

CIVIL AERONAUTICS AUTHORITY
PRIVATE FLYING AND PLANNING DIVISION

CONFIDENTIAL NOTE NO. 10

MEMORANDUM ON PROPOSED EXPERIMENTAL AIR MAIL CONTRACTS

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MEMORANDUM ON PROPOSED EXPERIMENTAL AIR MAIL CONTRACTS

During the National Air Mail Feeder Conference at Kansas City, Mo., on October 6, 7, and 8, 1938, representatives of the air carriers present held a special meeting on experimental air mail contracts. After the meeting, discussions continued at Kansas City and Washington, D. C., and on October 11, 1938, the Operators' Committee of the Air Transport Association of America sent Mr. T. O. Hardin, of the Air Safety Board, a confidential report for presentation to the Authority.

This report, a copy of which is attached, was prepared by Mr. Edgar S. Gorrell, President of the Association. It recommended a program of experimental flying, and the letter accompanying it explained that it was in reply to a request from the Air Safety Board to the aviation industry for their best "thoughts on the subject of saving of human life, and the ultimate reduction to the Government in the cost to it of scheduled airline flying, by doing tomorrow's flying today." The report recommended that experimental flying be paid for by air mail contracts, and that an appropriation therefor be incorporated in the budget of the Authority for 1940.

Mr. Gorrell came to Washington shortly thereafter for further discussion, and was followed by Mr. Jack Frye, President of Transcontinental & Western Air Inc., who further endorsed the recommendations made in the operators' report. The Administrator was advised of the proposed experimental contracts and particularly of the request for an appropriation of \$1,500,000 to carry out the plan.

It was the Administrator's opinion, in view of appropriations being asked for other developments, especially airports and airway aids, that it would be difficult to obtain additional funds for experimental flying at this time. He directed, however, that the whole plan be given careful study and that such recommendations as might support the request for an appropriation be prepared for early consideration.

The report of the Association and subsequent discussions is briefly summed up as follows:

PREMISES

1. Development of flying equipment and methods up to the present safety standards resulted largely from the early years of experimentation in scheduled air mail operation without passengers.
2. Most of the experimentation, carried on with "mail only", of necessity stopped with the advent of combined passenger and mail schedules.
3. Experience has shown that the airlines offer the most fruitful proving ground for the industry. Airline operation offered opportunity not only for the principal development of airplanes, accessory equipment, communications and weather facilities, but also for the most worth-while advances in operating technique for both military and commercial aviation. These gains were made during regular scheduled operations over the airways, schedules flown by pilots wearing parachutes, without passengers, and in all kinds of weather.

4. During the past ten years passenger carrying has been combined with the mail, and the co-pilots who have started their airline careers since 1928 have not had the benefit of flying in every conceivable type of weather unhampered by considerations for passenger safety, and of making independent decisions under such conditions. Now, in 1938, the air transport industry has reached the stage where these men must soon replace the older captains in command of the large passenger transports.

5. The dispatch of air mail suffers delays because of weather which is considered unsafe for passenger operation. This condition to some extent has curtailed the Post Office Department's plans for air mail expansion.

6. The amount of experimental flying necessary to attain the degree of safety and regularity which the flying public and users of air mail can reasonably expect cannot be financed by the air transport industry alone.

DISCUSSION

To provide a proving ground for the development of new aircraft design and airline operating technique available through the various stages of testing and under all kinds of operating conditions, it is desirable to set up a continuing program of governmental aid that may be expected to be, to a certain extent, self-liquidating. Since experimental flying has to be done without risking the safety of passengers, revenue from passenger fares cannot be counted upon to support it. Other means will have to be found. To justify governmental

aid, either in the form of experimental air mail contracts, or through a partial subsidy by the Civil Aeronautics Authority, the benefits from such an experimental program will have to be open to the entire industry. Not only the airline operators but also the manufacturers, the military services, the engineering schools, the laboratories and the government agencies concerned would have to be included. The N.A.C.A., the Weather Bureau, the Bureau of Standards and the Federal Communications Commission should participate. Furthermore, to have the greatest possible scope, such a program should be sufficiently flexible to permit testing to be done on any route or section and with any and all types of equipment as the need arises.

It has been stated as an objective that "air transport planes should be able to operate on schedule, with adequate comfort for passengers, with almost complete independence of weather and terrain, and having a duplication and reliability of equipment such that failure of any one function at any time during take-off, flight, or in landing, will not place the crew in a position where they must depend upon fortunate circumstances to bring them through safely." Leaving out the reference to passengers, this objective applies with equal force to air mail flying and military missions. It not only implies the development of new and improved aircraft, but also continues the same type of research which during the past has been of major importance in developing present standards of safety.

THE OLDER PROBLEMS

Some of the problems which have long been pressing for consideration - and will continue to do so - include:

Pilot Training: It has been frequently said that airline pilot training is the contractor's obligation. However, as mentioned above, the experience of having the sole responsibility for making and carrying out a flight plan under all weather conditions is an "executive" experience that has been denied to most of our airline co-pilots since passengers have been carried with the mail.

Experimental air mail schedules without passengers would provide this most important kind of final transitional pilot training.

Maintenance and Repair: This again has been the contractor's direct obligation to develop to a high standard of efficiency. New types of equipment, and improved methods of operation continually call for changes and improvements in shop facilities, in training of mechanics for inspection and repair, and in re-tooling and re-stocking. Experimental operation without passengers during changes of equipment would enable this work to be thoroughly completed before the new equipment is assigned to passenger schedules.

Engineering: The entire engineering responsibility can no longer be placed on the manufacturer. It is possible to put many more hours of "service" testing on any particular piece of equipment on the airlines than can be done in the same length of time by the manufacturer or the military services. The existence of engineering staffs on the airlines has made it possible for the operator to understand fully the functioning of new equipment and the adaptation of it to airline conditions.

Airline engineering staffs have been invaluable to the manufacturers in giving recommendations and in supervising the "breaking in" of new equipment. The airlines admittedly are the best proving grounds possible if they can be made available as such. And if, through the medium of experimental mail contracts, testing can be done in cooperation with the airline engineers, most defects will be brought to light and overcome early in the development stages. In addition, it will be possible to familiarize all ground and flight personnel with new equipment before this equipment is assigned to passenger schedules.

Communications: Experimental air mail contracts flown by pilots equipped with parachutes will permit and encourage flying in weather, now forbidden, that will test and thereby develop communications to the utmost. The Post Office Department has always felt a demand for the "mail to go through", and this could not be acceded to in weather making passenger safety doubtful. Improvements tried out experimentally doubtless will develop communications to a degree of reliability that will permit an uninterrupted schedule even with passengers.

Meteorology: Weather safety requirements for air mail experimental flying without passengers will be entirely different. Pilots with parachutes and aircraft from which they may be used will have a different attitude toward weather limitations. Weather recording instruments, such as the radiometeorograph, may be placed aboard such flights and records, that are not now available, may be obtained during sub-stratosphere flying. Attempting to operate under all kinds of weather conditions will improve cooperation of pilots with ground personnel and will foster a better understanding of flight control problems.

Icing Problems: Although there remains a great deal of experimentation to be done in the further development and improvement of de-icing devices, passenger flying requires the pilot, whenever possible, to avoid conditions where ice may be expected. With the advent of more efficient wings and relatively higher and higher wing loadings, it has been shown that the more efficient the wing the more it is affected by icing. The icing problem affects other parts of the aircraft as well, and this problem will continue to have an increasingly important influence on design. Only by means of experimental operation where icing conditions are encountered, can the susceptibility of new design to this danger be fully tested and conquered.

Metal Fatigue and Vibration Studies: With the change over to all metal construction, and with monocoque and stressed-skin types of design, the study of vibration, crystallization and metal fatigue has become of prime importance to safety. It was formerly necessary to wait until actual fatigue failures occurred to know what parts were being seriously affected. More often than not, these failures came to light while the plane was in use, and a considerable time after it had been assigned to airline operation. Now that vibration-indicating and recording instruments can be installed on aircraft, and measurements made under actual flight conditions, guess work in this phase of testing can be replaced by engineering knowledge. The amount of flying possible under experimental contracts will insure the completion of vibration analysis and the discovery and strengthening of weak sections before failures occur. From a safety standpoint such an engineering approach to the problem

must replace the older way of letting defects work themselves out of a new design. This is especially true since these shake-down periods have frequently been shown to extend over as much as the first year of operation on an airline, and have been characterized too often by unexpected break-downs, schedule tie-ups and accidents. Every component part of an airplane can now be subjected to vibration study during flights, before the aircraft is finally put on passenger runs. These studies will contribute greatly to safety, lowered maintenance costs, lengthened life of the aircraft, and comfort of passengers and crew.

NEW HORIZONS

Miles flown per fatal accident on domestic airlines have increased from 2,996,056 in 1932 to 12,832,649 in 1937. While these figures show substantial gains, the increases year by year have not been steady - in some years, from 1933 to 1934, and from 1935 to 1936, the record of safety has retrograded, indicating that our apparent achievements are not altogether a matter of engineering, but are partly the result of luck and good weather. It is still impossible for the airlines to advertise "safety" as an inducement to air travel. Emphasis has to be laid on the savings in time, and, to a lesser extent, on comfort. Until the safety record of the airlines equals or exceeds surface means of transportation this most important consideration must be suppressed in advertising. The saturation point in passenger travel is far from being reached, with the 57% average for

1937. This large source of revenue must be developed if the "ultimate reduction to the Government in the cost to it of scheduled airline flying" is the goal. It is estimated that reductions in passenger fares to the level of surface transportation costs should account for a twenty per cent increase in seats occupied, but not for a comparable increase in revenue. Safety of operation, and reliability of schedules is still the principal objective for the air carriers. Experiments and developments for increased safety and reliability point to sub-stratosphere and, ultimately, stratosphere flying. Among the first items called to mind in this connection are:

Pressure Cabins and Oxygen Equipment: Development of flying independent of weather will demand the reaching of at least sub-stratosphere altitudes. Although much has been done, there is still a great deal of experimentation ahead before the pressure cabin and oxygen apparatus developed for this work is ready for use on passenger airliners. This involves testing under operating conditions over a period of time that will extend through seasonal weather changes, and permit all personnel to become familiar with the technique. Comfort of passengers demands cabin pressure or oxygen or both, at altitudes of 9,000 feet and up, while the safety of passengers and crews definitely requires oxygen at levels above 14,000 feet. Airline operation in mountainous regions frequently has to exceed these altitudes. Engines and aircraft for stratosphere flying are well advanced. To complete this next logical advancement in airline operation it will be necessary to perfect the

pressure cabin and oxygen equipment.

Additional Stratosphere Requirements: Flying at even sub-stratosphere levels calls for the development of many more items than just the more spectacular ones of pressure cabins, and oxygen apparatus. Climbing to high cruising altitudes must be an economical operation and must offer inducements of greater block to block speed. In this direction there is much to be done in propeller design. An airplane intended for high-altitude work where high climbing and take-off efficiencies are important needs the largest possible diameter propellers compatible with tip speed and ground clearance. Theoretically, propeller diameter must be increased in direct proportion to the decrease of air density to provide for the proper absorption of available horsepower. The fact that lower temperatures prevailing at the higher altitudes call for slower tip speeds again seems to favor larger diameters for maximum efficiency; yet, if high cruising speed is more important, a wider bladed propeller is preferable to one with a larger diameter. Sub-zero temperatures will undoubtedly affect specific weight ratios per horsepower in many metal parts. With the advent of long range, sub-stratosphere flying, celestial navigation will soon come to be considered as necessary an adjunct to the safety of air transportation as it has been for centuries to marine. The further development of celestial navigation instruments adaptable to aircraft limitations together with pilot training in their use will, of necessity, become a part of such an experimental flying program.

Other Developments: Along with the developments of equipment and methods for flying reliably above the weather, will come, necessarily, many other aids, many of which are already in use and require only further experimentation and development to perfect. These include communications aids, blind landing systems, full feathering propellers, four engined transports, nose-wheel landing gears, anti-icing design, ground altitude indicators, automatic direction finding instruments, flight recording instruments, wing design for aircraft to be used in instrument landings that will not have critical stalling characteristics, improved protection against fire hazards, more efficient high performance power plants, Diesel engines for aircraft, use of flight mechanics on the larger transports, etc., etc. The country is seriously concerned over the need for larger airports, yet the general adoption of the nose-wheel landing gear alone may relieve the most pressing airport expansion demands. The nose wheel permits the heavier planes to start the take-off in the flying position and get into the air with a shorter run. It greatly simplifies instrument landings, shortening the roll and eliminating tendencies to nose-over and ground loop. If experimental flying is organized to serve as a providing medium for all aviation, it will tend to generate new developments not yet brought to light, as well as speed those already under way.

The above discussion can only touch on some of the advances under way and the multitude of problems bearing on safety. But it should be evident from even this brief resume that, although progress has been made during the past few years in raising the standards of

efficiency, comfort and safety, the industry cannot be satisfied with the present stage of development. As long as the safety record is below that of surface transportation, experimentation, testing under service conditions, and developments must continue, and there are so many existing problems it seems most unlikely that the air industry alone could finance or direct the research and development needed.

It seems practical to propose a thorough and coordinated program for experimental air mail flying to provide the proving ground and the revenue for this purpose. It must be done without involving passenger schedules, and under the supervision of the governmental agencies concerned. These agencies, no doubt, will include, in addition to the Civil Aeronautics Authority and the Post Office Department, the N.A.C.A., the Bureau of Standards, the Army Air Corps and the Navy Bureau of Aeronautics.

RECOMMENDATIONS

It is recommended that this proposal of the Air Transport Association be accepted in principle, with some modifications in details to be worked out to broaden the scope of the plan and permit it to help with the needs of the manufacturers as well as the operators, and that an effort be made to provide the means and funds to get at least one such experimental air mail contract under way at an early date. In order to make such experimental flying available to all the industry, the following modifications of the plan proposed by the Air Transport Association are recommended:

- a. Experimental air mail contracts should be provided primarily for testing and development work under scheduled airline conditions, including:
 - New types of aircraft and equipment,
 - New routes or operations procedures,
 - New airways facilities,
 - New territory - potential volume of air mail and express business from regions not previously served.
- b. Experimental air mail contracts should be made available to any and all airlines, regardless of whether they are transcontinental in extent, the criterion in each case being whether the operator is already an air mail carrier, and in need of testing new aircraft or equipment.
- c. Any air carrier should be permitted to obtain as many such experimental contracts running either concurrently or consecutively as he may be able to justify, or as may be necessary on the basis of actual experimental development or testing undertaken by the airline and the manufacturer, and approved by the Authority.
- d. Experimental mail contracts should be made available to every airline intending to purchase new types of equipment, even though other airlines may have conducted tests on similar equipment. This recommendation is made to prevent restricting experimental flying of one type to any one operator, and

for the further purpose of insuring personnel training and familiarization for all air carriers wherever new equipment may be used.

- e. Experimental air mail contracts should be available over existing contract routes already being flown by the air carrier as well as over new feeder routes, in recognition of the fact that the tests contemplated must be flown under conditions prevailing on routes where operations of tested equipment will probably continue after the tests are completed.
- f. Experimental air mail contracts should be subject to termination or cancellation upon due notice by the Authority to the carrier, and with the concurrence or approval of the Post Office Department, it being recommended that ordinarily such contracts should terminate with the completion of the experimental or development work which was the subject matter of the contract under consideration. As a matter of practice such terminations by the Authority ordinarily would follow applications of the operator or manufacturer for final approvals on tested equipment.
- g. Experimental mail contract routes should be limited in mileage to the division, section or region where equipment such as is being tested is intended to be used by the airline operator, or where conditions to be tested may be encountered. The intention of such a provision would be the conservation

of available air mail funds by spreading them over as many tests and contracts as possible, with the consideration at the same time of the requirements for through mail schedules or connections.

- h. Each experimental mail contract should be limited in time to the period necessary to complete the experiment, providing, however, for a certain minimums of flying in each case as required by the Post Office Department in order to establish serviceable air mail schedules.
- i. Experimental air mail contract flying should be made available for transition training of senior pilots on new equipment and for co-pilots otherwise ready for promotion to the status of captain. The latter will thus be given the responsibility of commanding flights, without passenger responsibility, and will be given experience in weather flying not encountered normally. Such a plan will probably require an arrangement with the A.L.P.A. and the N.L.R.B. in adjusting pay, or in providing for a special intermediate pay scale for co-pilots during this transition period by waiving the promotion to captain's status until the transition period of training is satisfactorily completed.
- j. Air mail payments should be on a non-profit basis, calculated on mileage rather than on a poundage, and the amount of experimental work involved in each individual contract should be taken into consideration. The contracts will necessarily be

awarded without competitive bidding in recognition of the experimental nature of the operation and the probable cost of the tests.

- k. Experimental air mail contracts on a non-profit basis should take into consideration the development of greater revenue from air express. In order to reduce air express rates in part, the report of the Association proposes a "deferred" classification. Delivery of this classification, although not guaranteed to be made on the first schedule, would be guaranteed to be at least as fast as railway express. This "deferred" express would be carried on these experimental air mail schedules, as a space or cargo filler, and in order to provide full loads for all other schedules.

Such a plan will require a revision of the contractual relations of the air lines with the railroads, which at present are in effect through the medium of the Railway Express Agency. Their contract makes the air carriers agree that at no time may the airlines require the Railway Express Agency to charge a rate less than twice the first-class Railway Express rate, nor may they accept express business from anyone other than the Railway Express Agency. The Railway Express Agency, in its turn, agrees not to enter into contracts for the handling of express by any air lines other than those of the Association which were doing business on December 1, 1935, without first giving the

members of the Association one year in which to establish a similar or competing service.

In order to reduce air express rates by providing for a deferred classification, the air carriers would have to seek an amendment of this collective contract with the Railway Express Agency. It may be presumed that since deliveries of "deferred" air express would only be guaranteed to be "as fast as, or faster" than surface means of transportation, the reduced rates could not be set higher than first class railway express. Since this "deferred" air express would offer the possibility of faster delivery than railway express at the same rate, it would immediately become a competitor with rail service, and the writer does not believe that the air carriers can hope to obtain any such modification of their contract. Obviously, it cannot be supposed that the railroads would willingly agree to the establishment of a competitive express business of this kind. The Railway Express Agency contract with the airlines explicitly states on this point as follows: "Provided, however, that the express company shall not be required without its consent to establish air-express rates less than twice the existing first-class rail express rates between the same points, unless required by law..." In effect, this agreement between the major

air lines and the railroads provides for the railroad's absolute protection against airplane competition in the express business, and the words underlined above by the writer suggest the only means apparent for reducing air express rates. If the Authority, through the enabling provisions of the Civil Aeronautics Act, particularly through Section 404 (a) and (b) should see fit to foster a "deferred" air express plan, including reduced rates, it no doubt has the jurisdiction permitting it to do so.

The Cost Ascertainment Report of 1931 shows that although the Government made a profit on parcel post for local delivery, it lost more than 20 million dollars on that delivered in zones 1 and 2 and more than 4 million dollars on that delivered in zone 3. (This report may be considered as typical of any year.) It is evident that business diverted from parcel post to "deferred" air express would be, for the most part, that business pertaining to the above-mentioned zones, because "deferred" air express would be slightly faster than parcel post by rail, and slightly cheaper than regular air express. The zones (zones 4, 5, 6, 7, and 8) in which the Government made a profit in parcel post, would not be affected because of the greater spread between parcel post and reduced air express rates for those distances.

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It appears evident, therefore, that the revenues necessary to support an experimental air mail service of the kind outlined could be increasingly supplemented as the service developed by air express revenues, particularly if the Authority made possible a "deferred" service at reduced rates. If the ideal accepted for an experimental proving ground be based on benefits to be spread over all airlines and throughout the industry, on a non-profit basis, and the incidental goal be the reduction to the Government of its costs in supporting aviation, it will be necessary to build up air express revenue in support of this objective.

In connection with the suggested course of action outlined above, the Civil Aeronautics Authority could further materially the progress made by means of such experimental contracts by supplying motors and instruments to the manufacturer or the operator on a lease basis during the period of experimental flying. By this means, much of the flying now done by the manufacturer during the development of a design could be combined with the flying required for breaking in new aircraft to airline use. Moreover, since the initial investment for the manufacturer is one of his largest items of expense, the reduction of this initial expense would not only make possible much longer periods of testing, but would also permit testing with various types of power equipment when experimental changes were desired.

The program should provide for the testing to be done as rapidly as new types of equipment are developed by manufacturers, regardless of whether they are developed on order or in anticipation of the market. It will provide actual operating tests of new equipment under the altitude requirements of a given route and subject to the limitations of its airports. It will provide for the greater part of the experimental flying to be done by the same airline pilots who will have to become familiar with the handling characteristics of new aircraft, and to be carried on over a much longer period than is now economically possible.

Furthermore, such experimental contracts may be used for the development of new territory in testing the potential volume of air mail and express business over proposed feeder lines from regions not previously served. Undoubtedly there will be considerable pressure brought on the coming Congress to provide feeder lines to many communities not now served. At the National Airmail Feeder Conference, mentioned above, the spokesman for the Government on all phases of airline feeder programs advocated careful preliminary analysis and progress by studied measures. The Conference issued a call for community and regional expressions on feeder airmail expansion, asking that an organized effort be started at once in order to be effective in November, to the end that "Congress shall authorize and provide funds for feeder airmail development." That the airmail can be carried without loss by the Government was disclosed by the chairman of the Committee on the Post Office and Post Roads, House of

Representatives, as long ago as 1933. It was stated, "According to the committee's airmail investigator, if passenger carrying were given up and air mail alone were carried in specially designed single-motor planes, the air mail could be carried without any Government subsidy whatever." While many arguments are being prepared by the proponents of feeder line service to their communities which cannot help but command attention at the coming session of Congress, nevertheless, the Post Office Department will insist on the necessity of each of such routes being proven before it will be willing to divert air mail appropriations from present mail line uses to expansions into new regions. By means of experimental air mail contracts, as discussed herein, available to present operators, such new regions may be tried out and made to justify service before calling for an investment in permanent feeder line service, airports and communications facilities.

CONCLUSIONS

The program as outlined in the report of the Association is not entirely definite on the matter of appropriations. On page 7 of the report it is stated that "it is believed that an appropriation of one and one-half million dollars should be requested by the Civil Aeronautics Authority to be used to pay air carriers for conducting experimental flight schedules." Later on, on the same page, the report adds "Of course the cost of such experimental flights, to be met from the special appropriations herein suggested, will be reduced

to the extent that they may be met by payments for mail transportation or by payments which the carrier may receive from the shippers of cargo."

In view of these statements, it is recommended that the Air Transport Association and the Aircraft Manufacturers Association be invited to confer with the Authority for the purpose of arriving at a definite and detailed plan for presentation to the Authority, the Post Office Department, the Bureau of the Budget and to Congress. It is believed that the recommendations made herein, modifying the preliminary proposal of the Air Transport Association can be fully reconciled to their program if the Authority will insist on the policy that whatever is done must be done for the benefit of the industry as a whole, and participated in, and supervised by, the Authority. There are so many existing problems in the experimental development of aviation that full responsibility cannot be assumed by the Authority alone - it must be shared jointly between the operators, the manufacturers and other Government agencies. Only in this manner can duplication of effort be eliminated and solutions rapidly attained.

A copy of the letter and confidential proposal of the Air Transport Operators Committee is attached to this report for reference.

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October 11, 1938.

CONFIDENTIAL

Honorable Thomas O. Hardin,
Air Safety Board,
Civil Aeronautics Authority,
Washington, D. C.

My dear Sir:

Pursuant to your request that our industry submit to you its thoughts on the subject of the saving of human life and the ultimate reduction to the Government in the cost to it of scheduled airline flying by doing tomorrow's flying today, a committee of the industry has given its earnest consideration to the matter and has prepared a report, setting forth concrete suggestions, which I enclose herewith.

In view of the imminence of the budget hearings, we trust that these suggestions may receive immediate and favorable action in order that they may be incorporated in the budget requests to be presented by the Authority for the fiscal year 1940.

Naturally this report is submitted to you, and through you to the Authority and the Administrator, with the understanding that it is to be treated as confidential.

Respectfully yours,

/s/ Edgar S. Gorrell,
President.

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CONFIDENTIAL REPORT OF COMMITTEE OF AIR TRANSPORT OPERATORS
ON PROPOSAL FOR EXPERIMENTAL FLIGHT SCHEDULES

It is the belief of the air transport operators that the Civil Aeronautics Authority should take the necessary steps to make possible a certain amount of flight operations to be operated for the purpose of carrying mail and cargo only, such schedules to be classed as experimental flight schedules.

Necessity

Much of the ceaseless experimentation with flying equipment and flying methods carried on with "mail only" schedules stopped with the advent of combined passenger and mail schedules. Curtailment of experimentation becomes a necessity as soon as passengers are taken aboard, since it is absolutely essential that passenger carrying operations be conducted under a policy which assures that no flights will be dispatched unless there is every assurance that the flight will arrive at its destination in safety. Operations under this policy prohibit most of the experimentation under adverse weather conditions which was carried out during the days of schedules carrying cargo only.

Past experience has shown that the airlines provide the most fruitful proving ground for airplanes, accessory equipment and flying methods. In the past both the military and commercial branches of aviation gained their most worth while developments in equipment and operating technique from experience over the airways during regular scheduled operations. These developments included engines, airplanes, instruments, radio, accessory equipment such as deicers, cowlings, streamlined forms, supercharging, engine lubricants, fuels and navigational methods. When the evolution of the modern airline aircraft is carefully analyzed the discovery is made that much of the development has resulted from experimentation of one kind or another in scheduled operation without passengers.

The single engined mail plane flying over the major trans-continental routes was the most important single medium in American aviation through which the important methods and equipment used today were developed. These mail schedules, flown by America's best pilots, were operated in and through every conceivable kind of weather winter and summer. All of our present flying instruments and airline flying methods were developed and refined to their present usefulness in such service. There are many items, which were of such an experimental nature that they could not have been first tried in airplanes carrying passengers, that were rapidly developed into items which have definitely made flying safer.

Most of what we now know about flying through weather was discovered by the mail pilots wearing parachutes and flying without passengers. The parachute was the way out in emergencies. The weather-wise and seasoned pilot of today, flying the large passenger craft is the man who was trained in the single engined mail school. These men are also serving as instructors to the group of pilots now being developed; however, there is much about flying which can be learned from experience alone.

We still have a great deal to learn about the art of flying and we have learned little that is new since the days of the single engined mail schedules. There has been very little improvement in flying methods since that time mainly because there has been no opportunity to develop new methods or to experiment with weather flying methods or flying equipment.

If military and commercial aviation is to go forward and become more efficient and more safe, experimentation must be carried on, pilots must be trained, new devices and methods must be tried out under actual conditions.

The training of flying personnel goes hand in hand with the development of flying equipment. The air transport industry has reached the stage where men who have not had the benefit of flying by themselves in every conceivable type of weather, and making their own decisions under such conditions, must be placed on the large passenger transports as captains. It is very simple to impart to pilots the knowledge necessary to fly the large transports during landings and takeoffs, but the experience and judgment necessary to safe decisions in all types of weather which they may encounter can be obtained in only one way and that is through flying through such conditions. Unless our newer pilots have the opportunity to fly under all weather conditions, they will never be trained to cope with the unexpected situation which may arise and cause a major crash.

Results

It is believed that the safety and efficiency of flying in general, and air transport operations in particular, will be greatly improved by experimental flight schedules as recommended because they will permit the early and sound development of the following, with the benefits accruing to the military services as well as civil aviation, through the development of technical design and flying methods.

(a) A substantial reduction in accidents in the air transport industry.

(b) Greater reliability and improvement in the dispatch of United States Air Mail. It is believed that proper experimentation and development will make possible 100% completion of air mail schedules on time.

(c) Provide a means to obtain data for the development of aircraft, aircraft engines, and aircraft accessories.

(d) Provide a means for the thorough testing and proving of aircraft, aircraft engines and aircraft accessories before they are used in passenger carrying operations. It has long been recognized by the aircraft and aircraft engine manufacturers and the airline operators that it is highly desirable that each new design be submitted to more thorough testing over the airways than is now possible because of the cost involved.

(e) The development of aircraft for stratosphere operations. It is believed that stratosphere operations will eventually provide the ultimate in safety and efficiency, as well as passenger comfort, and will thereby materially broaden the use by the public of scheduled air transport.

(f) Provide the rapid development and service use of an instrument landing system. Such development will be one of the most important factors in improvement of safety and dependability of transportation by air.

(g) Provide means to obtain additional information about weather and weather flying which is a vital factor in the improvement of safety.

(h) Increase the efficiency and safety of present operations. The flights operating as experimental flights would provide supplemental weather information on existing conditions to aid in the dispatch and operation of flights carrying passengers, enabling those flights to be dispatched and operated in complete safety at times when they are now cancelled due to inadequate weather information and also providing information for grounding airplanes under hazardous conditions.

(i) Provide a training ground for pilots, the value of which is so great that it cannot be estimated.

(j) Provide the development of navigational methods which are now impossible under the Civil Air Regulations governing passenger carrying operations. There is an urgent need for the development of navigational facilities. Most airline accidents can be traced to some error in navigation, either the human element or lack of proper facilities, lack of proper facilities probably being the most important reason. There is an urgent need for the development of facilities in the training of pilots so that it will be possible to determine the exact position at all times during a flight and finally to effect a safe landing at the destination regardless of weather conditions.

The above outlines immediate results which can be obtained. There are many other benefits to be obtained which would arise with the further development of the art of flying itself.

Plan of Procedure

The scope of the experimental flying necessary to obtain the safety and efficiency which the public can reasonably expect is such that the air transport industry alone cannot finance it.

In addition to the prime purpose of reducing accidents in scheduled airline operations it is felt that such experimental flying will benefit all types of flying, commercial and military included, and for this reason it is believed that a certain amount of governmental aid should be given. It is further believed that governmental aid should be given through the authorization of a certain number of transcontinental air mail schedules to be operated as strictly air mail and cargo schedules.

It is believed that an appropriation of one and one-half million dollars should be requested by the Civil Aeronautics Authority to be used to pay air carriers for conducting experimental flight schedules. It is suggested that these schedules be paid for and conducted under Section 305 of the Civil Aeronautics Act or such other statutory authority as may be appropriate. It is likewise suggested that the Authority permit a carrier to transport only mail and cargo upon such trips, together with such observers, military, naval or civilian, governmental or airline, as may be benefited thereby or as may be charged with the inspection thereof. Of course the cost of such experimental flights, to be met from the special appropriation herein suggested, will be reduced to the extent that they may be met by payments for mail transportation at the regular rates from the Post Office appropriation, or by payments which the carrier may receive from the shippers of cargo.

It is believed that the expenditure necessary for such experimental flight schedules is justified in the interest of the saving of human life and increasing of safety in flying in the years to come.

Further, the results of such a program will mean an early improvement in safety and a corresponding increase in public confidence. With public confidence in air transportation established, the Government will save more than the cost of this experimental service because, as passenger revenues increase, payments to the air carriers for the transportation of mail can be accordingly reduced.