Avenue.
Soo Skyways (Inc.).
H. W. Tennant, 715 South Dakota Avenue.

Spear Fish — E. C. Cunram.
Watertown — Pionair Lines (Inc.), P. O. Box 71.

Tennessee:

Knoxville —

Knoxville Aero Corporation, 211 West Cumberland Avenue.
W. I. Self, 211 West Cumberland Avenue.

Memphis —
Mid-South Airways (Inc.), Box 3055, Crosstown.
Tri-States Airways, in care of Bry-Block Mercantile Co.

TEXAS:

Abilene — West Texas Air Transport (Inc.), 313–314 Alexander Building.
Amarillo — Robert H. Gray, in care of Chamber of Commerce.
Austin —Universal Aerial Service Co., P. O. Box 1101, University Airport.
Beaumont — Sabine Airways (Inc.).
Dallas —
Good & Foster Aero Service, Love Field.
H. N. Holifield, 5829 Oram Street.
International Flying Service, Love Field.
Joseph F. Noyes, Box 858.
Everman — Reginald Robbins.
Fort Worth —
J. H. Mangham, 1232 Richmond Avenue.
L. W. Mendell, 212 North Royal Avenue.
Houston —
W. L. Edwards, 5511 Chenevert Street.
Houston Airways (Inc.), 210 Medical Arts Building.
Tips & Smith (Inc.), Box 153.
Midlothian — Boyd Findle.
San Angelo — San Angelo Airways (Inc.), 27–29 North Chadbourne Street.
Wichita Falls — Wichita Falls Air Transport Co.

UTAH:

Salt Lake City —
Air Service & Survey Co., P. O. Box 1444.
Red Raven Air Service & Survey Co.
Rocky Mountain Flying Service.
Scenic Airways (Inc.), 1001 Walker Bank Building.

VERMONT:

Bellows Falls — Capt. H. E. Stickney, 28 Henry Street.
Newport — Vermont Airways Corporation (Kingsbery Farms Airport, Derby, Vt.).

VIRGINIA:

Alexandria — Mount Vernon Airways, Hybla Valley Aviation Field, route 5.

Hopewell — Hopewell Air Lines (Inc.), P. O. Box 726.

Richmond —

Charles Flying Service, Box 44, Northside.

R. T. Flying Service, P. O. Box 1969.

Roanoke —

Reynolds Flying Service, 601 Arlington Road.

D. K. Steele, 372 Walnut Avenue.

South Washington —

Capital Airways (Inc.), Washington Airport.

Potomac Flying Service (Inc.), Hoover Field.

Seaboard Airways (Inc.), Washington Airport.

WASHINGTON:

Aberdeen —

Gray's Harbor Airways (Inc.), P. O. Box 1151.

Hobi Airways Co.

Chehalis — St. John Air Service.

Everett — Commercial Air Transport (Inc.), 2726 Lombard Street.

Port Angeles — Port Angeles Air Transport (Inc.), Municipal Airport.

Seattle —

Vern C. Gorst (Pacific Air Transport).

Northwest Air Service, 650 Henry Building.

Rainier Aeronautical Corporation.

Seattle Airways (Inc.).

Star Air Line (Inc.), 1622 Eighth Avenue.

Spokane —

Inland Eaglerock Aircraft Co.

Mamer Flying Service (Inc.).

N. B. Mauer.

Spokane Airways (Inc.), 302 Spokane Savings & Loan Building.

Tacoma —

Bergen-Bromley Flying Service (Inc.), Hotel Winthrop.

Washington Flying Service (Inc.), route 1, Box 73-B.

WEST VIRGINIA:

Charleston — West Virginia Air Service (Inc.), 1009 Quarrier Street.

Huntington — Bob Shank Airplane & Supply Co., 740 Sixth Avenue.

WISCONSIN:

Antigo — Charles Ostrom & J. H. Prosser.
Appleton — North American Airways Co.
Janesville — Kempton-Dudley Flying Service (Inc.), Janesville Airport.
Kenosha — Wisconsin Air Lines (Inc.).
Lake Geneva — Ray Applegate.
Larsen — Roy Larsen Aircraft Co.
Madison — Royal Airways Corporation, 116 East Washington Avenue.
Marshfield — Ski-Hi Airways (Inc.).
Milwaukee —
Ebert Aircraft Service Depot, Station D.
Midwest Airways (Inc.), 1524 Galena Street.
Milwaukee Air Transit (Inc.), 820 Forty-eighth Street.
Weeks Aircraft Corporation, 999 Third Street.
Wisconsin Aviation Service, 3005 Plankinton Arcade.
North Milwaukee — Holterhoff Flying Service (Inc.), route 2, Box 163 (Green Bay Road).
Racine —
Air City Airways (Inc.), Arcade Building.
Air City Flying School, Air City Flying Field.
Wausau — Northern Airways (Inc.).

WYOMING:

Casper — Wyoming Airways Corporation, P. O. Box 1112.

## SCHOOLS

NOTE. — Inasmuch as the Department of Commerce has not rated the various commercial schools throughout the country, a thorough study of the requirements for obtaining pilots' and mechanics' licenses is recommended before entering on any course. These requirements are defined in the Air Commerce Regulations.

Rating regulations for flying and ground schools have recently been issued (see Supplement 7-B, Air Commerce Regulations).

## Section 1. Flying and Groundwork

**Alabama:**

Birmingham — Glenn E. Messer Co., 1338 South Fifteenth Avenue.
Huntsville — Southeastern Airways, P. O. Box 715.
Mobile — Southern Aerial Service (Inc.), 453 Government Street.
Montgomery — Montgomery School of Aeronautics, Jefferson Davis Hotel.

**Arizona:**

Tucson — Southwest Air Service (Inc.).

**Arkansas:**

Fort Smith —
Ollie L. Blan, 4020 North Sixth Street.
Fort Smith Aircraft Co., 611 Rogers Avenue.
Little Rock — Arkansas Aircraft Corporation.

**California:**

Arlington — Prest Airplanes & Motors.
Alameda — Wright Air Service, 2034 San Antonio Avenue.
Bakersfield — Cardiff & Peacock.
Berkeley — Greer Aeronautical School, 2735 Ellsworth Street.
Carpinteria — Chadbourne-Donze Air Service, Santa Barbara at Carpinteria.
Compton — Ray F. Carpenter, 812 East Laurel Street.
Culver City — Frank Baker Airport, Box 341.
Fresno —
California National Airways, 204 Cory Building.
Center State Air Transport, 4639 Balch Avenue.
Glendale —
Glendale Aviation School, 1201 Flower Street.
Wilson Aero Service, Glendale Airport.
Hollister — San Benito Flying School & Air Transport, Turner Field.
Hollywood —
Eagle Flying School, 6040 Hollywood Boulevard.
Universal Institute of Aeronautics (Inc.), 1770 North Vermont Avenue.
Universal School of Aeronautics, 1861 Rodney Drive.

Kentfield — Don M. Cornell, Box 154.
Long Beach — Thomas E. Monday, 3108 Colorado Avenue.
Los Angeles —
- Aero Corporation of California, 9819 South Western Avenue.
- American Aircraft Corporation, Merritt Building.
- California Airways Co., Ninth Street and Telegraph Road.
- California School of Aeronautics, 524 South Spring Street.
- Dycer Airport, One hundred and thirty-sixth Street and Western Avenue.
- Rogers Flying School, 3901 Mesa Drive.
- Santa Maria Air Lines (Inc.), 1100 California Bank Building.
- Short's School of Aviation, Main at One hundred and ninetieth Street.
- Warren School of Aeronautics, 120 West Slauson Avenue.
- Western College of Aeronautics, 154 West Slauson Avenue.
- Frank E. Williams Flying School, 4539 West Seventeenth Street.
- William P. Williams School of Aeronautics.

Monterey Park — Callies Fliers, 322 South Garfield Avenue.
Oakland —
- Elm Aircraft Co., Central Bank Building.
- Royle-Rose Airlines, 324 Thirteenth Street.
- R. A. Shelton, 1218 Twenty-fourth Avenue.

Ontario — Ontario Aircraft Corporation, Ontario Airport.
Redding — Lassen View Airways.
Redlands — California Air Service, Hubbard Building, 104 Orange Street.
Sacramento —
- Andrews & Nicholson, 3967 D Street.
- Ingvalds School of Aviation, R. F. D. 7, Box 1545.

San Diego —
- Airtech Training School, Lindbergh Field.
- Bill Kingsley, San Diego Airport, O. B. Star Route.
- T. C. Ryan Flying Service, 3300 Barnett Avenue.
- San Diego Air Service Corporation, P. O. Box 6.

San Francisco —
- Breese Flying Service, 270 Seventh Street.
- Pond Aeronautical School, 308 Balboa Building.

San Leandro —
Aircraft Industries (Inc.), 931 East Fourteenth Street.
Fillmore Flying Field Co.
San Mateo — "Speed" Johnson's Flying School, Box 231.
Santa Ana — Eddie Martin's Airport, South Main and Newport Boulevard.
Stanford University — Palo Alto School of Aviation, Stanford University Campus.
Stockton — Allen-Lane Aircraft Co., Stockton Airport.

COLORADO:

Colorado Springs —
Alexander Aircraft Co.
Arkansas Valley Airways (Inc.), 1316 North Weber Street.
Pikes Peak Air Service Co. (Inc.), 121 North Nevada Avenue.
Denver — Denver School of Aeronautics (Inc.).
Pueblo — Colorado School of Aviation.

CONNECTICUT:

Bethany — Hill & Somers Aerial Service, Bethany Airport.
Greenwich — Greenwich Air Port School.
Hartford —
Interstate Airways (Inc.), Brainard Field.
New England Aircraft Co. (Inc.), 805 Main Street.
Meriden — Meriden Aircraft Corporation, 54 Grove Street.
New Haven — New Haven Air Terminal (Inc.), P. O. Box 919.

DISTRICT OF COLUMBIA:

Washington —
Congressional Airport (Inc.), 220 Transportation Building.
D. C. Air Legion, 711 International Building.
National Flying School (Inc.), 602 Southern Building.
Southern Airlines (Inc.), 923 Fifteenth Street NW.

FLORIDA:

Hialeah — East Coast Aviation Camp, P. O. Box 1.
Miami — Rogers Air Lines (Inc.), P. O. Box 3608.
Orlando —
Orlando Air College, Municipal Airport.

Orlando Airlines (Inc.), Beacon Hill Airport and Buck Field.

Palm Beach — Lake Geneva Flying Boat Service, 207 Maine Street (in winter).

Sebring — Sebring Airways (Inc.).

Tampa — A. B. McMullen Co., 1710 Mitchell Street.

West Palm Beach — Palm Beach Flying Service, 1209 Harvey Building.

Georgia:

Atlanta —

Beeler Blevins (Inc.), P. O. Box 329.

Douglas Davis Flying Service, Wynne-Claughton Building.

Major Aircraft Co., 712 Candler Building.

Pitcairn Aviation of Georgia (Inc.), Candler Field.

Vinings — Southern Flying School (Inc.), Cobb County.

Idaho:

Boise — Walters Flying Service.

Pocatello — Eastern Idaho Air Service (Inc.), 129 South Arthur Street.

Rupert — Rupert Aerial Service Co.

Illinois:

Chicago —

American Beauty Aircraft Co., 4215 Armitage Avenue.

Aviation Construction Engineers, 139 North Clark Street, suite 608.

Aviation Service & Transport (Inc.), 203 North Wabash Avenue.

La Pierre Cavender, 4639 Magnolia Avenue.

Chicago Aeronautical Service, 608 South Dearborn Street.

Commercial Aircraft Sales Co., 904 Wrigley Building, 400 North Michigan Boulevard.

Greer College of Automotive Engineering, 2024 Wabash Avenue.

Roy E. Guthier, 7131 Olcott Avenue.

Heath Airplane Co. (Inc.), 1727 Sedgewick Street.

Illinois Aeronautical Service, 8824 South Loomis Street.

Illinois Air Service, 226 East Superior Street.

Keller Aerial Service, 4400 West Eighty-third Street.

W. W. Meyer, 4945 North St. Louis Avenue.
Jack Oates (Inc.), 5101 West Madison Street.
Ray L. Olsen, 1917 Humboldt Boulevard.
Ostergaard Aircraft Works, 4305 North Narragansett Street.
Partridge (Inc.), 430 South Michigan Avenue.
Sievert Aircraft Corporation, 5934 South Cicero Avenue.
Hart G. Smith, Morton Grove, 5036 Kenmore Avenue.
Western Airplane Corporation, 53 West Jackson Boulevard.
Yackey Aircraft Co., Checkerboard Flying Field.

Chillicothe — Myrle Davis, route 3.
Downers Grove — Arthur C. Chester, 532 Giertz Avenue.
East Peoria — Varney Aircraft Co., 231 Stewart Avenue.
Elmhurst — Fred J. Bouchard, Eagle Flying Field.
Galena — W. W. McBoyle.
Hinckley — Eagle Airport School of Aviation.
Marion — Egyptian Airways Co.
Moline — Campbell-DeSchepper Airplane Co. (Inc.), 515 Eighteenth Street.
Momence — Brown Flying School.
Monmouth — Mid-West Airways Corporation.
Mount Prospect —
F. L. Barchard, Pal-Waukee Airport.
Pal-Waukee Airport, Milwaukee Avenue at Palatine Road.
Peoria — E. B. Cole (Inc.), 125 North Jefferson Avenue.
Quincy — Quincy Aircraft Co.
Rock Island — Illinois-Iowa Airways Co. (Inc.), 1820 Third Avenue.
Springfield — Springfield School of Aviation.

INDIANA:

Anderson —
Farnam School of Flying.
Orin Welch Aircraft Co.
Brazil — Watson's Aerial Service, 101½ East National Avenue.
Evansville — Fortner Flying Service.
Flora — Flora Aviation School.
Fort Wayne —
Sweebrock Aviation Co., 1117 Fairfield Avenue.
Tri-State School of Aeronautics, Farmer's Trust Building.

Gary —
    Atkinson Aviation Co., 406 Washington Street.
    Calumet Air Transport Co. (Inc.), 1106 Broadway.
Goshen — Charles E. Hastings, Jr., The Hedges.
Indianapolis — Hoosier Airport.
Kokomo — Shockley Flying School, route 10.
Lafayette — Shambaugh Airport.
Muncie — Muncie Aerial Co., Twenty-first and Hackley Streets.
Peru — Circus City Flying Corporation, 24 West Second Street.
Richmond — Richmond Airport.
Terre Haute —
    Terre Haute Airways (Inc.).
    Terre Haute Aviation, 705 West Prospect Avenue.

Iowa:

Battle Creek — Commercial Air (Inc.).
Cedar Falls —
    Air Taxi Co.
    Cedar Falls Flying School.
Des Moines —
    Des Moines Airways.
    Whites' Aircrafts, Seventeenth and Crocker Streets.
    Yellow Cab Airways (Inc.).
Mason City — Pioneer Flyers (Inc.).
Shenandoah — Freeburg Flying Service, Kiwanis Airport.
Sioux City — Interstate Airway Co.

Kansas:

Arkansas City — Pete Hill, Municipal Field.
Chanute — Aubrey M. Barnes Service, 613 North Washington Street.
Garnet — Heimer Airways.
Kansas City — Great Western School of Aviation, Box 138.
Lawrence — Allison Airplane Co.
Wichita —
    Braley School of Flying, 211 York Rite Temple.
    Cessna Aircraft Co. (Inc.), First and Glenn Streets.
    Landers-Lewis Flying School, Travel Air Flying Field.
    Wichita Air Service Provision Co., Municipal Airport.

Kentucky:

Louisville — National Aviation School, 809 West Market Street.

Paducah — Iseman Flying Field.

Louisiana:

New Orleans — New Orleans Air Lines, 824 Poland Avenue.

Maryland:

Baltimore —

Chesapeake Aircraft Co., Richmond Market Armory.

Steinmetz Airways, 717 West North Avenue.

College Park — National Flying School (Inc.).

Massachusetts:

Boston —

Associated Aircraft School of Aeronautics, P. O. Box 5, East Boston.

Curtiss Flying Service of New England, Boston Airport, East Boston.

Skyways (Inc.), Box 112, East Boston.

Cambridge — Capt. H. Louis Brewer, Box 159.

North Attleboro — Curtiss Aviation Service (Inc.), Martin Field.

Revere — Old Colony Airways Corporation, P. O. Box 285.

Springfield —

Massachusetts Airways Corporation, 1597 Main Street, suite 303.

Springfield Aviation Ground School, 367 Worthington Street.

East Taunton — Squawbetty Flying School, King Flying Field.

Michigan:

Ann Arbor — Flo School of Flying, 511 Miller Avenue.

Detroit —

Aero Corporation of Detroit, 154 Manistique Avenue.

Burns Flyers, 2800 West Grand Boulevard.

Detroit Air Taxi Service, 5032 Hurlbut Avenue.

Detroit School of Aviation, 3967 Grand River Avenue.

Flo School of Flying, Ford Road and Wyoming.

Holland & Hammill, 4606 Cass Avenue.

LaSalle Air Service, 10037 Cheyenne Avenue.
Maycock Flyers, 12945 Montrose Avenue.
Michigan State Aviation School, 3729 Woodward Avenue.
Stinson School of Aviation, 4–220 General Motors Building.
United Aero Service Corporation, 424 Benton Avenue.
Utopia Flying School, 7537 Williamson Avenue.
Williamson's Aviation School of Detroit, 2486 Townsend Avenue.

Flint —
Lovejoy School of Aviation, 2320 North Saginaw Street.
Charles W. Maris, route 2.
Skyways (Inc.), 604 Industrial Bank Building.

Grand Rapids — Furniture Capital Air Service, 702 Michigan Trust Building.
Halfway — Anderson Flying Service.
Iron Mountain — Northern Michigan Flying Service.
Jackson —
Becker Flying School, 902 Elizabeth Street.
Luthe Flying Service (Inc.), 302 Cooper Street.

Kalamazoo — Aero-Tech Aircraft Works, in care of C. E. Weaver, Western State Teachers' College.
Lansing —
Foster Airways, 224 South Capitol Avenue.
Michigan Airways (Inc.), 1141 Hillsdale Street, East Lansing.
S K F Air Service, 401 City National Bank Building.

Niles — Kysor Eaglerock Co.
South Haven — Trimble Flying Service.
Spring Lake — Joseph C. Dissette.
Ypsilanti — Knapp Flying Service, Box 388.

MINNESOTA:

Duluth — Great Lakes Airways (Inc.), 716 Torrey Building.
Hibbing — R. F. Davis, 2717 Seventh Avenue.
Minneapolis —
Air Service (Inc.), 2600 Delaware Street SE.
Federal School of Aeronautics, 230 Plymouth Building.
Mid Plane Sales & Transit Co., 124 South Ninth Street.
Minnesota Aircraft Co., 406 Sixth Avenue.
National School of Aviation, 2508 University Avenue.
United States Air Lines, 322 South Fourth Street.

Virginia — Rhodes School of Aviation, 802 South Sixth Avenue.

MISSISSIPPI:

Jackson —

Mississippi Airways (Inc.), P. O. Box 622.

Whittaker Flying Service, P. O. Box 233.

MISSOURI:

Anglum — St. Louis Aircraft Co., Lambert-St. Louis Flying Field.

Joplin —

Ozark Aviation (Inc.), 620 Joplin National Bank Building.

Lee R. Wallace, 3101 Main Street.

Kansas City —

Bennett Eaglerock Sales Co., 223 West Twelfth Street.

Commercial Airways Corporation, 205 East Twenty-second Street.

Kansas City Flying School, 617 Grand Avenue.

Porterfield Flying School, 2328 Harrison Street.

Sweeney Aviation School, 2905 Sweeney Building, 200 Union Station Plaza.

Marshall —

Marshall Flying School (Inc.), 604 North English Street.

Nicholas-Beazley Airplane Co., 226 West North Street.

St. Joseph —

Bird Wing Commercial Aircraft Co., Mid-America Airport.

Standard Aircraft Co. (Inc.), 2401 South Thirteenth Street.

St. Louis —

Missouri Aircraft Co., Paul Brown Building.

Parks Air Lines (or Parks Air College), 204 Missouri Theater Building.

Robertson Aircraft Corporation, 406 Pine Street.

Von Hoffmann Aircraft Co., 105 South Ninth Street.

MONTANA:

Billings

Billings Air Transport (Inc.).

National Parks Scenic Airways, 2313 First Avenue North.

Butte —
- Butte Aircraft Corporation, 2428 South Montana Street.
- Butte National Airport.

Dillon — Montana Air Service Co.
Great Falls — Vance School of Flying.
Sidney — W. M. Combes Co. (Inc.).

NEBRASKA:

Holdrege — Holdrege Airport.
Lexington — Lexington School of Aviation.
Lincoln — Lincoln School of Aviation, 2419 South Street.
Omaha — Overland Airways (Inc.), 4110 Commercial Avenue.

NEW HAMPSHIRE:

Concord — Fogg Flying School.

NEW JERSEY:

Atlantic City — Curtiss Air Station of Atlantic City (Inc.), 418 North New Hampshire Avenue.
Lodi —
- Gates Flying Circus & Aviation Co., 140 Main Street.
- Pioneer Aircraft School (Inc.), 515 Main Street.

Long Branch — Airview (Inc.), 211 Broadway.
Newark —
- Flyad Flyers, 44 Walnut Street.
- Reich Air Transport, 800 Broad Street; also 349 West Grand Street, Elizabeth, N. J.

New Brunswick — Miller Corporation, New Brunswick Airport.
Paterson — Murchio Flying Service, Hamburg Turnpike.
Trenton — Thropp Flying Service (Inc.), Mill and Bloomsbury Streets.
Washington — Warren County Aviation Co. (Inc.), Carlton and Belvidere Avenues.

NEW YORK:

Albany — Albany Air Service (Inc.).
Armonk — Barrett Airways (Inc.), Bedford Road, route 22.
Buffalo —
- Becker Flying Service (Inc.), 250 Franklin Street.
- Colonial Flying Service (Inc.), Buffalo Airport, P. O. Station E.

Cohoes — Cohoes Flying Service, Box 364.

Garden City — Curtiss Flying Service (Inc.).
Geneva — Finger Lakes Airport, in care of Capt. Harold Nester.
Hammondsport — Mercury Flying School, Aerial Service Corporation.
Jamestown — Great Lakes Airways (Inc.), 304 East Third Street.
Lake George — Rogers Air Lines (Inc.).
LeRoy — D. W. Flying Service (Inc.).
Long Island City — Aviation Engineering School, Queensboro Plaza Station.
New York —
  Atlantic Airways (Inc.), 44 West Sixteenth Street.
  Aviation-Automotive Engineering School, 225 West Fifty-seventh Street.
  Aviation School of America, 757 Broadway.
  Beacon Airways Co. (Inc.), 103 East One hundred and twenty-fifth Street.
  LaRoe Airways (Inc.), 220 West Forty-second Street.
  Reynolds Airways (Inc.), 2619 Graybar Building, 420 Lexington Avenue.
Pittsford — Clark-King Flying Service, Brizee Aviation Field.
Port Washington —
  Curtiss Metropolitan Airplane Co. (Inc.).
  Rogers Air Lines (Inc.), P. O. Box 53.
  Lieut. Donald G. Van de Water, 7 Locust Avenue.
Richmond Hill — Associated Aeronautical Corporation, 10930 One hundred and twenty-second Street.
Rochester —
  New York & Western Airlines (Inc.), 342 Granite Building.
  North Star Aerial Service Corporation, 29 Westgate Terrace.
Schenectady —
  Inter Cities Airway Service, Schenectady Airport.
  V. A. Rickard, Schenectady Airport.
Syracuse —
  Boise Homesite Co. (Inc.), Aviation Division, 402 Gridley Building.
  General Aviation Co. (Inc.), 208 South Geddes Street.
  Perin Flyer's Co., 708 West Brighton Avenue.
Washingtonville — William H. Hallock.

North Carolina:

Asheville — Storms Aviation Co., 20 North Spruce Street.
Friendship — Pitcairn Aviation of North Carolina (Inc.), Greensboro Municipal Airport.
Matthews — John E. Crowell.
Pinehurst — Lloyd O. Yost (in winter).
Raleigh Flying Service (Inc.), Poindexter Field.

North Dakota:

Bismarck — Northwestern Aircraft Co.
Fargo — Vernon L. Roberts, P. O. Box 400.
Minot — International Airways (Inc.).
Selfridge — Selfridge Aircraft Co.
Streeter — Salt Lake Flying School.
Towner —
Bertram Aircraft Co., McHenry County.
Leach Bros.

Ohio:

Akron —
Akron School of Aviation, Fulton Field.
Robbins Flying Service, 316 Berg Street.
Stow Aviation School, 411 Akron Savings & Loan Building.
Canton —
Canton Aero Transportation Co., 1910 Mahoning Road NE.
C. N. Hart, 834 Mahoning Road.
Cincinnati —
Embry-Riddle Co. (Inc.), Lunken Airport, Station C.
Watson Airport Co., Grisard Field, Blue Ash.
Cleveland —
Cleveland School of Aviation, 1816 Euclid Avenue.
Floyd J. Logan Aviation Co., 716 West Superior Street.
Stewart Aircraft Corporation, Cleveland Airport.
Willard Parker Flyers, 2400 Euclid Avenue.
Columbus — Columbus Flying Service, Norton Field.
Dayton —
Johnson Flying Service, 900 South Ludlow Street.
Rinehart-Whelan Co.
Greenville — Greenville Aircraft Co. (Inc.), Lansdowne Airport.

Lime — Superior Aircraft Co., 118 West High Street.
Mansfield — Mansfield Aerial Service.
Middletown — Palmco Air Service.
Port Clinton — Lake Shore Aviation Co., foot of Madison Street.
Portsmouth — Ronan Rock Aero Corporation.
Randolph — Thompson Aeronautical Corporation, 2196 Clarkwood Road.
Russell's Point — Indian Lake Aviation Co.
Sandusky — Parker Bros. Airways.
Willoughby — Sanborn Aviation Co., Euclid Avenue Airport.
Youngstown —
 Bernard Air Lines.
 Ohio Air Transport (Inc.), Lansdowne Field.

OKLAHOMA:

Duncan — Duncan Air Service, draw 27.
Miami — Miami Aircraft Co., R. F. D. 2.
Oklahoma City —
 Braniff Airlines, Braniff Building.
 R. W. Cantwell, Municipal Air Field.
 Southwest Airways (Inc.), Municipal Airport, route 5.
 Tibbs Flying School, Municipal Aviation Park, route 5.

OREGON:

Portland —
 Aeronautical Pursuits Corporation, 425 Morgan Building.
 Hill Aeronautical School, 821 Marshall Street.
 Mackenzie-Goff Aviation Co., foot of North Twenty-ninth Street.
 Rankin Flying Service (Inc.), P. O. Box 4268.

PENNSYLVANIA:

Allentown — Queen City Aircraft & Airways Co., 41 North Tenth Street.
Bridgeville — Mayer Aircraft Corporation.
Clarion — Cramer Flying Service.
Conynghan — Lloyd O. Yost (in summer).
Essington — Essington School of Aviation.
Gettysburg —
 Battlefield Airways.
 Doersom's Flying Service, in care of Doersom's Garage, 436 York Street.

Parkesburg — Universal Air Service, Beale Flying Field.
Philadelphia —
Crescent Air Service, room 722, 1011 Chestnut Street.
Ludington Philadelphia Flying Service, 816 Atlantic Building.
Pitcairn Aviation (Inc.), Land Title Building.
Pittsburgh —
Lovejoy Flying School, Bettis Field.
Morris Flying Service, Rogers Field, Aspinwall.
Pittsburgh Aircraft Co., Bettis Field.
Pittsburgh Aviation Industries Corporation, 1326 Henry W. Oliver Building.
Punxsutawney — Pennsylvania Aero Service.
Reading — Reading Airways.
Tipton — Altoona Aircraft Corporation, Stultz Field.
Towanda — Clarence B. Coombs.
Willow Grove — Pitcairn Aviation of Pennsylvania (Inc.).

SOUTH CAROLINA:

Darlington — Errett Williams, Box 179.
Spartanburg — Pitcairn Aviation of South Carolina (Inc.), Spartanburg Municipal Airport.

SOUTH DAKOTA:

Huron — Huron Air Lines (Inc.).
Sioux Falls —
Dakota Airlines (Inc.), 715 South Dakota Avenue.
Soo Skyways (Inc.).
H. W. Tennant, 715 South Dakota Avenue.
Watertown — Pionair Lines (Inc.), P. O. Box 71.

TENNESSEE:

Knoxville — W. I. Self, 211 West Cumberland Avenue.
Memphis —
Mid-South Airways (Inc.), Box 3055, Crosstown.
Tri-States Airways, in care of Bry-Block Mercantile Co.

TEXAS:

Austin — University Aerial Service Co., P. O. Box 1101, University Airport.
Beaumont — Sabine Airways (Inc.).
Dallas —
Dallas Aviation School, Love Field.

International Flying Service, Love Field.
Texas School of Aviation, Love Field.
Houston — Houston Airways (Inc.), 210 Medical Arts Building.
San Antonio —
Mission Airplane Service.
San Antonio Aviation & Motor School, 210 College Street.

VERMONT:

Newport — Vermont Airway Corporation.

VIRGINIA:

Lynchburgh — Dixie Aircraft Corporation.
Richmond —
Charles Flying Service, Box 44, Northside.
Pitcairn Aviation of Virginia (Inc.), Richmond Municipal Flying Field.
R. T. Flying Service, P. O. Box 1969.
Roanoke — Reynolds Flying Service, 601 Arlington Road.
South Washington —
Capitol Airways (Inc.), Washington Airport.
Potomac Flying Services (Inc.), Hoover Field.

WASHINGTON:

Aberdeen — Hobi Airways Co.
Chehalis — St. John Air Service.
Everett — Commercial Air Transport (Inc.), 2726 Lombard Street.
Seattle —
Aviation School (Inc.), 2125 Fifth Avenue.
J. T. Milhollin, 210 Y. M. C. A. Building.
Northwest Air Service, 650 Henry Building.
Seattle Airways (Inc.).
Star Air Line (Inc.), 1622 Eighth Avenue.
Spokane —
Inland Eaglerock Aircraft Co.
Mamer Flying Service (Inc.).
Spokane Airways (Inc.), 302 Spokane Savings & Loan Building.
Tacoma — Washington Flying Service (Inc.), route 1, Box 73-B.

West Virginia:

Huntington — Shank & Bevins Flying School, 740 Sixth Avenue.

Wisconsin:

Appleton — North American Airways Co.

Kenosha — Wisconsin Air Lines (Inc.).

Lake Geneva — Lake Geneva Flying Boat Service (in summer).

Madison — Royal Airways Corporation, 116 East Washington Avenue.

Marshfield — Ski-Hi Airways (Inc.).

Milwaukee —

Holterhoff Flying Service (Inc.), route 2, Box 163 (Green Bay Road), North Milwaukee.

Midwest Airways (Inc.), 1524 Galena Street.

Milwaukee Air Transit (Inc.), 820 Forty-eighth Street.

Weeks Aircraft Corporation, 999 Third Street.

Wisconsin Aviation Service, 3005 Plankinton Arcade.

Racine —

Air City Airways (Inc.), Arcade Building.

Air City Flying School, Air City Flying Field.

Wyoming:

Casper — Wyoming Airways Corporation, P. O. Box 1112.

## ENGINEERS, AERONAUTICAL, CONSULTING

Acre, William R., 28 North Clinton Street, Chicago, Ill.

Aeronautical Engineering Co., 527 Fifth Avenue, New York, N. Y.

Akers Aircraft Manufacturing Co., 1438 West Jackson Boulevard, Chicago, Ill.

American Airports Corporation, 527 Fifth Avenue, New York, N. Y.

Anderson, E. S., Chattsworth, Ga.

Arthur, William E., & Co. (Inc.), 103 Park Avenue, New York, N. Y.

Black, Archibald, 25 Brixton Road, Garden City, L. I., N. Y.

Gazley & La Sha, Hill Building, Washington, D. C.

Kerber, L. V., and F. A. Stalker, 302 Engineering Building, Ann Arbor, Mich.

Klemin, Alexander, New York University, College of Engineering, University Heights, New York, N. Y.

Kneer, Horace C., 538 East Washington Lane, Philadelphia, Pa.

Langley Corporation, 527 Fifth Avenue, New York, N. Y.

Lay, Charles E., Blue Ash (Cincinnati), Ohio.

Loudy, F. E., 14212 Coit Road, Cleveland, Ohio.

Newell, Joseph S., Massachusetts Institute of Technology, Cambridge, Mass.

New York Testing Laboratories, 80 Washington Street, New York, N. Y.

Niles, Alfred S., Leland Stanford University, Calif.

Polachek, Z. H., 70 Wall Street, New York, N. Y.

Shaw, B. Russell, & Co., 1064 Arcade Building, St. Louis, Mo.

Taylor, C. Fayette, Cambridge, Mass.

Van Deventer, H. R. (Inc.), 342 Madison Avenue, New York, N. Y.

Waterhouse, William J., 901 Guaranty Building, 6331 Hollywood Boulevard, Hollywood, Calif.

## INSURANCE, AERONAUTICAL

### UNDERWRITERS

Associated Aviation Underwriters, 54 Stone Street, New York, N. Y.

Barber & Baldwin, 535 Fifth Avenue, New York, N. Y.

McGee, William H., & Co. (Inc.), 11 South William Street, New York, N. Y.

United States Aviation Underwriters, 80 John Street, New York, N. Y.

BROKERS

Adams & Porter, 602 Cotton Exchange Building, Houston, Tex.
Alexander & Alexander, 80 Maiden Lane, New York, N. Y.
Ashley, Egbert F., Co., 19 Main Street West, Rochester, N. Y.
Auer (Inc.), Century Building, Milwaukee, Wis.

Ball, Edward, Agency, 504 Standard Life Building, Pittsburgh, Pa.
Bartholomay Darling Co., 175 West Jackson Boulevard, Chicago, Ill.
Beach, Forman & Co., 25 Central Row, Hartford, Conn.
Brants Co., 207 Petroleum Building, Fort Worth, Tex.
Burkley & Son, 83 South Fourth Street, Columbus, Ohio.

Campbell-Okell & Co., Russ Building, San Francisco, Calif.
Central Bureau, Hartford Connecticut Trust Building, 750 Main Street, Hartford, Conn.
Chappell, J. F. & Co., 172 West Jackson Boulevard, Chicago, Ill.
Coleman & Co., Brady Building, San Antonio, Tex.
Cook, C. E., 42 Elysian Avenue, Nyack, N. Y.
Cornwall & Stevens, 80 John Street, New York, N. Y.
Crowdus, W. C., & Co., 202 South State Street, Chicago, Ill.

Dale & Co., 1311 Metropolitan Building, Toronto, Ontario, Can.
Dunn & Fowler, 42 Beaver Street, New York, N. Y.

Equipment Finance Corporation, 205 West Wacker Drive, Chicago, Ill.

Fisher, D. A., Fisher Building, Memphis, Tenn.
Fox & Pier, 83 Maiden Lane, New York, N. Y.
Fuller & O'Brien, 75 State Street, Albany, N. Y.

Gregg & McKenzie (Inc.), 313 Hanson Street, Monroe, La.
Guarantee Fund Life Association, Eighteenth and Douglas Streets, Omaha, Neb.

Heath Komaiko, 175 West Jackson Boulevard, Chicago, Ill.
Herberick-Hall-Harter, Main and Exchange Streets, Akron, Ohio.
Hinkley & Woods, 40 Broad Street, Boston, Mass.
Hollister Dux Hollister, Sioux Falls, S. Dak.
Home Insurance Co., 59 Maiden Lane, New York, N. Y.

Howe, Paul C., 303 Frances Building, Sioux City, Iowa.
Hutton, A. M., & Sons, Schweiter Building, Wichita, Kan.

Johnson & Higgins, 67 Wall Street, New York, N. Y.
Joyce, William B., & Co., Minneapolis, Minn.

Kelly, D. J., Jr., 219 South Scott Street, South Bend, Ind.
Killson, B. A., & Co., Cotton Exchange Building, Houston, Tex.
Krueger, Fred G., & Co., 1516 Insurance Exchange, Chicago, Ill.

McCormick, W. C., 422 Pine Street, Williamsport, Pa.
Mallette, James E., 61 Main Street, Torrington, Conn.
Marsh & McLennan, 80 Maiden Lane, New York, N. Y.
Martin, F. E., 80 William Street, New York, N. Y.
Michigan Mutual Liability Co., Park Avenue, Detroit, Mich.
Millers National Insurance Co., 18 North Grove Avenue, Elgin, Ill.
Mountain States Agency, Stout at Twelfth Street, Denver, Colo.
Mudd, J. A., 231 South La Salle Street, Chicago, Ill.
Muller, William A., & Co., 35 Kilby Street, Boston, Mass.
Mutual Life Insurance Co. of New York, Nassau, Cedar, Liberty, and William Streets, New York, N. Y.

New York Underwriters Insurance Co., 100 William Street, New York, N. Y.

Parker & Co., Fifth and Walnut Streets, Philadelphia, Pa.
Patterson, Wylde Windeler, 40 Broad Street, Boston, Mass.
Providence Washington Insurance Co., Providence, R. I.

Rathbone, King & Seeley (Inc.), 114 Sansome Street, San Francisco, Calif.

Salvage Adjustment Corporation, 80 Maiden Lane, New York, N. Y.

Ter, Bush & Powell, 423 State Street, Schenectady, N. Y.

Veitch, Shaw & Remsen (Inc.), 45 John Street, New York, N. Y.

Warner & Co., Merchants National Bank Building, Fargo, N. Dak.
Weller Co., 300 Western Building, Mitchell, S. Dak.
Wells & O'Keeffe, First National Bank Building, Fort Wayne, Ind.

Willcox, Peck & Hughes (Inc.), 67 Wall Street, New York, N. Y.
Wood, Henry E., 110 William Street, New York, N. Y.

Zinn, B. F., Insurance Agency, 803 Straus Building, Milwaukee, Wis.

COMPANIES

Indemnity Company of America, 223 Pierce Building, St. Louis, Mo.
Independence Indemnity Co., Independence Building, Philadelphia, Pa.
Independence Insurance Co., Independence Building, Philadelphia, Pa.

Transportation Indemnity Co., 11 South William Street, New York, N. Y.
Transportation Indemnity Co. of New York, South William Street, New York, N. Y.
Transportation Insurance Co., 11 South William Street, New York, N. Y.
Travelers Fire Insurance Co., Hartford, Conn.
Travelers Indemnity Co., Hartford, Conn.
Travelers Insurance Co., Hartford, Conn.

## INVESTIGATIONS, VALUATIONS, AND REPORTS

American Airports Corporation, 527 Fifth Avenue, New York, N. Y.
Aviation Business Bureau (Inc.), 72 Wall Street, New York, N. Y.

Black & Bigelow (Inc.), 551 Fifth Avenue, New York, N. Y.
Bowman & Co., 220 North Fourth Street, St. Louis, Mo.

Durante, A. A., & Co. (Inc.), 117 Liberty Street, New York, N. Y.

Hansel, Charles, Consulting Specialists, Transportation Building, Washington, D. C.
Holmes, E. H., Co., 60 Wall Street, New York, N. Y.

Municipal Service Co., Room 402, City Hall, New Britain, Conn.

## ORGANIZATIONS, AERONAUTICAL

Aeronautical Chamber of Commerce of America (Inc.), 10 East Fortieth Street, New York, N. Y.

Federation Aeronautique Internationale, in care of National Aeronautic Association, 910 Seventeenth Street NW., Washington, D. C.

Daniel Guggenheim Fund for the Promotion of Aeronautics, 598 Madison Avenue, New York, N. Y.

Manufacturers Aircraft Association (Inc.), 300 Madison Avenue, New York, N. Y.

National Advisory Committee for Aeronautics, 3841 Navy Building, Washington, D. C.

National Aeronautic Association of the U. S. A. (Inc.), 910 Seventeenth Street NW., Washington, D. C.

National Airport Association, 916 Ridgely-Farmers Bank Building, Springfield, Ill.

U. S. Air Force Association, 815 Fifteenth Street NW., Washington, D. C.

## AIRPORT STATEMENT

November 4, 1929

| | |
|---|---|
| *Number of airports:* Army, Navy municipal, commercial, Department of Commerce intermediate and marked auxiliary | 1,527 |
| *Number municipal airports* | 446 |
| *Number commercial airports* | 470 |
| *Number Department of Commerce intermediate fields* | 276 |
| *Number Army airdromes* | 68 |
| *Number naval air stations* (including Marine and Coast Guard) | 14 |
| *Number marked auxiliary fields* | 250 |
| *Miscellaneous* | 3 |
| *Number proposed airports* | 1,352 |

## PROPOSED AIRPORTS

Department of Commerce Oct. 15, 1929 (L S) Land and sea

Alabama
- Auburn
- Brewton
- Carbon Hill
- Decatur
- Dothan
- Eufaula
- Eutaw
- Huntsville
- Lockhart
- Monroeville
- Plantersville
- Selma
- Sheffield
- Troy
- Tuscaloosa
- Winfield

Alaska
- Ketchikan

Arizona
- Ajo
- Bisbee
- Florence
- Globe
- Holbrook
- Jerome
- Mesa
- Nogales
- Salome
- St. Johns
- Tempe
- White River
- Winslow

Arkansas
- El Dorado
- Gould
- Jonesboro
- Little Rock
- Prairie Grove
- Russellville
- Stuttgart
- Texarkana
- Warren

California
- Alameda
- Alturas
- Angels Camp
- Atascadero
- Berkeley
- Bieber
- Brentwood
- California Hot Springs
- Calistoga
- Carlsbad
- Cloverdale
- Coachella
- Coalinga
- Covina
- Crescent City
- Dixon
- Eureka
- Fort Bragg
- Fowler
- Garberville

California—*Cont.*
- Gilroy
- Gregg
- Gustine
- King City
- La Jolla
- Long Beach
- Los Angeles
- Lynwood
- Madera
- Marysville
- Merced
- Mill Valley
- Modesto
- Monterey
- Napa
- Newhall
- Newman
- Newport Beach
- Oakdale
- Oakland
- Oroville
- Pacific Grove
- Paso Robles
- Patterson
- Redlands
- Redondo
- Redwood
- Rialto
- Riverside
- Rosemead
- Sacramento
- San Benito
- San Luis Obispo
- Santa Barbara
- Sonora
- Stockton
- Susanville
- Temecula
- Ukiah
- Ventura
- Visalia
- Watsonville
- Westwood
- Woodland
- Zelzah

Colorado
- Akron
- Alamosa
- Craig
- Denver
- Durango
- Fort Morgan
- Grand Junction
- Greeley
- Holly
- Holyoke
- La Junta
- Lamar
- Longmont
- Montrose
- Springfield
- Sugar City
- Telluride
- Trinidad

Connecticut
- Bristol
- Canaan
- Cheshire
- Danbury
- Devon
- Fairfield
- Glastonbury
- Greenwich
- Hampton
- New Haven
- New London
- Norwalk
- Norwich
- South Norwalk
- Stamford
- Stratford
- Waterbury

Delaware
- Wilmington

District of Columbia
- Washington

Florida
- Avon Park
- Bartow
- Bradenton
- Cocoa
- Dunedin
- Eustis
- Fort Myers
- Fort Pierce
- Gainesville
- Lake Jovita
- Lake Placid
- Marianna
- Miami
- Mount Dora
- New Smyrna
- Ocala
- Olympia
- Palm Beach
- Pensacola
- Perry
- Pinellas Park
- Point Washington
- St. Augustine
- St. Petersburg
- Sanford
- Sebring
- Tampa
- Titusville
- Vera Beach
- Winter Haven

Georgia
- Albany
- Americus
- Arlington
- Athens
- Atlanta
- Baxley
- Brunswick
- Carrollton
- Cedartown
- Cordele

Georgia — *Cont.*
- Cuthbert
- Dalton
- Darien
- Fitzgerald
- Gainesville
- Griffin
- Lagrange
- Louisville
- Montezuma
- Moultrie
- Pelham
- Quitman
- Savannah
- Thomasville
- Waycross
- Waynesboro
- West Point

Idaho
- Arco
- Ashton
- Blackfoot
- Boise
- Caldwell
- Centerville
- Challis
- Gooding
- Grangeville
- Hailey
- Idaho Falls
- Lewisville
- Mackey
- Nampa
- Ontario
- Payette
- Rexburg
- Saint Anthony
- Solomon
- Twin Falls
- Wallace

Illinois
- Avon
- Belvidere
- Bloomington
- Bradley
- Carlinville
- Centralia
- Chicago
- Clinton
- Decatur
- Depue
- Dixon
- Downers Grove
- East St. Louis
- Edwardsville
- Elgin
- Evanston
- Freeport
- Galesburg
- Galva
- Granite City
- Griggsville
- Hoopeston
- Jacksonville
- Joliet

Illinois — *Cont.*
- Kankakee
- La Harpe
- Lake City
- La Salle
- Lombard
- Marengo
- Mattoon
- Metropolis
- Moline
- Morris
- Murphysboro
- Olney
- Ottawa
- Paris
- Peoria
- Quincy
- Robinson
- Rockford
- Rock Island
- Salem
- St. Charles
- Shelbyville
- Streator
- Sycamore
- Vandalia
- Waukegan
- Wheaton
- Zion

Indiana
- Anderson
- Bloomington
- Cambridge City
- Columbus
- Connersville
- Culver
- Crawfordsville
- Elkhart
- Elwood
- Evansville
- Fairmont
- French Lick
- Gary
- Goshen
- Greencastle
- Hartford City
- Hebron
- Huntington
- Jasper
- Kokomo
- La Fayette
- La Porte
- Lebanon
- Logansport
- Madison
- Marion
- Martinsville
- Michigan City
- Muncie
- Newcastle
- Plymouth
- Richmond
- Syracuse
- Terre Haute
- Valparaiso

Iowa
- Algona
- Ames
- Audubon
- Boone
- Burlington

Iowa — *Cont.*
- Carroll
- Chariton
- Clarinda
- Clinton
- Council Bluffs
- Cresco
- Creston
- Davenport
- Dodge City
- Eldora
- Estherville
- Fairfield
- Fort Madison
- Keokuk
- Lake View
- Lohrville
- Marshalltown
- Newton
- Parsons
- Sheldon
- Sigourney
- Storm Lake
- Toledo
- Washington
- Winterset

Kansas
- Atchison
- Brewster
- Coffeeville
- Colby
- Concordia
- Ellsworth
- Emporia
- Hays
- Hiawatha
- Holton
- Horton
- Hutchinson
- Lenora
- McCracken
- Oberlin
- Russell
- Salina
- Sharon Springs
- Syracuse
- Topeka
- Wakeeney
- Wichita
- Yates Center

Kentucky
- Bowling Green
- Central City
- Corbin
- Cynthiana
- Diamond Caverns (Glascow Junction)
- Falmouth
- Lawrenceburg
- Lexington
- Louisville
- Mayfield
- Newport
- Paducah
- Williamsburg

Louisiana
- Alexandria
- Bastrop
- Baton Rouge
- Bogalusa

Louisiana — *Cont.*
- Chalmette
- De Ridder
- Franklinton
- Lafayette
- Marrero
- Monroe
- New Iberia
- New Orleans
- Plaquemine
- Ruston
- Shreveport
- Winnfield

Maine
- Bar Harbor
- Calais
- Camden
- Dark Harbor
- East Millinocket
- Farmington
- Fryeburg
- Houlton
- Machias
- Norway
- Rockland
- Rumford
- Waterville
- Wiscasset

Maryland
- Annapolis
- Baltimore
- Bradley Hills
- Cambridge
- Chestertown
- Cumberland
- Frederick
- Frostburg
- Hagerstown
- Hancock
- Laurel

Massachusetts
- Andover
- Beverly
- Cambridge
- Chatham
- Fall River
- Fitchburg
- Gardner
- Gloucester
- Greenfield
- Ipswich
- Lawrence
- Lee
- Leominster
- Lynn
- Manomet
- Mansfield
- Marlboro
- New Bedford
- Newburyport
- North Adams
- Pittsfield
- Plymouth
- Southbridge
- Springfield
- Stoneham
- Waltham
- Watertown
- Whitinsville
- Winchendon
- Worcester

Michigan
- Ahmeek
- Amasa
- Ann Arbor
- Bad Axe
- Battle Creek
- Bay City
- Bessemer
- Beulah
- Big Rapids
- Boyne City
- Cadillac
- Center Line
- Charlotte
- Cheboygan
- Chelsea
- Chippewa
- Crystal Falls
- Detroit
- Detour
- Dowagiac
- Escanaba
- Ewen
- Flint
- Gladstone
- Grand Rapids
- Greenville
- Hancock
- Harbor Springs
- Hermansville
- Holland
- Howell
- Ironwood
- Iron River
- Ishpeming
- Kalamazoo
- Lake Odessa
- L'Anse
- Lapeer
- Manistee
- Manistique
- Marshall
- Muskegon
- Newberry
- Northport
- Norway
- Orchard Lake
- Orion
- Owosso
- Royal Oak
- Sebewaing
- St. Ignace
- St. Joseph
- Tecumseh
- Three Rivers
- Traverse City
- Wakefield
- Wayne

Minnesota
- Alexandria
- Argyle
- Austin
- Bemidji
- Benson
- Crookston
- Detroit Lakes
- Duluth
- Eveleth
- Fairmont
- Faribault
- Grand Marais

Minnesota — *Cont.*
- Hibbing
- Jackson
- Little Falls
- Minneapolis
- Marshall
- Ortonville
- Owatonna
- Rochester
- St. Cloud
- Thief River Falls
- Tracy
- Two Harbors
- Virginia
- Wadena
- West Duluth
- Windom
- Worthington

Mississippi
- Biloxi
- Brookhaven
- Clarksdale
- Columbus
- Durant
- Greenwood
- Gulfport
- Hattiesburg
- Laurel
- McComb
- Natchez
- Picayune
- Tupelo
- Vicksburg
- Water Valley
- Webb
- Woodville
- Yazoo

Missouri
- Butler
- Cape Girardeau
- Carthage
- Chaffee
- Festus
- Hannibal
- Joplin
- Kansas City
- Lebanon
- Louisiana
- Mason
- Moberly
- New Florence
- Poplar Bluff
- Sedalia
- Slater
- Springfield
- St. Charles
- St. Joseph
- Tarkio
- Trenton
- Warrensburg
- Wyaconda

Montana
- Belton
- Billings
- Bozeman
- Butte
- Conrad
- Deer Lodge
- Forsyth
- Glasgow
- Glendive

Montana — *Cont.*
- Great Falls
- Hamilton
- Hardin
- Kalispell
- Polson
- Roundup
- Scobey
- Terry
- West Yellowstone
- Whitefish

Nebraska
- Alliance
- Auburn
- Beatrice
- Bridgeport
- Columbus
- Crete
- Falls City
- Fremont
- Hawthorne
- Kearney
- Keene
- Lincoln
- McCook
- Nebraska City
- Oakland
- Omaha
- Plattsmouth
- Scottsbluff
- Sidney
- Superior
- Valentine
- York

Nevada
- Round Mountain
- Tonopah

New Hampshire
- Berlin
- Conway
- Dover
- Deerfield
- Hillsboro
- Kearsarge
- Lancaster
- Littleton
- Middletown
- Milford
- Nashua
- Newport
- Peterboro
- Rochester
- Wolfeboro

New Jersey
- Atlantic City
- Avalon
- Bridgeton
- Burlington
- Camden
- Cape May
- Dunellen
- Elizabeth
- Fortescue
- Hackensack
- Hackettstown
- Jersey City
- Linden
- Long Branch
- Lyons
- Millville

New Jersey — *Cont.*
- Morristown
- Mount Holly
- Newark
- New Brunswick
- Paterson
- Perth Amboy
- Pinewald
- Pleasantville
- Short Hills
- Trenton
- Union City
- Ventnor City
- Washington
- Westfield
- York

New Mexico
- Belen
- Clovis
- Elephant Butte
- Las Vegas
- Raton
- Roswell

New York
- Amsterdam
- Angola
- Athens
- Auburn
- Avoca
- Ballston Spa
- Binghamton
- Broadalbin
- Bronxville
- Brooklyn
- Callicoon
- Canandaigua
- Canastota
- Canton
- Catskill
- Chatham
- Chenango Bridge
- Cohoes
- Cortland
- De Ruyter
- Dolgeville
- Elmira
- Far Rockaway
- Flushing
- Fulton
- Geneseo
- Gloversville
- Goshen
- Greenville
- Hamburg
- Hamilton
- Hartfield
- Hicksville
- Hinsdale
- Hornell
- Hudson
- Huntington
- Ilion
- Islip
- Ithaca
- Jamaica Bay
- Jamestown
- Jay
- Keane
- Kingston
- Lake George
- Lawrence

New York — *Cont.*
- Liberty
- Malone
- Middleburgh
- Middletown
- Mineville
- Newark
- Newburgh
- New York City
- Niagara
- North Beach
- North Tonawanda
- Ogdensburg
- Olean
- Oneonta
- Oswego
- Owego
- Perry (L S)
- Plattsburg
- Port Jervis
- Poughkeepsie
- Richfield Springs
- Rosedale
- Sayville
- Schoharie
- Silver Creek
- Staten Island
- Tarrytown
- Troy
- Tupper Lake
- Warwick
- Watkins Glen
- Westfield
- Westport
- Whitehall
- White Plains
- Williamson

North Carolina
- Asheville
- Burlington
- Charlotte
- Cliffside
- Durham
- Fayetteville
- Hendersonville
- Hickory
- High Point
- Kannapolis
- Lenoir
- Marion
- Oxford
- Rich Square
- Rocky Mount
- Salisbury
- Sanford
- Wilson

North Dakota
- Adams
- Bismarck
- Crosby
- Devils Lake
- Finley
- Hettinger
- Jamestown
- Mandan
- New Rockford
- Oakes
- Van Hook
- Valley City
- Washburn

Ohio
Alliance
Ashland
Barnesville
Bellevue
Blanchester
Bridgeport
Bucyrus
Cambridge
Canton
Cincinnati
Colton
Coshocton
Crestline
Dayton
Delphos
Dennison
Denver
East Liverpool
Findlay
Fostoria
Galion
Greenville
Hamilton
Highland
Hudson
Ironton
Kent
Lancaster
Lebanon
Lima
Lisbon
Mansfield
Marietta
Marion
Massillon
Metropolis
Middlefield
Middletown
Mount Healthy
Newark
Niles
Norwalk
Oberlin
Osborn
Painesville
Perry
Piqua
Put in Bay
Salem
Sandusky
Shelby
Sterling
Steubenville
Sidney
Tiffin
Warren
Washington
Wellsville
Willoughby

Oklahoma
Ada
Afton
Alva
Blackwell
Cherokee
Chickasha
Claremore
Cleveland
Cordell
Durant

Oklahoma — *Cont.*
Frederick
Holdenville
Lindsay
McAlester
Oklahoma City
Pawhuska
Pawnee
Ponca City
Row
Sayre
Seminole
Shattuck
Stillwater
Tonkawa
Vinita
Wewoka
Woodward
Yale

Oregon
Albany
Astoria
Bandon
Bend
Burns
Canyon City
Cottage Grove
Dalles
Grants Pass
Hillsboro
Hood River
Klamath Falls
Marshfield
Medford
Newberg
Ontario
Oregon City
Portland
Redmond
Salem
Scappoose
Tillamook
Westimber
Wolfcreek

Pennsylvania
Altoona
Ambridge
Barrett Township
Beaver Falls
Bloomsburg
Brownsville
Bradford
Butler
Cambridge Springs
Carlisle
Chester
Clairton
Clarendon
Clearfield
Coatesville
Conyngham
Corry
Danville
Duncansville
Eagle Pass
Easton
East Stroudsburg
Erie
Farrell

Pennsylvania—*Cont.*
Franklin
Greensburg
Grove City
Hanover
Harrisburg
Hazleton
Hollidaysburg
Huntingdon
Indiana
Jeannette
Johnstown
Kane
Kittanning
Lancaster
Lansford
Lebanon
Lewistown
Matamoras
McClure
McKees Rocks
Mercer County
Meyersdale
Milford
Milroy
Montrose
Mount Carmel
New Castle
New Kensington
Norristown
Oil City
Paoli
Pettys Island
Philadelphia
Philipsburg
Pittsburg
Pittston
Pottstown
Reading
Scranton
Sellersville
Sharon
Shenandoah
Stroudsburg
Warren
Washington
Waynesboro
Waynesburg
Wilkes-Barre
Williamsport
York

Rhode Island
Providence

South Carolina
Aiken
Anderson
Andrews
Beaufort
Charleston
Columbia
Denmark
Florence
Georgetown
Greenville
Greenwood
Hartsville
Myrtle Beach
Orangeburg
Rock Hill
Tillman

South Dakota
Florence
Gregory
Hot Springs
Huron
Lake Preston
Lead
Lemmon
Madison
Mitchell
Newell
Redfield
Sioux Falls
Webster
Winner
Yankton

Tennessee
Clarksville
Chattanooga
Dyersburg
Elizabeth
Fayetteville
Jackson
Jellico
Johnson City
Kingsport
Knox
Martin
Murfreesboro
Nashville
Trenton

Texas
Amarillo
Albany
Alice
Artesia
Austin
Bay City
Bonham
Brady
Brownwood
Brownfield
Cameron
Center
Cisco
Clarendon
Clebourne
Corsicana
Crosbyton
Dalhart
Denison
Denton
Eagle Pass
Eastland
Easton
Edinburgh
Ennis
Fort Stockton
Galveston
Graham
Hamilton
Henderson
Honey Grove
Jefferson
Kerrville
Lamesa
Longview
Lubbock
Lufkin
McAllen
McCamey

Texas — *Cont.*
- Marlin
- Marshall
- Mason
- Menard
- Mercedes
- Midlothian
- Mineola
- Mount Pleasant
- Odessa
- Orange
- Paris
- Palestine
- Post
- Quanah
- San Diego
- Saint Jo
- Shamrock
- Sherman
- Stamford
- Texarkana
- Texon
- Timpson
- Tulia
- Tyler
- Vernon
- West
- Winters
- Yoakum

Utah
- Cedar City
- Duchesne
- Logan
- Myton
- Provo
- Roosevelt
- Vernal

Vermont
- Barre
- Bellows Falls
- Bennington
- Brattleboro
- Montpelier
- Pownal
- St. Albans
- St. Johnsbury

Vermont — *Cont.*
- Wells River
- White River Junction
- Windsor

Virginia
- Abingdon
- Appomattox
- Blacksburg
- Blackstone
- Brookneal
- Buena Vista
- Charlotte
- Charlottesville
- Chilhowie
- Culpeper
- Danville
- Ewing
- Fairfax
- Farmville
- Franklin
- Front Royal
- Galax
- Grottoes
- Hampton
- Harrisonburg
- Hopewell
- Lexington
- Luray
- Lynchburg
- Manassas
- Mount Jackson
- New Market
- Newport News
- Norfolk
- Petersburg
- Staunton
- Vienna
- Warrenton
- Winchester

Washington
- Bellingham
- Blaine
- Chehalis
- Cle Elum
- Ellensburg

Washington — *Cont.*
- Enumclaw
- Ephrata
- Ilwaco
- Ione
- Kelso
- Kennewick
- Lind
- Longview
- Low Divide
- Oak Harbor
- Pierce County
- Port Townsend
- Pullman
- Raymond
- Shelton
- Spokane
- State College
- Tacoma
- Walla Walla
- White Bluffs
- Yakima

West Virginia
- Bluefield
- Charleston
- Clarksburg
- Elkins
- Fairmont
- Glenville
- Huntington
- Keyser
- Levels
- Martinsburg
- Morgantown
- Moundsville
- Parkersburg
- Princeton
- Terra Alta
- Thomas
- Weston

Wisconsin
- Antigo
- Appleton
- Beaver Dam
- Black River Falls
- Boscobel

Wisconsin — *Cont.*
- Chippewa Falls
- Clintonville
- Delavan
- Ephraim
- Fond du Lac
- Fort Atkinson
- Green Lake
- Green Bay
- Horicon
- Janesville
- Kenosha
- Kewaunee
- La Crosse
- Lake Geneva
- Madison
- Marshfield
- Menomonie
- Milwaukee
- Monroe
- Phelps
- Princeton
- Racine
- Reedsburg
- Rhinelander
- Shawano
- Sheboygan
- Superior
- Waukesha
- Watertown
- Williams Bay

Wyoming
- Basin
- Cody
- Dubois
- Greybull
- Lander
- Osage
- Powell
- Rawlins
- Riverton
- Rock Springs
- Sheridan
- Thermopolis

## Aviation's Increasing Usefulness to Business

(Department of Commerce Report, August, 1929)

| *Item* | *December 31, 1926* | *December 31, 1927* | *December 31, 1928* | *July 1, 1929, six-month period* |
|---|---|---|---|---|
| Air Transport | | | | |
| Airplane miles flown | 4,318,087 | 5,870,489 | 9,888,307 | 8,000,000 |
| Airplane miles flown, daily average | 11,830 | 16,083 | 26,606 | 70,000 |
| Miles of airways | 8,404 | 9,121 | 16,667 | 30,000 |
| Miles of lighted airways | 2,041 | 4,468 | 6,988 | 10,000 |
| Passengers carried for hire | 5,782 | 8,679 | 33,414 | 40,000 |
| Express and freight carried (pounds) | 1,733,090 | 2,263,580 | 1,847,836 | 1,200,000 |
| Total mail carried (pounds) | 810,855 | 1,654,165 | 4,061,210 | 3,400,000 |
| Number of transport operators | 14 | 19 | 37 | 45 |
| Airplanes in service | 69 | 128 | 268 | 400 |
| Miscellaneous | | | | |
| Airplane miles flown (not including airway operations) | 18,746,640 | 30,000,000 | 60,000,000 | |
| Pilots licensed or pending | 0 | 3,242 | 5,605 | 6,835 |
| Student pilots permits issued or pending | 0 | 545 | 9,983 | 9,606 |
| Airplanes licensed or pending | 0 | 2,299 | 4,156 | 5,204 |
| Airplanes identified or pending | 0 | 851 | 2,164 | 3,045 |
| Private and commercial airports | | 263 | 391 | 410 |
| Lighted intermediate fields | 92 | 134 | 210 | 282 |
| Municipal airports | | 240 | 412 | 420 |
| Proposed airports | | 422 | 921 | 1,035 |
| Radio communications stations | 17 | 19 | 29 | 34 |
| Weather Bureau airway stations | 12 | 23 | 95 | 125 |
| Value of airplanes produced | $8,871,027 | $14,504,999 | $43,812,318 | |
| Total value of all air products produced | $17,694,905 | $21,161,853 | $64,662,491 | |
| Number of concerns engaged in air industry | 600 | 900 | 1,400 | 1,950 |
| Approved models of airplanes | 0 | 21 | 96 | 170 |
| Approved models of airplane engines | 0 | 0 | 13 | 25 |
| Number of aeronautic schools | 175 | 375 | 475 | 575 |

### AMERICA TAKES THE LEAD

In 1928, American transport planes flying on scheduled routes established a mileage record of approximately 10,500,000 miles, a figure 50 per cent in advance of Germany. In America, freight, express, and mail carried totaled more than 6,000,000 pounds; in Germany, the total was approximately 5,200,000 pounds. In passenger carrying, Germany led almost three to one.

The detailed story of our next competitor is on the following page.

STATISTICS OF GERMAN AIR SERVICE, 1928

| Period | | *Number of routes* | *Flights scheduled* | *Flights completed* | *Regularity* | *Mileage flown* | *Passengers carried* | *Cabin places sold, percentage* | *Freight, etc., carried, pounds* | *Mail carried, pounds* |
|---|---|---|---|---|---|---|---|---|---|---|
| January | Winter schedule | 28 | 1,247 | 887 | 71.1 | 231,096 | 2,369 | 28.8 | 104,889 | 5,818 |
| February | | 35 | 1,559 | 1,177 | 75.5 | 227,828 | 3,165 | 32.3 | 140,750 | 7,899 |
| March | | 35 | 1,814 | 1,642 | 90.5 | 364,481 | 6,477 | 48.6 | 250,149 | 12,672 |
| April 1 to 22 | | 35 | 1,178 | 1,041 | 88.4 | 237,743 | 4,610 | 55.1 | 177,119 | 6,482 |
| April 23 to 30 | Summer schedule | 60 | 760 | 718 | 94.5 | 161,784 | 2,454 | 43.5 | 106,556 | 16,859 |
| May | | 79 | 3,875 | 3,701 | 95.5 | 802,181 | 12,904 | 47.2 | 548,880 | 104,797 |
| June | | 89 | 4,157 | 4,047 | 97.4 | 860,799 | 13,898 | 45.8 | 619,547 | 117,528 |
| July | | 100 | 4,659 | 4,521 | 97.0 | 954,298 | 10,711 | 59.0 | 710,381 | 140,525 |
| August | | 100 | 4,851 | 4,664 | 96.1 | 997,180 | 21,949 | 61.7 | 791,141 | 142,756 |
| September | | 94 | 3,553 | 3,428 | 96.5 | 723,448 | 13,723 | 53.8 | 511,185 | 86,983 |
| October 1 to 14 | | 51 | 1,213 | 1,158 | 95.5 | 258,732 | 4,075 | 29.5 | 173,848 | 28,133 |
| October 15 to 31 | Winter schedule | 31 | 881 | 756 | 85.8 | 204,900 | 2,976 | 43.0 | 170,787 | 17,015 |
| November | | 29 | 744 | 539 | 72.4 | 164,650 | 1,900 | 30.9 | 151,755 | 9,101 |
| December | | 14 | 530 | 260 | 49.1 | 103,328 | 904 | 16.8 | 70,610 | 3,589 |
| Year................ | | ... | 31,021 | 28,539 | 92.0 | 6,292,448 | 102,115 | 51.3 | 4,527,597 | 700,157 |

## How the World Flies

(Scheduled Air Transport)

*Compiled by Black & Bigelow, Inc.*

| Country of Registry | 1919 | 1920 | 1921 | 1922 | 1923 | 1924 | 1925 | 1926 | 1927 | 1928 |
|---|---|---|---|---|---|---|---|---|---|---|
| Australia | ...... | ...... | ........ | ........ | 235,582 | 262,895 | 352,847 | 417,946 | 772,643 | 1,492,200 |
| Austria | ...... | ...... | ........ | ........ | ........ | ........ | ........ | ........ | 245,043 | 383,000 |
| Belgium | ...... | ...... | ........ | ........ | ........ | 160,000 | 144,000 | ........ | ........ | ........ |
| Canada | ...... | ...... | ........ | ........ | ........ | 294,778 | 446,648 | 631,715 | ........ | ........ |
| Colombia | ...... | 2,687 | 53,650 | 125,678 | 184,375 | 169,500 | 183,206 | ........ | ........ | ........ |
| Czechoslovakia | ...... | ...... | ........ | ........ | ........ | 126,400 | 48,300 | 170,895 | 257,888 | ........ |
| Denmark | ...... | ...... | ........ | ........ | 56,000 | ........ | 114,500 | 126,730 | 116,798 | ........ |
| France | ...... | 505,500 | 1,460,000 | 2,015,000 | 2,115,000 | 2,249,000 | 2,946,000 | 3,243,900 | 3,755,369 | 4,666,137 |
| Germany | ...... | ...... | ........ | 842,986 | 885,881 | 1,860,000 | 3,070,000 | 3,816,144 | 5,921,593 | 6,303,150 |
| Great Britain | 168,000 | 599,000 | 259,000 | 778,000 | 1,004,000 | 890,000 | 865,000 | 840,000 | 873,000 | 1,135,000 |
| Italy | ...... | ...... | ........ | ........ | ........ | ........ | ........ | ........ | 824,474 | 1,237,000 |
| Mexico | ...... | ...... | ........ | ........ | ........ | ........ | ........ | 96,800 | 146,400 | ........ |
| Netherlands | ...... | 50,850 | 217,000 | 246,200 | 336,000 | 482,800 | 679,753 | 597,500 | 813,510 | 627,793 |
| Poland | ...... | ...... | ........ | 66,293 | 142,057 | 233,823 | 465,847 | ........ | 654,873 | 780,000 |
| Soviet Russia | ...... | ...... | ........ | ........ | ........ | 288,600 | 292,595 | 311,000 | ........ | ........ |
| Sweden | ...... | ...... | ........ | ........ | ........ | 69,280 | 248,610 | 222,000 | 206,766 | 208,418 |
| Switzerland | ...... | ...... | ........ | ........ | ........ | 268,400 | 87,427 | 210,340 | 459,720 | 117,000 |
| United States | 393,066 | 880,028 | 1,828,954 | 2,329,296 | 1,743,030 | 2,220,761 | 2,910,611 | 4,407,263 | 6,009,226 | 10,472,000 |
| | | | | | | 9,576,237 | 12,855,344 | 15,092,233 | 20,284,660 | 28,421,398 |

## AIR PASSENGERS IN 1928

### Transport Lines

(Aeronautical Chamber of Commerce Estimate)

| | | | |
|---|---|---|---|
| Germany ....... | 111,000 | Sweden ......... | 14,948 |
| United States .... | 52,934 | Poland ......... | 7,911 |
| England ........ | 29,500 | Austria ......... | 5,477 |
| France ......... | 21,963 | Finland ......... | 3,201 |
| Netherlands ..... | 17,165 | Switzerland ..... | 2,090 |
| Italy ........... | 15,590 | | |

## SHRINKING THE BUSINESS MAP

Aviation's service in speeding business in the western hemisphere is revealed by comparison of land and water travel with hours of air travel.

In the following table daylight flight, night and day flight as of today's speed, and the two-hundred-mile speed of tomorrow enter into the commutation.

| *Washington, D. C., to* | *Hours, surface transportation* | *Miles, great circle course* | *Hours by air, assuming 10 hours flying per day, average speed 100 MPH.* | *Hours by air, assuming continuous flight at average speed 100 MPH.* | *Hours by air, assuming continuous flight at average speed 200 MPH.* |
|---|---|---|---|---|---|
| Mexico City........... | 94 | 1920 | 33.2 | 19.2 | 9.6 |
| Tegucigalpa........... | 303 | 1840 | 32.4 | 18.4 | 9.2 |
| Managua............... | 558 | 1950 | 33.5 | 19.5 | 9.8 |
| Panama City........... | 153 | 2075 | 48.8 | 20.8 | 10.4 |
| Havana................ | 42 | 1140 | 25.4 | 11.4 | 5.7 |
| Port au Prince......... | 114 | 1425 | 28.3 | 14.3 | 7.2 |
| Bogota................ | 216 | 2375 | 51.8 | 23.8 | 11.9 |
| Caracas............... | 197 | 2065 | 48.7 | 20.7 | 10.4 |
| Rio de Janeiro......... | 318 | 4775 | 103.8 | 47.8 | 23.9 |
| Montevideo............ | 414 | 5250 | 122.5 | 52.5 | 26.3 |
| Buenos Aires.......... | 426 | 5200 | 122.0 | 52.0 | 26.0 |
| Santiago, Chile........ | 507 | 5020 | 120.2 | 50.2 | 25.1 |
| Lima.................. | 288 | 3550 | 77.5 | 35.5 | 17.8 |

FOREIGN STATISTICS OF CIVIL AIR TRANSPORTATION

(From the Department of Commerce, September, 1929)

| Country | Year | Miles of air lines in operation | Passengers carried (regular service) | Pounds of mail and express carried (regular service) | Number of aircraft employed in regular service | Total number of civil aircraft | Estimated production of civil aircraft |
|---|---|---|---|---|---|---|---|
| Australia | 1927 | 3,605 | 28,962 | 141,755 | 34 | 120 | ..... |
| Austria | 1928 | 1,137 | 5,477 | 229,821 | 9 | 30 | ..... |
| Belgium | 1928 | 370 | 1,543 | 40,516 | 10 | 14 | ..... |
| Belgian Congo | 1928 | 2,195 | 735 | 124,822 | 33 | ..... | ..... |
| Bolivia | 1928 | 2,130 | 2,963 | 128,671 | 8 | 8 | ..... |
| Canada | 1928 | 1,654 | 74,689 | 2,721,313 | ... | 327 | ..... |
| Colombia | 1928 | 1,774 | 2,667 | 530,413 | 15 | 17 | ..... |
| Czechoslovakia | 1928 | 1,379 | 10,965 | 391,145 | 31 | 141 | ..... |
| Denmark | 1928 | 181 | 1,602 | 89,387 | 4 | ..... | ..... |
| Finland | 1928 | 268 | 3,201 | 104,431 | 4 | 9 | ..... |
| France | 1927 | 11,542 | 21,000 | 4,352,280 | 241 | 860 | 1,440[1] |
| Germany | 1928 | 18,540 | 115,000 | 5,412,000 | 190 | 535 | 352 |
| Great Britain | 1927 | 2,322 | 19,935 | 1,318,544 | 15 | 353 | 204 |
| Hungary | 1927 | 373 | 2,293 | 109,251 | 8 | ..... | ..... |
| Italy | 1928 | 5,150 | 15,590 | 549,025 | 54 | 1,000 | 475[1] |
| Japan | 1928 | 1,328 | 270 | 119 | 26 | 108 | ..... |
| Mexico | 1928 | 1,518 | 5,089 | 108,329 | 19 | 83 | ..... |
| Netherlands | 1928 | 2,092 | 17,165 | 1,645,651 | 21 | 30 | ..... |
| Persia | 1927 | 1,095 | 2,800 | 84,537 | 7 | ..... | ..... |
| Peru | 1928 | 2,350 | 517 | 24,000 | 10 | 18 | ..... |
| Poland | 1928 | 1,231 | 6,585 | 548,395 | 20 | 24 | ..... |
| Russia | 1927 | 7,022 | 7,079 | 375,622 | ... | ..... | ..... |
| Spain | 1928 | 730 | 1,027 | 25,617 | 6 | ..... | ..... |
| Sweden | 1928 | 711 | 14,948 | 233,361 | 8 | ..... | ..... |
| Switzerland | 1928 | 2,105 | 14,283 | 342,593 | 19 | 43 | 25[1] |

[1] Military production included.

UNITED STATES AIR-TRANSPORT ROUTES

| | *Airway miles* | *Service* | *Schedule* | *Plane miles scheduled daily* | *Originally commenced* | *Present operator* |
|---|---|---|---|---|---|---|
| Domestic Routes | | | | | | |
| New York to Boston | 219 | ME | 6 times weekly | 375 | July 1, 1926 | Colonial |
| New York to Boston (219 miles) | ..... | P | 6 times weekly | 375 | Apr. 15, 1929 | Colonial |
| St. Louis to Chicago | 268 | ME | Daily | 536 | Apr. 15, 1926 | Robertson |
| St. Louis to Chicago | 251 | MP | Daily | 502 | Aug. 20, 1928 | Robertson |
| St. Louis to Omaha | 401 | MP | Daily | 802 | May 1, 1929 | Robertson |
| Dallas to Chicago | 995 | ME | Nightly | 1,990 | May 2, 1926 | National |
| Kansas City to Chicago (454 miles) | ..... | ME | Daily | 908 | Feb. 1, 1928 | National |
| Wichita to Kansas City (175 miles) | ..... | P | Daily | 350 | ............ | Wichita |
| Tulsa to Ponca City | 76 | ME | Daily | 152 | July 5, 1928 | National |
| Los Angeles to Salt Lake | 664 | MPE | 2 times daily | 2,466 | Apr. 17, 1926 | Western |
| Salt Lake to Pasco | 530 | M | Daily | 1,080 | Apr. 6, 1926 | Varney |
| Oakland to San Jose | 38 | MPE | Daily | 76 | Dec. 3, 1928 | Pacific |
| Los Angeles to Seattle | 1,080 | MPE | Daily | 2,160 | Sept. 15, 1926 | Pacific |
| Los Angeles to San Francisco (378 miles) | ..... | P | 2 times daily | 1,404 | Apr. 14, 1928 | Maddux |
| Los Angeles to San Francisco (378 miles) | ..... | PE | 2 times daily | 1,512 | May 26, 1928 | Western |
| Sacramento to San Francisco (88 miles) | ..... | P | Daily | 176 | ............ | West Coast |
| Portland to Seattle (153 miles) | ..... | PE | Daily | 306 | Mar. 5, 1928 | West Coast |
| San Francisco to Portland (549 miles) | ..... | PE | Daily | 2,442 | Mar. 5, 1928 | West Coast |

| | | | | | | |
|---|---|---|---|---|---|---|
| Chicago to Twin Cities....... | 407 | MPE | 3 times daily | 1,628 | June 7, 1928 | Northwest |
| Milwaukee to Green Bay..... | 120 | MPE | Daily | 240 | Dec. 15, 1928 | Northwest |
| Pittsburgh to Cleveland...... | 121 | MPE | 2 times daily | 484 | Apr. 21, 1927 | Ball |
| Pueblo to Cheyenne.......... | 200 | MPE | Daily | 400 | May 31, 1926 | Western |
| Louisville to Cleveland....... | 345 | MP | 2 times daily | 1,380 | Aug. 1, 1928 | Continental |
| Akron to Cleveland (31 miles) | ..... | M | 6 times weekly | 53 | Nov. 15, 1928 | Continental |
| Chicago to New York........ | 718 | MPE | 2 times daily | 2,852 | July 1, 1919 | National |
| Chicago to Cleveland (313 miles)................. | ..... | P | Daily | 626 | Sept. 15, 1928 | Universal |
| San Francisco to Chicago..... | 2,018 | MPE | Daily | 4,036 | Sept. 8, 1920 | Boeing |
| San Francisco to Chicago via Lincoln (2,029 miles)..... | 573 | MPE | Daily | 3,768 | May 1, 1929 | Boeing |
| Atlanta to New York......... | 769 | M | Daily | 1,538 | May 1, 1928 | Pitcairn |
| Washington, D. C., to New York (201 miles)......... | ..... | M | 6 times weekly | 345 | May 1, 1929 | Pitcairn |
| Washington, D. C., to New York (201 miles)......... | ..... | P | Daily | 402 | June 15, 1928 | United States |
| Cleveland to Albany......... | 445 | MPE | 6 times weekly | 762 | Dec. 17, 1927 | Colonial W'n |
| Cleveland to Buffalo (177 miles)................. | ..... | MPE | 6 times weekly | 303 | May 1, 1929 | Colonial W'n |
| Brownsville to Dallas......... | 546 | MP | Daily | 1,092 | Feb. 6, 1928 | Texas |
| Brownsville to San Antonio (265 miles).............. | ..... | P | Daily | 530 | Mar. 9, 1929 | Texas |
| San Antonio to Fort Worth (281 miles).............. | ..... | P | Daily | 562 | Apr. 1, 1929 | Texas |
| Galveston to Dallas.......... | 308 | M | Daily | 616 | Feb. 6, 1928 | Texas |
| Galveston to Dallas (308 miles)................. | ..... | P | Daily | 616 | Mar. 30, 1929 | Texas |
| Houston to New Orleans...... | 319 | M | Daily | 638 | Jan. 23, 1929 | Gulf |
| New Orleans to Atlanta...... | 483 | MP | Daily | 966 | May 1, 1928 | Gulf |
| Cincinnati to Chicago........ | 272 | MPE | 3 times daily | 1,623 | Dec. 17, 1927 | Embry-Riddle |
| Indianapolis to Chicago (165 miles)................. | ..... | P | 5 times weekly | 239 | Oct. 22, 1928 | Capitol |
| Salt Lake to Great Falls...... | 489 | MP | Daily | 978 | Aug. 1, 1928 | National Parks |
| Salt Lake to Pocatello (147 miles)................. | ..... | MP | Daily | 294 | May 1, 1929 | National Parks |

UNITED STATES AIR-TRANSPORT ROUTES (*Continued*)

| | *Airway miles* | *Service* | *Schedule* | *Plane miles scheduled daily* | *Originally commenced* | *Present operator* |
|---|---|---|---|---|---|---|
| Domestic Routes — *Continued* | | | | | | |
| Chicago to Muskegon to Bay City to Pontiac | 521 | M | Daily | 1,042 | July 17, 1928 | Thompson |
| Cleveland to Bay City (233 miles) | 33 | M | Daily | 466 | Apr. 1, 1929 | Thompson |
| Miami to Atlanta | 622 | M | 6 times weekly | 1,066 | Dec. 1, 1928 | Pitcairn |
| Tampa to Daytona Beach | 129 | M | 6 times weekly | 221 | Apr. 1, 1929 | Pitcairn |
| Atlanta to Chicago | 623 | MP | Daily | 1,246 | Dec. 1, 1928 | Interstate |
| St. Louis to Evansville | 145 | MP | Daily | 290 | Dec. 1, 1928 | Interstate |
| Detroit to Cleveland | 134 | P | 2 times daily | 536 | Sept. 1, 1927 | Stout |
| Detroit to Cleveland (134 miles) | ..... | M | Daily | 268 | May 14, 1929 | Thompson |
| Detroit to Chicago | 252 | P | Daily | 504 | Nov. 1, 1928 | Stout |
| Detroit to Chicago (252 miles) | ..... | E | 6 times weekly | 432 | Feb. 15, 1926 | Ford |
| Detroit to Buffalo | 218 | E | 6 times weekly | 374 | Mar. 28, 1927 | Ford |
| Los Angeles to El Paso | 800 | PE | Daily | 1,600 | Nov. 28, 1927 | Standard |
| Los Angeles to Phoenix (414 miles) | 299 | PE | Daily | 720 | Feb. 10, 1929 | Maddux |
| Los Angeles to Avalon | 32 | PE | 2 times daily | 128 | June —, 1922 | Western |
| Tulsa to Dallas (357 miles) | 327 | P | Daily | 714 | Feb. 11, 1929 | Braniff |
| Tulsa to Oklahoma City (98 miles) | ..... | P | 3 times daily | 588 | June —, 1928 | Braniff |
| Louisville to Indianapolis | 108 | P | 5 days a week | 154 | Oct. 22, 1928 | Capitol |
| Indianapolis to Detroit | 240 | P | 5 days a week | 343 | Oct. 22, 1928 | Capitol |
| El Paso to Dallas | 575 | P | Daily | 991 | Mar. 16, 1929 | Texas |
| Des Moines to Waterloo | 91 | P | 6 times weekly | 156 | Nov. 12, 1928 | Midwest |

| | | | | | | |
|---|---|---|---|---|---|---|
| Tulsa to Wichita | 132 | P | 2 times daily | 528 | ............ | Central |
| Dallas to Tulsa (308 miles) | ..... | PE | Daily | 616 | Apr. 2, 1929 | S. A. F. E. |
| Tulsa to St. Louis | 358 | PE | Daily | 716 | Apr. 2, 1929 | S. A. F. E. |
| Sweetwater to Tulsa (371 miles) | 149 | P | Daily | 742 | June 15, 1929 | S. A. F. E. |
| Tulsa to Kansas City | 215 | PE | Daily | 430 | Apr. 2, 1929 | S. A. F. E. |
| Portland to Spokane (via Walla Walla) | 332 | PE | 3 times weekly | 285 | Apr. 15, 1929 | Mamer A. T. |
| Portland to Spokane (via Yakima) | 291 | PE | 3 times weekly | 275 | Apr. 15, 1929 | Mamer A. T. |
| Kansas City to Twin Cities | 415 | PE | 6 times weekly | 711 | May 6, 1929 | Yellow Cab |
| Los Angeles to Kansas City (1,439 miles) | 1,266 | P | Daily | 2,878 | June 1, 1929 | Western |
| Garden City to Cleveland (1,072 miles) | 759 | P | Daily | 2,144 | June 15, 1929 | Universal |
| | 21,701 | | | 62,365 | | |
| Foreign Routes | | | | | | |
| Seattle to Victoria | 77 | MP | Variable | 66 | Oct. 15, 1920 | Barnes & Gorst |
| Pilottown to New Orleans | 75 | M | Variable | 150 | Apr. 9, 1923 | New Orleans |
| Habana to Miami | 261 | MP | Daily | 522 | Oct. 28, 1927 | Pan American |
| New York to Montreal | 334 | MP | 6 times weekly | 572 | Oct. 1, 1928 | Can Colonial |
| Miami to Nassau | 200 | MP | 3 times weekly | 171 | Jan. 2, 1929 | Pan American |
| Miami to San Juan | 1,445 | M | 3 times weekly | 1,239 | Jan. 9, 1929 | Pan American |
| Cristobal to Miami | 2,074 | M | 3 times weekly | 1,778 | Jan. 11, 1929 | Pan American |
| Brownsville to Mexico City | 472 | M | Daily | 944 | Mar. 9, 1929 | Pan American |
| Mollendo, Peru to Cristobal, Canal Zone | 2,445 | M | Weekly | 1,222 | May 18, 1929 | Pan American |
| Seattle to Vancouver | 143 | P | Daily | 286 | ............ | Commercial |
| Total | 7,526 | | | 6,664 | | |
| Grand total | 29,227 | | | 69,029 | | |

| | |
|---|---|
| Miles of mail airways operating November 1, 1929 | 26,567 |
| Miles of airways operating November 1, 1929 | 36,736 |
| Airplane miles scheduled daily (average) with mail | 51,801 |
| Airplane miles scheduled daily (average) nonmail services | 39,108 |
| Airplane miles scheduled daily (average), all services | 90,909 |

M = Mail. P = Passengers. E = Express.

AIR MAIL OPERATION STATISTICS
(Issued Oct. 15, 1929)

| Domestic Routes | January-June, 1929 (inclusive) Miles of service: Scheduled[1] | Miles of service: Actually flown | Total weight of mails dispatched | Amount paid to contractor | Revenue per scheduled mile | July-December, 1928 (inclusive), revenue per scheduled mile |
|---|---|---|---|---|---|---|
| | | | Pounds | | | |
| 1. Boston-New York | 63,936 | 52,971 | 50,926 | $152,729.87 | $2.39 | $2.06 |
| 2. Chicago-St. Louis | 134,830 | 131,241 | 40,149 | 101,629.45 | .75 | 1.34 |
| 3. Chicago-Dallas (night) | 387,325 | 324,079 | ........ | ........ | ........ | ........ |
| 3. Chicago-Kansas City (day) | 168,418 | 147,302 | 169,903 | 511,031.09 | .92 | .81 |
| 4. Salt Lake City-Los Angeles | 317,699 | 302,417 | 335,159 | 1,005,297.68 | 3.16 | 2.98 |
| 5. Salt Lake City-Pasco | 197,816 | 175,651 | 98,393 | 294,579.04 | 1.49 | 1.38 |
| 8. Seattle-Los Angeles | 388,523 | 375,419 | 114,852 | 325,027.00 | .84 | .76 |
| 9. Chicago-Minneapolis | 328,157 | 299,336 | 65,610 | 180,378.53 | .55 | .87 |
| 11. Cleveland-Pittsburg | 61,867 | 57,199 | 51,545 | 154,610.56 | 2.50 | 2.83 |
| 12. Cheyenne-Pueblo | 79,326 | 77,240 | 45,533 | 37,792.07 | .48 | .46 |
| 16. Cleveland-Louisville | 156,818 | 141,565 | 45,408 | 55,346.62 | .35 | .31 |
| 17. New York-Chicago | 652,309 | 562,651 | 737,304 | 633,058.22 | .97 | .91 |
| 18. Chicago-San Francisco | 1,182,191 | 1,127,724 | 803,496 | 1,632,744.43 | 1.38 | 1.40 |
| 19. New York-Atlanta | 279,512 | 246,316 | 151,136 | 453,405.91 | 1.62 | 1.08 |
| 20. Albany-Cleveland | 157,553 | 134,302 | 49,323 | 54,739.68 | .35 | .35 |
| 21. Dallas-Galveston | 118,638 | 113,888 | 24,551 | 70,948.96 | .60 | .45 |
| 22. Dallas-Brownsville | 180,612 | 173,457 | 40,361 | 116,600.40 | .65 | .65 |
| 23. Atlanta-New Orleans | 161,396 | 150,321 | 40,444 | 70,778.84 | .44 | .26 |
| 24. Chicago-Cincinnati | 101,688 | 92,133 | 35,569 | 52,263.05 | .51 | .43 |
| 25. Atlanta-Miami | 217,860 | 209,613 | 58,482 | 85,384.46 | .39 | .20 |
| 26. Great Falls-Salt Lake City | 203,219 | 177,193 | 29,985 | 74,185.46 | .37 | .37 |
| 27. Bay City-Chicago | 235,995 | 199,280 | 73,881 | 65,754.73 | .28 | .40 |
| 28. St. Louis-Omaha | 49,166 | 45,834 | 8,420 | 6,610.44 | .13 | ........ |
| 29. New Orleans-Houston | 92,510 | 87,438 | 18,883 | 18,883.62 | .20 | ........ |
| 30. Chicago-Atlanta | 283,295 | 258,668 | 49,990 | 38,993.07 | .14 | .13 |
| 31. Chicago Municipal Airport-Grant Park Ramp, Chicago | 135 | 135 | 3,349 | 210.00 | 1.56 | ........ |
| Total | 6,200,794 | 5,664,373 | 3,142,652 | 6,193,083.18 | 1.00 | 1.03 |

AIR MAIL OPERATION STATISTICS (*continued*)

| | January-June, 1929 (inclusive) | | | | | July-December 1928 (inclusive) revenue per scheduled mile |
|---|---|---|---|---|---|---|
| | Miles of service | | Total weight of mail dispatched | Amount paid to contractor | Revenue per scheduled mile | |
| | Scheduled [1] | Actually flown | | | | |
| Total brought forward | 6,200,794 | 5,664,373 | 3,142,652 | 6,193,083.18 | 1.00 | 1.03 |
| Foreign Routes | | | | | | |
| 1. New York-Montreal | 51,916 | 46,476 | [2] | 44,616.96 | [3].48 | [3].48 |
| 2. Seattle-Victoria | 9,856 | 9,856 | [2] | 9,120.00 | [3].93 | [3].93 |
| 3. New Orleans-Pilottown | 31,800 | 31,800 | [2] | 15,900.00 | [3].50 | [3].50 |
| 4. Miami-Habana | 94,482 | 99,180 | [2] | 99,180.00 | [3]1.00 | [3]1.00 |
| 5. Miami-Canal Zone | 178,364 | 178,364 | [2] | 356,728.00 | [3]2.00 | ........ |
| 6. Miami-San Juan | 213,860 | 213,599 | [2] | 425,688.00 | [3]2.00 | ........ |
| 7. Miami-Nassau, Bahamas | 30,800 | 30,400 | [2] | 30,400.00 | [3]1.00 | ........ |
| 8. Brownsville-Mexico City | 106,652 | 105,728 | [2] | 105,728.00 | [3]1.00 | ........ |
| Total | 717,730 | 715,403 | ........ | 1,087,360.96 | [3]1.52 | [3].76 |
| Grand total | 6,918,524 | 6,379,776 | ........ | 7,280,441.14 | 1.05 | 1.02 |

[1] Miles scheduled as estimated by Post Office Department on basis miles of route times trips scheduled. Actual miles flown on regular schedule plus ferry and test mileage amounts to practically the same as scheduled mileage.
[2] Poundage on individual routes not available.
[3] Revenue per mile actually flown used instead of scheduled miles.

AIR TRANSPORT OPERATIONS

(January to June, 1928)

| *Operator* | *Services operated* | *Months operated* | *Miles flown (a)* | *Passengers flown (b)* | *Express, pounds* | *Mail, pounds* | *Mail, payments* |
|---|---|---|---|---|---|---|---|
| Ball................ | Pittsburg-Cleveland | 6 | 39,625 | 80 | *0* | 21,193 | $ 63,578 |
| Boeing.............. | San Francisco-Chicago | 6 | 702,342 | 662 | 11,294 | 313,809 | 655,517 |
| Braniff............. | Tulsa-Ponca City | *x* | *x* | *x* | *x* | *x* | *x* |
| | Tulsa-Oklahoma | *x* | *x* | *x* | *x* | *x* | *x* |
| | Tulsa-Okmulgee | *x* | *x* | *x* | *x* | *x* | *x* |
| Colonial............ | New York-Boston | 6 | 60,578 | 12 | 1,059 | 14,854 | 44,560 |
| Colonial Western..... | Cleveland-Albany (*c*) | 6 | 86,253 | 676 | 84 | 8,811 | 9,780 |
| Embry-Riddle....... | Cincinnati-Chicago | 6 | *p*87,257 | *0* | *x* | 11,944 | 17,559 |
| Ford Motor Co...... | Detroit-Chicago (*d*) | 6 | 161,774 | *0* | 995,846 | 9,078 | 9,765 |
| | Detroit-Buffalo | 6 | *f* | *f* | *f* | *0* | *0* |
| | Detroit-Cleveland | 6 | *f* | *f* | *f* | 1,079 | 1,163 |
| Gulf Air Lines....... | New Orleans-Atlanta | 2 | 60,740 | 107 | *0* | 5,734 | 10,034 |
| Maddux............. | Los Angeles-San Francisco | 2½ | 94,740 | 3,991 | *x* | *0* | *0* |
| Mutual............. | Los Angeles-Oakland | *x* | *x* | *x* | *x* | *0* | *0* |
| National Air Transport | Chicago-New York | 6 | 913,217 | 309 | 27,504 | 282,052 | 332,547 |
| | Dallas-Chicago | 6 | *f* | *f* | *f* | 72,618 | 217,842 |
| National Parks...... | Salt Lake City-Great Falls | 1/30 | *p*493 | *0* | *0* | 5 | 12 |
| New Orleans......... | Pilottown-New Orleans | 6 | 26,340 | *0* | *0* | 37,852 | 18,040 |
| Northwest.......... | Chicago-Twin Cities | 6 | *p*95,064 | *x* | *x* | 20,224 | 55,614 |
| Northwest Air Service | Seattle-Victoria | 6 | *p*11,088 | 185 | *x* | 29,248 | 13,680 |
| Pacific Air Transport | Los Angeles-Seattle | 6 | 318,146 | 484 | 504 | 46,759 | 132,238 |
| Pitcairn............ | Atlanta-New York | 1 | 74,464 | *0* | *0* | 15,817 | 47,451 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pan-American....... | Havana-Key West | 6 | 39,930 | 687 | 1,916 | 159,140 | 64,451 |
| Robertson........... | St. Louis-Chicago | 6 | 70,087 | 182 | *0* | 21,647 | 54,794 |
| Standard............ | Los Angeles-Tucson | 6 | *y*72,230 | *x* | 48 | *0* | *0* |
| Stout Air Service.... | Detroit-Cleveland | 6 | 74,472 | 2,759 | 662 | *0* | *0* |
| Texas Air Transport.. | Laredo-Dallas | 5 | *p*79,324 | *x* | *x* | 12,654 | 36,527 |
| Union.............. | Galveston-Dallas | 5 | *p*84,612 | *x* | *x* | 10,681 | 30,873 |
| | Sacramento-San Francisco | *x* | *x* | *x* | *x* | *0* | *0* |
| | San Francisco-Portland | $3\frac{5}{6}$ | *x* | *x* | *x* | *0* | *0* |
| | Portland-Seattle | $3\frac{5}{6}$ | *x* | *x* | *x* | *0* | *0* |
| United States........ | Washington D. C.-New York | $\frac{1}{2}$ | *x* | *x* | *x* | *0* | *0* |
| Varney............. | Salt Lake City-Pasco | 6 | 175,640 | *0* | *0* | 39,625 | 118,865 |
| Western Air Express | Los Angeles-Salt Lake City | 6 | 374,820 | 862 | 6,134 | 125,882 | 377,644 |
| | Los Angeles-San Francisco | 1 | *f* | *f* | *f* | *0* | *0* |
| | Pueblo-Cheyenne | 6 | *f* | *f* | *f* | 20,263 | 16,819 |
| | Wilmington-Avalon | 6 | *f* | *f* | *f* | *0* | *0* |
| Wichita Air Service Provision Co. ..... | Kansas City-Wichita | *x* | *x* | *x* | *x* | *0* | *0* |
| | | | 3,703,236 | 10,996 | 1,045,051 | 1,280,698 | $2,329,341 |

*a.* Miles flown scheduled trips only. In this period (no data reported) transport operators conducted air service operations and flew an unknown number of airplane miles. In ferry and test (no data reported) additional miles were flown.

*b.* Scheduled trips only. Fourteen lines of operators reporting carried passengers at an average fare of 11 to 12 cents a passenger-mile. In addition to the passengers carried as shown in the above table, 2,693 others were flown on scheduled trips free, so far as reported. Passengers flown in air service operations by these transport operators totaled (no data reported).

*c.* Cleveland-Buffalo only for first 5 months.
*d.* Discontinued July 16 as mail route.
*e.* Discontinued July 19, entirely.
*f.* Included in total of operator.
*0.* None flown, or paid for, according to heading.
*p.* Post-office data.
*x.* No data.
*y.* Calculated from reported number of trips completed.

AIR TRANSPORT OPERATIONS, 1928

(July to December)

| *Operator* | *Service operated* | *Months operated* | *Miles flown (a)* | *Passengers flown (b)* | *Express, pounds* | *Mail, pounds* | *Mail, payments* |
|---|---|---|---|---|---|---|---|
| Ball | Pittsburg-Cleveland | 6 | 42,436 | 57 | 2,146 | 45,624 | $ 139,874 |
| Barnes & Gorst | Seattle-Victoria | 6 | 11,627*p* | *x* | *x* | 29,595 | 10,759 |
| Boeing | San Francisco-Chicago (*k*) | 6 | 1,065,962 | 1,100 | 12,786 | 672,355 | 1,360,979 |
| Braniff | Tulsa-Ponca City | 6 | *x* | *x* | *x* | None | None |
| | Tulsa-Oklahoma | 6 | *x* | *x* | *x* | None | None |
| | Tulsa-Okmulgee | 6 | *x* | *x* | *x* | None | None |
| Canadian Colonial | New York-Montreal | 3 | 40,806 | 119 | *x* | 32,103 | 23,061 *c* |
| Capitol Airway | Detroit-Fort Worth-Louisville | *x* | *x* | *x* | *x* | None | None |
| Colonial | New York-Boston | 6 | 60,549 | 84 | 891 | 40,889 | 122,407 |
| Colonial Western | Cleveland-Albany | 6 | 118,594 | 174 | 188 | 44,177 | 49,035 |
| Commercial | Seattle-Vancouver | *x* | 3,500 | 48 | *x* | None | None |
| Continental | Louisville-Cleveland | 5 | 108,535 | 27 | None | 27,616 | 33,690 |
| Embry-Riddle | Cincinnati-Chicago | 6 | 93,086 | 169 | 672 | 29,154 | 42,843 |
| Ford Motor Co. | Detroit-Chicago | 16 days | 121,341 | None | 635,666 | 680 | 735 |
| | Detroit-Cleveland | 19 days | *f* | None | *f* | 91 | 96 |
| | Detroit-Buffalo | 6 | *f* | None | *f* | None | None |
| Interstate | Atlanta-Chicago | 1 | 46,993 | 127 | None | 8,850 | 6,900 |
| Jefferson | Rochester-Twin City | *x* | *x* | *x* | *x* | None | None |
| Maddux | Los Angeles-San Francisco | 6 | 272,256 | 6,255 | *x* | None | None |
| | Agua California-South Dakota | 5 | *f* | *f* | *x* | None | None |
| | South Dakota-Palm Springs | 1½ | *f* | *f* | *x* | None | None |
| | South Dakota-Los Angeles | 6 | *f* | *f* | *x* | None | None |
| Midwest | Waterloo-Des Moines | ½ | 4,600 | 68 | 35 | None | None |
| Mutual | Los Angeles-Oakland | 6 | 106,175 | 61 | 95,135 | None | None |
| National | Chicago-New York | 6 | 1,179,385 | 525 | 40,686 | 626,376 | 577,972 |
| | Dallas-Chicago | 6 | *f* | *f* | *f* | 153,418 | 460,251 |
| National Parks | Salt Lake City-Great Falls | 5 | 164,831 | 450 | *x* | 23,871 | 59,082 |
| New Orleans | Pilottown-New Orleans | 6 | 34,270 | None | None | 43,124 | 15,509 |
| Northwest | Chicago-Twin City | 6 | 159,320*p* | *x* | *x* | 50,846 | 139,910 |
| | Milwaukee-Green Bay | ½ | *f* | *x* | *x* | *f* | *f* |
| Northern | Chicago-Twin City | 6 | *x* | *x* | *x* | None | None |
| | Twin City-Fargo | 5 | *x* | *x* | *x* | None | None |
| | Twin City-Duluth | 5 | *x* | *x* | *x* | None | None |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pacific | Los Angeles-Seattle (*h*) | 6 | 329,603 | 894 | 2,792 | 90,858 | 257,369 |
| Pan-American | Havana-Miami | 6 | 79,780 | 475 | 4,324 | 186,586 | 81,912*e* |
| Pitcairn | Atlanta-New York | 6 | 262,369 | None | None | 90,737 | 272,207 |
| | Miami-Atlanta | 1 | *f* | None | None | 4,841 | 6,994 |
| Rankin | Portland-Yakima | *x* | *x* | *x* | *x* | None | None |
| Robertson | St. Louis-Chicago | 6 | 79,230*p* | *x* | *x* | 41,842 | 105,909 |
| Royal | Chicago-Madison | *x* | *x* | *x* | *x* | None | None |
| Saint Tammany | New Orleans-Atlanta | 6 | 146,959 | 242 | *x* | 21,943 | 38,399 |
| Standard | Los Angeles-Tucson | 6 | *x* | *x* | *x* | None | None |
| Spokane | *x* | *x* | 10,800 | 218 | *x* | None | None |
| Stout | Detroit-Chicago | 2 | *x* | *x* | *x* | None | None |
| | Detroit-Cleveland | 6 | *x* | *x* | *x* | None | None |
| Texas | San Antonio-Dallas | 6 | 275,376 | *x* | None | 30,188 | 87,243 |
| | Galveston-Dallas | 6 | *f* | *x* | None | 18,534 | 53,560 |
| Thompson | Chicago-Pontiac | 5½ | 166,876 | *x* | None | 70,166 | 62,447 |
| Union | Sacramento-San Francisco | *x* | *x* | *x* | *x* | None | None |
| West Coast | San Francisco-Portland | 6 | 135,182 | 3,026 | *x* | None | None |
| | Portland-Seattle | 6 | *f* | *f* | *x* | None | None |
| United States | Washington D. C.-New York | 6 | 27,200 | 238 | None | None | None |
| Universal | Chicago-Cleveland | 3½ | *x* | *x* | *x* | None | None |
| Varney | Salt Lake City-Pasco | 6 | 184,465 | *x* | *x* | 93,451 | 280,352*d* |
| Western Air | Los Angeles-Salt Lake City | 6 | 575,732 | 4,614 | 7,464 | 260,043 | 779,010 |
| | Pueblo-Cheyenne | 6 | *f* | *f* | *f* | 42,554 | 35,320 |
| | Los Angeles-San Francisco | 6 | *f* | *f* | *f* | None | None |
| | Los Angeles-Avalon | 6 | *f* | *f* | *f* | None | None |
| Wichita Air Service | Kansas City-Wichita | *x* | *x* | *x* | *x* | None | *x* |
| | | | 5,907,838 | 18,971 | 802,785 | 2,780,512 | 5,103,825 |

*a.* Miles flown scheduled trips only. In this period (no data reported) transport operators conducted air service operations and flew an unknown number of airplane miles. In ferry and test (no data reported) additional miles were flown.

*b.* Scheduled trips only. Thirty lines of operators reporting carried passengers at an average fare of 11 cents a passenger-mile. In addition to the passengers carried as shown in the above table, (unknown) others were flown on scheduled trips free. So far as reported passengers flown in air service operations by those transport operators totaled (unknown).

*c.* Operator reports $18,085 additional received from other mail sources than U. S. Government.

*d.* Operator reports $281,186.

*p.* Post Office estimate on mail-miles only.

*e.* Operator reports $26,489 additional received from other mail sources than U. S. Government.

*g.* Includes Toledo-Detroit and Tulsa-Ponca City feeders.

*h.* Includes San Francisco-San Jose feeder.

*k.* Includes Lincoln section.

*x.* Unknown.

### Some Light on Operating Costs

| | *1926* | *1927* | *1928* |
|---|---|---|---|
| Mail income to contractors | $765,549d | $2,643,454d | $7,433,166 |
| Average mail income per scheduled trip | $590 | $1,307 | $1,979 |
| Average mail load per scheduled trip, pounds | 182 | 545 | 973 |
| Average income per pound of contract mail | 2.03 | 2.08 | 1.83 |
| Average mail income per contract mile flown | .39 | .625 | .94 |
| Average passenger-mile rate | .12 | .106 | .11 |
| Average airplane-mile cost | .......... | .671 | .659 |

NOTE.—Cost figures above are based on reports, variously, from 50 to 90 per cent of the operators. In some instances also it was chiefly the more profitable operating concerns, and those having the heaviest traffic and therefore lowest unit costs, which reported.

### Growth of Air-Mail Routes in the United States in Miles

| *Date* | *Miles* | *Station stops* |
|---|---|---|
| December 31, 1918 | 218 | 2 |
| December 31, 1919 | 930 | 6 |
| December 31, 1920 | 3,727 | 20 |
| June 30, 1921 | 3,509 | 19 |
| December 31, 1922 | 2,738 | 16 |
| March 31, 1923 | 2,842 | 17 |
| June 30, 1924 | 3,073 | 20 |
| December 31, 1925 | 2,813 | 18 |
| November 30, 1926 | 8,528 | 56 |
| December 31, 1927 | 8,223 | 54 |
| December 31, 1928 | 17,890 | 101 |

AIR-MAIL INCOME PER MILE

| Post office Route number | Route | July to December 1928 per mile | July to December 1927 per mile |
|---|---|---|---|
| CAM | | | |
| 1 | Boston-New York | $2.063 | $0.726 |
| 2 | Chicago-St. Louis | 1.337 | 0.765 |
| 3 | Chicago-Dallas | 0.814 | 0.514 |
| 4 | Salt Lake City-Los Angeles | 2.982 | 1.626 |
| 5 | Salt Lake City-Pasco | 1.375 | 0.638 |
| 6 | Detroit-Cleveland | 0.041 | 0.037 |
| 7 | Detroit-Chicago | 0.129 | 0.119 |
| 8 | Seattle-Los Angeles | 0.762 | 0.399 |
| 9 | Chicago-Minneapolis | 0.878 | 0.501 |
| 11 | Cleveland-Pittsburgh | 2.834 | 1.045 |
| 12 | Cheyenne-Pueblo | 0.460 | 0.782 |
| 16 | Cleveland-Louisville | 0.312 | ...... |
| 17 | New York-Chicago | 0.912 | 0.684 |
| 18 | Chicago-San Francisco | 1.396 | 0.883 |
| 19 | New York-Atlanta | 1.076 | ...... |
| 20 | Albany-Cleveland | 0.349 | 0.119 |
| 21 | Dallas-Galveston | 0.451 | ...... |
| 22 | Dallas-San Antonio | 0.647 | ...... |
| 23 | Atlanta-New Orleans | 0.260 | ...... |
| 24 | Chicago-Cincinnati | 0.428 | 0.235 |
| 25 | Atlanta-Miami | 0.204 | ...... |
| 26 | Great Falls-Salt Lake City | 0.371 | ...... |
| 27 | Bay City-Chicago | 0.396 | ...... |
| 30 | Chicago-Atlanta | 0.125 | ...... |
| | Domestic Average | $1.030 | $0.737 |
| FAM | | | |
| 2 | Seattle-Victoria | 0.925 | 1.233 |
| 3 | New Orleans-Pilottown | 0.501 | 0.733 |
| 4 | Key West-Havana | 1.000 | 2.925 |
| 5 | New York-Montreal | 0.480 | ...... |
| | Foreign Average | 0.761 | 1.208 |
| | Average | $1.021 | $0.769 |

## WHAT IT COST THE GOVERNMENT TO FLY THE MAIL

The following table shows the cost of air-mail operation by the Post Office Department to have been 50 cents a mile when government operation ceased. This was exclusive of maintenance of fields and lights, communications, motor vehicles, warehouses, lighting equipment and ground improvement. The total expended, including these items, shows a mileage cost of $1.08.

| *Fiscal year* | *1925* | *1926* | *1927* |
|---|---|---|---|
| Maintenance of Equipment: | | | |
| Rebuilding planes | $575,736.33 | $259,453.73 | $76,806.82 |
| Rebuilding engines | 114,867.65 | 132,254.01 | 71,683.97 |
| Repairing field equipment | 72,975.65 | 15,568.97 | 22,806.89 |
| | $763,579.63 | $407,276.71 | $171,297.68 |
| Transportation: | | | |
| Pilots base and mileage pay and travel expense | $294,592.57 | $330,200.67 | $351,352.39 |
| Gasoline | 191,125.08 | 183,074.48 | 169,839.31 |
| Oil | 35,872.76 | 21,754.93 | 17,864.21 |
| Forced landings | 1,376.81 | 2,964.99 | 1,546.85 |
| | $522,967.22 | $537,995.07 | $540,602.76 |
| Executive Overhead: | | | |
| General superintendent's office | $79,575.45 | $51,670.30 | $44,575.95 |
| Divisional superintendent's office | 41,045.27 | 60,899.89 | 31,804.59 |
| Superintendent, repairs | 26,132.56 | 28,207.39 | 23,495.28 |
| | $146,753.28 | $140,777.58 | $99,875.82 |
| Capital: | | | |
| New buildings | $114,077.19 | $257,367.97 | $ 1,137.72 |
| New flying equipment | 172,890.85 | 254,827.00 | 480,545.95 |
| New miscellaneous equipment | 39,073.51 | 12,323.56 | 2,161.71 |
| | $326,041.55 | $524,518.53 | $483,845.38 |
| Total cost | $1,759,341.68 | $1,610,567.89 | $1,295,621.64 |
| Miles flown: | | | |
| Regular schedule | 2,076,764 | 2,256,137 | 2,329,553 |
| Ferry and test | 424,791 | 291,855 | 253,453 |
| Total | 2,501,555 | 2,547,992 | 2,583,006 |
| Total cost per mile | $0.703 | $0.632 | $0.502 |
| Transportation cost per mile | $0.209 | $0.211 | $0.209 |

## Tabulations of Accidents, Civil Aviation

(Period: January 1, 1928 to December 31, 1928)

| Cause of Accident | | Percentage First half | Percentage Second half |
|---|---|---|---|
| | *Personnel* | | |
| Pilot | Error of judgment | 8.45 | 12.64 |
| | Poor technique | 22.95 | 29.80 |
| | Disobedience of orders | 4.95 | 2.65 |
| | Carelessness or negligence | 6.32 | 10.12 |
| | Miscellaneous | 0.62 | 0.58 |
| Errors of pilot | | 43.29 | 55.79 |
| Other personnel | Supervisory | 0.35 | 0.50 |
| | Miscellaneous | 3.10 | 1.68 |
| Due to other personnel | | 3.45 | 2.18 |
| Total personnel causes | | 46.74 | 57.97 |
| | *Material* | | |
| Power plant | Fuel system | 5.12 | 3.78 |
| | Cooling system | 0.57 | 0.74 |
| | Ignition system | 4.00 | 2.48 |
| | Lubrication system | 0.13 | 0.30 |
| | Engine structure | 1.29 | 1.75 |
| | Propellers and accessories | 0.44 | 0.56 |
| | Engine control system | | 0.58 |
| | Miscellaneous | 0.45 | |
| | Undetermined | 4.59 | 5.55 |
| Power plant failures | | 16.59 | 15.74 |
| Structural | Flight control system | 0.85 | 0.29 |
| | Movable surfaces | 0.35 | 0.07 |
| | Stabilizing surfaces | | |
| | Wing, struts and bracing | 1.09 | 1.15 |
| | Undercarriage | 1.64 | 1.87 |
| | Wheels, tires and brakes | 0.19 | 0.85 |
| | Pontoons or boat | 0.03 | |
| | Fuselage, engine mountings and fittings | 0.75 | 0.07 |
| | Tail skid assembly | 0.19 | 0.14 |
| | Miscellaneous | 0.23 | |
| | Undetermined | | 0.03 |
| Structural failures | | 5.32 | 4.47 |
| Handling qualities | | 0.44 | 0.25 |
| Instruments | | | |
| Total material failures | | 22.35 | 20.46 |
| *Miscellaneous* | | | |
| Weather | | 10.23 | 4.67 |
| Darkness | | 1.28 | 0.50 |
| Airport and terrain | | 8.72 | 3.70 |
| Other | | 3.90 | 3.25 |
| Due to miscellaneous reasons | | 24.13 | 12.12 |
| Total miscellaneous causes | | 24.13 | 12.12 |
| Undetermined and doubtful | | 6.78 | 9.45 |
| Total undetermined and doubtful | | 6.78 | 9.45 |
| Total | | 100.00 | 100.00 |

WHERE THE PLANES ARE AT WORK

The Department of Commerce announced, on July 15, 1929, that 7,117 planes were operating under licenses or identification numbers in the United States.

The following table shows the total number of licensed airplanes in each state, and the number of persons per plane in each commonwealth:

| *State* | *Airplanes* | *Population per Airplane* |
|---|---|---|
| Alabama | 15 | 171,533 |
| Arizona | 15 | 31,600 |
| Arkansas | 24 | 81,000 |
| California | 519 | 8,778 |
| Colorado | 37 | 29,459 |
| Connecticut | 43 | 38,767 |
| Delaware | 16 | 15,250 |
| District of Columbia | 60 | 9,200 |
| Florida | 36 | 39,194 |
| Georgia | 20 | 160,150 |
| Idaho | 14 | 39,000 |
| Illinois | 300 | 24,653 |
| Indiana | 84 | 37,809 |
| Iowa | 51 | 47,608 |
| Kansas | 81 | 22,654 |
| Kentucky | 18 | 141,833 |
| Louisiana | 44 | 44,318 |
| Maine | 4 | 198,750 |
| Maryland | 32 | 50,500 |
| Massachusetts | 109 | 39,357 |
| Michigan | 235 | 19,540 |
| Minnesota | 92 | 29,586 |
| Mississippi | 18 | 99,500 |
| Missouri | 193 | 18,253 |
| Montana | 19 | 28,894 |
| Nebraska | 40 | 35,200 |
| Nevada | 2 | 38,500 |
| New Hampshire | 9 | 88,333 |
| New Jersey | 97 | 39,391 |
| New Mexico | 3 | 132,000 |
| New York | 753 | 15,338 |
| North Carolina | 29 | 101,345 |
| North Dakota | 14 | 45,786 |
| Ohio | 230 | 29,678 |
| Oklahoma | 134 | 18,104 |

WHERE THE PLANES ARE AT WORK—*Con.*

| *State* | *Airplanes* | *Population per Airplane* |
|---|---|---|
| Oregon | 36 | 22,277 |
| Pennsylvania | 244 | 40,035 |
| Rhode Island | 9 | 79,555 |
| South Carolina | 13 | 143,307 |
| South Dakota | 28 | 25,143 |
| Tennessee | 33 | 75,818 |
| Texas | 173 | 31,716 |
| Utah | 21 | 25,286 |
| Vermont | 6 | 76,000 |
| Virginia | 26 | 99,038 |
| Washington | 108 | 14,694 |
| West Virginia | 7 | 246,286 |
| Wisconsin | 121 | 24,404 |
| Wyoming | 10 | 109,000 |

AIRCRAFT PRODUCTION CALENDAR YEARS 1925 TO 1928 (*a*)

| | 1928 | 1927 | 1926 | 1925 |
|---|---|---|---|---|
| Total value, including engines and parts | $64,662,491 | $21,161,853 | $17,670,405c | $12,524,719 |
| Airplanes: | | | | |
| Number | 4,216 | 1,888 | 1,179 | 711 |
| Value | $35,344,721 | $12,224,979 | $8,771,077 | $5,908,335 |
| Seaplanes and amphibians | | | | |
| Number | 129 | 107 | 7 | 78 |
| Value | $3,143,118 | $2,280,020 | $99,950 | $765,324 |

AIRPLANE AND ENGINE PRODUCTION 1928
(From Department of Commerce report of May 30, 1929)

Airplanes

| *Kind* | *New construction* | | *Rebuilt and reassembled* | | *Total value* |
|---|---|---|---|---|---|
| | *Number* | *Value* | *Number* | *Value* | |
| One-, two-and three-place, open cockpit... | 3,114 | $19,896,073 | 116 | $198,229 | $20,094,302 |
| Small transport, mail and express, open cockpit........ | 86 | 954,544 | 26 | 241,803 | 1,196,347 |
| Cabin, single engine........ | 902 | 9,132,460 | 20 | 59,138 | 9,191,598 |
| Cabin, multimotored........ | 114 | 5,361,644 | 1 | 3,500 | 5,365,144 |
| Amphibian........ | 111 | 2,565,600 | ... | ....... | 2,565,600 |
| Seaplanes, all types........ | 18 | 577,518 | 1 | 5,000 | 582,518 |
| Parts (other than engine)........ | ..... | .......... | ... | ....... | 4,714,547 |
| Repair work........ | ..... | .......... | ... | ....... | 609,932 |
| Total........ | 4,345 | $38,487,839 | 164 | $507,670 | $44,319,988 |

Engines

| *Kind* | *New construction* | | *Rebuilt and reassembled* | | *Total value* |
|---|---|---|---|---|---|
| | *Number* | *Value* | *Number* | *Value* | |
| Engines (Aircraft only) | | | | | |
| Radial, 1 to 150 horse power........ | 621 | $ 592,217 | 25 | $ 23,000 | $ 616,217 |
| Radial, 150 to 400 horse power........ | 1,547 | 6,041,316 | ... | ....... | 6,041,316 |
| Radial, 401 horse power and over........ | 1,073 | 7,987,975 | ... | ....... | 7,987,975 |
| All other types, 1 to 150 horse power..... | 11 | 15,975 | 65 | 40,000 | 55,975 |
| All other types 150 to 400 horse power.... | 9 | 13,700 | 604 | 356,727 | 370,427 |
| All other types, 401 horse power and over.. | 235 | 2,157,981 | 6 | 7,152 | 2,165,133 |
| Spare parts........ | ..... | 2,812,216 | ... | ....... | 2,812,216 |
| Repair work........ | ..... | 294,244 | ... | ....... | 294,244 |
| Total........ | 3,496 | $19,915,624 | 700 | $426,879 | $20,343,503 |

### Airplane Production and Export, 1909 to 1928

Following is a survey of American airplane production since its inception, based on such governmental statistics as are available.

During the prewar period, hundreds of airplanes were produced throughout the country by "backyard" builders, in addition to those built by manufacturers proper, and the annual production reported, beginning in 1919, by manufacturers to the Bureau of the Census does not account for planes produced complete or partially from war surplus parts by "air service" operators about the country.

Of the war surplus there were resold, by the army, 1,500 planes and 12,166 engines to the end of 1927, with parts sufficient to make 500 more planes. The navy sold a negligible number of war surplus planes and 750 engines. A large number of all these was put into service by various air-service operators and private flyers, the balance being held in stock by supply houses, or "washed out" in course of conditioning.

| *Year* | *Army* | *Navy* | *Post office* | *Export* | *Civil* | *Total production* |
|---|---|---|---|---|---|---|
| 1909 | 1 | 0 | 0 | ... | (Census figures not available.) | (Census figures not available.) |
| 1910 | 0 | 0 | 0 | ... | | |
| 1911 | 7 | 4 | 0 | ... | | |
| 1912 | 12 | 4 | 0 | 29 | | |
| 1913 | 8 | 6 | 0 | 29 | | |
| 1914 | 11 | 4 | 0 | 34 | | |
| 1915 | 20 | 6 | 0 | 152 | | |
| 1916 | 83 | 59 | 0 | 269 | | |
| 1917 | 1,807 | 206 | 0 | 135 | | |
| 1918 | 11,916 | 2,075 | 9 | 20 | | |
| 1919 | 409 | 273 | 13 | 85 | | 662 |
| 1920 | 215 | 42 | 7 | 65 | | * |
| 1921 | 336 | 53 | 0 | 48 | | 302 |
| 1922 | 175 | 39 | 0 | 37 | | * |
| 1923 | 51 | 175 | 8 | 48 | 314 | 587 |
| 1924 | 88 | 76 | 1 | 59 | * | * |
| 1925 | 126 | 213 | 2 | 80 | 305 | 789 |
| 1926 | 351 | 163 | 52 | 50 | 568 | 1,186 |
| 1927 | 251 | 368 | 0 | 63 | 1,311 | 1,995 |
| 1928 | 396 | 432 | 0 | 170 | .... | 4,345 |

* Census figures not available.

## In Foreign Trade

United States exports of aeronautical products, calendar years 1922 to 1928

| *Item* | *Number* | *Value* | *Item* | *Number* | *Value* |
|---|---|---|---|---|---|
| 1922: | | | 1926: | | $303,149 |
| Planes.......... | 37 | $156,630 | Planes.......... | 50 | 573,732 |
| Engines......... | 147 | 72,819 | Engines......... | 297 | 150,329 |
| Parts for planes.. | ........ | 265,481 | Parts for planes.. | ........ | |
| Total value.... | ........ | $494,930 | Total value.... | ........ | $1,027,210 |
| 1923: | | | 1927: | | |
| Planes.......... | 48 | $309,051 | Planes.......... | 63 | $848,568 |
| Engines......... | 80 | 65,558 | Engines......... | 84 | 484,875 |
| Parts for planes.. | ........ | 58,949 | Parts for planes.. | ........ | 570,117 |
| Total value.... | ........ | $433,558 | Total value .... | ........ | $1,903,560 |
| 1924: | | | 1928: | | |
| Planes.......... | 59 | $412,738 | Planes.......... | 170 | $1,825,687 |
| Engines......... | 146 | 219,609 | Engines......... | 169 | 595,402 |
| Parts for planes.. | ........ | 165,926 | Parts for planes.. | ........ | 1,240,244 |
| Total value..... | ........ | $798,273 | Total value.... | ........ | $3,661,333 |
| 1925: | | $511,282 | | | |
| Planes.......... | 80 | 170,793 | | | |
| Engines......... | 73 | 101,584 | | | |
| Parts for planes.. | ........ | | | | |
| Total value.... | ........ | $783,659 | | | |

Exports for 1928 were practically equal to the three previous years.

Canada, Peru, and Mexico lead in the purchase of airplanes in 1928. Canada, Russia, and China headed the parts buyers; and Canada, Germany, and the United Kingdom were at the top with engines. The average value of the plane was $10,867; that of the engines, $3,714.

An estimate of 4,600 planes as the American production for 1928 compares favorably with the 2,240 estimate for France, Italy, Germany, and Switzerland.

## Exports of Aircraft, Engines, and Parts from the United States in 1928

Compiled by the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C.

| Countries | *Airplanes, Seaplanes and other aircraft* | | *Engines for aircraft* | | *Parts except tires* |
|---|---|---|---|---|---|
| | *Number* | *Dollars* | *Number* | *Dollars* | *Dollars* |
| Canada | 70 | 766,644 | 48 | 179,993 | 540,215 |
| Soviet Russia in Europe | ... | ....... | ... | ...... | 142,772 |
| China | 9 | 102,175 | ... | ...... | 78,678 |
| Germany | 1 | 5,500 | 23 | 132,510 | 70,548 |
| United Kingdom | 4 | 24,526 | 29 | 75,780 | 57,191 |
| Philippine Islands | 2 | 34,500 | ... | ...... | 52,499 |
| Japan | 3 | 63,000 | 6 | 21,000 | 49,531 |
| Brazil | 5 | 66,340 | 7 | 5,150 | 44,661 |
| Panama | ... | ....... | 1 | 150 | 22,705 |
| Mexico | 21 | 191,035 | 10 | 25,473 | 19,694 |
| Netherlands | ... | ....... | 15 | 70,117 | 20,483 |
| Chile | ... | ....... | ... | ...... | 17,343 |
| Spain | ... | ....... | 1 | 3,111 | 15,940 |
| Argentina | 5 | 55,052 | 7 | 23,315 | 15,499 |
| Peru | 26 | 226,360 | 2 | 8,002 | 15,459 |
| Colombia | 1 | 19,250 | ... | ...... | 9,894 |
| Ceylon | ... | ....... | ... | ...... | 8,210 |
| Italy | 2 | 84,950 | 4 | 8,338 | 6,546 |
| Cuba | 4 | 54,887 | 3 | 250 | 6,450 |
| Poland and Danzig | ... | ....... | 1 | 3,574 | 4,575 |
| Sweden | ... | ....... | 2 | 10,566 | 4,455 |
| Czechoslovakia | ... | ....... | ... | ...... | 3,890 |
| Netherlands East Indies | ... | ....... | 2 | ...... | 3,323 |
| Rumania | ... | ....... | ... | 1,525 | 2,791 |
| Australia | 7 | 50,872 | 2 | 980 | 2,777 |
| Hong Kong | ... | ....... | 4 | ...... | 2,182 |
| Honduras | 1 | 9,000 | ... | ...... | 2,253 |
| Norway | ... | ....... | ... | ...... | 1,925 |
| Guatemala | ... | ....... | ... | ...... | 1,517 |
| France | ... | ....... | 3 | 6,223 | 1,303 |
| Siam | 4 | 38,400 | ... | ...... | 1,101 |
| Nicaragua | ... | ....... | ... | ...... | 990 |
| Switzerland | ... | ....... | ... | ...... | 950 |
| Ecuador | ... | ....... | ... | ...... | 688 |
| British India | ... | ....... | ... | ...... | 500 |
| British Malaya | ... | ....... | ... | ...... | 150 |
| Denmark | ... | ....... | ... | 19,345 | 100 |
| British West Indies | ... | ....... | ... | ...... | 73 |
| British West Africa | ... | ....... | ... | ...... | 20 |
| Dominican Republic | ... | ....... | ... | ...... | 62 |
| Austria | 1 | 20,000 | | | |
| French Oceania | 1 | 6,000 | | | |
| Belgium | 1 | 4,183 | | | |
| Bermudas | 1 | 2,850 | | | |
| Hungary | 1 | 163 | | | |
| Total | 170 | 1,825,687 | 169 | 595,402 | 1,229,943 |

AIRCRAFT APPROPRIATIONS, UNITED STATES

(Aeronautical Chamber of Commerce, 1922 to 1929)

| | | Total | Increase or Decrease | Net |
|---|---|---|---|---|
| 1922 to 1923: | | | | |
| 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 | |
| 1923 to 1924: | | | | |
| Army | 12,426,000 | ............ | †469,000 | †4,347,841 |
| Navy | 14,647,174 | ............ | †36,416 | |
| Air Mail | 1,500,000 | ............ | †400,000 | |
| N.A.C.A. | 283,000 | 28,856,174 | *73,000 | |
| 1924 to 1925: | | | | |
| Army | 14,113,043.80 | ............ | *1,687,043.80 | †832,416 |
| 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 | |
| 1925 to 1926: | | | | |
| Army | 14,700,000** | ............ | *586,956.20 | *3,626,869.80 |
| Navy | 14,790,000‡ | ............ | †360,000 | |
| Air Mail | 2,810,000†† | ............ | †150,000 | |
| N.A.C.A. | 534,000 | 32,624,000 | *64,000 | |
| 1926 to 1927: | | | | |
| Army | 15,050,000 | ............ | *350,000 | *350,956.20 |
| 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 | |
| 1927 to 1928: | | | | |
| Army | 20,396,300 | ............ | *5,346,300 | *3,884,288 |
| Navy | 20,100,000 | ............ | *1,594,712 | |
| N.A.C.A. | 513,000 | | | |
| Commerce | 3,791,500 | 44,787,800 | *3,291,500 | *10,219,512 |
| 1928 to 1929: | | | | |
| Army | 24,848,562(1) | ............ | *4,452,262 | |
| Navy | 32,189,560(2) | ............ | *12,089,560 | |
| N.A.C.A. | 600,000 | ............ | *87,000 | |
| Commerce | 4,361,850 | 61,999,972 | *570,350 | *17,199,172 |

(1) And contract authorization of $5,000,000.
(2) And contract authorization of $10,000,000.
* Increase over preceding year.
† Decrease from preceding year.
** 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.

*Note* — Budget estimates for the fiscal year 1929–30 recommended for the Army, $33,578,683; Navy, $31,645,420 [and contract authorization of $10,000,000] National Advisory Committee for Aeronautics $1,292,200; and Department of Commerce $6,393,620. Total estimated amount $72,909,923.

## AERONAUTICAL CHAMBER OF COMMERCE PRODUCTION REPORT

(September, 1929)

### COMMERCIAL AIRCRAFT PRODUCTION

| | 1928 | *Jan.–June,* 1929 |
|---|---|---|
| Open monoplanes | 171 | 144 |
| Open biplanes | 2,348 | 1,623 |
| Cabin monoplanes | 850 | 884 |
| Cabin biplanes | 69 | 17 |
| Multimotored monoplanes | 58 | 115 |
| Multimotored biplanes | 5 | 0 |
| Seaplanes and flying boats | 11 | 18 |
| Amphibians | 30 | 53 |
| Total monoplanes | 1,079 | 1,143 |
| Total biplanes | 2,422 | 1,640 |
| Total seaplanes, flying boats and amphibians | 41 | 71 |
| Total number of planes | 3,542 | 2,854 |
| Total value of monoplanes | $8,738,683 | $9,829,845 |
| Total value of biplanes | 7,541,615 | 5,421,902 |
| Total value of seaplanes and amphibians | 914,000 | 1,781,000 |
| Total value of all types (commercial production) | 17,194,298 | 17,032,747 |
| Total value of all types (including military) | ......... | 23,685,572 |

## COMMERCIAL ENGINE PRODUCTION

| *Hp.* | *Number Reported* 1928 | *Number Reported Jan.–June,* 1929 | *Total Value Jan.–June,* 1929 |
|---|---|---|---|
| 0– 50 ............... | 32 | 43 | $33,540 |
| 50–100 ............... | 237 | 509 | 482,500 |
| 100–200 ............... | 182 | 1,001 | 2,141,750 |
| 200–300 ............... | 924 | 480 | 1,391,800 |
| 300 and up ............ | 475 | 1,242 | 6,883,784 |
| Total number reported | 1,850 | 3,275 | $10,923,374 |

| | 1928 | *Jan.–June,* 1929 |
|---|---|---|
| Total value commercial production ... | $8,936,725 | $10,923,374 |
| Total value, including military ....... | ......... | 14,349,375 |

## AIRPLANE LICENSES BY MAKES

(Compiled by "Aviation" from Department of Commerce data, as of July 15, 1929)

| | | |
|---|---|---|
| Waco Aircraft Co. | | 814 |
| Travel Air Mfg. Co. | | 666 |
| Biplanes | 608 | |
| Monoplanes | 58 | |
| Alexander Aircraft Co. (Eaglerock) | | 386 |
| Curtiss-Robertson Airplane Mfg. Co. (Robin) | | 290 |
| American Eagle Aircraft Corp. | | 156 |
| Swallow Airplane Mfg. Co. | | 153 |
| Fairchild Airplane Mfg. Co. | | 126 |
| Ryan Aircraft Co. | | 126 |
| Mono Aircraft Co. | | 114 |
| Stinson Airplane Co. | | 113 |
| Stinson Detroiter | 90 | |
| Stinson Jr. | 23 | |
| Stearman Aircraft Co. | | 110 |
| Kreider Reisner Aircraft Co. (Challenger) | | 99 |
| Fleet Aircraft Co. | | 90 |
| Command-Aire, Inc. | | 79 |
| Ford Motor Co. (Stout Airplane Division) | | 75 |
| Wasp powered | 36 | |
| Wright powered | 38 | |
| Miscellaneous | 1 | |
| Pitcairn Aviation, Inc. | | 67 |

| | | |
|---|---|---|
| Curtiss Aeroplane & Motor Co. (not including JN or MF) | | 65 |
| Falcon | 10 | |
| Fledgling | 45 | |
| Miscellaneous | 10 | |
| Fokker Aircraft Corp. | | 62 |
| Wasp powered | 30 | |
| Wright powered | 7 | |
| Universals | 25 | |
| Lincoln Aircraft Co. | | 61 |
| Boeing Airplane Co. | | 59 |
| "40" | 26 | |
| "95" | 24 | |
| Miscellaneous | 9 | |
| Cessna Aircraft Co. | | 48 |
| Lockheed Aircraft Corp. | | 37 |
| Buhl Aircraft Co. | | 29 |
| International Aircraft Co. | | 27 |
| The Douglas Co. | | 26 |
| Bellanca Aircraft Co. | | 24 |
| Sikorsky Aviation Corp. | | 22 |
| Miscellaneous American | | 260 |
| Foreign planes | | 42 |
| Total licensed aircraft as of July 15, 1929 | | 4232 |

## AMERICAN AIRWAY AND OPERATION MILEAGE FOR 14 MONTHS

(Department of Commerce)

| | *Miles of Mail Airways* | *Total Miles of Airways* | *Airplane Miles Scheduled Daily with Mails* | *Total Airplane Miles Scheduled Daily* |
|---|---|---|---|---|
| May 30, 1928 | 10,058 | 11,067 | 22,448 | 27,493 |
| July 31, 1928 | 12,171 | 13,108 | 27,660 | 33,317 |
| Aug. 31, 1928 | 11,921 | 13,133 | 25,288 | 32,042 |
| Sept. 30, 1928 | 12,397 | 13,609 | 26,240 | 33,792 |
| Oct. 31, 1928 | 12,397 | 14,941 | 28,204 | 40,602 |
| Nov. 30, 1928 | 13,974 | 16,486 | 27,606 | 38,902 |
| Dec. 31, 1928 | 14,155 | 16,667 | 27,848 | 39,060 |
| Jan. 31, 1929 | 17,470 | 19,888 | 32,816 | 42,698 |
| Feb. 28, 1929 | 17,470 | 20,788 | 38,045 | 53,345 |
| Mar. 31, 1929 | 18,074 | 21,392 | 39,216 | 57,516 |
| Apr. 30, 1929 | 19,022 | 22,778 | 40,472 | 57,453 |
| May 31, 1929 | 19,721 | 25,336 | 41,929 | 62,265 |
| June 30, 1929 | 22,165 | 29,227 | 48,068 | 69,029 |
| July 31, 1929 | 24,088 | 32,196 | 52,070 | 74,970 |