The United States Civil Aviation Policy.

by

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The United States Civil Aviation Policy.

Introduction.

Aviation after 1926 made so much progress that we are apt to lose our perspective and to imagine that little was accomplished earlier. It is the aim of this work to try to restore the proper perspective as regards the attitude of the federal government towards civil aviation.

The term "aviation" is often taken to cover the whole field of flying. In this work it will be taken in its strictly technical meaning-"the art of operating heavier-than-air craft." If occasionally the author does digress into the subject of "aerostation" or of "aeronautics," it will be to bring out more clearly what was done up to 1928 in aviation proper. The work will cover, roughly speaking, the fiscal years 1919 to 1927 inclusive. It is generally taken for granted that there was an almost complete lack of interest on the part of the government and of the general public before the entrance of the United States into the World War-an almost complete lack of interest on the part of everyone, in fact, except a few flyers and their backers. This view of the problem is no doubt greatly exaggerated as the following chapters will at least to some extent show. The war, however, did create a great deal more interest; and for this reason, as well as for the impossibility of tracing through the government's whole policy in so short a study,

the author has chosen to begin his work proper near the close of the World War. Before entering upon a detailed study, however, perhaps a few statements about the pioneer flyers will not be amiss.

What is generally accepted as the first flight in the history of aviation was accomplished by Orville Wright at Kitty Hawk, N. C., December 17, 1903. It lasted just twelve seconds and covered a distance of 120 feet; and at no time was the first airplane more than ten feet from the ground. A fourth flight the same day, lasting 59 seconds for a distance of 852 feet, damaged the machine so badly that further experiments were impossible for the time being.

Such were the small beginnings of aviation. But small as they were, they were not dependent solely upon the work of the Wright Brothers. Others, both in Europe and in the United States, were studying the problem and had been for more than a decade. It is not a slight to the Wrights, or an exaggeration of the truth, to say that the invention of the airplane was inevitable and that it would have come even though they had never become interested. Their particular contribution to the science of flying was the building of warping wings, which enabled them to keep their machine under lateral control in flight.

The father of modern airplane experimentation was Otto Lilienthal, who in 1891 began a long series of careful,

scientific flights with gliders, which ended only with his death in 1896. Meanwhile, a Frenchman, Clement Ader, was building a plane to fly under power. In his first monoplane, powered with a steam engine, he is said to have flown 150 feet as early as 1890. The wrecking of a larger plane by the wind in 1897 weakened public confidence in him and so discouraged him that he destroyed all his work except his first plane, which was several years later exhibited at an exposition in Paris.

A pioneer worker in the United States was Professor Samuel P. Langley, Secretary of the Smithsonian Institution. In the 1880's he began to work out mathematical tables of wind pressure, and in the early 1890's constructed several small airplane models with propellers driven by twisted rubber bands or motors of compressed air, carbonic acid gas, or steam. In 1897, backed by a $50,000 subsidy granted by the War Department and encouraged by the Smithsonian Institution, he began the construction of a plane which when finished in 1903, sank into the Potomac on its first attempt to fly. This unhappy outcome of his efforts helped to hasten his death, which occurred two years later. But in 1914 his associates in the Smithsonian resurrected his old machine, had certain important changes made in it, and flew it. Their reports gave the impression that the machine had flown without changes; and the official label placed on it described it as "the first heavier-

than-air craft in the history of the world capable of sustained free flight under its own power, carrying a man."

The Smithsonian's action started a controversy which resulted in the sending of the Wright plane to the British Museum early in 1928. Orville Wright contended that his and his brother's work was entirely independent of Langley and that, though they studied his tables, they could not use them because they were so inaccurate. All the facts in the dispute were never cleared up, but they would be if the McSwain Joint Resolution, adopted by the House on May 16, 1928, was given the support of the Senate and the President. It is significant, however, that Orville Wright was not invited to send his plane to England before an elaborate investigation was made by Griffith Brewer, a British expert.

Finally, Congress granted the Wrights tardy recognition by passing on March 2, 1927, "an act providing for the erection of a monument on Kill Devil Hill, at Kitty Hawk, N. C., commemorative of the first successful attempt in history at power-driven airplane flight." To complete this work a national airport was inaugurated on the site of the first flight on December 21, 1928. This interest was greatly in contrast to the government's early attitude, which forced the Wrights to go to France for encouragement.

Prior to the World war aviation development was slow. It was fast enough, however, to allow the Frenchman

Blériot to fly the English channel in 1909 and the American C. P. Rogers to cross the United States in 1911-after several accidents and forced landings. Moreover, during the five years immediately preceding the war, there were promises of a more rapid development in the United States and Europe. In 1910 airplanes were first used in successful military maneuvers in France, and in actual battles in the Italian-Turkish and Greek-Turkish wars in 1912. The same year Great Britian created the Royal Flying Corps; and two years later Congress organized an Aviation Section of the Signal Corps. Nor was commercial development altogether lacking, for on May 1, 1913, air mail was carried for the first time between Ghent and Brussels.

The World War turned the interest of the prind pal nations to military aviation. There was a great deal of criticism of the American war record; but the fact remains that in a year and a half flying fields in the United States increased from two to forty-eight; and airplanes from 224 of doubtful value to over 17,000,many of which were first class. England, with the next best record, had only 14,000 machines at the signing of the armistice.

The end of the war brought renewed interest in commercial aviation.

Chapter 1.

The Story of the Air Mail.

Origin.

The Air Mail started officially in May, 1918, but the idea originated much earlier. It is certain that as early as June 14, 1910, Representative Sheppard of Texas introduced into the House a bill providing that the Postmaster-General should investigate the cost and practicability of carrying mail by airplane.[1] The fact that Congress took no action on the measure makes little difference. The Air Mail idea was at least conceived and its materialization was only a matter of time and development.

The first action on the part of the executive branch seems to have been a recommendation to Congress by Postmaster-General A. S. Burleson, in 1913, that an appropriation be made for the establishment of an experimental air mail.[2] As has been already pointed out, Belguim had established an air mail earlier in the year.[3] Probably Burleson was following the example of the latter rather than the early sheppard idea; and, if so, the United States was behind Europe even in this one pioneer venture as some have contended it was behind in all commercial aviation progress.

Congress moved somewhat more slowly than the Post Office wished; but on March 2, 1917, temporary legal sanction was given to Burleson's request by the Post Office Appropiation Bill for 1918, for it allowed the Postmaster-General to expend not more than $100,000 for experimental

airplane mail service between such points as he might determine.[4]

Meanwhile Burleson had somewhat cautiously directed the Second-Assistant Postmaster-General to make a study of the subject with a view to establishing a service "if assurance could be given that it would be practical, continuous, and efficient."[5] This shows that whatever might be the idea of Congress, the head of the postal service had rather definite notions as to what could be done. The required assurance was obtained after a careful survey had been made by the postal authorities, by business men at their request, and by the National Advisory Committee for Aeronautics, the War Department, and the Aircraft Board. It is worthwhile noting that the last two agencies favored the proposal because it would give army aviators training in long distance flying.[6]

The New York-Washington Route.

The new venture had been originally planned to be purely civilian; but when the advice of the War Department was sought, Colonel E. A. Deeds, Chief Signal Officer and head of the army air service, asked permission to carry the mail. About two weeks before the service was scheduled to begin Colonel Goodyear, who was to be in charge of actual operations, together with Colonel Bloomfield, a British aviator, tried to persuade the army authorities to give up the mail because it could not be carried in bad weather.

Nevertheless the service was opened between New York and Washington on May 15, 1918, with army equipment and personnel, and carried on in this way until August 12, when it was taken over directly by the postal authorities.

There was some dispute as to the army's record during the three months it was in charge. Senator New stated that the Post Office had nothing but praise for the War Department until it was afraid that the mail was to be put under an aviation department. The truth, however, seems to be that while the War Department officials were eager to co-operate, the men directly in charge were antagonistic.[8] This, together with the fact that four different army men were placed over the service in the brief three months' period of military operation produced an efficiency of only 90.3 per cent in summer weather, while the efficiency of the Post office Department averaged 93.4 per cent during the sixteen following months in all kinds of weather.[9]

The equipment even after the army had abondoned the project was for a long time furnished by the War Department. The service for the first year was conducted with small army training planes that carried 200 pounds of mail and failed to maintain a speed schedule of 70 miles an hour. After the signing of the armistice about 100 De Havilands were obtained from the War and Navy Departments; but only a portion were put into actual use. These could carry 400 pounds of mail and maintain a satisfactory speed

schedule of more than 80 miles and hour. When converted into two-motored planes, a load of 800 pounds was possible, with only one engine running.[10] However, the De Havilands in the long run proved to be unsafe; and the Department developed planes of its own-first, a small plane, called the Curtiss Carrier-Pigeon, and, later, the Douglas Mail Plane.[11]

The Purpose of the Air Mail.

The Air Mail had been established in a haphazard sort of way with no very great cooperation between the executive and legislative departments and without any definite formulation of policy. If, however, one examines, the speeches of various Congressmen and the correspondence of the Postmaster-Generals, he will find that the service was meant to fill three needs; to serve as an agency of national defense, to encourage commercial aviation, and to better the actual postal service.

When it came to repeating for 1919 the appropriation which had been made for 1918, there was little objection in the House; but the discussion in the Senate brought out the three purposes just stated. Most of the opposition came from the Utah senators, King and Smoot- both of whom thought that the mail would interfere with American success in the War, because of the financial outlay required. King went further and stated that the Air Mail was not demanded and not needed. Even Senator Jones of Washington, who later on became quite enthusiastic about the new service, was at this time in favor of waiting until the end of the War.[12]

Senator Weeks of Massachusetts was sure that some such form of commercial flying was needed to furnish competition in the aircraft industry.[13] He said that the President's proclamation requiring a license in order to fly had practically stopped all development except that of the Wright and Curtiss companies, which were very largely supplying the government.[14]

Senator Bankhead of Alabama suggested that the appropriation be kept on account of the difficulty of furnishing efficient service in Alaska.[15] As a matter of fact no air Mail was then in existence in Alaska and none was established until 1924. It is true, though, according to a Burelson statement that the Department invited bids for an Alaskan service in 1916, but nothing came of it because certain parties who had announced the intention of establishing an express and passenger route finally decided that aviation was not far enough advanced for such an undertaking. A contract of this kind could have been justified by the Post Office appropriation for 1917 "for inland transportation by steamboats or other power boats, or aeroplane."[16]

The Transcontinental.

During the five years from 1920 to 1924 the chief interest centered in the establishment and maintenance of a single transcontinental route from New York to San Francisco. This shows the experimental nature of the early service and the belief of most Congressmen that the Air Mail was not to

improve the efficiency of letter carrying so much as it was to point the way to commercial aviation.

When Congress was considering the appropriation for 1920, the Post Office Department asked for sufficient funds to establish a line from New York to Omaha, with the idea of eventually extending it to San Francisco, and a line from Boston to Atlanta, to be prolonged finally into a Montreal-Havana route.[17] Second-Assistant Postmaster-General Praeger did not consider the New York-Washington route a satisfactory experiment, because of the short distance, although it advanced the delivery of New York mail to Washington from two and a half to three hours,[18] and the New England mail from the following morning to the afternoon of the same day-the latter would have to have been mailed before eight o'clock in the morning to have gotten the same service otherwise.[19] Longer distances, it was thought, would result in still greater time saving.

The Department had estimated that it would cost about $1,600,000 for both routes.[20] Congress appropriated $850,000 and left the selection of the route, or routes, to the Postmaster-General.[21] In 1921 and every subsequent year until government operation ceased, the appropriation was made only for this single Transcontinental line. The beginning of the fiscal year 1921, then, may be taken as the legal beginning of the Transcontinental.

The actual beginning almost coincided with this date,

for the route was opened from New York to San Francisco on September 10,1920.[22] During the previous year a route had been inaugurated from Cleveland to Chicago, and in May of the same year, from New York to Cleveland. In August this combined line was extended to Omaha.[23] The creation of the Transcontinental was thus a steady process of growth, extending over about a year.

In 1920, also, the Department had established a Chicago-St. Louis route and a Chicago-Minneapolis route,[24] which, with the old New York-Washington route, were operated until the close of the fiscal year 1921. The legality of the operation of these lines was questioned in Congress,[25] but explained by the postal authorities as being allowed by a provision in the appropriation for 1921, which authorized the Postmaster-General to secure army planes and to pay the necessary expenses "out of any appropriation available for the service in which such vehicles or airplanes are used."[26] This clause seems elastic enough to cover the case, though there was no explicit appropriation after June 20,1920.

The Transcontinental between 1921 and 1924 was not a through airplane service. To carry mail over the long New York-San Francisco route entirely by air was impracticable because, before the coming of the Night Air Mail, whatever saving in time could be effected by day would have been lost by night. The Transcontinental was consequently operated in conjunction with the train service, the planes carrying

the mail during the day and the trains at night. In going from coast to coast a letter thus changed from plane to train and vice versa several times. It was estimated that under this system each of the 24 planes in the service advanced about 500 pounds of mail a full business day every 24 hours.[27]

Another peculiarty of the Transcontinental was that it carried no Air Mail, but only such first-class mail as might be conveniently advanced. A law adopted May 10,1918, allowed the Postmaster-General to charge not more than 24 cents for each ounce of Air Mail.[28] Under this act the postage was fixed at six cents[29] at first,and gradually increased to 24 as the lines lenghtened. When, however, the Transcontinental was fully established the special rates were dropped altogether, until the Night Air Mail was inaugurated. This period, consequently, was the heaviest in volume of mail carried by plane until after the passage of the Air Mail Act of 1925.[30]

Congressional Opposition.

In making the appropriation for 1919 most of the discussion had been in the Senate. But during the period of the Transcontinental the House was the strong hold of opposition; and the Senate, year after year, except the last, had to save the Air Mail from military domination or from complete destruction. The principal basis of objection to the service as conducted by the Post Office during the four fiscal years from 1920 to 1923 was that it was unnecessary duplication and should have been conducted, if at all, by the army.

The appropriation for 1920 came up for discussion in the House early in 1919. The friends of operation by the postal authorities-especially Moon and Garrett of Tennessee were in favor of compelling the War Department to turn over certain planes.[31] La Guardia of New York and Green of Iowa, however,[32] wanted the service carried on by army personnel. Green finally secured the adoption of an amendment to this effect, and only upon the suggestion of Moon did he add a clause which stated that army operation was to be under the direction of the Postmaster-General.[33]

The Senate restored the service to its original status;[34] and the House was finally induced to give way, but not before a provision had been made which compelled the Postmaster-General to try to purchase his planes from the War and Navy Departments, except in case of emergency, any other purchase to be reported to Congress with reasons.[35] The appropriation for 1919[36] had stated that the Postmaster-General might at his discretion use such planes as the Secretary of War might see fit to turn over; and the 1921[37] appropriation later authorized the use of such planes by the postal authorities; but the provisions of the middle year were mandatory upon all parties concerned. This year, therefore, marked the climax in the fight for army personnel and army equipment. If the policy of using army and navy planes exclusively had been followed all the way through, certainly a different record would have been set down for the Air Mail.

The advantages of army operation were not nearly so conspicuous the following year, and there was no action to bring it about, although prominent members of the House, like Mann, Tilson and Ramseyer,[38] expressed themselves rather mildly as being in favor of such a scheme. The Military side of the case was not lost sight of entirely in framing the appropriation, however, for it was asserted that Colonel Mitchell's opinion that the New York-San Francisco route was the best from a standpoint of national defense had been rather influential in determining Congress to definitely establish the Transcontinental.[39]

The next annual appropriation for the experimental service was ruled out in the House on a point of order by Tincher of Kansas. His point of order was that there was no law to support the appropriation; and the reason behind it, unnecessary duplication-[40] which was but another way of saying that the army aviators should secure their training by carrying letters rather than by performing stunts.

It is doubtful whether any Congressmen really ever favored the abolition of the Air Mail entirely, once it had been established, although there were a few who said they did. The only real opposition, besides that already discussed,[41] was to the growing cost. For 1918 and 1919 the Postmaster-General had been allowed but $100,000 for the new service; for 1920[42] this amount was increased to $850,500; and for the next two years,[43] to $1,250,000; after this the increases were not large until after the inauguration of

night service, the amounts rising to $1,900,000 for 1923[44] and dropping back to $1,500,000 for 1924.[45]

Up to 1921 each addition to the appropriation meant an extension of service. But most Congressmen were of the opinion that the experimental character of the service did not require extension at least, beyond a certain point. The postal authorities had asked for $3,000,000 for 1921 to enable them to establish five routes. When certain members insisted upon giving the full amount asked, Mondell of Wyoming, called it pork barrel legislation and raised the same point of order[46] that Tincher was to raise the year following, and Crompton four years later. This gave the Senate its first opportunity to play the role of savior, and led to the establishment of the New York-San Francisco route as a compromise.

The Night Air Mail

After the appropriation for 1921 the postal authorities seem to have become reconciled to the one-route idea; but beginning with 1922 they asked each year for additional funds for the creation of a night service. Their requests had little influence on Congress until the appropriation bill for 1925 came up, when a serious effort was made by La Guardia to give the Department most of what it asked.[47] The result was that the whole appropriation was ruled out once more as it had been twice before. Crompton of Michigan, who raised the point of order, used very much the same language that Mondell had employed on a similar occasion.[48] Clancy, Crompton's

colleague, hinted rather vaguely of a railroad lobby's being behing the opposition, but later admitted that he knew that Crompton had other motives.[49]

When the restored apporpriation came back from the Senate, there was an amendment to it providing $1,250,000 for "the installation, equipment, and operation of the Air Mail service by night flying."[50] The House receded from its previous position, as it had become quite accustomed to doing, and a four years' fight for a night air mail was finally won.

The Post Office Department had been investigating night flying since early in 1921. On Washington's Birthday, a plane left San Francisco at four o'clock in the morning and arrived at New York at 4:50 the following afternoon. The total elapsed time was 33 hours, 21 minutes, but the actual flying time was only 25 hours, 16 minutes. The 885 miles between Cheyenne and Chicago were covered by night flying.[51]

After this encouraging experiment the Department took up the engineering problem of lighting, and by August 21, 1923, was ready for a more elaborate try-out.[52] On that date it undertook eight through mail trips in addition to the regular work. The schedule time was 30 hours, 15 minutes. Seven of the eight flights were successful, six lowering the schedule time from one to two hours. The time of one flight was 26 hours, 14 minutes. In the previous experiment one plane had flown the entire distance. But this time each flight was conducted in seven or eight relays, much as the old Pony Express had been.[53]

So careful was the preliminary work of the postal officials that the beginning of the fiscal year 1925, the first year for which there was an appropriation for night service, saw the opening of the new system, and from then on its operation was continuous.[54] The schedule proved to be a few hours slower than the experiment had seemed to indicate was practical. The mail left each terminal before noon and arrived at the night-lighted section of the route before sunset; flying over this part of the Transcontinental during the night, it reached the opposite terminal the following afternoon.[55]

It soon became apparent that such a schedule was of little benefit to New York mail sent to Chicago and points farther west because most of the mail was in the New York postoffice by the close of the business day and could be carried to Chicago by several fast night trains.[56] The next move, then, was to compete successfully with the efficient rail transportation. The lighted route was therefore extended eastward; by July 1,1925, it had been completed to New York; and that day marked the opening of a night service between New York and Chicago.[57]

It likewise developed, in the course of time, that the Transcontinental Night Mail was beginning and ending at the wrong time. It left each terminal in the morning when there was little mail to be carried, and arrived at the opposite end of the route on the following day too late for

delivery. So, while the schedule was theoretically only a little over 30 hours, it was in practice much longer than that. To remedy this the western end of the route was lighted during 1928 with the idea of having the mail leave each terminal at the close of the business day and arrive at the opposite terminal in time for the early morning delivery.[58]

The new schedule was a complete reversal of the old. While under the latter night flying was done over the middle section, under the new plan the night flying was done over the ends of the route. This seems to imply a lack of foresight on the part of the government, but in reality it shows the progress that was made in aviation. The Chicago-Cheyenne section was selected for night flying not because it provided for the most efficient schedule, but because it was the only portion at the time considered safe for night service. In 1924 the fog in the east and the high mountain in the west were thought to be insuperable obstacles.

Experimental Contract Mail.

The opposition to the way in which the Air Mail was being operated by the Post Office Department sometimes took surprising turns. Crompton, whose sense of economy could not favor the expansion of the governmental service into a great system, announced himself as being opposed to an increased appropriation for 1921 because the postal authorities had shown no inclination to inaugurate a contract system.[59] Just a few months later Steenerson[60] of Minnesota and Madden of Illinois,

the chairman of the powerful Committee on Appropriations, assumed a rather hostile attitude because the Department had attempted to do the very thing which Crompton wanted.

As a matter of fact Congress had made an appropriation of $1,250,000 for contract Air Mail for 1921, as it did likewise for the year following.[62] The three contracts which the Postmaster-General had made to go into effect January 1, 1921 were well within this figure-$685,000 for the three-;-but the difficulty was that the appropriation stated that the contract service must be furnished "at a cost no greater than the cost of the same service by railroad." The result was that the contracts were never carried out.

For the two following years contract service was allowed by a provision in the appropriation acts " for mail messenger service in lieu of payment to railroad companies for side and terminal landing service."[64] Under this provision a contract route was actually operated in Alaska between Fairbanks and McGrath from February 1 to June 30,1924,[65] at which date the appropriation ceased until after the passage of the Air Mail act of 1925. The reason that there were no contract routes started within the United States proper seems to have been that all bidders demanded a guaranteed payload.[66]

The Beginning of Foreign Air Mail.

There were really three other contract routes during this early period, but they were officially classed as foreign Air Mail. Congress appropriated $100,000 for this

service for 1921 and continued the appropriation at the same figure down to the fiscal year 1928.[67] The Government's purpose here seems to have been not so much to encourage Air Mail to foreign countries in general as to meet certain special conditions.

On October 15,1925 there was established a route between Seattle and Victoria, British Columbia. Its purpose was to speed up the mail to and from Asia. Most of the ocean liners stopped to unload at Victoria before going to Seattle and likewise took on an additional load after leaving Seattle. By carrying the mail by plane a full business day was saved.[68] This route, once established was never abondoned.

Shortly before, a contract line was inaugurated between Key West and Havana, Cuba, by the Aeromarine West Indies Airways, which used flying boats secured from the navy. In going by boat to Havana the mail waited from two o'clock in the afternoon until evening and reached its destination the following morning. By plane it was in Havana about two hours after reaching Key West.[69] This service ceased March 31, 1921, not to be resumed until 1927.[70]

The third early contract route operated between New Orleans and Pilottown, Louisiana, connecting with mail to and from Cuba and Central and South America. After its inception on April 9,1923, the service was continuous.[71]

Authorization of the Air Mail.

The experimental character of the early Air Mail

is shown by the fact that for almost seven years it was operated without definite authorization of Congress. During this whole period its existence was subject to the whim of any individual Congressman, for the Holman rule provided that there could be no appropriation for which there was no law as a basis, except by unanimous consent. In three years out of the seven individual members of the House exercised their right under the Holman rule and once-in 1923-the Committee on Appropriations in the House failed to recomment an appropriation. The House finally agreed to the appropriation each time; but four threats of extinction in seven years showed the necessity for a more solid legal basis.

There were several bills to authorize a government Air Mail as early as 1919, but these were all to provide special routes and only one-an attempt to extend the Transcontinental to Boston-received any consideration at the hands of Congress. The first and only important bill to authorize government mail in general was introduced by LaGuardia on February 12,1924.[72] It passed the House in December, but got no farther than reference to the committee on Post Offices and Post Roads in the senate.[73] It had originally provided for both government and contract mail, but the latter provision was stricken out by the committee,[74] because there was another bill before Congress, which took care of it. Another bill of the same nature introduced by LaGuardia a year later was lost in committee, and this marked the end of the attempt to legalize government operation.

The fight to authorize contract Air Mail started almost as early as the efforts of the government advocates. There was this difference, however; that the contract bills from the very first were of a general character. In fact, the six introduced from December, 1921, to February, 1924, were almost identical except that Representative Kelly's three and Senator Shortridge's one were entitled "a bill to encourage commercial aviation and authorizing the Postmaster-General to contract for Air Mail service," while Representative Steenerson's two bills added to this title "and prescribing rates of postage thereon."

In point of time Steenerson's first bill was the first of the six,[75] As a representative from Minnesota, Steenerson had been somewhat critical of the postal authorities for abolishing the Chicago-Minneapolis route; and less than a year before his first bill was introduced he had rather questioned the wisdom of making contracts. But Second-Assistant Postmaster-General Shaughnessy's interest and a little individual investigation had won him over. His second bill reached the House calendar, but was never considered.[76] Kelly's last bill finally became the Air Mail act of 1925. The others diad in Committee.

Representative Kelly of Pennsylvania, chairman of the Committee on Post Office and Post Roads introduced his bill on February 18, 1924.[77] It was reported by his committee too late for consideration,[78] but was called up

the following session, on December 17, and passed the next day.[79] The Only opposition was voiced by Griffin of New York, who held out for permanent government operation with army personnel. It passed the Senate without debate on January 27,1925,[80] and was signed by the President on February 2.[81]

The new law authorized the Postmaster-General to contract with any individual, firm or corporation for the transportation of Air Mail between such points as he might designate at a rate not exceeding four-fifths of the revenue of this mail and also to contract for the carrying of ordinary first-class mail on the same terms. The postage rate on Air Mail was fixed at not less then ten cents an ounce.[82]

To determine what portion of the revenue each contractor was to receive, under the new law, it was necessary to count the letters. This resulted in a loss of from 30 to 50 minutes at each terminal. To speed up operations the act was amended on June 3, 1926, so as to allow the Department to make contracts at a maximum charge of three dollars a poundfor the first thousand miles and a maximum of 30 cents additional for each extra 100 miles for Air Mail and a maximum charge of 60 cents a pound for the first thousand miles and an additional maximum charge of six cents a pound for each additional hundred miles for ordinary first-class mail. Existing contracts could be amended with

the written consent of both parties concerned.[83] The new rates were figured out approximately on the old basis.[84] Four-fifths of four dollars-the estimated average gross revenue on a pound of Air Mail-would have been $3.20, but this was reduced slightly to cover the cost of carrying the mail sacks.

An attempt was made by Madden to strike out the provision for carrying ordinary first-class mail; but it was retained on the ground that it might furnish additional revenue to the contractors, although, as it turned out, no contracts were ever made for such mail, and what little was carried was done free of charge.[80]

The last Air Mail to be legalized was the foreign service. This was done by an act passed March 8,1928 giving the Postmaster-General the right to make contracts for the transportation of mail by air to foreign countries and the possessions of the United States. The contractor, who was to be the lowest responsible bidder, could be paid by the pound or by the mile, but the rate in either case could not exceed two dollars a mile.[86]

Expansion of Contract Mail.

The various companies interested in air transportation had expressed themselves as being completely satisfied with the provision of the Air Mail Act;[87] but there was no scramble to secure contracts following its passage. Only two contract companies began operating within the next year-on the San Diego-Los Angeles and Key Largo-Key West

routes- and both later went out of busire ss. February 15,1926, marked the real beginning of the contract system. On that day the Ford Motor Company started to transport mail between Detroit and Cleveland and between Detroit and Chicago. During April three more important routes were started; and by the end of the year ten contractors were engaged in the mail business under the new act. During 1927 four more companies commenced operation.[88]

Meanwhile the Postoffice Department had decided to discontinue government operation in order to allow those who took over the Transcontinental to have the benefit of carrying passengers and express.[89] With the transfer of the San Francisco-Chicago portion of the route to the Boeing Air Transpor t on July 1, 1927, and the handing over of the eastern portion to the National Air Transport two months later the government went out of the mail transportation business. Counting the two old foreign routes, there were eighteen different contract routes at the opening of 1928. In addition contracts had been let on five routes which were to begin operating on May 1, 1928, or sooner.[90]

At the close of the first quarter of 1928, 26 states were being served directly by Air Mail. When all routes contracted for,or advertised, had gone into the operating column, this number would be increased by ten.[91]

Postage rates have played an important roll in our mail growth. After the inauguration of the Night Mail

the country was divided into three zones by lines running north and south through Chicago and Cheyenne, eight cents being charged for each zone. This complicated system was found to confuse the average mail patron. So on February 1, 1927, the Post Office Department announced that the rate would be ten cents for each half-ounce, anywhere in the United States. The fact that it now took about sixty letters to average a pound instead of forty increased the government's revenue on the short hauls, thus compensating to some extent for its loss on the longer carriages.

In August, 1928, the rates were still further reduced to five cents for the first ounce and ten cents for each additional ounce. The results of this regulation were soon apparent. One company reported an increase of about 25 per cent in volume of air mail within a few days after the lower rates had gone into effect.[92] The total gain for the year 1928 was three-fold.

Before the days of the Transcontinental there were no special patrons of the Air Mail. Novelty seekers and those cought in emergencies sent most of the letters by the faster method. Under the Transcontinental system itself, there, of course, could be no patrons of the special service. With the coming of the Night Air Mail a regular patronage grew up, headed by banking and financial institutions, eager to save an extra day's interest.[93] Later the bankers were pushed into second place by the moving picture companies. It was estimated in 1928 that

about fifteen reels of films were transported daily from Hollywood to New York. Jewelers, advertising agencies, fashion houses, and newspaper feature syndicates were also large users.[94]

The Future of Foreign Air Mail.

The foreign air mail seemed destined in 1928 to develop along two lines: through aircraft connections to foreign countries and connections made by aircraft in conjunction with sea-going vessels. The latter development was practically the same as the earlier foreign mail already discussed. It was concerned chiefly with European mail, while the more direct communication sought an outlet to Central and South America.

The Department of Commerce became interested in air transport to Central and South America even before the passage of the Air Commerce Act. In June, 1927, Assistant-Secretary McCracken advised those contemplating non-stop flights to direct their attention to the south rather than to the east.[95]

Early in 1928 the Post Office Department announced that six tentative mail routes were planned, making connections with Mexico, Central and South America, and Canada.[96] Bids were asked on a new Orleans-Laredo route, which was to connect with a Mexican line to Mexico City via Vera Cruz.[97] The latter, however, was not to be in

operation until toward the close of the year. A contract was let for a service between the United States and Peru.[98]

The American government was somewhat behind foreign countries in the field-at least, as far as South America was concerned. A German company was operating between Barranquila and Bogata, Columbia, as early as 1920; it made no European connections, however,[99] a service which did make such connections was inaugurated by the French Latecoere Company, February 28,1928. It carried mail from Paris to St. Louis, Senegal, and from Natal, Brazil, to Buenos Aires via Rio de Janeiro, the middle passage being taken care of by fast boats.[100] It belonged rather, therefore, to the second type of foreign air service.

One phase of this type of air service reached quite a high stage of development in the United States-that is, the kind which simply connected the Air Mail with the same service in foreign countries. By 1927 mail could be sent by air to all of the principal countries of Europe-the Atlantic, of course, being crossed by boat. Two Air Mail stamps, as well as the regular first-class postage to the country concerned, were required, if two carriages by air were desired.[101]

The ship-to-shore-service, which was the second phase of the air-boat mail had reached only the experimental stage by 1928. On August, 1927, Clarence D. Chamberlin, on the invitation of the United Shipping Board, hopped off the Leviathan and landed successfully at Hasbrook, New Jersey.[102]

Shortly afterwards 100 pounds of mail were dropped on the deck of the same liner, about 500 miles east of New York, by Lieutenant Chas. H. Schildhauer, a naval officer.[107] Chamberlin's experiment was repeated a year later when an airplane was catapulted from the liner Ile de France, about 450 miles out to sea, and reached New York with a passenger and a cargo of mail. The French company for which this feat was accomplished planned a regular ship-to-shore service for the Ile de France and eventually for all of the boats.[104] But the United States government made no move in the same direction.

About the same time it was reported that Vilhjoemur Stefansson, the Arctic explorer, was advising certain interests who were considering the establishment of a four-day Air Mail route from New York to Peking, China, across the North Pole.[105] Stefansson was long a fervent advocate of the Arctic route because of the great distance saved. But probably direct airplane service with either Asia or Europe was several years in the future.

Financial Condition.

The financial side of the Air Mail is one of the most difficult to handle for two reasons, first, because separate accounts apparently were not kept all the way through;[106] and, secondly, because expenditures were given on so many different bases that the available figures were

very confusing. To simplify the problem as much as possible, the government's financial status under operation of the Post Office Department will be considered first; its financial status under the contract system, secondly; and the financial status of the contracting companies, last.

It is probably not too broad a statement to say that government operation was a losing proposition all the way through. It is true that in the early 1920's there were numerous statements which seemed to imply the contrary. For instance, at the beginning of 1920 both Burleson and his second assistant reported that the saving on car space and the cost of train distribution had enabled them to abolish the extra postage,[107] but the latter a little earlier gave exact figures showing an actual loss of approximately twenty per cent.[108] Moreover, it was confidently asserted in Congress that the saving in car space was only theoretical, since the cars continued in the service as before.[109] Some of the Air Mail enthusiasts, both in and outside of Congress, went even further than the postal authorities and claimed an actual profit.[110]

All the later statements of the Department, however seem to prove the opposite. Second-Assistant Postmaster-General Paul Henderson, writing for the Sunday edition of the New York Times for December 7, 1924, said that the service was still not self-sustaining,[111] seeming to imply that it never had been. If the later service did not pay for

itself certainly the earlier could hardly have done so, for even those not disposed to be friendly admitted that the cost was decreasing.

The cost per plane-mile seems to have decreased at first and then to have increased again,[112] but this is easily accounted for by the enlarged size of the planes and their greater carrying power. The ton-mile basis seems to be a fairer way of determining progress.

It is quite generally agreed that the ton-mile cost was about $5.35 in 1921 and that by 1924 or 1925 it had decreased to somewhere around $2.60.[113] This certainly shows remarkable development and it also seems to indicate that some of the earlier statements were put out to secure larger appropriations.

The government up to 1928 appeared to be no better off under the contract system than under operation by the Department. The latter's statement before the Appropriation Committee of the House in its hearings on the appropriation for the fiscal year 1929 indicated that a count of Air Mail, kept from October 10 to October 16, 1927, at all offices on air routes and some others, showed a revenue of $66,845.45; while $74,470.09 was paid to the contractors for the same period. Allowing fifteen per cent of this revenue for the cost of handling, there was a weekly deficit of $17,651.46, or a yearly deficit of $847,270.08.[114] It is quite possible that too much was allowed for handling; but there was a deficit of $396,481.28 for the year without allowing anything

for this item. Taking the Department's figures just as they stand, the percentage of loss was 23, or more than three per cent greater than the loss for the first six months of government operation.

With the government apparently bearing as large a percentage of the loss as it ever did and the cost of operating constantly decreasing, the contractors should have been making money; but their reports were almost as unfavorable as that of the government. Towards the close of 1926 one of the most successful of the operators stated that during its first six months of mail transportation it had lost $750 a day.[115] Due to the carrying of passengers and express and the increased volume of mail, conditions improved somewhat during the following year. But incomplete returns from fifteen operators showed a revenue of only $2,149,111 for 1927 against expenses of $2,100,427. Since the actual investment was about $5,000,000, there was a profit of slightly less than one per cent. Eight of the fifteen, however, still showed losses.[116]

Safety and Efficiency.

From 1918 up to the close of the first half of 1927 only 32 pilots lost their lives in a total of 15,627,531 miles flown. This was an average of 489,298 miles for each pilot fatality. In the first year of operation there was one fatality for 102,548 miles ; in 1926, only one for 2,583,056; while 12,239,394 miles were flown during the first half of 1927 with but one loss of life.[117]

During the first four years of flying, safety progress was slow, the average being 138,600 miles for each pilot killed. This was somewhat behind the French and British records for approximately the same period, which showed averages of 233,000 and 256,500 miles respectively. After 1922 there was steady improvement in the safety factor, due to the adoption of a standard plane and concentration on one route. From 1922 to 1925 the Air Mail record of 789,110 miles per fatality was better than either the French or British, whose figures were 728,500 and 554,400 miles respectively.[118]

The fatality record of the American contracting companies during their first eighteen months of operation compared favorably with the figures just given, but was considerably behind the governments record for the same period. Scheduled flying, including both government and contract, was far in advance of miscellaneous operations, there being but seven pilot fatalities in the former and fifteen in the latter. Practically all of the fatalities in the miscellaneous column occurred with unlicensed pilots and in unlicensed planes.[119]

Mail apparently was just as safe as pilots, for the Postoffice Department reported a loss of but 2,386 pounds lost or destroyed out of 9,000,000 pounds carried from 1918 to November, 1927,-a loss of 0.000265 per cent.[120] The percentage of loss in 1918 was o.001734, and it decreased

steadily every succeeding year. The losses between 1922 and 1924 were equal to about half the percentage of registered packages lost by the railroads. So far as known there was only one air service which had a better record; The Magdalena route in Columbia was reported to have carried 55,592 pounds of mail in five years without the loss of a single letter.[122]

The care taken of the planes by the Department should have indicated a fairly high degree of efficiency under government operation. After 100 hours of flying the motors were removed from the planes for overhauling, while after 750 hours the planes themselves were taken to the government shops at Maywood, Illinois, for reconditioning.[122] Efficiency is best shown by a consideration of forced landings, scheduled trips completed, and on-time record.

The early forced-landing record of the government route was relatively very good. In 1920, which showed an increase in forced landings as compared with the previous year, there were 5,270 miles flown for each such accident, as compared with only 2,290 miles for the London-Paris route. Three years later, however, the latter had a mileage of 11,280 for each forced landing and the government mail a mileage of only 10,280; and later information seemed to indicate that the Paris-North Africa route and the London-Paris route had a mechanical reliability from 200 to 300 per

cent greater than the Air Mail. Despite this fact, there was almost constant progress except for the year 1921, when there was too rapid an extension of the service and a great deal of experimenting with planes. The absence of night flying in the French and British services may have accounted for their better showing.[123]

The record for scheduled trips completed, oddly enough, did not show any progress, or even much variation, except for the year 1920 and the first half of 1927, when there was a decided drop. This was accounted for in the earlier year by the fact that the Transcontinental was just getting started.[124] In the latter year the showing for all eighteen routes was but 87 per cent, a decline of several points from all of the previous years except the one just mentioned. The explanation for this should naturally have been sought in the poorer performance of the new contract routes; but strange to say it was the two government services which fell down, their record being only slightly more than 67 per cent.[125] Probably a different interpretation of "completed trips" partly accounted for the poorer showing; but the superior performance of the contract operators seemed to indicate a loss of interest on the part of the government.

The on-time record of government operation compared very favorably with a similar record of the railroads. Based on a ground schedule of 70 miles per hour, the mail planes between New York and Chicago, June, 1921, to May 1925, inclusive,

showed on-time averages ranging from 73 per cent in winter to 97.8 per cent in summer-a yearly average of 85.8. The passenger trains in New York State arriving at division terminals from 1910 to 1920 inclusive, on schedules of about 30 to 35 miles an hour, showed on-time averages ranging from 75.3 per cent to 85.3 and -an annual average of 80.7.[126]

Chapter 2.

The Development of a Definite Policy.

The government's most outstanding contribution to commercial aviation before the passage of the Air Commerce Act of 1926 was the Air Mail. There were other less conspicuous developments, which will be taken up in Chapter 4. It may be well, however, briefly to mention here the government's achievements in famous record flights, because in the eyes of many these were more spectacular than the work of carrying the mail and hence almost as important as the Air Mail itself in keeping alive sentiment for aviation.

It is significant that every important record flight made in America between the close of the World War and the adoption of the Air Commerce Act was the work of the army or the navy-except the last, which was performed by a naval officer. In 1917 Lieutenant-Commander Read, in the navy flying-boat N-C4, completed the first trans-Alantic flight, from Newfoundland to Portugal, by way of the Azores. A little over six years later Commander Rogers in a navy seaplane almost completed the first flight to Hawaii, being forced down near Honolulu after establishing a non-stop seaplane record of 1,992 miles. On May 9, 1926, still another naval officer, Commander Byrd, flew from Spitzbergen to the North Pole and back in about fifteen hours; this feat, however, was not really a naval enterprise.[1]

The army had even more records to its credit.

In 1920 four DeHaviland planes, led by Lieutenant Street, flew from New York City to Nome, Alaska, approximately 5,000 miles, in 55 hours actual flying time. In May, 1923, Lieutenants Kelly and Macready made a non-stop flight, New York City to San Diego, 2, 516 miles, in 26 hours, 50 minutes. Less then two months later, the distance from New York to San Francisco, 2, 540 miles, was covered by Lieutenant Maughan in 21 hours, 48½ minutes, actual flying time. The following summer two of four Douglas transport planes which left Seattle flew around the world by way of Alaska, Japan, India, England, and Iceland in 371 hours, 11 minutes actual time in the air, over a period of 175 days.[2] The purpose of the last flight was to test equipment and to determine the feasibility of inter-continental travel.[3]

Meaning of Policy.

Despite these notable accomplishments, however, the lack of "a definite and continuing policy" on the part of the federal government did a great deal to retard commercial flying in the United States.[4] Such a policy implies, first, the determination of the legal status of aviation and, secondly, the encouragement of the art according to an established plan. For the legal side of the question nothing was done before 1926. There was considerable encouragement, but it lacked consistency and sometimes even strict legality.

The law of aviation embraces both theory and practice. From the theoretical standpoint the two most important questions which had to be cleared up were ownership and sovereignty of the air. Logically both should have been settled before there could have been any actual flying; but since the world is not logical, there was a great deal of flying before anything at all was settled; and governments showed a much greater interest in the more practical problem of governmental machinery, regulation and encouragement. For this reason the last topics will be discussed in the order given, leaving the more theoretical subjects until the end of the chapter.

Governmental aviation machinery.

Since commercial aviation grew very largely out of the War, it was but natural that those nations which took a leading part in it should have been among the first to create agencies to control this new kind of transportation. England created an Air Ministry in 1919 with control over both military and commercial flying. The same year Germany established a Ministry of Air and Transportation; and, about the same time, France appointed an Undersecretary of State for Aeronautics.[5]

The United States was able to construct no such machinery until seven years later, but various attempts to do so were made at that time. From America's entrance

into War until the problem was finally solved, there were bills before Congress almost constantly, looking towards the setting up of adequate machinery for the control of aviation. There was, first of all, an effort to centralize aircraft procurement for the various governmentalagencies; secondly, there was an attempt to centralize all aviation in a single department; lastly, there was the fight to give the Department of Commerce control of Civil aviation.

An act of Congress, passed October 1, 1917, provided for an Aircraft Board to expand and coordinate the industrial activities relating to aircraft produced for any purpose in the United States and to facilitate air service generally. The military character of this law is shown by the fact that the Board was to be made up of three military and three naval officiers and three civilians,and was to function not longer than six months after the World War. The principal duty of the Board was to recommend the best means of obtaining aircraft and equipment, the contracts actually being let by the regular authorities. The act carried an appropriation of $100,000. This and a like amount for the following year confined the Board's activities entirely to the military side of aviation.[6]

The only other attempt at legislation of this type was a bill (H.R. 11284) introduced by Representative Vinson of Kentucky on April 14, 1926. It passed the House, but died in committee in the Senate. It provided for an

Aircraft Procurement Board, consisting of Assistant-Secretaries of the War, Navy and Commerce Department, an Assistant Postmaster-General-all to be appointed by their respective department heads-and of the chief of the Air Service and the chief of the Bureau of Aeronautics in the navy. The duties of this board were to be similar to the original Aircraft Board.[7]

The advocates of complete centralization were divided among three plans-control by the War Department, by a Department of Aeronautics and by a Department of National Defense. The first scheme came at the beginning of the struggle; the last, towards the end; while the second was advocated all the way through.

About the time that the military enthusiasts were trying to hand the Air Mail over to the army, Senator Sherman introduced a bill (S.2593) which was intended to do the same for all civil aviation. Its innocent-looking title was"a bill to regulate the navigation of the air." It got no farther than reference to the Senate Committee on Military Affairs.[8]

On October 9 of the same year, Representative Curry of California began a long series of attempts to establish a separate department for all aviation by introducing "a bill (H.R.9804) to create a Department of Aeronautics, defining the powers and duties of the Director thereof, providing for the organization, disposition and

administration of a United States air reserve force, and providing for the development of civil and commercial aviation."[9] His example was followed by Hull and Morin in the House and by New in the Senate. The only one of these bills to reach the floor of either house was the latter's bill (S 3348) of October 30, 1919, which bore almost exactly the same title as Curry's first bill.[10]

This bill was reported back from the committee on Military Affairs by Senator New himself on December 8[11] and was considered as in committee of the whole towards the end of January, 1920. Originally it provided for a distinct executive department under a Director, but an amendment which Senator Smoot was able to put through created an independent establishment instead.[12] Senator Borah opposed the whole plan on the ground of economy; but the principal opposition came from McKellar, who wanted to keep the Air Mail separate, and from Gerry of Rode Island, who said that most of the naval experts wanted their own air force and that their opinion had not been asked.[13] It was this last consideration which finally induced New to ask unanimous consent to recommit his bill, with the result that no more was heard of it.

Curry continued his agitation until toward the close of 1925. In the end, however, he gave up his separate-department idea for what amounted to a bureau in the War Department. According to a bill (H. R.12285) introduced into

into the 68th Congress all air activities of the government were to be transferred to this new bureau.[14] He had therefore practically returned to Sherman's position of 1919.

One of the objections raised against Senator New's bill was that it created three departments where there had been two. Hitchcock of Nebraska had stated that he would have been in favor of the measure if it had provided a single Department of National Defense.[15]

A bill (H.R.9044) to provide for such a department was introduced by Representative James of Michigan in the first session of the 69th Congress, but it died in Committee.[16] Civil aviation was destined to have its own organization, distinct from the military.

The first federal agency to suggest control of civil aviation by the Department of Commerce was apparently the National Advisory Committee for Aeronautics. This board, consisting of representatives of the War and Navy Departments, the Smithsonian Institution, the Weather Bureau, the Bureau of Standards, and five civilian members, was created by the Naval Appropriation Act for 1916, on March 3, 1915,[17] to study the problems of flight with a view to their practical solution and to determine problems to be experimented with. In its fourth annual report to Congress, on December 3, 1918, it recommended the creation of an Air Commerce Bureau in the Commerce Department;[18] and each subsequent annual report up to 1925 contained a like recommendation.[19]

President Wilson seems to have been only slightly interested in aviation; but his Secretary of the Treasury, with his approval, on February 26,1919, submitted to Congress the proposal of the National Advisory Committee with an estimate of the appropriation necessary to carry it out. This message was referred to the Senate Committee on Appropriations.[20]

President Harding was the first chief executive to take up actively the need for governmental aviation machinery. A month after his inauguration he requested the National Advisory Committee to "take up vigorously and fully the question of federal regulation of air navigation, air routes, and cooperation among the various departments of the government concerned with aviation."[21] The special report of the National Advisory Committee made on April 19, 1921, as a result of his action, he indorsed in rather general terms,[22] as he later did its eighth annual report in December of 1922;[23] but in presenting the committee's seventh annual report, December 7, 1921, he explicitly pointed out that its most important recommendation was for a bureau to be established in the Department of Commerce for the regulation and development of air navigation.[24]

President Coolige in his first annual message to Congress, on December 6, 1923, said that laws should be passed regulating aviation; but his interest was rather passive until the spring of 1925, when he determined upon the appointment of a board to investigate. This decision, however, was not

reached without a suggestion from Secretaries Wilbur and Davis, on September 12.[25] A little later, in submitting the eleventh annual report of the National Advisory Committee, the President used language as pointed as Harding had employed four years earlier.[26]

Meanwhile Congress had not been idle. There was considerable agitation in Congress in 1919 to carry out the recommendation of the National Advisory Committee.[27] But the first important bill was one (H.R.14601) introduced by Representative Kahn of California on May 13,1920, and referred to the Committee on Interstate and Foreign Commerce. The bill, as orginally drawn, provided for an Air Navigation Commission composed of one representative each from the Departments of State, Treasury, War, Post Office, Navy, Agriculture, and Commerce and the National Advisory Committee. The Committee, however, partly upon the advice of the National Advisory Committee, substituted for this commission a Commissioner of Air Navigation in the Department of Commerce, to work under the advice of the National Advisory Committee.[28] The following year Kahn returned to his original plan;[29] but schemes somewhat like the committee idea were taken up by other men.

On May 19, 1920, Hicks introduced a bill (H.R.14137) which created a Bureau of Aeronautics within the Department of Commerce under a Commissioner of Aeronautics and an Aero Board. Again the National Advisory Committee showed

its hand and had itself substituted for the Aero Board by the Interstate Commerce Committee, to which the bill had been referred.[30]

Just ten days later a bill (S.4470) was introduced by Senator Wadsworth of New York, worded exactly the same as Kahn's early bill, but providing for a Bureau of Civil Aeronautics under a Commissioner. This bill got no farther than the Committee on Commerce; but it started a long[31] series of bills of the same nature by Wadsworth himself and by Hicks and Winslow.

The first such bill to receive much attention was one (S.2815) proposed by Wadsworth early in 1922. It was debated in the Senate committee of the whole on February 13,1922, and passed the next day. Overman opposed the Bureau which it created because of expense; and Hitchcock, Harrison, and King, because it would interfere with the establishment of a Department of National Defense.[32] No action was taken on the measure in the House.

Another of Wadsworth's bills (S.76) passed the Senate, January 8, 1924, without debate. The Committee on Interstate and Foreign Commerce, to which it was referred in the House, failed to report on it.[33]

The next important link in the chain leading up to the Air Commerce Act of 1926 was "a bill (S.41) to encourage and regulate the use of aircraft in commerce, and for other purposes," introduced by Senator Bingham of Connecticut on

December 8, 1925, and referred to the Committee on Commerce. Unlike the two Wadsworth bills it provided for an additional Assistant-Secretary of Commerce instead of a Bureau of Aeronautics, because there were existing bureaus which could do most of the work if properly coordinated. King wanted to strike out this last section altogether; but Bingham pointed out that the President's Aircraft Board, previously referred to, had recommended three additional Assistant-Secretaries, in the War, Navy and Commerce Departments, to coordinate the work of aviation.[34] The President's Aircraft Board's suggestion, however, was a "Bureau of Aeronautics under an Assistant-Secretary of Commerce."[35] Either Bingham or the Commerce Committee must have been responsible for the elimination of the Bureau.

Having passed the Senate on December 15,[36] the bill was three days later referred to the House Committee on Interstate and Foreign Commerce, which had it under consideration until March 17,1926. It seems that the Committee had been working on a bill based largely upon Winslow's bill and the report of the President's Aircraft Board. The result was that the Senate bill was stricken out entirely and a committee amendment substituted for it.

The latter passed the House, April 15, after considerable debate and an attempt by Bland to abolish the office of Assistant-Secretary,[37] but was rejected by the Senate two days later.[38] A conference committe then adopted

a compromise bill, which was agreed to by the Senate on May 13 and by the House four days afterwards. With the President's signature on the nineteenth, it became a law.[39]

In the original Senate bill the additional Assistant-Secretary was to have charge of aviation and such other duties as might be assigned by the Secretary. The House amendment confined his work to aviation. The last provision was made part of the final law.[40]

The Control of Air Navigation.

The regulation of civil aviation was one of the most important questions affecting air commerce and one which received first attention in practically every country. It usually started with a few simple rules covering particular cases and gradually grew into an elaborate system containing a statement of general principles, provisions for inspection and licensing of pilots, aircraft and airports, and provisions for air traffic rules. It was in most cases found better to make the laws rather general and to take care of details by regulations.

Great Britain was one of the first countries to attempt the control of aviation. In 1911 a member of the cabinet was given the power by Parliament to prohibit flying over such areas as he might prescribe, in order to prevent low flying over coronation processions and other ceremonies. In 1913 this power was extended to prohibited areas for national defense and safety. Finally, in 1919, the law was made to

cover the inspection and licensing of pilots, aircraft and airdromes, and the conditions under which aircraft might be used for the carriage of passengers and goods.[41]

Regulation of air commerce in Germany is interesting because she had to meet conditions similar to those of the United States. As early as 1910 some of the German States required aviators to be licensed and to give three days' notice to the police of each intended flight. The police were to inspect the craft before each flight and might prohibit it if dangerous.[42]

The most important move in the direction of regulation, outside of the United States, was international. The International Air Navigation Commission was created by the Supreme Council of the Paris Peace Conference, March, 1919, to draft a convention relating to air navigation. This convention was completed within the next few months and signed on October 13, 1919, by all of the allied and associated powers except the United States and Japan. The United States finally signed May 31, 1920, but the convention was never submitted to the Senate for ratification.[43]

The covenant provided for registration, identification, and certification as to airworthiness of all craft engaged in international navigation; the licensing of all international pilots; and the licensing of wireless apparatus and those operating it. All this was to be done by the contracting states in accordance with regulations, called annexes, added to

the convention itself by its framers or made by the International Committee for Air Navigation created for that purpose. The convention with its annexes also laid down certain traffic rules.[44]

The first attempt at regulation of air traffic in the UnitedStates was by Connecticut. In 1911 its legislature, largely on the recommendation of Governor Baldwin, passed an act requiring registration, licensing and marking of all aircraft flown within the state. Two years later Massachusetts, passed an act providing for licensing and registration and establishing certain traffic rules.[45] Before the Air Commerce Act of 1926, six states required the licensing of pilots and planes; one, the licensing of pilots alone; and two had a system of traffic rules. There were numerous other provisions in the different states, which, however, like the laws just mentioned, were for the most part not enforced.[46]

Meanwhile, in 1921, a Uniform State Law was drawn up by the Conference of Commissioners on Uniform State Laws. This law originally provided for a State Aircraft Board with the power to license pilots and aircraft, to make regulations and to enforce them. There was so much adverse criticism, however, that all of these provisions were dropped the following year; and the only regulation retained was a general prohibition against dangerous flying and hunting from from aircraft. The revised statute was adopted by eight

states without change and by one with an amendment. This seemed to leave the way open to exclusive federal control.[47]

The demand for federal regulation came to a head in 1919 and 1920. It was advocated by the Aero Club of America, the Manufacturers' Aircraft Association, the National Aircraft Underwriters' Association, The American Bar Association, and the National Advisory Committee for Aeronautics.[48]

At the same time the movement entered Congress. Here the principal question was just how far the federal government should go. All the early bills providing for centralization favored giving the federal government control only over interstate and foreign commerce; while the early bills providing for a bureau in the Department of Commerce wanted exclusive federal control. By 1921, however, the patrons of the two different types of legislation had changed sides; and ultimate victory for control by the Department of Commerce left the regulation of purely intrastate air commerce partly to the individual states. According to the Air Commerce Act of 1926 only pilots and planes engaged in interstate and foreign commerce had to be licensed, while all flying was made subject to the traffic rules.[49]

This division of power came about as a result of a compromise. All three of the important Senate bills referred to in the preceding section had provided that the federal government should control only interstate and foreign commerce;

but the House amendment to Senator Bingham's bill stated that regulation of all private flying was necessary, "because air commerce in a unit and the United States cannot exercise complete effective control and protection of interstate and foreign commerce without incidental regulation of intrastate navigation." It provided that public aircraft-those owned by federal, state, territorial or municipal governments, should obey the traffic rules and register, although they and the airmen serving in connection with them were not obliged to be licensed.[50] The three senate bills exempted public aircraft from all requirements. The Air Commerce Act obliged all craft to obey the traffic rules and required all registered craft and the airmen serving in connection with them to be licensed, although registration for public craft and private craft not engaged in interstate or foreign commerce was voluntary. Military craft, however, were exempt even from the traffic rules if "the Secretary of War had control over exclusive military craft upon exclusive military airways." But, although the Secretary of War might establish such airways as he saw fit, they might be taken over at any time by the Department of Commerce and subjected to the regular rules.[51]

In contrast with the rigid requirements of the House amendment to Senator Bingham's bill, the Senate Commerce Committee had added to Wadsworth's first important bill a provision, which if retained, would practically have

nullified federal legislation, for it stated, "that operators and pilots of aircraft duly licensed under state laws shall be deemed duly licensed operators and pilots under this act." But the whole section was struck out by an amendment offered by Norris of Nebraska, who pointed out that really only two members of the Committee had favored it, and that the rest had agreed to it simply to secure unanimous consent to the bill as a whole. Jones of Washington, who was in charge of the measure defended the Committee's stand on the ground that all of the states were supposed to adopt the federal regulations; while Poindexter was of the opinion that the section in question would practically render worthless all good state legislation, as well as federal.[52]

Despite the apparent correctness of Norris's and Poindexter's views, the same section appeared again in Wadsworth's second bill only to be made harmless by a committee amendment which said that state licensed personnel "may, upon compliance with the terms of this act, be duly licensed as operators and pilots without charge."[53] In the later bills and in the final Act the section did not appear.

Probably Norris and Jones were both right. The Committee gave in to the states in order to get its bill through, but at the same time sought to extend federal authority as far as possible; for in the very same bill it made the term "commerce" include not only flying in interstate or foreign commerce, but also the operating of any civil aircraft

"in, over, or through the District of Columbia, the Territories, dependencies, reservations , national parks, or over any place or building over which the United States has jurisdiction."[54] According to Jones the idea of including the last four items was to force all pilots and planes to be licensed by the federal government.

The same provision appeared in Wadsworth's second bill,[55] but not in any of the later measures. Bingham's bill defined commerce in the same way with the items in question omitted;[56] the House amendment to this bill contained no definition of commerce at all; while the final Act with great clarity redefined both "commerce" and "interstate or foreign commerce."

According to this Act, "air commerce" meant "transportation, in whole or in part, by aircraft of persons or property for hire, navigation of aircraft in furtherance of a business, or navigation of aircraft from one place to another for operation in the conduct of a business." "Interstate or foreign commerce" was "air commerce between any State, Territory or possession, or the District of Columbia, and any place outside thereof; or between points within the same State, Territory or possession, or the District of Columbia, but through the airspace over any place outside thereof; or wholly within the airspace over any Territory or possession, or the District of Columbia."[57]

This permitted a business man residing in one state

to fly to his place of business in another state without a federal license. But if his plane was used to inspect his business houses in different states both the plane and the pilot had to be licensed. This part of the definition was the work of the conference committee.

The third part of the definition was meant to cover gypsy flying and was probably inserted as a result of a discussion which took place in the Senate when Wadsworth's first bill was under consideration. Senator Cummins wanted to know whether the measure covered the flying of a plane from one state to another for exhibition flying since perhaps 95 per cent of flying outside of the army and navy was of this sort. Jones thought that the subject was not covered, but should be. Poindexter thought such flying between states was interstate commerce and hence already taken care of.[58] The Air Commerce Act cleared up this point.

The definition of interstate and foreign commerce in the Act of 1926 did not include the phrase "reservations, national parks, or any place or building over which the United States has jurisdiction," as has been said; but section four of the Act gave the President authority to set apart and protect "airspace reservations for national defense or other governmental purposes and, in addition, in the District of Columbia for public safety purposes."[59] The phrase for "national defense" might possibly have given the chief executive absolute control of aviation in time of war; while

"or other governmental purposes" might even have extended this exclusive federal regulation to peace-time flying. On the other hand, the same section allowed the several states to set apart and protect "necessary airspace reservations in addition to, and not in conflict either with airspace reservation established by the President under this section or with any civil or military airway designated under the provisions of this act." In discussing this provision Senator Bingham said that it gave a state the right to prohibit interstate air commerce altogether, provided of course, it acted before the president and his Secretary of Commerce.[60]

All of section four came from the House amendment to Bingham's bill, where it had been inserted by the House Committee on Interstate and Foreign Commerce,[61] either because the Committee thought it necessary, or to balance state and federal power.

The same effort to please two masters was made when it came to the question of court jurisdiction over cases involving violations of the federal laws and regulations. The House amendment to Bingham's bill, although in favor of exclusive regulation by the federal government, was willing to give the state a chance to help enforce the federal provisions. It stated that the states, territories, and possessions might provide for the prosecution of offenses punishable by the federal government under the act and

prescribe penalities or forfeitures, civil or criminal-trial, acquittal, or conviction constituting a bar to trial and conviction by the federal government.[62] This concession to states' mights was struck out in the final act and procedure conforming as nearly as possible to civil suits in admiralty prescribed, except that either part might demand a jury trial in cases involving more than twenty dollars, and the facts tried in this way were to be re-examined only in conformity with the common law.[63]

Before this there had been some question as to the nature of the penalties which the federal government should exact. The early Wadsworth bill had provided a fine of not more than $500, and not exceeding six months' imprisonment, or both, for violating the measure itself or the rules and regulations issued under it.[64]

Bingham's bill provided a civil penalty of the same amount against any owner who allowed his aircraft to navigate in commerce without registration, or identification, or without a certificate of airworthiness, or with airmen not holders of certificates, or in violation of the rules and regulations made under the act; and against any person acting as airman without a license-the Secretary of Commerce being able, upon application, to remit or mitigate the penalty or discontinue the prosecution as he might think proper.[65]

The House amendment to the bill went back to the idea of criminal penalties, but this time they were partly for a different set of offenses. Any person who counterfeited,

forged, or altered any certificate, or any person who knowingly used or attempted to use such certificate was to be fined not more than $1,000 or imprisoned not more than three years. A fine not exceeding $5,000, or imprisonment not exceeding five years, or both, were to be levied against any person (1) who with intent to interfere with navigation displayed a false light or signal, or (2) who knowingly removed or extinguished any true light or signal, or (3) who without lawful authority knowingly exhibited any such true light or signal. For failure to secure the required licenses and for violation of traffic rules there was to be a fine of not more than $500, or imprisonment of not more than 90 days, or both.[66]

The Air Commerce Act of 1926 kept all of these penalties except the last, for which it substituted essentially the original provisions of Senator Bingham's bill.[67] It therefore provided criminal penalties for one set of offenses and civil penalties for offenses of a less serious nature. It was thought that civil procedure in the latter case would be faster and less likely to clog the machinery of the federal courts.

Besides the important question of maintaining a balance of power between state and nation in framing a policy of regulation, there were also the almost equally important questions of elasticity and effectiveness.

Should there be iron-clad laws and strict rules? Or should some federal authority be given the power to issue regulations which could be changed quite readily to meet varying conditions? Here there was, in general, agreement amon

all the important bills and the final Act itself. The effect of too strict rules in England seems to have been at least partly instrumental in forming all efforts at control along the line of elastic regulations. There were minor differences, of course. For instance, in the two Wadsworth bills the Secretary of Commerce was to direct the Commissioner to issue most of the regulations; while in the two later bills and the Air Commerce Act, all regulations were to be issued by the Secretary himself.[67] Then, too, the amount of discretion which the Secretary might exercise varied somewhat. All four bills provided for reasonable fees-optional with the Secretary in the two early bills-, but the Act itself said nothing about fees, although it was taken for granted that they were to be charged.[68]

The question of effectiveness of federal regulation was similar to the states' rights' problem. Should federal control be merely nominal or should it really accomplish what it was supposed to do? This involved principally the certification or licensing of aircraft and airmen. If licenses were to be practically permanent, once granted, federal control would be little morethan nominal. Wadsworth's first bill, as it came from the Commerce Committee, provided simply for the inspection and certification of aircraft.[69] Jones of Washington interpreted this to mean one inspection although he said that he personally favored more and that the bill had originally so provided.[70] There was no change in the second

Wadsworth bill,[71] but Bingham's bill required "inspection and testing from time to time.[72] The House amendment went still further and made it the Secretary's duty "to provide for the rating of aircraft of the United States as to their airworthiness upon registration andperiodically thereafter."[73] The Act of 1926 made periodic examination optional with the Secretary, but encouraged it by permitting inspection by owners, manufacturers, and properly qualified private persons satisfactory to the Secretary.[74]

The solution of the airman-license problem followed much the same process, except that there was no compromise at the end. The three Senate bills had provided simply for the examination of airmen. But in the House amendment examination and rating was to be periodic,[75] and the final Act followed this provision.[76]

Space does not permit a complete discussion of all the regulatory features of the Air Commerce Act of 1926. A few more of the important ones will be taken up in connection with the subsequent sections of this chapter.

A Definite Policy of Encouragement.

Great Britain, France, and Germany, beginning in 1919, actively promoted civil aviation by the payment of cash subsidies and the provision of navigational aids such as airways, airports, lighting, radio, and weather service. The cost of indirect aid probably equalled or exceeded the direct subsidies.[77]

Despite this policy of enouragement, a careful investigation by the Commerce Department and the American Engineering Council disclosed in 1926 that the German line in Columbia was the only one paying.[78] Outside of the United States this seemed to be true two years later. France, which did more for civil aviation than any other country, spent about $7,000,000 annually after 1922, about $2,000,000 of this being paid out every year as a direct subsidy. But here, as elsewhere, air transportation was not put upon a sound business basis. Only five per cent of the patrons of the passenger service were French.[79] The policy of direct subsidy was a failure.

In the United States the states were ahead of the national government in adopting a policy of encouragement. But by 1926 only four states had laws permitting municipalities to acquire and maintain landing fields. And this was the only type of aid offered.[80]

The granting of direct subsidies in the United States never received serious consideration, although numerous Congressmen liked to contrast progress in Europe under such a policy with American backwardness. The attempt to establish a definite policy of indirect encouragement, however, started in 1919 and ended successfully with the Air Commerce Act of 1926. This act provided for two kinds of indirect assistance; aids to navigation and more general methods of encouragement. The former included civil airways; navigation facilities, except

airport; emergency fuel, oil, supplies, equipment and services; and weather reports. The latter took in the development of air commerce; the promotion of aeronautical industry and trade; technical research work; the investigation and recording of accidents, and the exchanging with foreign countries of information about air navigation.

The first bill to provide for civil airways was Senator Sherman's, previously referred to. It gave the Secretary of War authority to lay out routes for civil flying;[81] and every succeeding regulatory bill conferred the same power on some federal agency. This most essential aid to navigation seems never to have been questioned. The Act of 1926 made it the duty of the Secretary of Commerce to encourage the establishment of civil airways as well as to designate them himself.[82]

In regard to airports the provision was different; the Secretary was to encourage them, but was not authorized to establish any.[83] In fact, the Act practically prohibited federal civil airports, for it allowed the Postmaster-General to turn over those under his control only to municipalities.[84]

The government's airport policy had a rather checkered legislature history. Many of the early bills, like New's (S.3348) and Hicks' (H.R.14137), authorized establishment by the federal government. As early as April 27,1920, however, Kahn of California introduced a bill (H.R.13803) providing only for federal cooperation with the local authorities,[85]

which amounted to practically the same thing as the provision in the Act of 1926. Both the Wadsworth bills and the Bingham bill followed Kahn; but the House amendment to Bingham's bill went back to the idea of government establishment,[86] with results already seen.

The provision for other navigation facilities in the Air Commerce Act, including "emergency landing fields, light or other electrical communications, and any other structure or facility used as an aid to air navigation," were the same as those for civil airways. Their history in Congress, however, except for the first, was somewhat different.

Apparently the necessity for lighted airways did not impress anyone until after the Air Mail had demonstrated the feasibility of night flying; for the first bill to include lighting was one (H.R.11667) introduced by Representative Winslow on January 15, 1925.[87] After that every important bill contained a similar provision.

The attempt to provide for radio direction finding seems first to have been made in the Winslow bill also radio communication was not included until about a year later- in the Bingham bill.[88] The House amendment to the latter stated that the national government should furnish both types of radio aid.[89]

There was a clause in the Air Commerce Act which permitted air navigation facilities owned or operated by the United States to "be made accessible for public use under such conditions and to such extent as the head of the department

or other independent establishment having jurisdiction thereof deems advisible and may be regulation prescribe."[90] The House Interstate Commerce Committee was directly responsible for this provision; for it appeared word for word in the House amendment to Bingham's bill.[91] Before that, the early Wadsworth bill had required the Secretary of Commerce to give full cooperation to operators and owners of aircraft;[92] and the later one had extended this duty to the heads of the War, Navy, Treasury and Post Office Department.[93] Nothing of the kind appeared in the Bingham bill.

The two Wadsworth bills also allowed the five department heads just mentioned to sell, in cases of emergency, to any owner or operator landing on an airport under their jurisdiction fuel, oil, supplies, and services under such regulations as they might approve and promulgate for their respective establishments.[94] The House amendment to Bingham's bill and the final Act contained provisions very much along the same line; but any head of a department or other independent establishment might furnish shelter as well as the other items enumerated in the two Senate bills, only on condition, however, that this was necessary to aid the aircraft in getting to the nearest airport operated by private enterprise.[95]

Two propositions appeared in the Act of 1926 in regard to the aerial weather service. The first, requiring the Secretary of Commerce to make recommendations to the Secretary of Agriculture as to the necessary meteorological

service,[96] was nothing new. It had been a part of every important bill since 1922. But the second provision, making it the duty of the chief of the Weather Bureau under the Secretary of Agriculture to furnish weather reports to promote the safety and efficiency of air navigation, especially in the civil airways,[97] was part of the House Commerce Committee's work of framing the amendment to Bingham's bill.

According to the Air Commerce Act the Secretary of Commerce was "to study the possibilities for the development of air commerce and the aeronautical industry and trade in the United States and to collect and disseminate information relative thereto and also as regards the existing state of the art."[99] This provision, except for the very last phrase, was copied word for word from the House amendment to Bingham's bill.[100] The latter itself had required the Secretary to investigate only the potentialities of air commerce. The two Wadsworth bills contained practically everything in the final Act except that they neglected to mention trade.

Both the Air Commerce Act and the House amendment made it the Secretary's duty to consult the Bureau of Standards and other agencies in the executive branch in carrying forward such research as tended to create improved air navigation facilities, and authorized him to transfer any appropriation for research to any of the agencies mentioned. None of the early bills had included research, although all

three of the Senate bills stated that the Secretary was to consult and cooperate with all other established governmental agencies, federal or state, in fostering civil aviation in every way possible.[101]

Closely connected with Air Commerce was the problem of avoiding accidents; and one way of lessening them was to investigate, record and publish their causes. The early Wadsworth bill gave this duty to the Secretary of Commerce,[102] as did all the following bills and the Air Commerce Act.

To secure the best results cooperation abroad as well as at home was necessary. Realizing this, both the House amendment and the final Act required the Secretary to exchange with foreign government, through existing governmental channels, information about civil air navigation.[103] Congressmen had seen the advantage of this at least as far back as the first Wadsworth bill.

Ownership of the Air.

If the Roman idea of ownership-"Cujus est solum ejus est usque ad coelum"- had been interpreted literally, there would have been no flying, for every modern code followed the old principle. But before flying became a problem the courts had decided that a man owned the space over his land only in so far as he made use of it. The Germans had even seen fit to include this common-sense view in their code, for the latter statedthat "the owner cannot

prohibit the interferem es which take place at such a height or depth that he has no interest in their exclusion."[104] When air navigation did become a problem, the governments of the world either explicitly gave the aviator the right of flight or took it for granted that he had such a right.

The question of air ownership was perhaps chiefly important because of the idea of the aviators liability which was associated with it. The theoretical question of ownership could have been left to take care of itself; but something had to be done to determine to what extent the groundman could hold the airman responsible for damage done.

In 1913 France gave the aviator freedom of passage, subject to government regulation, but made his liability to the groundman absolute, regardless of negligence. Seven years later England followed the French lead, limiting the aviator's liability only in case of contributory negligence by the groundman injured.[105]

Here, as in other matters the state of Connecticut was not behind Europe. Her law of 1911 made the aviator and his employer absolutely liable. Massachusetts varied this law somewhat from 1913 to 1919, with a provision which created a presumption that damage was due to the negligence of the aviator.[106]

The Uniform State Law, previously referred to contained nothing new. It merely stressed the right of free navigation and absolute liability on the part of the owner

and the operator of aircraft for damage done to persons or property on the ground.[107] Its inclusion of the second provision, however, probably accounted for the hands-off attitude on the part of the federal government towards the question of liability.

In regard to freedom of passage, Senator Sherman's bill stated that the groundman's ownership of the airspace over his land was absolute and that he might prohibit air navigation above his domain by simply publishing a notice of prohibition.[108] After 1919 no one was willing to defend such a view, although there were a few, down to the passage of the Air Commerce Act, who argued that the government, or the interests concerned, should be forced to purchase right-of-ways for air navigation, just as the railroads had done for land transportation.[109]

Most of the early bills were content to express the jurisdiction of the United States courts over the navigable airspace, without defining the liability of the pilot or definitely asserting the right of freedom of passage. The only bill to define liability, apparently, was Winslow's amendment to Wadsworth's second bill, and even it provided for the limiting of liability by contract.[110]

Both Wadsworth bills were quite definite in stating, "That the district courts of the United States shall have jurisdiction over all claims and controversies involving aircraft, their owners, lessees, charterers, and operators

licensed thereunder, with the right of appeal as in other cases;" but the whole section was struck out by the Senate committee of the whole in the first case and by the Commerce Committee in the second."

Senator Bingham's bill avoided the whole subject ; but the House amendment to it included this provision; "As used in this act, the term navigable airspace means airspace above the minimum safe altitudes of flight prescribed by the Secretary of Commerce under section 3, and such navigable airspace shall be subject to a public right of freedom of interstate and foreign air navigation in conformity with the requirements of the act". The Act of 1926 took over this whole section just as it stood. The question of liability, however, was left to the states.[112]

Sovereignty of the Air.

Sovereignty received attention much earlier than ownership, in Europe, if not in the United States. Probably the former's numerous political division made some sort of settlement of the question imperative.

The earliest expressions of sovereignty were almost a negation of it. The Institute of International Law, meeting at Ghent, September 24, 1906, adopted this provision; "The air is free. States have no authority over it, in time of peace or in time of war, other than that which is necessary for their own preservation." Five years later the International Juridic Committee on Aviation took a similar stand.[113]

The governments themselves however, were not willing to go so far. France and Germany made a convention in 1915 which clearly recognized state sovereignty with a right of innocent passage granted to alien aviators upon compliance with certain conditions. Military craft might fly over a foreign state only on invitation of that state. Commercial craft might enter another state only if supplied with a domestic license and a pilot's certificate.[114]

The convention also took up for the first time the question of court jurisdiction. Visiting craft were to comply with the laws of the country entered, but crimes, torts, and violations of contracts committed in the air were to be subject to the nationality of the craft.[115] The treaty was therefore essentially an expression of sovereignty limited only by a few concessions for the good of international air navigation.

A similar agreement was urged by the International Law Association at Madrid, the same year; but the Pan-American Aeronautic Federation, Santiago, Chile, March, 1916, swung the balance a little more to the side of sovereignty when it said that air space was state property, but that navigation above the American continents would be free to all Americans.[116]

The International Air Navigation Convention of 1919 went back to the Franco-German convention and perhaps a little beyond, for it contained a clause which said, "No contracting State shall expept by a special and temporary

authorization permit the flight above its territory of an aircraft which does not possess the nationality of a contracting State."[117] On the otherhand it abolished exterritoriality when the United States objected.[118]

In the United States the question of sovereignty was scarcely aspractical as the question of ownership; hence it received hardly as much attention. The Uniform State Law contained a declaration of state sovereignty, but went little beyond.[119] Most of the early federal bills-and one of the later ones-neglected the question entirely; while not a single one of them, including the Air Commerce Act itself, dealt with the subject of jurisdiction over crimes, torts, and contracts. Probably this was left to be taken care of by the Uniform State law.[120]

The two Wadsworth bills contained no declaration of sovereignty, but they did follow the Franco-German convention in guaranteeing to alien pilots the same rights and privileges which theircountry extended to the pilots of the United States district courts jurisdicition over all controversies involving aircraft and their owners. The last provision, however, was struck out in both cases, as we have already seen.[121] Senator Bingham's bill was silent on the whole problem.

The Air Commerce Act, which followed the House amendment's sovereignty provisions throughout, stated that, "The Congress hereby declares that the government of the United States has, to the exclusion of all foreign nations, complete

sovereignty of the airspace over the lands and waters of the United States, including the Canal Zone". It followed the sense, but not the wording of the Wadsworth bills both in regard to the privileges of foreign aviators and the punishment of violations of the air traffic laws by foreigners.[122]

Chapter 3.

The Carrying out of a Definite Policy.

The passage of the Air Commerce Act of 1926 was a great step forward in commercial aviation; but the government's aid to commercial flying was still small as compared with other items, as a study of the following figures will show:

Army air appropriations, fiscal years 1919-28.[1]

1919	$1,369,304,758
1920	25,000,000
1921	33,000,000
1922	19,200,000
1923	12,700,000
1924	12,426,000
1925	12,435,000
1926	14,700,000
1927	15,050,000
1928	120,396,300
Total	$1,534,212,058

Naval air appropriations, fiscal years 1919-28[2]

1919	318,383,119
1920	25,000,000
1921	20,000,000
1922	13,413,431
1923	14,683,590
1924	14,647,174

1925	15,150,000
1926	41,790,000
1927	22,626,148[3]
1928	20,100,000
Total	$505,793,462

Air appropriations for Department of Commerce, fiscal years 1919-28

1919	$20,000[4]
1920	30,000[4]
1921	15,000
1922	15,000
1923	30,000
1924	30,000
1925	27,800
1926	27,800
1927	577,800[5]
1928	3,819,300[5]
Total	$4,592,700

Appropriations for Air Mail, fiscal years 1919-28

1919	100,000
1920	850,000
1921	2,725,000[6]
1922	2,825,000
1923	2,550,000
1924	3,150,000
1925	2,900,000[7]

1926	3,460,000
1927	4,800,000
1928	4,300,000
Total	27,660,000

The federal government gave to civil aviation during the nine-year period under consideration $31,479,300, as compared with the huge sum of $2,040,005,520 given to military and naval aviation. Omitting the fiscal year 1919 as being abnormal, Congress appropriated more than ten times as much for military and naval aviation as for civil.

This comparison is not entirely fair because the government consistently followed a policy of indirect subsidy only. But when $120,000,000 was appropriated annually as an aid to water navigation, as it was in 1926,[8] it is readily seen that relatively little was done for aviation. Much, however, was accomplished with rather small sums, and the future held promise of larger appropriations.

General Policy

After the passage of the Air Commerce Act the government's policy seemed to be to assist aviation in every way possible. This notion was expressed by President Coolidge's letter to the sixth Annual convention of the National Aeronautic Association,[9] held at St. Joseph, 1928; and the same idea was exemplified by his calling the first International Civil Aeronautic Conference, held at Washington from December 12 to 14 of the same year, to celebrate the

silver jubilee of the first flight. Fifty-four nations were represented and practically every phase of aviation was discussed.[10]

The same policy of encouragement was shown when the Vice-President of the National Aeronautic Association protested against further oceanic flight for prize money. A committee composed of the three Assistant-Secretaries in charge of aviation stated that, although reckless flying should be discouraged, they saw no reason why pioneer ocean flights should be prohibited altogether.[11]

A good-will flight to Mexico City promoted by the Houston Chamber of Commerce, was prohibited by the State Department. The prohibution, however, was seemingly made on diplomatic grounds.[12]

The government's policy was more definitely stated by Clarence M. Young, Director of Aeronautics; "It is the aim of the Department of Commerce to assist in bringing about a combination of four elements which are considered essential to the success of civil aeronautics in this country; (1) airworthy aircraft, adequately equipped and efficiently maintained, and (2) flown by competent pilots over (3)suitably equipped airways(4) in conformity with standard air-traffic rules. When this has been accomplished, the public will take air transport for granted, as it does the railroad, the steamship, and the automobile."[13]

Organization

The accomplishment of this aim was given to the

Aeronautics Branch of the Department of Commerce, which was at first under the direct supervision of the Assistant-Secretary of Commerce, but after July 1, 1927, was under the direct control of the Director of Aeronautics, with the Assistant-Secretary retaining general supervision. The Branch was made up of five divisions; the Division of Air Regulations; the Division of Air Information-this and the preceding one both created after the Air Commerce Act-;(3) the Airways Division of the Bureau of Lighthouses; (4) the Airway-Mapping Section of the Coast and Geodetic Survey; and (5) the Aeronautical Research Division of the Bureau of Standards.

The work of the Air Regulations Division included the inspection of aircraft for airworthiness and their registration as aircraft of the United States; the examination and licensing of airmen serving in connection with licensed aircraft; the identification of all aircraft, including those not licensed; the investigation of accidents; the enforcement of the air traffic rules; and the rating of air-navigation facilities.

The Air Information Division collected and disseminated information on civil aeronautics; encouraged airport construction and other aids to navigation; and promoted air commerce. It was the point of contact between activities of the Department and industry and all others interested.

The Air ways Division worked under the laws, rules, and regulations applicable to the lighthouse establishment,

and as far as possible through the regular district organization of the Lighthouse Service. It was divided into four sections; adminstration, extension and construction, maintenance, and weather and communications.

The second section laid out routes and intermediate landing fields, and installed lights and radio direction finding and radio communication systems.

The fourth section was responsible for the coordination of Weather Bureau forecasts in connection with the special requirements for meteorological service on civil airways and for maintenance of communication systems designed to secure safety of flight.

The Research Division carried on experiments with various types of radio aids, lighting, and technical problems having to do with aircraft construction.[14]

Plan of Treatment.

Instead of discussing the work of each one of these agencies in detail the author proposes to treat the subject of this chapter under the two general headings of the control of air traffic and its encouragement. The control of air traffic will include the licensing and identification of aircraft, the licensing of pilots and mechanics, and the air traffic rules. The principal means of encouragement to be considered are the supplying of airways, radio aids, and weather service.

After the organization of the Aronautics Branch had been completed, regulations to carry out the provisions of the

Air Commerce Act were the first thing to be considered. They were completed December 31, 1926, after numerous conferences attended by representatives from every interested branch of aeronautics. They provided in detail for practically every phase of the control of air navigation.[15]

Licensing and Identification of Aircraft.

All aircraft engaged in interstate commerce had to be licensed; and an aircraft was considered as engaging in interstate commerce if its carriage between two points in the same state was part of a through carriage between points in different states. Non-commercial craft flying between states were not required to be licensed; but where they submitted to licensing voluntarily, they had to comply with the same rules as licensed craft. Foreign aircraft might operate within the jurisdiction of the United States without a license and without having the airmen serving in connection with them licensed, if the country owning the craft granted the same privileges to the United States.[16]

In order to be licensed, public aircraft had to be used exclusively in government service. Private aircraft had to be owned by American citizens or by corporations in which Americans had the controlling influence.[17] All craft, whether public or private had to comply with many technical regulations laid down by the Department of Commerce for the purpose of securing safety and comfort.[18]

To make licensing as easy as possible a manufacturer

of aircraft might secure what was called a manufacturer's approved type certificate. This was done by filing application, accompanied by technical information under oath, with the Secretary of Commerce, who had to approve of the design submitted, find the specimen plane to correspond exactly with the design and see that the specimen passed certain flight tests. The manufacturer might then give to each purchaser his affidavit to the effect that his planes were of an approved type, and the purchaser might have his machine licensed by simply passing a flying test.[19]

Airplane licenses were issued for one year and were renewable for yearly periods upon application of the owner and the finding of the Secretary of Commerce that the craft was still air-worthy and owned by an eligible person. In case the plane was sold, the purchaser might have it relicensed for the rest of the period by filing application within 30 days of the purchase, during which time the license was considered as in effect. A longer delay made licensing by the ordinary process necessary.[20]

A license might be cancelled upon request of the owner at any time. It might be revoked or suspended for any violation of the Air Commerce Act or any of the regulations made in conformity with it. One regulation, especially noteworthy, was that, "After an aircraft is licensed and between the times it is inspected for airworthiness by an inspector, the owner is charged with the continuous duty of maintaining

the aircraft in a good and proper state of repair and condition. " Planes were to be given a line inspection at least once within each 24 hours preceding flight, and the result was to be entered in the log under the signature of the person making the inspection. After each 100 hours of flight there had to be a periodic inspection by the owner, covering the working condition and repair of the engine installation, control systems throughout, propeller alignment, and fuselage.[21]

The license had to be displayed in a conspicuous place where it could readily be seen by passengers and inspectors, whenever in service; and presented for inspection upon the demand of any passenger.[22]

Licensed aircraft were identified by their license numbers, preceded by a Capital S for craft used exclusively for governmental purposes and by C for all others. The letter N had to precede the identification on all craft engaged in foreign commerce and might precede it on other licensed craft if the owner wished. The marks were assigned when the license was issued. Unlicensed craft were identified by numbers only, assigned by the Secretary of Commerce. All identifications were to be painted in large characters on the wings and rudders. Except with the approval of the head of the Commerce Department no design or description was to be placed on the aircraft if it tended to subtract from the identification marks.[23]

A Licensed pilot could not carry passengers for hire

or reward in any class of plane unless he had piloted a plane of that class for at least two hours within the last 90 days, except where he made practice flights for at least a half-hour and took off and landed a minimum of ten times-at least three to a full stop. Likewise, a pilot who had not had at least one hour of night solo flying within the last 30 days was not to pilot a plane with passengers at night, unless he made night solo flights for at least a half-hour and took off and landed as stated above.[24]

The regulations attempted to control accidents by requiring the owner of a licensed craft to report by telegraph or telephone to the Secretary of Commerce all accidents in which there was serious injury to persons or property.[25]

The owner or operator of a licensed plane was obliged to keep a navigation and engine log book and to transmit quarterly to the Secretary of Commerce a navigation summary report in duplicate, showing the number of hours and the approximate number of miles the craft had been flown during the quarter.[26]

Up to November 1, 1928, 10,000 planes were licensed,[27] with apparently gratifying results. In 1927 only twenty per cent of all air fatalities were in licensed planes, while nearly 98 per cent of such planes were flown millions of miles without a fatal accident.[28]

Licensing of Pilots and Mechanics.

All persons in command of licensed airplanes in

flight and all persons in charge of overhauling, repairing, or adjusting of planes had to be licensed. The former were given pilot's licenses and the latter mechanic's licenses.[29]

Pilots were classed as commercial or private. Commercial pilots were licensed as transport, limited commercial, or industrial pilots. Private pilots were simply private or student pilots. No licensed pilot could pilot an unlicensed plane carrying persons or property for hire or reward. Limited commercial pilots might pilot persons for hire or reward only within the areas mentioned in their licenses. Industrial pilots might carry property for hire or reward, but not persons; while private pilots might carry neither. Student pilots might fly licensed craft only for instruction and only within the areas specified in their licenses.[30]

To obtain a pilot's license one had to be a good moral character, at least sixteen years old for private and at least eighteen for commercial flying. All applicants had to take a physical examination, the severity of which depended upon the grade of license sought. Those who had passed, within six months previous to the application, a suitable physical examination for flying in the United States Army, Navy or Marine Corps were exempt from examination altogether, while those possessing experience might have certain physical requirements waived if the Secretary of Commerce thought the experience compensated for the defect.[31]

All commercial pilots had to have some experience.

Transport and limited commercial pilots were required to have 200 hours of solo flying, of which at least five hours had to be within 60 days before the application was filed. Fifty hours of solo flying at least five hours within the last 60 days were necessary for the industrial pilot.[32]

All pilots except students had to pass an examination in the traffic rules and certain flight tests. The latter varied in difficulty with the grade of license sought. In addition, the transport pilot had to pass a practical and theoretical examination in elementary engine and plane mechanics and rigging, and a theoretical examination in the fundamentals of meteorology and air navigation. The limited commercial pilot was required to take the first of these, but not the second.

All pilots, under certain conditions could be exempt until December 31, 1927, from all of the examinations mentioned in the last paragraph except the examination on the traffic rules. Transport or limited commercial pilots could secure this exemption if holders of airplane-pilot rating or certificates in the army or navy, or had actually engaged as pilots for not less than six months within the last year preceding the date of application in carrying mail either for the government or private contractors. These exemptions were doubtless made to make up for any shortage of pilots which might occur because of the new rules.[33]

Transport and limited commercial pilot's licenses were issued for six months; all others for one year. All might be renewed for corresponding periods, where the prescribed

physical condition of the holder was shown by the same method as when the original license was issued, except that a transport or a limited commercial pilot had to prove that he had had at least ten hours of solo flying within the last 60 days, industrial pilots at least 25 hours within the last year, and private pilots at least ten hours within the last year.[34]

The license was required to be in the personal possession of the pilot while in flight, and shown upon the request of any passenger or authorized official or employee of the Commerce Department. Refusal to meet such a request, as well as violations of the Air Commerce Act, any regulation issued under it, or the air traffic rules, was sufficient cause for suspension or revocation of the license.[35]

All licensed pilots had to keep accurate records of their flying time.[36]

Up to July 31, 1928, 2,678 pilots were licensed under these regulations and almost as many more had applied for licenses.[37] That the requirements were not unreasonable was shown by the fact that 86,590 applicants qualified without waiver for the class of license requested.[38]

Exact figures on the relation between licensing and accident were unobtainable. But raising the standard of examination for pilot licenses in France reduced accidents due to piloting 35 per cent;[39] and most authorities were agreed that poor piloting was one of the worst causes of accidents.

The Air Traffic Rules.

In addition to the regulations covering the licensing

of planes and pilots, which applied only to interstate and foreign commerce, the Department of Commerce also drew up a set of traffic rules. "In order to protect and prevent undue burden upon interstate and foreign air commerce," these were to apply "whether the aircraft was engaged in commerce or non-commerce, or in foreign, interstate, or intrastate navigation in the United States, and whether or not the aircraft was registered or was navigating in a civil airway."[40]

A landing plane had the right of way over one taking off, and take-offs were not to begin until preceding craft were clear of the field. A plane forced to land had the right of way over all others. When a forced landing was necessary at night at a lighted airport, the plane had to indicate this by signaling with lights.[41]

In the air the rules followed closely the ordinary rules for land and sea traffic. For instance, all traffic had to keep to the right when safe and practicable; and balloons, airships, and airplanes had the right of way over one another in that order. Aircraft required to give way had to keep a minimum distance of 300 feet.[42]

One of the most important provisions had to do with height. When not taking-off or landing, craft were not to be flown "over congested parts of cities, towns or settlements except at a height sufficient to permit a reasonably safe emergency landing, which in no case should be less than 1000 feet." Generally speaking, planes were to maintain a minimum height of 500 feet except where lower flying was necessary for an industrial operation.[43]

Acrobatic flying was greatly curtailed by the rules. There was to be no acrobatic flying over a congested area, over a certified airport, or while carrying passengers for hire or reward; and such flying over any established airway had to be at a minimum height of 2000 feet.[44]

A plane navigating the air between a half-hour after sunset and a half hour before sunrise was required to display a green light on its right, a red one on its left, and a white one towards its rear.[45]

Weather signals were agreed upon to make flying safer. At certified airports and emergency landing fields one red fusee, or approved equivalent, indicated the approach of unfavorable flying weather; while two such signals were a definite indication that weather conditions made it impossible to go farther.[46]

The regulations were made somewhat elastic by two clauses. One of these stated that the air-traffic rules might be deviated from to avoid immediate danger or because of bad weather or unavoidable cause. The other gave the Secretary of Commerce authority to waive the regulations when particular facts, in his judgment, justified it.[47]

Airports.

In England airports were owned and controlled by the national government, as were the airways. France followed a

somewhat different scheme, but the principle was the same. In Germany, on the other hand, most airports were constructed by cities with the assistance of the federal government; or the cities aided in the construction of commercial ports.[48]

The Air Commerce Act of 1926 definitely announced that it was the policy of the federal government to encourage, but not to own civil airports.[49] But this was only the confirmation and clarification of a policy which already existed. No civil airports were constructed by the national government before the Air Commerce Act, although there were half-hearted attempts in that direction.[50] All of the ports owned by the Post Office Department were donated by the cities or civic organizations.[51]

The Air Commerce Act did suggest a slight change in the use of military and naval airports for civil purposes, although it was left to the head of the department to decide whether fields under his jurisdiction should be used by the public.[52] The year previous, the War Department had announced that it was the Department's policy that private aircraft should not be permitted to use any active government airdrome as a base, but that the officers in charge might permit such use of the field if the private aircraft was not operated for profit; and any craft might use any government filed in emergencies endangering life or aircraft.[53]

After the passage of the Air Commerce Act development of airports was directly aided by the Department of Commerce

through its airport bulletin and other publications. The bulletin covered practically every subject connected with the construction and equipment of an airport. Personal advice and aid in the establishment of airports was given by the Assistant-Secretary for aeronautics or the personnel of his office.[54] Many difficulties were taken care of by correspondence.

The Department also collected and published exact information on every airport in the UnitedStates, giving its name, class, rating, location, description, obstructions, marking and identification, lighting, accommodations, and weather conditions and Weather Bureau facilities.

When the year 1925 was half over, the cities of the United States had furnished in all about 250 fields; but many of these were not properly equipped, there being only about 100 ports, open to commercial users, with gas and oil available and a caretaker present.[55] Towards the end of 1927 there were more than 4000 fields in the United States, owned by states, municipalities, corporations, clubs, commissions, and individuals. Evidently most of these were almost entirely lacking in the necessary equipment, since only slightly over 500 were prepared for night flying.[56] The existence, however, of so large a number of potential parts proved that some progress had been made.

In connection with the encouragement of airports the government fostered a roof-marking campaign,[57] with the result that one oil company marked 980 towns.[58] Several other

companies, as well as many cities, also did something along this line.

The Department in 1927 suggested a set of airport rules, which if generally accepted, would give the federal government control of all commercial aviation. These rules made careful provision for safety, similar to those found in the Air Traffic Rules; but their most striking clause was this; "All pilots and mechanics operating commercially from this field must be licensed by the Department of Commerce and must comply with the Air Commerce Regulations."[59] Up to the beginning of 1928 apparently only one airport, the Richard E. Byrd Flying Field at Richmond, Virginia, had adopted a provision identical in meaning with this, if not in phraseology.[60]

The government still further strengthened its position by a suggested standard municipal ordinance requiring all persons operating aircraft over or within the jurisdiction of a city to be licensed and to fly airworthy craft.[61] By the end of March, 1928, the state of New York[62] and the city of San Diego had adopted codes prescribing adherence to the Air Commerce Regulations.

Airways.

According to the Air Commerce Act the Secretary of Commerce was to establish civil airways and to provide them with all necessary air navigation facilities except airports.[64] This policy, like that of airports, seems to have grown largely

out of the practice of the Air Mail. The Post Office Department provided its own airways, if not its own airports. Moreover, it lighted 1,886 miles of the Transcontinental, from New York to Rock Springs, Wyoming, for night flying.[65] It is true, of course, that this was done for the government's own experiment.

Airways were laid out for the Department of Commerce by licensed pilots and engineers of the Airways Division. They were determined after a reconnaissance made by plane flights. Emergency landing fields, which contained about 40 acres, were placed approximately 30 miles apart.[66]

The same agency also marked air routes. All obstructions -radio masts, flag poles, and the like-had to be painted with alternate bands of white, yellow, and black. At night they had to be marked at the top with flashing red lights.[67] A 50-foot arrow, four-feet wide, painted chrome yellow, and illuminated at night by electric flood lights, was adjudged the best airways marker submitted in an airway marker contest held in connection with the National Airways Marking Conference, which met in August, 1928.[68]

The system of lighting employed by the Post Office Department for the Air Mail was essentially followed, although the Bureau of Standards, beginning with the autumn of 1926, carried on rather successful experiments with various types of lamps.[69] The New York-Boston route, which may be taken as

typical, was lighted with nineteen electric 24 inch beacons of 2,000,000 candle power, rotating at six revolutions a minute. These beacons were spaced approximately ten miles apart. Four acetylene gas blinkers at irregular intervals marked especially dangerous spots. Commercial current was used where available and was turned off and on each night by sun relay control; otherwise a generator with a man in charge furnished the power.[70]

The emergency landing fields were provided with an internally lighted wind indicator, a tower, a flood-lighted 54 foot concrete arrow, and boundary lights indicating the safest and most dangerous ways of approach.

It cost $514,405 to light the 1,886 mile Air Mail route between New York and Rock Springs, Wyoming, or $273 a mile. This route was supplied with 89 emergency landing fields and 500 beacons. The annual maintenance cost after construction was $157 a mile.[71] The Department of Commerce in 1926 gave theoretical estimates somewhat below these figures.[72]

At the beginning of September, 1927, the total airway mileage in the United States was 11,170[73] as compared with 36,507 for Europe at a somewhat later date.[74] On the other hand 4,121 miles of the American airways were equipped for night flying, and it was estimated that 3,398 miles more would be so equipped by the end of the fiscal year 1928[75] -a better showing than Europe certainly.

The work of mapping the civil airways was done by the Coastand Geodetic Survey. Up to the middle of 1928,

however, few of their maps were completed. The War Department had finished 43 maps out of 52 routes planned. The Hydrographic Office of the Navy made strip maps of the various coastal regions. All maps, from whatever source, were published by the Air Information Division of the Department of Commerce.[76]

Radio Aids.

Four types of radio aids were developed or experimented with; communications, whose history need not be treated here except in so far as it applies to aviation; direction finding; various types of markers; and a radio altimeter.

The radio direction finder was meant to keep a plane on its course regardless of weather conditions, instrument flying being considered unsafe because of wind drift and because of varying speed due to unequal wind pressure on front or rear. A special kind of radio station called the Directive Beacon, emitted two sets of wave lengths, strongest in one direction. As long as the aviator was on his course the signals were of equal intensity but showed variation the moment the aviator left his route.[77]

This type of radio was first used by the army, for whom it was devised by the Bureau of Standards, just before the signing of the Armstice.[78] Shortly afterwards the same work was taken up for civil aviation by the Post Office Radio Division and the navy jointly.[79]

The first radio marker was devised by the Bureau of

Standards in August, 1918. It consisted of a transmission aerial which emitted waves in an ascending spiral. The pilot was to receive the proper signal above the landing field and then spiral down, even though he could not see what was below him.[80] This device did not prove practical.

A "super-directional horn" was invented in 1928 by the navy and the Victor Talking Machine Company to take the place of the "field localizer," just described. The horn was constructed so that it could throw a volume of sound along a path as a searchlight focuses light. A preliminary test made by the Los Angles seemed to indicate that messages from the horn could be heard 10,000 feet away.[81]

The most practical radio marker was the "marker beacon," which by a characteristic signal told a pilot just what part of the route he was flying over.[82] This, according to the Bureau of Standards, was ready early in 1927 for a try-out on regular commercial routes.[83] Beacons of this kind had to be spaced at rather short intervals.

The search for a satisfactory altimeter was apparently solved in 1928 by Dr. E.F.W.Alexanderson. The difficulty with the barometric altimeter was that it gave elevation above the last level for which it was adjusted. The new radio instrument determined absolute distance by measuring the length of time elapsed between the sending of a radio signal and the reception of its echo. If successful, this device would worn the pilot that he was approaching a mountain, as well as foretell unexpected landings.[84]

The two types of aviation radio which received most attention were communication and direction finding. Despite the experiments already mentioned little seems to have been accomplished along either line until active work was started by the Bureau of Standards at College Park, Maryland, July 1, 1926. During August of the following year a number of flights made over the New Brunswick-Cleveland airway seemed to indicate a generally reliable range of 100 miles for the radio beacon and of 800 to 100 miles for the radio telephone. Night flights showed fading phenomena which made direction finding inaccurate beyond 75 miles and worthless in mountainous country at 120 miles.[85] The remedy for this appeared to be the substitution of the vertical-pole antenna for the long trailing wire. The abandonment of the latter would mean a loss of distance, but a gain in accuracy and safety, since there would be less chance of the low-flying plane's catching anything on the ground.[86]

Radio direction finding was at first auditory. But during 1927 the Bureau of Standards had considerable success with the "visual reed indicator," which pointed out the proper direction by means of equal reeds, and the wrong one by unequal reeds. The advantage of the new method over the old was that a pilot could receive a radio telephonic message and keep his eyes fixed upon the reeds at the same time. Under the old method one message was apt to confuse the other.[87]

The airplanes of the New-York-Cleveland line were equipped with receiving sets for visual direction finding and

were scheduled to start using this type of radio aid on May 1, 1928.[88] In October of the same year the auditory method was to be put into practical use on the Key West-Havana route.[89]

The Department of Commerce intended to establish radiotelephone and radio beacons on all airways.[90] In 1928 it maintained seventeen radio telegraph stations on the old Transcontinental, used principally for weather forecasts.[91]

The only type of radio aid which up to 1928 appeared to be a complete success on trans-oceanic flights was the radio telephone. The sudden stoppage of the constantly repeated call signals of Byrd's plane warned sea-going vessels that something had happened.[92] But the only trans-oceanic flight able to maintain radiotelephonic communication both ways was the Southern Cross on its hop from San Francisco to Honolulu.[93]

The Weather Service.

Weather is one of the most important elements in aviation, judging by its influence on flights. During the first half of 1927, of the 685 defaulted trips out of 5,272 scheduled, 623 were due to this one cause.[94] Despite this importance, the Guggenheim Fund's report for 1927 stated that meteorology for aviation "is in a primitive stage in the United States and far behind its organization in other countries where passenger carrying services have been highly developed."[95]

Yet the government was not altogether neglectful. The Agricultural Appropriation bill for 1919 carried a

provision for $95,740 for establishing additional aerological stations in aid of aeronautics.[96] Each succeeding year a similar sum was devoted to the same purpose, until 1928 saw it enlarged to $2,487,573. Most of this latter, however, was for necessary expenses "incident to collecting and disseminating meteorological, climatological, and marine information and for investigations in meteorology, climatology, seismology, evaporation and aerology."[97] Some of these activities were probably of direct aid to aviation; while others were of doubtful value. But in any case considerable progress was made during the fiscal year 1928.

The problems which had not yet been solved by 1928, but which were in the process of solution, were the lack of adequate communication, adequate report of local conditions, and the fog problem.

There were seventeen radiotelegraph stations on the Transcontinental; but on the other routes there was no means of sending out weather reports except by ordinary telephone or telegraph. Even on the Transcontinental there was no way of warning an aviator in flight of an approaching storm.[98] This situation was improved somewhat by the fact that the Weather Bureau began in June, 1928, to send out its reports for aviators at 8:15 each morning instead of at 10:30 as formerly.[99] The real solution, of course, would be the general establishment of radiotelephone between stations and between ground and plane.

In 1928 there were 28 weather reporters on the

Transcontinental who were trying to keep the Weather Bureau informed of local conditions. It was suggested that pilots also might send in such reports if the proper radio facilities were available. Closer cooperation between pilot and forecaster would lead to better understanding of each other.

If bad weather constituted one of the greatest hazards for the aviator, certainly fog was the most serious weather problem. Realizing this, an informal fog-studing committee, consisting of members of the War, Navy and Commerce Departments and the Vice-President of the Guggenheim Fund[100] was formed in 1927; and about the same time the latter agency established a "full-flight" laboratory on a section of an established airway, where fog flying under regular operating conditions could be studied.[101]

Of the three methods of solving the fog problem-dissipation, penetration and perfection of instruments for guiding the plane through the fog-only one seemed to have met with much practical success, although the Neon light had been shown to penetrate fogs to some extent. Radio direction finding and other radio devices which would allow the pilot to follow his course regardless of weather seemed to be the real solution.[102]

Chapter 4.

Various Aerial Activities.

This last chapter is an attempt to summarize briefly the growth of the aircraft industry and some of the more important developments in the use of the airplane. Although the formation of a governmental policy has been traced in the preceding chapters, an attempt will be made here to show the government's hand in many enterprises not previously considered; otherwise there could be little reason for the inclusion of such a chapter in a work of this kind.

The Aircraft Industry.

Although opinions vary as to the American aviation record in the World War, there seems to be general agreement as to the fact that the aircraft industry at the signing of the Armistice was in a rather prosperous condition. There were at that time 22 aircraft manufacturers with an estimated capacity output varying all the way from 11,000 to 21,000 planes a year. Just seven years later a normal production capacity of 1,200 planes a year was reported.[1]

The Joint Committee on Civil Aviation of the Commerce Department and the American Engineering Council in attempting to explain this rapid decline, stated in its report that, "The failure to formulate and put into operation a continuing aviation policy resulted in a practical cessation of production and the industry was left to liquidate or to make other drastic re-adjustments."[2] This statement is certainly

true, but it is equally true that a certain amount of curtailment was necessary, for abnormal war conditions could not have continued under any sort of federal policy of regulation and encouragement.

It seems, however, that the national government was guilty of sins of commission as well as the almost unpardonable sin of delaying the adoption of a definite policy for eight years. For one thing, the statutes required all government contracts to be let to the lowest bidder, which in many cases worked a hardship upon manufacturers who had spent thousands of dollars in developing aircraft designs beneficial to the government, only to have them passed over in favor of firms which had done relatively little.[3] The principle of competition is surely sound, but in a case of this kind it does seem that the heads of the departments should have been allowed some discretionary power.

Since the home market was overstocked with surplus war material and the government was a purchaser of rather doubtful value, the only logical market for the enterprising manufacturer was foreign countries, especially those which had not participated in the War. France and Italy, Great Britain and Germany early realized this and sent out official flying missions to build up markets in Asia, South and Central America, and even in the United States. The American government did nothing of the sort; instead, it repeatedly prohibited the exportation of commercial airplane products

for fear they might be used for military purposes.[4]

Yet the worst that can be said of the government's policy is that it was misguided, for the other side of the story is the Air Mail. Then, too, the various federal agencies did furnish a market, however inadequate, for the newer types of planes. The Curtiss Carrier-Pigeon and the Douglas Transport were both developed because of initial government purchases.[5]

Moreover, the federal agencies themselves were not idle. The army developed a reversible propeller which allowed a plane to "backwater" in air and come to a stop on the ground in 200 feet instead of 800.[6] The navy helped to perfect a catapult, turn-table, launching platform by which a plane could be launched into the wind without altering the course of the ship.[7] And the Aeronautic Interstate Section of the Bureau of Standards, working with meager funds, was able to adapt the motion picture camera to photographing the instrument board of a plane, thus removing the personal equation from official tests.[8]

The aircraft industry, then, grew partly because of the federal government and partly in spite of it. That its growth was fairly constant except for the after-the-war depression is shown by the following table.[10]

Year	No. of planes	Value of planes	Total value of all products.
1919	662	$3,924,468	$14,372,643
1921	302	4,233,108	7,430,824

1923	587	$7,737,069	$13,142,364
1925	789	6,673,659	12,775,181
1926	1,186	8,871,027	24,161,752

Since the census of manufactures was taken only every two years, figures were not available for the even years; but it may be fairly assumed that they would have showed no greater variation than the actual record. A study of the table seems to indicate a decided slump only in 1921, where one would hardly look for anything else. The year 1926 was of course distinctly better than any of the preceding years, and complete figures for 1927 and 1928 would no doubt have showed still greater progress. There were approximately 2,000 planes turned out in 1927 and 5,000 in 1928."

The story of American export trade was just as encouraging. From 1922 to 1927 there was for the most part steady growth and no real setback.[12]

Year	No. of planes exported	Value of planes	Total value of all products.
1922	37	$156,630	$494,930
1923	48	309,051	433,558
1924	59	412,738	798,273
1925	80	511,282	783,659
1926	50	303,149	1,027,210
1927[13]	63	848,568	1,365,076

The record exhibits an increase in the number and value of planes exported except for the last two years. The number of planes exported fell to 50 in 1926, and their value in about the same ratio. The following year brought

the number up to 63, which was still below the 1925 showing. But it will be noted that the value of the exported craft during the later year was much larger than that of the earlier. This was accounted for by the sale of more modern planes.[14]

When the total value of all aeronautic exports is considered there is found to be an increase every year except for 1923 and 1925, which years, as we have seen, showed progress in planes exported. This fact is no doubt explained by the sale of fewer parts. On the other hand the two years which were down in plane sales made the greatest advance in total exports. These last years, therefore, saw a revival of purchases of engines and other parts.

The future of the export trade was seemingly brighter even than the past. According to the Department of Commerce, "The increasing movement of American Aeronautic products promises in 1928 to double that in 1927, and their demonstrated quality may be used to develop such markets as already have manufacturers of automotive products."[15] This statement seemed to be verified by the wide distribution of American exports, though Latin America was the United States' best customer for 1927.[16]

Air Transport.

Air Transport is the carrying of passengers and goods on schedule time over regular routes. It really includes Air Mail therefore; but it was thought better to discuss the latter separately because the government's whole early policy was built around it, while the carrying of passengers and express were encouraged only indirectly by awarding Air Mail

Contracts.

Air Transport, aside from Air Mail, got an earlier start in Europe than in the United States. This is especially true of Great Britain, France, and Germany.

One of the earliest commercial lines in the world was started between London and Paris about a year after the inauguration of the American Air Mail. It was not at first open to the public, but was used only to carry important mail and members of the peace delegation.[17]

In 1921 England began the policy of government subsidy, but little progress was made until the organization in 1924 of the Imperial Airways-a monoply backed by the government.[18] Up to the end of 1926 British machines had carried across the English Channel 69,870 passengers and about eight million dollars'worth of goods, exclusive of gold.[19] In 1927 the Imperial Airways carried 52,000 passengers over 2,500,000 miles without injury.[20] At the beginning of 1928 there were 2500 miles of routes in operation, including two flights a week each way between Cairo and Bagdad.[18]

In France, Air Transport in 1926 was divided into three fields; western Europe, where there was competition with the British and Dutch lines; Central Europe and toward the East, where the acknowledged purpose was political and for the disposal of French aeronautics products; and French colonial territory in North Africa and toward South America, where there was a real economic benefit due to the lack of

competition.[21] None of the French lines were on a paying basis.

Nine restrictions were imposed upon Germany by the treaty of Versailles,[22] and her airplane material taken away. Her planes were restricted to five passengers and a radius of 400 miles.[23] But Germany was able to overcome all obstacles; in fact, there were those who went so far as to say that Germany was actually helped by the treaty of Versailles because it gave her a fresh start.

There were in 1926 two big companies- the Junkers Luftverkehr and the Deutcher Aero Lloyd. The latter took care of most of the actual commercial aviation; while the former promoted commercial aviation in foreign countries, principally for the purpose of disposing of its products. The rates were somewhat less than first-class railroad fare-less than one-half American fare- and the service was extensively patronized by the German people.[24]

Air transport in the United States was not established on a sound basis until the beginning of the contract Air Mail system early in 1926. But there were various pioneer efforts almost as early as the Air Mail itself.

One of the most notable of these was by the Aeromarine Airways, which operated three scheduled passenger services from 1921 to 1924. From November 1 to May 1 each year it carried passengers, mail and goods-the last mostly personal baggage-between Key West and Havana, making one trip each way a day. During the summer months, from June 1 to

October 1, for the first two years of the period it conducted a daily service passenger service between Detroit and Cleveland. Its third line was carried on between Miami and Nassau. During the first year of operation it reported for all three lines 6,814 passengers and 29,000 pounds of mail and goods. All three routes were all-water, and the craft employed were converted naval flying boats.[25]

There were in addition a number of small enterprises in operation for several years, most of which seemed to be able to make expenses. A passenger service was tried for a short time between New York and Newport, but without financial success. A los Angeles-San Diego passenger service claimed considerable temporary attention.[26]

The Ford Motor Company proved to be the real pathfinder in this field. In May, 1925, it started a private daily express service between Detroit and Chicago and duplicated it with one between Detroit and Cleveland two months later. On February 15, 1926, both lines took mail contracts, though they continued to handle only their own express. Up to October, 1925, 120,000 miles were flown with 300,000 pounds of goods without loss and with greater regularity than the train service.[27]

After the Ford Company's good example the Air Mail Act of 1925 and the Air Commerce Act of 1926 proved to be the factors most needed to set Air Transport development in motion. In 1926 six lines carried 5,782 passengers and

810,855 pounds of express.[28] The following year saw a marvelous development of express, eleven companies carrying 2,261,507 pounds. This was no doubt partly accounted for by agreements which went into effect, September 1, between the American Railway Express and five important lines. The same year thirteen lines carried 8,572 passengers.[29]

But 1928 was easily the record year. Thirty-six lines covered a distance of 10,472,624 miles and carried 52,934 passengers. At the same time the amount of Air Mail tripled and nine new express lines were started. At the close of the year 15,128 miles of airways were in operation, two-thirds of which were thoroughly equipped for night flying.[30]

The early part of 1929 saw development of connections with Latin America. Air Mail with Mexico and the Central American countries was established; a mail and passenger service between Florida and the West Indies was set up; and plans were laid for services down both coasts of South America.[31]

One of the last developments in passenger carrying was the air-rail service. There was a great deal of discussion of this subject, but apparently only two definite plans had been made up to 1928. The purpose of both was eventually to create an all-air service.

One of these called for passenger transportation over the Pennsylvania Railroad from New York to Columbus, Ohio, and then either all-air service over the Transcontinental Air Transport Company to the Western coast, or car-

riage by the Sante Fe between Dodge City, Kansas and Las Vegas, Mexico, and air travel the rest of the way. The first scheme was to require about 36 hours and the second about 48.[32]

In the other cross-country system, which was scheduled to become effective about June 1, 1929, persons leaving New York would go to Cleveland over the New York Central and there take plane to Los Angeles. The air service was to be handled between Cleveland and Kansas City by the Universal Airways System; and from Kansas City west, by the Western Air Express. It was planned to cover the air portion of the route in eighteen hours.[33]

Business Flying.

One development came as a surprise to the aircraft industry. Corporations and individual business men made unexpected purchases of the most modern airplanes. The Standard Oils three-engine passenger plane, the Stanolind proved to be so practical that a three-seater was purchased. According to the vice-president the directors were able to make ten business trips, 11,128 miles, in six months.[34] This promised to be one of the most desirable of airplane uses.

Aerial Advertising.

The possibility of advertising by plane was recognized before 1910. The method of advertising went through different stages. The first stage consisted of drop-

ping handbills from planes flying over towns. Then gypsy pilots began the practice of selling space on the fuselage and the lower surfaces of the wings. Finally "skywriting" was perfected in England about 1919 and introduced into the United States the following year.[35] Broadcasting from planes promised to be still another way of putting products before the puolic.[36] In 1927 there were 54 firms engaged in aerial advertising.[37]

Forest Patrol

Forest fire patrol by plane was recommended at a convention of forest supervisors at El Paso as early as 1909. Six years later L. A. Vilas in his own plane made a few trial flights over forest areas near Big Trout Lake in Wisconsin. But the first organized and sustained forest-fire patrol was begun by the Forest Service in California, June 1, 1919, with army planes and army personnel.[38]

The first year's work continued until October 31, when the fall rains made it no longer necessary. It was found that it had discovered 442 fires in six months with only one fatality and an efficiency of 85 per cent. Location of fires proved to be possible within a radius of 35 miles and at a speed of 75 miles an hour.[39]

The service was repeated for the two years following and then practically discontinued because of the lack of an appropriation and because it was found that a regular patrol was expensive and unnecessary. An appropriation of $50,000

for 1926 and the two years following made a resumption of operations possible in 1925;[40] and the Forest Service reported a considerable saving and recommended an extension. The work was greatly hampered by lack of landing fields and radio equipment, it being necessary either to drop messages or to telephone them.[41]

In Canada, the Dominion planes were equipped with radio and were used to carry fire-fighting crews as well as messages. But the Province of Ontario seemed to have had greater success. The service here started in 1924 and immediately reduced the loss to 140,000 acres from 2,120,000 acres the year before and an annual average of 900,000 acres for the five years preceding. This reduction was accomplished at a considerable saving in operating cost and despite the fact that over a thousand more fires were reported for 1924 than for 1923.[42]

Aerial Surveys.

Up to 1928 the principal use of aerial photography in surveying was by the governments of the United States and Canada and by private firms in work on preliminary location of transmission lines, reservoir, drainage and irrigation projects and preliminary surveys and city maps for tax purposes, parks, and the like. It was also used to some extent for studying geological conditions in prospecting.[43] More than 80 firms were engaged in this type of aviation in 1927.[44]

The Geological Survey began in 1921 to employ army

planes and personnel for the construction of base maps. This work was found to be most effective in densely populated and inaccessible regions, especially where there was not too great a variation in elevation. It seemed in certain cases to secure greater accuracy with the same expenditure of time and money. In 1921, 512 square miles were surveyed by this method; in 1925 the amount was 6,857.[45]

The Coast and Geodetic Survey employed a naval seaplane in 1922 for the first accurate survey of the Mississippi delta. This region had been surveyed previously in boats equipped, because of the marshes and the tall vegetation, with special ladders and tripods. Because of the constantly changing river channel these surveys had to be made frequently. It was reported that they could be done much more quickly and cheaply by plane than by the old method.[46]

The German airline in Columbia made a survey for the Columbia-Venezuela boundary commission in the Catatomba-River region, which was swampy and heavily timbered and peopled only by hostile savages. This work was completed in three months at a cost of about $20,000. It was estimated that the work by ground methods would have cost $200,000 and taken two years.[47]

The War Against Plant Pests.

The plane was used to fight plant pests in two ways; first, in preventing their spread; and, secondly, in destroying them where they already existed. The first of these was

first in point of time, but the second-commonly called dusting-appears to be first in order of importance.

The Department of Agriculture in 1918 began to use planes to discover cotton fields in cotton-free zones, the purpose of these zones being to prevent the spread of the pink boll worm from Mexico. It found seven outlaw fields along the Trinity River and near Galveston Bay, which had escaped discovery by all other methods. The work was later extended.[48]

Dusting was first done in 1921 by an army plane from McCook Field, Dayton, Ohio, furnished at the request of C. R. Neillie of Cleveland and H. A. Gossard, chief of the Ohio Department of Entomology. The plane sprayed poisonous powder upon a grove of Catalpa trees infected with Catalpa Sphinx. The results were completely satisfactory, not more than one per cent of the the pests being alive in an hour.[49]

The idea was taken over the following summer by the Bureau of Entomology. Two planes borrowed from the War Department were used to dust cotton plants with calcium arsenate for the destruction of the boll weevil. With the aid of a congressional appropriation of $40,000 the work was continued in 1923. It was found that the airplane was more effective because of the propeller blast, that it used only half of the arsenate ordinarily required, and that it covered 500 to 700 acres an hour as compared with 70 to 80 acres a day by a team-drawn motor machine. Seven foreign countries conferred with the government in 1926, and five of them took up the same sort of work.[50]

In the United States, however, most of the work after 1923 was carried on by commercial companies under the supervision of the federal and state agricultural authorities. The cost was somewhat less than the older method and the farmers found it much more satisfactory because it was more efficient and did not require any apparatus to be owned by the farmers themselves. The Huff-Doland Aero Corporation, the pioneer in commercial work of this kind, experimented with other plants and trees, particularly peach trees, pecan groves, and sugar cane. The Department of Commerce thought that the maximum use of planes would mean a saving of $135,000,000 annually for cotton growers alone.[51] Nine firms were engaged in various types of dusting in 1927.[52]

Crop Reporting.

The Department of Agriculture carried on experiments with planes to determine total acreage and to estimate the amount of damage inflicted by hail, floods, and other natural agencies. Both types of work were proved perfectly possible, but only the second seemed practical. The carrying on of this work in the future seemed to depend upon cooperation with the army, since the Agricultural Department was not planning on the purchase of planes of its own.[53]

Fish Patrol.

In 1919 the navy from its station at San Diego, California, began to report schools of fish and their location to the State Fish and Game Commissioner, who then in-

formed fishing boats. The scheme seemed to have met with some success in the sardine industry.[54]

Rescue Work.

The Coast Guard used the aircraft for scouting, for carrying messages and relief, and even for actual rescues from the water.[55] The army and navy flyers did the same sort of work during the Mississippi flood of 1927.[56] The plane was also used on various occasions for carrying vaccines and serums and other preventatives and remedies.

Conclusion.

One of the greatest drawbacks to the development of aviation in the United States was for a long time the lack of adequate insurance protection. Accident policies excluded flying as a part of their risks. Ordinary life insurance policies were rather indefinite, but could be secured with difficulty, if at all, by those expressing the intention to fly. Pilot insurance and comprehensive policies, covering damage to plane, to passengers, and goods, and to property of groundsmen, were so high as to be almost prohibitive. These were conditions before the passage of the Air Commerce Act; and they existed, quite probably, largely because of the need of such an act.[57]

After 1927 insurance companies adopted a much more lenient attitude. Nearly 30 great life and accident companies agreed to issue policies protecting passengers;[58] while insurance for pilots and comprehensive policy rates were reduced about 40 per cent.[59]

In conclusion let it be said that aviation grew in one brief decade from a humble servant of the God of War to a potential giant of industry. And though an American aviation policy was sometimes lacking, sometimes vacillating, it in the long run helped to get results.

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2. Includes a large deficiency appropriation.

3. Includes appropriation for naval reserves.

4. Includes appropriation for experimental work in mechanical, hydraulic, and aeronautic engineering as well as the appropriation for the Bureau of Standards. The remaining years down to 1926 cover only the latter.

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