

CIVIL AERONAUTICS JOURNAL



ISSUED TWICE MONTHLY BY THE CIVIL AERONAUTICS AUTHORITY

VOL. 1

WASHINGTON, FEBRUARY 1, 1940

NO. 3

PLANS CLEARED FOR TEN LANDING BEAMS

National Academy of Sciences approves instrument landing program

The Civil Aeronautics Authority on January 22 announced that it was ready to proceed with the installation of instrument landing equipment at approximately ten important air terminals throughout the United States. The type of equipment to be installed is substantially the same as that developed at the Authority's experimental station at Indianapolis.

The Authority's program, which calls for an extended service testing of this equipment at the ten stations to be designated, has been endorsed by a special committee set up by the National Academy of Sciences at the request of President Roosevelt. Selection of sites will be made from a priority list of 25 submitted to the Authority by the Radio Technical Committee for Aeronautics, a group which represents the air transport industry, the radio industry, and the Army and Navy air services. The list is as follows:

New York (North Beach); Chicago; Los Angeles (Mines Field); Kansas City; Atlanta; Seattle (Snohomish); Fort Worth; Oakland; Washington, D. C. (Gravelly Point); Memphis; Salt Lake City; Minneapolis; Miami; Pittsburgh; Detroit (Wayne County Airport); Nashville; St. Louis; Columbus; Denver; Philadelphia; New Orleans; Albuquerque; Omaha; Cleveland; and Brownsville.

The full report follows:

Report on Instrument Landing System

The conference group of the National Academy of Sciences appointed in response to request of the President of the United States that the academy undertake the study of the problem of standardizing instrument landing equipment for airplanes met in Washington on October 13 and 14, 1939. This meeting was preceded by several preliminary conferences and consideration of development and progress to date.

The group interprets "standardization" in its usual engineering sense,

which is that standards established at any time represent the then existing status of the art, recognizing that as the art develops, better standards will become available and should then be adopted.

Although other methods have been proposed for assistance in landing airplanes during times of low visibility, the greatest progress so far made has been through use of radio systems. This report is, therefore, most concerned with that field.

The conference group has heard the representatives of the Army, the Navy, and the Civil Aeronautics Authority, and through them indirectly the views of the equipment manufacturers, the air transport companies, and the pilots. Members of the group are also familiar with the researches being carried on at educational institutions. They have ascertained the special requirements for each class of service, civil and military, and have reviewed the reports of the latest tests and installations intended to meet these requirements. Subsequent to the formal meetings, the conference group reviewed further data and opinions from many interested individuals and organizations transmitted through the chairman, and the chairman accompanied pilots in flying several of the systems.

The situation with which the group is faced may be summarized as follows:

A practicable system, the elements of which have had extensive trial, has been demonstrated. This system is the culmination of some ten years of development, started by the Bureau of Standards and the Aeronautics Branch of the Department of Commerce, participated in by numerous governmental and commercial groups, and brought to its present state by the Civil Aeronautics Authority in accordance with the recommendations of the Radio Technical Committee for Aeronautics. It is referred to herein as the Indianapolis sys-

(Continued on next page)

IN THIS ISSUE

First Annual Report of the Civil Aeronautics Authority submitted to Congress

PRIVATE FLYING

(Page 39)

Pilot program trainees log 35,000 hours . . . Flight instruction under way at 90 percent of participating colleges . . . Certificated pilots pass 30,000

AIR TRANSPORTATION

(Page 40)

Postmaster General cites growth of air mail . . . Annual Report of Post Office Department activities shows 12.49 percent increase in miles flown . . . Air Safety Board reports on Rio accident

MANUFACTURING AND PRODUCTION

(Page 41)

Take-off weight and fuel dumping regulations interpreted . . . Authority studies cockpit visibility problems . . . Airworthiness report discusses spruce and substitute spar material . . . Aircraft radio equipment approved for scheduled air carrier use in 1939

AIRWAYS AND AIRPORTS

(Page 44)

Dealers in aeronautical charts of the Coast and Geodetic Survey . . . Latest editions of aeronautical charts, and map showing areas covered . . . Airport projects approved

OFFICIAL ACTIONS

(Page 48)

Opinions, and abstracts of orders and regulations



Published with the approval of the Director of the Bureau of the Budget by the

CIVIL AERONAUTICS AUTHORITY:

ROBERT H. HINCKLEY, *Chairman*
 HARLEE BRANCH, *Vice Chairman*
 OSWALD RYAN, *Member*
 G. GRANT MASON, JR., *Member*
 EDWARD WARNER, *Member*
 CLINTON M. HESTER, *Administrator*
 PAUL J. FRIZZELL, *Secretary*

Issued on the 1st and 15th of each month. Subscription \$1 per year. Single copies 5 cents. Sold by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

Instrument Landing Program

(Continued from preceding page)

tem. With slight modifications this system is suitable for immediate use. There is another system coming along, referred to herein as the microwave system, which offers prospect for considerable improvement. This is similar to the first in fundamentals, but it involves new elements not yet adequately tested by experience.

Adoption of the Indianapolis system may lead to the installation of equipment at landing fields and in the planes themselves, which will later have to be scrapped if advantage is to be taken of further advances in the art. If such adoption becomes too extensive and widespread before the improved system materializes, there is a possibility that the introduction of the superior system may be inhibited by costs in making the change. On the other hand, failure to adopt the Indianapolis system may result in too much delay in getting any system at all and in withholding immediately realizable benefits.

The Indianapolis system seems good enough already to assist and to expedite the landing of planes in unfavorable weather. Furthermore, it would offer opportunity for the pilot training and experience necessary to judge the merits of any system. The experience thus gained would probably be applicable to later systems and would undoubtedly be an appreciable factor in guiding future developments.

The question before the conference group reduced itself, therefore, to considering the possible installation of the Indianapolis system with full appreciation that it may later be replaced by a superior system and with the understanding, of course, that it should not retard and might well contribute greatly to future developments by giving a sounder basis for determining requirements. Under such circumstances and in view of its immediate usefulness in

pilot training and in assisting and expediting the landing of planes in bad weather, the costs involved in its adoption at this time might well be justified even for a limited period of use.

With regard to the technical features of the systems, there are many points on which all are in agreement. There is general agreement in regard to the principal features of a radio system for instrument landing. It should consist of three parts, localizer, localizer beam markers, and glide path beam. The localizer beam generally along the lines of that used at Indianapolis is acceptable. The positioning and nature of the markers in general as there demonstrated are acceptable. It is agreed by all that the glide path should be inclined at an angle of 3° to 4°, that it should be essentially straight over the portion navigated, and that it is desirable that this straight portion should extend as far as possible from the landing point.

There are other points on which development has not progressed far enough to bring about general agreement. The situation with regard to these is as follows:

1. The length of the straight line portion of the glide path that is necessary for successful operation is undetermined. In the opinion of the conference group, a straight path of even 2 or 3 miles would have substantial utility in the operation of air transport planes, but a much longer path than this, preferably 10 to 20 miles, is desirable for this service, and decidedly important for some military needs.

2. For some conditions it is desirable that the end of this path be flared or leveled out in the immediate vicinity of the landing point, in order that smooth and safe landings may be more easily made. It is the opinion of the group that when proper markers are used, this is a desirable but not an essential feature.

3. While the crossed needle type of indicator has had the greatest attention, there is much opinion that improved types of indication combining flight and landing information on the same instrument would be desirable. The cathode ray type of instrument, which can give, in a single instantaneously grasped figure, a range of information ordinarily obtainable only by combining numerous needle indicators, thus greatly simplifying the mental processes involved, offers especial promise. However, it appears, that nearly all of these various indicators could be used with the same type of ground equipment and with the same radio equipment on the plane. Hence, the group feels that, while further careful attention should be given to plane instrumentation, and while instrumentation should be studied with primary attention to the physiology and psychology of the pilot, it is not necessary that there should be uniformity on the type of instrument used as among different classes of users of the equipment at the present time. When the same instrument is adopted by different users, it should, however, be always operated in the same sense. At present the Army and the Civil

Aeronautics Authority use the crossed needle instrument with opposite connections. This small difference should be adjusted by agreement after recommendation by the Radio Technical Committee for Aeronautics.

4. It is apparent that fixed equipment will meet the usual civil needs, while portability is desirable and often necessary for the Army and in general necessary for Navy uses. It appears, however, that both fixed and portable equipment can be developed and used which will give the same radio patterns about the field, and hence the same indication to the user. Therefore, it appears desirable that fixed equipment should be installed of such nature that portable equipment to duplicate its performance can be built when necessary.

5. On choice of frequencies there is still lack of complete agreement. The frequencies at Indianapolis, chosen by the Civil Aeronautics Authority with due regard to available channels and interference, are in the vicinity of 100 megacycles, and the selection appears

(Continued on page 52)

First Annual Report to Congress by the Civil Aeronautics Authority

First Annual Report of the Civil Aeronautics Authority, 58 pages, 6 illustrations (maps and charts). For sale by the Superintendent of Documents, United States Government Printing Office, Washington, D. C. Price 25 cents.

The First Annual Report of the Civil Aeronautics Authority, submitted to Congress early in January, covers the activities of the Authority from August 22, 1938, when the Civil Aeronautics Act of 1938 became effective, to June 30, 1939, the close of the fiscal year, with additional activities to October 31, 1939.

At the time of the writing of the report, a year and 5 months had elapsed since the enactment of the Civil Aeronautics Act. This period, the report states, was "marked by an unprecedented advance in American civil aviation."

"For the first time," the report continues, "civil aviation in this country has had the benefit of a unified and comprehensive national policy, administered by a single Federal agency."

The improved economic condition of the air carriers was attributed in large part to the new Government policy laid down in the Civil Aeronautics Act.

The body of the report outlines the major activities of the Authority, the Administrator, and the Air Safety Board. The Appendixes include organization and airway charts, and maps showing existing routes of domestic air carriers and United States air carriers engaged in foreign, transoceanic and territorial air commerce. In both cases new routes, for which applications have been filed with the Authority, are also shown. Statistical summaries show progress in safety of operations, increases in scheduled operations and nonscheduled flying, air navigation facilities, aircraft production, and numbers of certificated aircraft and pilots.

PRIVATE FLYING

Pilot Program Trainees Log 35,000 Hours

Flight Instruction Under Way at 90 Per- cent of Participating Colleges

The Civil Aeronautics Authority announced on January 15 that a total of over 35,000 hours had already been flown by the 9,310 students in the Civilian Pilot Training Program, without serious accident of any sort.

A total of more than 1,200 of these students had already reached the solo stage of instruction. Flight instruction was under way at at least 90 percent of the 437 colleges and universities taking part in the program.

"The colleges cooperating in this training and the flying instructors deserve great credit for this fine record," Chairman Robert H. Hinckley said in making public the figures. "It should be remembered that it was not even possible to discuss these plans with the colleges until August 5, 1939, when the appropriation bill was passed. The enthusiasm with which the work has been taken up goes far to encourage us in the belief that close to 10,000 new pilots will be certificated by the end of next June. The safety record of this first 35,000 hours further encourages our confidence in this course as one productive of safe pilots.

"There has also been the most gratifying public acceptance of the program for training 700 students who are not in the colleges. Washington, D. C. and Syracuse, N. Y., for instance, have, through their local sponsors, raised additional funds to provide scholarships for students beyond the 10 in each city provided for under the Civil Aeronautics Authority's plan."

Designation of Medical Examiners

During the month of December 1939 the following physicians were officially authorized to act as medical examiners for the Authority in the cities named:

Arkansas.—Dr. Robert Hood, Pearson Hotel Building, Russellville; Dr. Lester L. Scott, Webster Building, Siloam Springs.

Colorado.—Dr. James G. Espey, Jr., 402 West Main Street, Trinidad.

Georgia.—Dr. Ed Lane Moore, 25 South Main Street, Statesboro.

Illinois.—Dr. Noland W. White, City National Bank Building, Centralia.

Iowa.—Dr. Barnhard B. Gloeckler, Fleenor Building, Mount Pleasant.

Kansas.—Dr. Herbert Atkins, 216½ South Main Street, Pratt.

Louisiana.—Dr. Matthew Ragan Green, James Building, Ruston.

Missouri.—Dr. Paul C. Platt, 612 Professional Building, Kansas City (as air line medical examiner); Dr. Arie C. van Ravenswaay, Victor Building, Boonville; Dr. William J. Smith, 504 Trust Building, Hannibal; Dr. Eamil A. Stricker, Rolla Hospital, Rolla.

New Jersey.—Dr. Aids B. Coultas, 1 Madison Avenue, Madison; Dr. Leon J. Schwartz, 20 North Pearl Street, Bridgeton.

New Mexico.—Dr. William Howe, Crocket Building, Las Vegas.

New York.—Dr. Reuben Paul Higgins, 20 Court Street, Cortland; Dr. George M. Shearer, 110 West Third Street, Jamestown.

Ohio.—Dr. Alan D. Knisely, 43 Public Square, Lima.

Pennsylvania.—Dr. Raymond F. O'Connor, 42 North Brady Street, Du Bois.

Texas.—Dr. Malone Vincent Hill, Holland Hotel Building, Alpine.

Virginia.—Dr. Ray A. Moore, Farmville.

Canal Zone.—Lt. Comdr. R. W. Hege, United States Naval Air Station, Coco Solo, and Capt. John B. Herman, Albrook Field (both as air line medical examiners).

The following physician changed his address during the month, his new

address being as follows:

Dr. William C. Keller, 1737 Chestnut Street, Philadelphia, Pa.

The following named physicians are no longer conducting examinations for the Authority at the cities named:

Lt. Alfred W. Eyer, St. Thomas, Virgin Islands.
Dr. Hill Hastings, Los Angeles, Calif.
Dr. Roy C. Hubbs, Sheridan, Wyo.
Dr. Herman C. Hughes, Du Bois, Pa.
Lt. Lester W. McDonald, United States Fleet Air Base, Canal Zone.
Lt. Col. Wood S. Woolford, Albrook Field, Canal Zone.

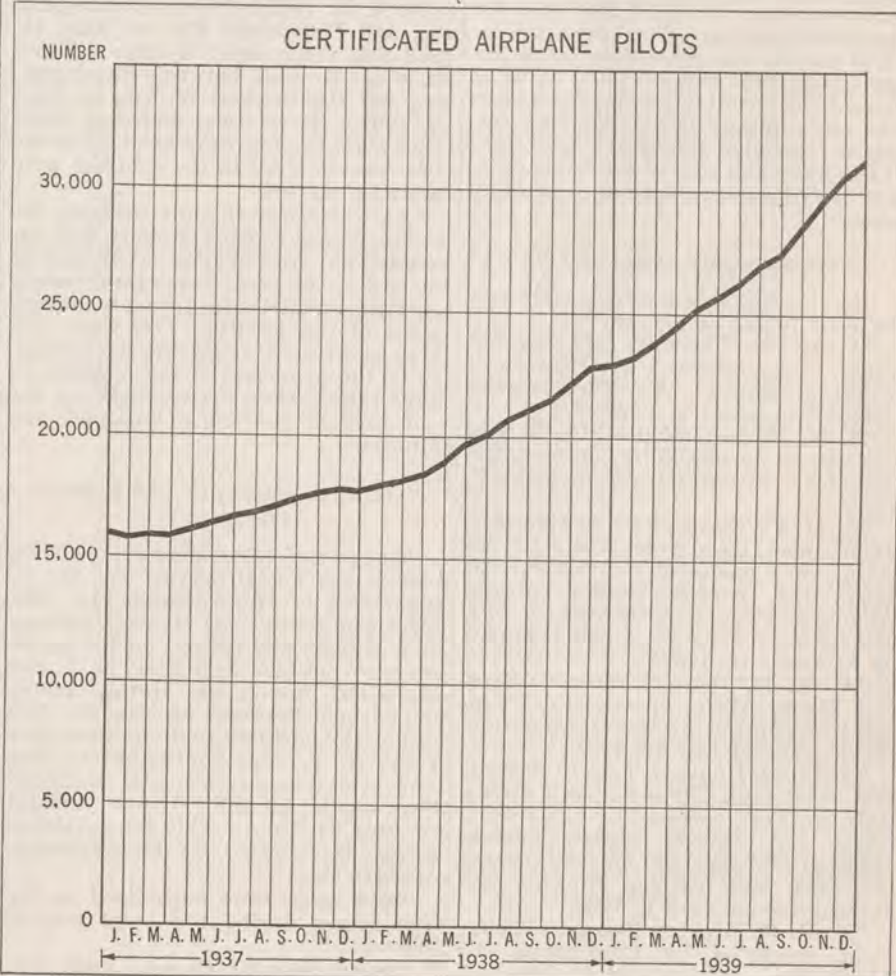
Certificated Pilots Pass 30,000 Mark

On January 1, 1940, there were 31,264 pilots holding various grades of Civil Aeronautics Authority certificates. This represented an increase of 37 percent during the year 1939 and an increase of 96 percent in the 3-year period since January 1, 1937. These figures do not include student pilots, among whom are the participants in the Authority's current Nation-wide Civilian Pilot Training Program. It is believed, however, that the successful completion of this pro-

gram will add close to 10,000 new private pilots by the end of next June.

At the start of 1937, there were 15,952 certificated pilots. On January 1, 1938, the number had grown to 17,681 and at the beginning of 1939 there were 22,983. During 1939, 8,281 pilots were added, bringing the total to the previously mentioned figure of 31,264.

The accompanying chart illustrates the increase in the number of certificated pilots during 1937, 1938, and 1939.



AIR TRANSPORTATION

Postmaster General Cites Growth of Air Mail

Annual Report on Post Office Department Activities Shows 12.49 Percent Increase in Miles Flown

A total of 57,551,255 miles was flown by American airplanes on domestic and foreign air mail routes on a pay basis during the fiscal year 1939, according to figures revealed last month in the Postmaster General's Annual Report to Congress. This exceeded by 12.49 percent the miles flown during the previous fiscal year.

Those portions of the report devoted to air mail, which covered the activities of both the foreign and domestic systems, including the inauguration of two new experimental "pick-up" routes, were summarized as follows:

"Both the domestic and foreign air mail systems were improved and extended during the fiscal year 1939. There were 52,193,772 miles flown by planes on domestic air mail routes on a mileage pay basis, and 5,357,483 miles on United States foreign air mail routes—a total of 57,551,255 miles for the entire service. This exceeded by 12.49 percent the miles flown with pay during the fiscal year 1938 and by 29.61 percent the record of any previous year. The route mileage of the domestic system at the end of the fiscal year totaled 37,049 miles and that of the foreign system 31,478.9 miles—a total of 68,527.9 miles.

"DOMESTIC AIR MAIL SERVICE

"Service was inaugurated on six new domestic routes as follows:

"A. M. 38, Phoenix, Ariz., to Las Vegas, Nev., operated by Transcontinental & Western Air, Inc. Service started November 1, 1938.

"A. M. 39, Jacksonville, Fla., to New Orleans, La., operated by National Airlines, Inc. Service started November 1, 1938.

"A. M. 40, Tampa, Fla., to Memphis, Tenn., and Tallahassee, Fla., to Atlanta, Ga., operated by Eastern Air Lines, Inc. Service started between Atlanta and Tampa on October 10, 1938, and between Tallahassee and Memphis on February 15, 1939.

"A. M. 41, Detroit, Mich., to Sault Ste. Marie, Mich., operated by Pennsylvania-Central Airlines Corporation. Service started July 20, 1938.

"A. M. 42, Houston, Tex., to Brownsville, Tex., and Houston, Tex., to San Antonio, Tex., operated by Eastern Air Lines, Inc. Service started between Houston and San Antonio on October 20, 1938, and between Houston and Brownsville on April 6, 1939.

"A. M. 43, Wichita, Kans., to Pueblo, Colo., operated by Continental Air Lines, Inc. Service started June 23, 1939.

"Carriers throughout the system have continued to improve aircraft equipment. Notwithstanding the continued increase in the volume of air mail, carriers have provided the equipment to transport it expeditiously.

"A total of 15,818,617,372 air mail pound-miles were performed during the fiscal year, as compared with 14,137,360,791 pound-miles in the fiscal year 1938, and 12,732,530,874 pound-miles in the fiscal year 1937. This represents an increase of 11.89 percent over the last fiscal year and 24.24 percent over any other previous year.

"EXPERIMENTAL AIR MAIL SERVICE

"Two experimental routes utilizing devices for exchange of mail in flight, were established during the year. Service was started at a number of cities on route A. M. 1001 between Philadelphia, Pa., and Pittsburgh, Pa., on May 14, 1939, and at a number of other cities on route A. M. 1002 between Pittsburgh, Pa., and Huntington, W. Va., on May 12, 1939. Service was added at other cities from time to time until all of the cities provided for in the contract were receiving service.

"An experimental route utilizing the service of rotary-wing aircraft was advertised on November 28, 1938, and at the end of the fiscal year arrangements had been completed for the early inauguration of the service. This route will serve as a test to determine the feasibility of the operation of the autogiro or other rotary-wing aircraft between the roof tops of post-office buildings and airports.

"AIR MAIL ROUTES IN THE FOREIGN SYSTEM

"One of the outstanding events of the year in the Postal Service was the inauguration of trans-Atlantic Air Mail Service on route F. A. M. 18. Twice-a-week service was started on the southern route between New York, N. Y., and Marseille, France, via Horta, Azores, and Lisbon, Portugal, on May 20, 1939, and on the northern route between New York, N. Y., and Southampton, England, via Shediac, Canada; Botwood, Newfoundland; and Foynes, Ireland, on June 24, 1939. This trans-Atlantic service is operated by Pan American Airways Co.

"New stops were authorized on foreign routes during the fiscal year as follows:

"Quito, Ecuador; Quanta, Venezuela; Horta, Azores; Lisbon, Portugal; Mar-

seille, France; Shediac, Canada; Botwood, Newfoundland; Foynes, Ireland; and London, England.

"The United States foreign system now directly serves 93 cities in the following countries:

"Alaska, Canada, Newfoundland, Europe, Cuba, Mexico, Central and South America, Hawaii, Guam, the Philippine Islands, and Asia."

Air Safety Board Issues Report on P. A. A. Accident at Rio

The crash of a Pan American Airways' twin-engine flying boat at Rio de Janeiro on August 13, 1939, with fatal injuries to 4 crew members and 10 passengers, was found by the Air Safety Board to have resulted from the failure of 1 engine during a landing approach.

In a report transmitted to the Civil Aeronautics Authority on January 9, the Board said that after a scheduled flight from Miami through the West Indies and down the east coast of South America the aircraft was making a normal approach to the landing area adjoining the Rio base when it suddenly lost power from the left engine, yawed to the left, and started a descending turn in the same direction.

Continuing its sharp descending turn, the report stated, the aircraft struck a caisson anchored at right angles to a small island in the harbor immediately adjacent to the normal landing approach path. The aircraft was demolished by the impact and the wreckage caught fire. Two passengers escaped, one with minor injuries, the other with serious injuries.

Sailors from the Brazilian battleship *Minas Geraes*, anchored nearby, who immediately swam or rowed to the scene of the accident and participated in fire-fighting and rescue activities were praised by the report for having demonstrated a "high degree of courage."

The report concluded that evidence obtained during the investigation indicated that the aircraft's turn to the left in continuation of the initial yaw was the result of the pilot's decision to attempt a landing in the water to the left of the original flight path. This attempt proved to be beyond the operating capacities of the aircraft under flight and other conditions existent at the time, according to the report, and further indications were that other available choices were likewise beyond the operating capacities of the plane. Evidence produced by the investigation failed to supply any conclusive explanation for the loss of power from the left engine.

Copies of the full report may be obtained from the Correspondence Unit, Civil Aeronautics Authority, Washington, D. C.

MANUFACTURING AND PRODUCTION

Take-off Weight and Fuel-Dumping Regulations

A temporary interpretation of those sections of the Civil Air Regulations dealing with take-off weight and fuel-dumping in the operation of air-carrier airplanes has been issued by the Authority and distributed to aircraft manufacturers and air-carrier operators. This material, which has been issued pending the development of regulations covering an "air carrier" category and such revision of the existing regulations covering scheduled operation as appear likely to be necessary as a result of the establishment of such a category, is as follows:

1. General

A. Approval may be continued for the operation of all air-carrier airplanes over the routes and at the gross weights now authorized.

2. Take-off Weight

A. The weight at take-off on any scheduled flight shall not exceed the standard weight, unless:

- (1) Specifically approved by the Authority,
- (2) The airplane is equipped with a fuel-dumping installation which has been demonstrated to comply with all the requirements therefor, and
- (3) The airplane has been shown to comply with all the provisions of CAR 04.71.

B. In the case of airplanes eligible, in accordance with the terms of item 2A above, for take-off weights in excess of the standard weight, the take-off weight shall not exceed any one of the following limitations:

- (1) The *provisional* weight,
- (2) The *standard* weight plus the weight of fuel and oil required to reach the first intended destination under forecast conditions of wind and weather. Additional fuel and oil required for dispatching requirements must be carried as a part of the *standard* weight.
- (3) (For *landplanes* only): The weight corresponding to a minimum take-off distance of 1,000 feet¹ in calm, sea level, standard air; except that this limitation may be exceeded subject to the following additional limitations:
 - (a) The take-off weight shall not exceed that at which the rate

of climb with one engine inoperative is less than 200 feet per minute in sea level standard air with the inoperative propeller, landing gear, and flaps in the minimum drag condition and with the remaining engine(s) operating

at not more than METO (maximum except take-off) power.

- (b) The operation of the airplane at the take-off weight shall be restricted to landing areas which meet all other condi-

(Continued on next page)

Aircraft Radio Equipment Approved for Scheduled Air-Carrier Use

During 1939, 143 units of aircraft radio equipment were approved by the Authority for scheduled air-carrier use and issued type certificates. These units, with the name of the manufacturer, the certificate number, and the date of certification, were as follows:

Certificate No.	Manufacturer	Unit	Date of certification
240	Western Electric Co.	7-A receiver mounting	Feb. 25
241	do	27-A radio transmitter	Sept. 2
244	do	25-A radio transmitter R. F. unit.	Mar. 22
245	do	25-A radio transmitter A. F. and power unit.	Do.
246	do	KS-10044 list 1 and KS-10044 list 2 power units.	Sept. 2
33	T. L. Siebenthaler Manufacturing Co.	Type 90 receiver	Mar. 22
34	do	CR-4 radio receiver R. F. amplifier unit.	Mar. 10
35	do	CR-4 radio receiver I. F. and A. F. amplifier unit.	Do.
37	do	Type 91 vibrator power supply	Do.
38	do	Type 107 switch and terminal box.	Do.
39	do	Type 107 loop coupling unit	Do.
290	do	Type 137 jack box	Mar. 22
291	do	Type 242-2 aircraft power unit	Mar. 10
292	do	242-3 receiver power pack (dynamotor).	Apr. 19
40	Bendix Radio Corporation	RA-2B receiver	Feb. 8
41	do	MR-14A remote control	Feb. 25
42	do	RA-4C receiver	Feb. 8
43	do	MS-18A jack box	Feb. 25
44	do	RA-6A receiver	Feb. 8
45	do	MR-36A shock mount	Feb. 13
46	do	MR-44A shock mount	Do.
47	do	MR-46A shock mount	Do.
48	do	MX-2B crystal unit	Feb. 8
49	do	MX-2C crystal unit	Feb. 13
50	do	MN-4-B loop drive	Mar. 22
51	do	MN-4C-loop mounting	
52	do	MN-6A loop amplifier	Oct. 18
53	do	MN-6C loop amplifier	Mar. 10
54	do	MN-16B loop	Apr. 19
55	do	MN8D control unit	Do.
56	do	MN8E control unit	Do.
57	do	MN8F control Unit	Do.
58	do	MR-30A change-over switch	Mar. 22
59	do	MR-30B antenna change-over switch.	Apr. 19
80	do	Type MN-28A remote-control unit.	Sept. 28
81	do	MN-20A rotatable loop	Apr. 19
82	do	Type MN-52B azimuth control	Sept. 28
83	do	MN-26A and MN-26B radio compass receiver.	Oct. 7

(Continued on next page)

¹ In order to determine whether or not the 1,000-foot take-off run in calm, sea level, standard air is exceeded at a proposed take-off weight, the minimum take-off run at this weight may be measured under a particular set of altitude and weather conditions and this result reduced to standard sea level, no-wind conditions by the method contained in chapter X of the Inspection Handbook.

Take-Off Weight Regulations

(Continued from preceding page)

tions essential to safe operation, and to surfaced runways therein having an effective² length which exceeds 3,500 feet by at least five times the amount by which the minimum take-off run at the take-off weight in calm, standard air at the geographical altitude of the airport exceeds 1,000 feet.

- (4) (For seaplanes only:) The weight corresponding to a minimum take-off time of 45 seconds in moderately smooth water in a wind up to 10 miles per hour, except that this limitation may be exceeded subject to the following additional limitations:
- (a) The take-off weight shall not exceed that at which the rate of climb with one engine inoperative is less than 200 feet per minute in sea level standard air with the inoperative propeller, landing gear, and flaps in the minimum drag condition and with the remaining engine(s) operating at not more than METO power.
- (b) The operation of the airplane at the take-off weight shall be restricted to landing areas which meet all other conditions essential to safe operation and to take off therein, in such direction(s) that there is sufficient room available to permit landing straight ahead after the speed for best rate of climb with one engine inoperative has been reached, and to surface conditions such that any wave height limitation included in the aircraft specification is not exceeded.
- (c) The take-off weight shall be determined in accordance with such other terms as the Authority may deem necessary for safe operation.

3. Dumping of Fuel: CAR 04.712 is interpreted as follows

A. If the airplane is equipped with means for dumping fuel and the installation has not been demonstrated to comply with the requirement therefor (aircraft specification does not list an installation as optional equipment), the dump valve(s) shall be made positively inoperative.

B. If any airplane is equipped with means for dumping fuel and the installation has been demonstrated to comply with the requirements therefor, the aircraft certification will incorporate the following statement:

² "Effective" length is the distance from one end of the runway to the intersection with the surface of the runway of a plane (having a slope of 1 in 20) through the highest obstruction to flight at the other end of the runway.

(Continued on next page)

Aircraft Radio Equipment Approved for Scheduled Air Carrier Use— Continued

Certificate No.	Manufacturer	Unit	Date of certification
85	Bendix Radio Corporation	MR-12F tuning control	Dec. 11
86	do	TA-2J aircraft transmitter	Do.
87	do	MT-36BA antenna tuning unit	Do.
88	do	MX-1B crystal unit	Do.
89	do	MX-4C crystal unit	Do.
90	do	American Export Airlines' power transfer unit.	Do.
92	do	MN-5B and MN-5B-24 direction finder (loop amplifier).	Dec. 18
94	do	MN-25A loop rotator	Do.
95	do	MN-6D loop amplifier	Oct. 13
96	do	RA-1L aircraft radio receiver	May 18
97	do	MR-12G azimuth control	Oct. 18
98	do	MR-15A crank drive	Dec. 11
99	do	MN-22A azimuth control	Do.
100	do	TA-2G transmitter	Feb. 18
101	do	TA-2H transmitter	Feb. 14
102	do	MP-10A power supply	Feb. 18
105	do	MT-56B shock mount	Do.
106	do	MR-40A drive assembly	Feb. 13
107	do	MS-6A radio control panel	Do.
108	do	MR-22A antenna coupler	Oct. 18
109	do	Type MR-22B impedance matching transformer.	Mar. 10
110	do	MR-26A remote control	Feb. 13
111	do	MP-20A vibrator power supply	April 19
112	do	MP-20B power supply (800-cycle).	Do.
113	do	RA-12A instrument landing receiver.	Do.
114	do	MP-12A power unit	Mar. 10
115	do	MR-16A filter	April 19
116	do	IN-3A cross pointer meter	Do.
117	do	RA 6-B receiver	Mar. 22
118	do	RA-10A and RA-10B aircraft radio receiver.	Oct. 7
119	do	MR-9A remote-control unit	Dec. 11
380	do	TA-6A and TA-6B transmitter	May 22
381	do	MT-54A remote control	Do.
382	do	MT-11B key	Do.
383	do	MS-14A junction box	Do.
384	do	MS-14B junction box	Do.
385	do	MS-14C junction box	Do.
386	do	IN-4A compass indicator	Dec. 18
388	do	MP-8A power supply	Dec. 11
389	do	MN-52B azimuth control	Dec. 18
390	do	MN-52D azimuth control	Do.
391	do	MR-11A and MR-11B loop coupling unit.	Dec. 11
216	RCA Manufacturing Co.	MX-9B crystal unit	Dec. 19
217	do	AVT-15-A aircraft transmitter	Mar. 10
218	do	AVT-17 radio transmitter	Feb. 25
219	do	MI-5902 transmitter low frequency tuning unit.	Do.
220	do	AVT-17-17-A radio transmitter control unit.	Do.
221	do	AVT-17-17-A radio transmitter dynamotor power supply unit.	May 10
222	do	AVT-17-17-A radio transmitter junction box.	Do.
223	do	AVR-14 aircraft radio receiver	Mar. 10
226	do	AVR-14 radio receiver control unit.	Do.
227	do	Model AVA-41 aircraft antenna reel system.	May 10
228	do	AVR-15 aircraft receiver unit	Do.
229	do	AVR-15-A aircraft receiver unit	Do.
230	do	AVA-51 vibrator power unit	Do.
231	do	AVA-51-A vibrator power unit	Do.
232	do	AVR-15-15-A antenna transformer.	Do.
		MK-1 automatic radio direction finder receiver part No. 643665.	Sept. 2

**Aircraft Radio Equipment Approved for Scheduled Air Carrier Use—
Continued**

Certificate No.	Manufacturer	Unit	Date of certification
233	RCA Manufacturing Co.	Antenna coupling transformer part No. 163896.	Sept. 2
234	do	Antenna coupling transformer (dual) part MI-5991-3.	Sept. 20
235	do	AVR-20 aircraft communication receiver.	Oct. 7
280	Collins Radio Co.	17-D-4 autotune transmitter	Jan. 25
281	do	17-F-5 aircraft transmitter	July 31
181	Aeronautical Radio Co.	R-1-M antenna reel system	May 31
182	do	R-2 antenna reel system	June 30
183	do	R-2 antenna fairlead	Aug. 8
410	American Airlines, Inc.	ATR receiver mount	Nov. 6
370	Bendix Aviation, Ltd.	Model 3404, type 1779, pilot's jack box.	Apr. 25
371	do	Model 3404, type 1779, copilot's jack box.	Do.
372	do	Model 3905, type 1827, antenna switching relay.	Do.
373	do	Model 3705, type 1774, control panel.	Do.
374	do	Model 3915 7-G receiver mount	Nov. 8
375	do	Model 3914 14-A receiver mount	Do.
376	do	Model 3910 buzzer unit	Do.
377	do	Model 3917 sensitivity control unit.	Do.
378	do	Model 3405-R copilot's jack box	Do.
379	do	Model 3405-L pilot jack box	Do.
420	do	Model 3912 dynamotor base	Do.
421	do	Model 3909 antenna coupling unit.	Do.
422	do	Model 3707 control panel	Do.
320	Fairchild Aerial Camera Corporation.	C-6 radio compass	Feb. 11
350	Kenyon Transformer Corporation.	Type S-6353 simultaneous radio range filter.	Do.
333	Lear Developments, Inc.	UT-6 transmitter	Apr. 19
334	do	GT-30-AB transmitter power supply and modulator unit.	Sept. 5
335	do	T-30-AB transmitter tuning unit.	Do.
336	do	G-30-AB transmitter and receiver power supply unit.	Nov. 11
337	do	R-3-AB receiver tuning unit	Do.
338	do	G-3-AB receiver power supply and I. F. unit.	Do.
339	do	R-3-AC receiver tuning unit	Do.
344	do	ADF-7 automatic direction finder.	Nov. 29
269	Pan American Mfg. & Supply Corporation.	FL-33 fairlead	Feb. 27
270	do	FL-62 fairlead	Do.
400	Sperry Gyroscope Co., Inc.	Parts 643666 and 643964 control unit and indicator (part of Sperry-RCA MK-1 automatic direction finder).	Aug. 7
401	do	Parts 643667 and 643789 loop and motor drive assembly (part of Sperry-RCA MK-1 automatic direction finder).	Do.
310	Standard Piezo Co.	S-5-A crystal holder	Feb. 11
311	do	S-5-B crystal holder	Do.
312	do	S-5-C crystal holder	Do.
313	do	S-5-D crystal holder	Do.
314	do	CS-5-A crystal unit	Do.
315	do	CS-5-B crystal unit	Do.
316	do	CS-5-C crystal unit	Do.
317	do	CS-5-D crystal unit	Do.
161	United Airlines Transport Corporation.	ES-292 loop antenna	Mar. 22
162	do	ES-280 rotatable loop control unit	Feb. 24
163	do	ES-283-A radio marker indicator unit.	Mar. 10

Fuel-Dumping Regulations

(Continued from preceding page)

- (1) With authorized weight in excess of standard, "Landing shall not be made at a weight in excess of standard except in accordance with the provisions of CAR 61.7811. Fuel shall not be dumped except in accordance with CAR 61.6711."
- (2) With authorized weight not in excess of standard "Fuel shall not be dumped except in accordance with CAR 61.7811."

Authority Studies Cockpit Visibility Problems

A study having as its ultimate purpose the establishment of minimum standards of aircraft cockpit visibility is being conducted by the Authority's Certificate and Inspection Division.

The determination of standards of this nature does not readily lend itself to a theoretical approach, as such standards are usually evolved over a long period of time as a result of compromise between structural considerations and the desired goal—unlimited visibility. Therefore, since a cross section of the experience of the industry in visibility problems would be an invaluable aid to the Authority in setting up minimum standards for various types of airplanes, a questionnaire was prepared and distributed to aircraft manufacturers, air-carrier operators, and all commercial pilots. This questionnaire requests recommendations regarding the minimum angles of vision values considered advisable and opinions as to whether or not the pilot's seat should be adjustable and, if so, in which directions.

From the answers to these questions, the Authority will be able to compile data which, along with its own research results, will serve as a gage for standardizing visibility requirements.

Copies of the questionnaire may be obtained from the Correspondence Unit, Civil Aeronautics Authority, Washington, D. C.

Airworthiness Report Discusses Spruce and Substitute Spar Materials

Aircraft Airworthiness Section Report No. 15 entitled "Defects in Spruce, Laminating, Splicing, and the Use of Substitute Materials in Spars" has been released by the Authority. The report presents the results of the work to date on this subject, which is but one of the many special studies on airworthiness problems being conducted by the Authority. Copies have been forwarded to aircraft manufacturers.

The report states that the present shortage of high quality aircraft spruce prompted the Authority to make, and continue, an investigation of possible solutions to the problem. The study revealed that three methods of solving the problem appear to have possibilities:

1. A possible broadening of the interpretation of the present spruce specifica-

(Continued on page 47)

AIRWAYS AND AIRPORTS

Dealers in Aeronautical Charts of the Coast and Geodetic Survey

In order that its aeronautical charts might be more easily obtainable by airmen and others interested, the Coast and Geodetic Survey of the Department of Commerce appoints "recognized dealers" to stock the charts for sale at the principal airports in the country.

A complete list of the aeronautical charts now available appears on page 46 in this issue of the JOURNAL. Appropriate notice of the issuance of new and revised aeronautical charts is carried each month in the Airways and Airports department of the JOURNAL.

The current list of "recognized dealers" is as follows:

Alabama		
BIRMINGHAM.....	Municipal airport.....	Southern Airways, Inc.
MOBILE.....	Bates Field.....	Oak Air Service, Inc.
Arizona		
PHOENIX.....	Sky Harbor Airport.....	Sky Harbor Air Service, Inc.
California		
BURBANK.....	Union Air Terminal.....	Pacific Airmotive.
GLENDALE.....	Grand Central Air Terminal.....	*Air Associates, Inc., 1100 Airway Drive.
LOS ANGELES.....	.....	Fowler Bros., 414 West 6th Street.
OAKLAND.....	Municipal airport.....	Boeing School of Aeronautics.
SAN DIEGO.....	Lindbergh Airport.....	*San Diego Aeromarine Radio & Navigation, Administration Bldg.
SAN FRANCISCO.....	Municipal airport.....	Pacific Airmotive, South San Francisco, Calif.
.....	.....	*U. S. Coast and Geodetic Survey, 307 Customhouse.
Colorado		
DENVER.....	Municipal airport.....	Airport manager.
Delaware		
WILMINGTON.....	Du Pont Airport.....	Airport manager.
District of Columbia		
WASHINGTON.....	.....	*U. S. Coast and Geodetic Survey, Commerce Bldg.
Florida		
MIAMI.....	Municipal airport.....	Karl Voelter, Inc.
Georgia		
ATLANTA.....	Municipal airport.....	Aviation Supply Corp., post office box 57, Hapeville, Ga.
AUGUSTA.....	Daniel Field.....	Southern Airways, Inc.
Illinois		
CHICAGO.....	Municipal airport.....	*Air Associates, Inc., 5300 West 63d St.
SPRINGFIELD.....	do.....	Springfield Aviation Co., Inc.
Indiana		
INDIANAPOLIS.....	Municipal airport.....	Central Aeronautical Corporation.
SOUTH BEND.....	Bendix Field.....	Indiana Air Service, Inc.
Iowa		
DES MOINES.....	Municipal airport.....	Iowa Airplane Co., post office box 59, Des Moines.
Kentucky		
LOUISVILLE.....	Bowman Field.....	Louisville Flying Service, Inc.
Louisiana		
NEW ORLEANS.....	New Orleans airport.....	Weems System of Navigation.
.....	.....	*U. S. Coast and Geodetic Survey, 314 customhouse.
Maine		
WATERVILLE.....	Municipal airport.....	Airways, Inc.
Maryland		
ANNAPOLIS.....	.....	Weems System of Navigation.
BALTIMORE.....	Logan Field.....	Airport manager, municipal airport.
Massachusetts		
BOSTON.....	Municipal airport.....	Inter City Airlines, Inc., East Boston, Mass.
.....	.....	*U. S. Coast and Geodetic Survey, 10th floor, customhouse.
Michigan		
DETROIT.....	Detroit City Airport.....	General Aircraft Supply Corporation.
.....	Wayne County Airport.....	Board of Wayne County road commissioners, 3800 Barlum Tower.

Minnesota		
MINNEAPOLIS.....	Wold Chamberlain field.....	Director, municipal airport.
Mississippi		
JACKSON.....	Municipal airport.....	Airport manager.
Missouri		
KANSAS CITY.....	Municipal airport.....	*Bredouw Aeromotive Corporation, hangar 5.
ST. LOUIS.....	Lambert Airport.....	*Supply Division, Inc., Robertson, Mo.
Nebraska		
OMAHA.....	Municipal Airport.....	Krantz Airways, Inc.
New Jersey		
CAMDEN.....	Central Airport.....	The Waltz Corporation.
NEWARK.....	Newark Airport.....	Newark Air Service, Inc.
New Mexico		
ALBUQUERQUE.....	TWA Airport.....	Cutter Flying Service.
New York		
BROOKLYN.....	Floyd Bennett Field.....	Aeronautical Trading Co.
BUFFALO.....	Municipal airport.....	*Buffalo Aeronautical Corporation.
GARDEN CITY.....	Roosevelt Field.....	*Air Associates, Inc., building No. 19.
HICKSVILLE, LONG ISLAND.....	Aviation Country Club of Long Island, Inc., Airport.	Country Club Flying Service, Inc.
NEW YORK.....		*C. S. Hammond and Company, Inc., 30 Church St.
		*International Map Co., Inc., 90 West St.
		*U. S. Coast and Geodetic Survey, 620 Federal Office Bldg.
ROCHESTER.....	Municipal airport.....	*Airport manager, 34 Court St.
SCHENECTADY.....	Schenectady County Airport.....	Airport manager.
North Carolina		
CHARLOTTE.....	Municipal airport.....	Charlotte Flying Service, Inc.
Ohio		
CINCINNATI.....	Cincinnati Airport.....	Cincinnati Aircraft Service, hangar No. 2.
CLEVELAND.....	Municipal airport.....	Sundorph Aeronautical Corporation.
COLUMBUS.....	Port Columbus.....	John T. Corrodi, Inc., box 185, Bexley Station.
DAYTON.....	Municipal airport.....	Moore Flying Service, post-office box 753.
Oregon		
PORTLAND.....	Portland Airport.....	S. & M. Flying Service.
Pennsylvania		
ERIE.....	Port Erie Airport.....	Manager, Port Erie Corporation.
LOCK HAVEN.....	Cub Haven Airport.....	Piper Aircraft Corporation.
PHILADELPHIA.....		J. L. Smith Company, 1603 Sansom St.
PITTSBURGH.....	Pittsburgh-Bettis.....	Pittsburgh Institute of Aeronautics, R. F. D., Homestead, Pa.
SCRANTON.....	Scranton Airport.....	Scranton Airways, Inc., R. F. D. No. 1, Clarks Summit, Pa.
YORK.....		*Karl Ort, 608 West Poplar St.
Rhode Island		
PROVIDENCE.....	State airport.....	E. W. Wiggins Airways, Inc., Hillsgrove, R. I.
South Carolina		
CHARLESTON.....	Municipal airport.....	Hawthorne Flying Service.
COLUMBIA.....	do.....	Hawthorne Flying Service, Inc.
Tennessee		
MEMPHIS.....	Municipal airport.....	Southern Air Services, Inc.
NASHVILLE.....	do.....	Tennessee Aero. Corporation.
Texas		
AMARILLO.....	English Field.....	Amarillo Airport Corporation.
DALLAS.....	Love Field.....	*Air Associates, Inc.
FORT WORTH.....	Meacham Field.....	Airport News Stand.
HOUSTON.....	Municipal airport.....	Air Activities, Inc.
SAN ANTONIO.....	Stinson Field.....	Hangar Six, Inc.
Utah		
SALT LAKE CITY.....	Municipal airport.....	Thompson Flying Service, Inc.
Washington		
SEATTLE.....		*U. S. Coast and Geodetic Survey, 601 Federal Office Bldg.
SEATTLE.....	Boeing Field.....	Washington Aircraft Transport Corporation.
Wisconsin		
MILWAUKEE.....	Milwaukee County Airport.....	Midwest Airways, Inc., box 147, Cudahy, Wis.

* Dealers marked with an asterisk have advised that they carry a complete stock of aeronautical charts.

Aeronautical Charts of the Coast and Geodetic Survey

Listed herewith by types are the latest editions of the aeronautical charts issued by the United States Coast and Geodetic Survey. The date of issue is shown in each case.

Sectional

These are scaled at 1:500,000 (8 miles to the inch), and are about 20 by 42 inches in size. They are priced at 40 cents each. The area covered by each sectional chart is indicated on the map at the bottom of this page. The complete series of 87 charts covers the entire United States and all have been published. Notice of the issuance of revised editions of these charts will be carried in the airways and airports department of this JOURNAL.

Aberdeen.—August 1936.
Albany.—December 1938.
Albuquerque.—June 1939.
Aroostook.—November 1935.
Austin.—January 1939.
Beaumont.—May 1939.
Bellingham.—October 1938.
Birmingham.—April 1939.
Boise.—January 1939.
Boston.—November 1939.
Burlington.—June 1939.
Butte.—May 1939.
Casper.—February 1937.
Charlotte.—January 1939.
Chattanooga.—August 1939.
Cheyenne.—March 1939.
Chicago.—February 1939.
Cincinnati.—December 1939.
Cleveland.—December 1938.

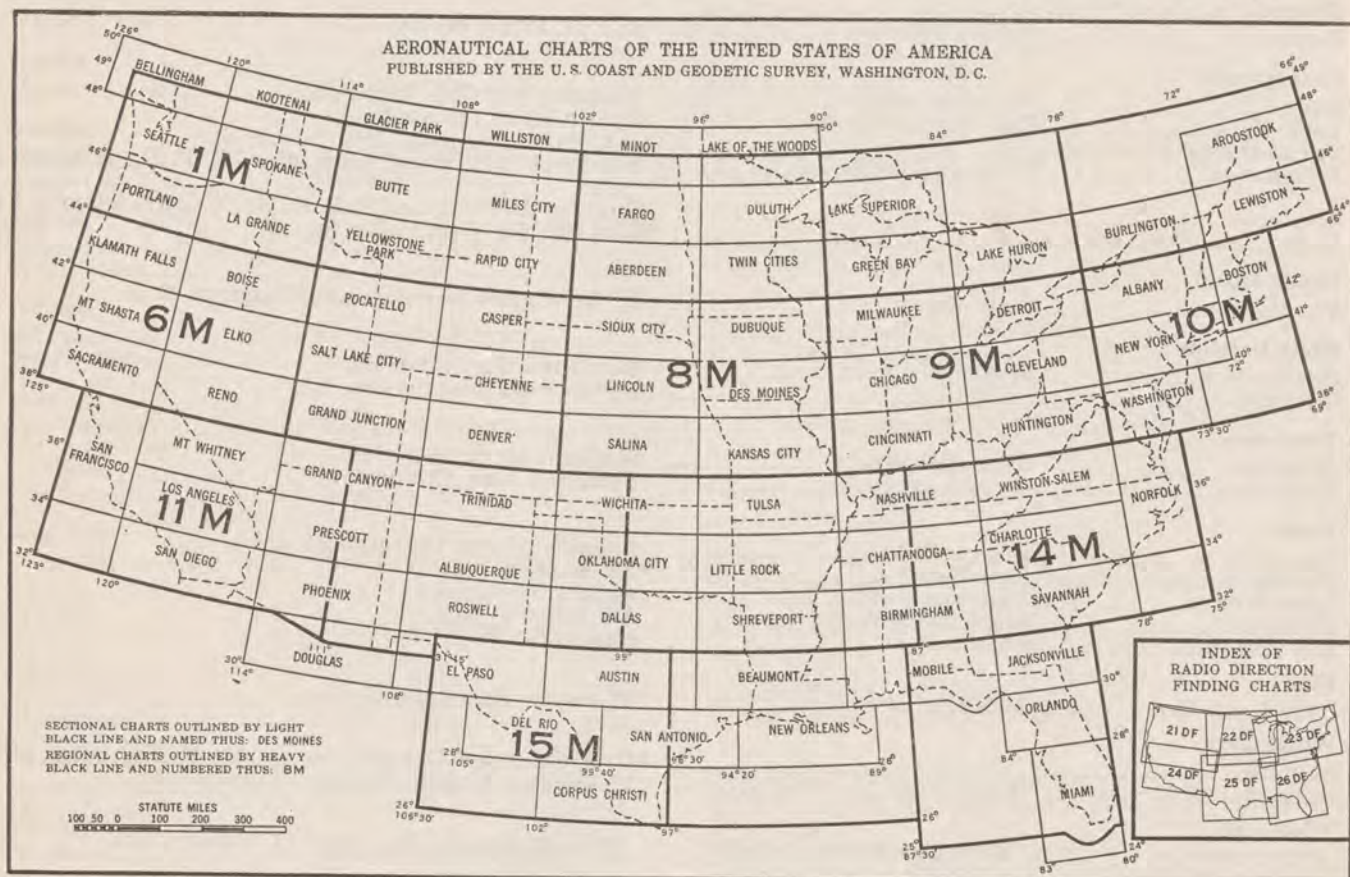
Corpus Christi.—February 1939.
Dallas.—February 1939.
Del Rio.—November 1937.
Denver.—February 1939.
Des Moines.—April 1939.
Detroit.—April 1939.
Douglas.—January 1939.
Dubuque.—April 1939.
Duluth.—September 1936.
El Paso.—July 1939.
Elko.—March 1939.
Fargo.—August 1938.
Glacier Park.—September 1938.
Grand Canyon.—December 1938.
Grand Junction.—November 1938.
Green Bay.—February 1939.
Huntington.—December 1938.
Jacksonville.—August 1939.
Kansas City.—May 1939.
Klamath Falls.—January 1939.
Kootenai.—June 1939.
La Grande.—April 1937.
Lake Huron.—June 1939.
Lake of Woods.—February 1939.
Lake Superior.—April 1939.
Lewiston.—June 1938.
Lincoln.—April 1939.
Little Rock.—February 1939.
Los Angeles.—November 1939.
Miami.—May 1939.
Miles City.—March 1936.
Milwaukee.—February 1939.
Minot.—July 1939.
Mobile.—February 1939.
Mount Shasta.—December 1938.
Mount Whitney.—November 1939.
Nashville.—June 1939.
New Orleans.—May 1939.
New York.—June 1939.

Norfolk.—September 1938.
Oklahoma City.—June 1939.
Orlando.—April 1939.
Phoenix.—May 1939.
Pocatello.—April 1939.
Portland.—January 1939.
Prescott.—May 1939.
Rapid City.—April 1939.
Reno.—April 1939.
Roswell.—August 1938.
Sacramento.—February 1939.
Salina.—October 1938.
Salt Lake City.—May 1939.
San Antonio.—June 1939.
San Diego.—February 1939.
San Francisco.—February 1939.
Savannah.—April 1939.
Seattle.—March 1939.
Shreveport.—November 1938.
Sioux City.—February 1939.
Spokane.—June 1939.
Trinidad.—January 1939.
Tulsa.—March 1939.
Twin Cities.—March 1939.
Washington, D. C.—January 1939.
Wichita.—April 1939.
Williston.—March 1939.
Winston-Salem.—December 1938.
Yellowstone Park.—April 1939.

Regional

These are scaled at 1:1,000,000 (16 miles to the inch), and are about 33 by 50 inches in size. They are priced at 75 cents each. The area covered by each regional chart is shown on the map at the bottom of this page. Of the

(Continued on next page)



Aeronautical Charts

(Continued from preceding page)

17 regional charts designed to cover the entire United States, only 8 have been issued to date.

- 1-M.—August 1939.
- 6-M.—August 1939.
- 8-M.—July 1939.
- 9-M.—July 1939.
- 10-M.—July 1939.
- 11-M.—November 1939.
- 14-M.—May 1939.
- 15-M.—October 1939.

Alaska

Kenai.—February 1939.

This chart is scaled at 1:1,000,000. Priced at 40 cents, it includes Kodiak, Seward, Anchorage, Valdez, and Cordova.

Radio Direction Finding

These charts, which are scaled at 1:2,000,000 (32 miles to the inch), have been especially designed for radio direction finding. They are priced at 75 cents each. Six charts with generous overlaps are required to cover the United States. The inset in the lower right-hand corner of the map at the bottom of page 46 shows the area covered by each of these DF charts.

21-DF.—May 1939. Includes the area between San Francisco, Denver, and the Canadian boundary.

22-DF.—November 1938. Includes the area between Denver, Chicago, St. Louis, and the Canadian boundary.

23-DF.—August 1939. Includes the area between St. Louis, Washington, and the Canadian boundary.

24-DF.—December 1939. Includes the area between the cities of San Francisco, Denver, San Diego, and El Paso.

25-DF.—May 1939. Includes the area between the cities of El Paso, Denver, St. Louis, and New Orleans.

26-DF.—June 1939. Includes the area between the cities of New Orleans, St. Louis, Washington, and Key West.

Auxiliary Charts

The Coast and Geodetic Survey also has three auxiliary charts available. These are:

3060a.—Aeronautical planning chart of the United States, showing principal cities, airports, and radio broadcasting stations. On Lambert conformal conic projection. Scale, 1:5,000,000. Price 40 cents.

3074.—Great circle chart of the United States. On gnomonic projection. Shows selected airports along air routes. Price 40 cents.

3077.—Magnetic chart of the United States showing the lines of equal magnetic declination compass variation and of equal annual change for the year 1935. This chart is issued at intervals of 5 years, the lines of annual change providing means of estimating declination for intervening years. Price, 20 cents.

Copies of aeronautical charts may be obtained from the Director, United States Coast and Geodetic Survey,

Washington, D. C., or from the "recognized dealers," a list of whom is carried on page 44 of this JOURNAL.

The Coast and Geodetic Survey allows a discount on orders amounting to a gross value of \$10 or more when sent in one shipment to one address. The discount on such orders (which may be assorted) will be 33½ percent.

Airport Projects Approved

In accordance with the provisions of section 303 of the Civil Aeronautics Act, the Administrator of the Authority has issued certificates of air navigation facility necessity authorizing the expenditure of Federal funds in the operation of the following projects:

Alpine, Tex.—\$1,350 for N. Y. A. project for removal of 4,400 linear feet of 4-strand barbed wire fence, cleaning out of small shrubs and the general leveling of entire field, and the erection of 7,000 linear feet of 4-strand barbed wire fence, posts set 15 feet on center, at the municipal airport.

Auburn, Maine.—\$110,221 (actually covering only \$15,659 of this amount, the remainder having been expended prior to effective date of Civil Aeronautics Act) for W. P. A. project for construction of a hangar, storm sewer, and open ditch; grading and placing asphalt surface on runways; grading triangle between runways and safety bands; and graveling entire area at Auburn-Lewiston Airport.

Boston, Mass.—\$28,692 for W. P. A. project for modernizing and improving present administration building, constructing waiting room and larger passenger facilities, constructing rooms and corridor for office space, grading, draining, and performing incidental and appurtenant work at East Boston Airport.

Bridgeport, Conn.—\$242,788 for W. P. A. project for construction of a class 3 airport, the work to consist of grading, drainage, hard-surfacing runways, lighting, fencing, and incidental and appurtenant work.

Detroit, Mich.—\$45,180 for W. P. A. project for construction of new runway and drainage facilities and performance of necessary and appurtenant work at Detroit City Airport.

Memphis, Tenn.—\$181,740 for W. P. A. project for grading, clearing, and grubbing, extension of runways, sodding, rearrangement of boundary lights and fence, construction of refuse incinerator, concrete curb and gutter, installation of drainage pipe, surfacing with gravel and asphalt, and performing incidental and appurtenant work at the municipal airport.

Meridian, Miss.—\$115,897 for W. P. A. project for construction of adequate housing facilities, septic tank, aprons, driveways, and walks; grading, sodding, landscaping grounds for observation squadrons of the Mississippi National Guard; and performing incidental and appurtenant work at the municipal airport, Key Field.

Montgomery, Ala.—\$942 for W. P. A. project for construction of paved apron and performance of work incidental and appurtenant thereto. Project in-

cludes operation of borrow pits to produce material for use on this project at the municipal airport.

Nashville, Tenn.—\$113,429 for W. P. A. project for construction of two airplane hangars (concrete, brick, and steel); construction of concrete apron common to both hangars, construction of two taxi strips of asphaltic surfacing on waterbound macadam base, leading from concrete apron to the E.-W. and NW.-SE. runways, construction of water-supply line, construction of septic basin and disposal, and quarrying and crushing stone at the municipal airport.

New York, N. Y.—\$2,440,250 for W. P. A. project for extending filled area, taxiways, and aprons, increasing length of runways, providing radio markers; installing lighting and drainage facilities, seeding, constructing roadways, parking area, and additions to hangars, and performing incidental and appurtenant work at North Beach Airport.

Omaha, Nebr.—\$13,184 for W. P. A. project for grading outfield, installing drainage pipe, constructing manholes and fences, reoiling taxi area, preparing and seeding field, and performing appurtenant and incidental work at the municipal airport.

Russellville, Ark.—\$1,400 for N. Y. A. project for construction of a hangar.

All of the certificates are issued subject to withdrawal for certain specified causes, including failure to operate the projects in accordance with approved plans, specifications, and other supporting material.

Airworthiness Report

(Continued from page 43)

tions by establishing mechanically the quality of the basic material and an intelligent judging of the weakening effects of surface defects;

2. The use of varying thickness and short-length material through laminating and splicing; and

3. The use of substitute material.

The first two methods are covered in detail and some notes on the third method are included. A further investigation of the use of substitute materials is being conducted and this information will be made available upon completion of data compilation now under way.

Although the material contained in the report was carefully worked up, the Authority was cognizant of the fact that some of the points brought out may be at variance with particular experience of some aircraft manufacturers or that important phases may have been overlooked and, therefore, included a questionnaire form for comments when the report was transmitted to aircraft manufacturers.

The study upon which the report is based was supplemented by special discussions between members of the Authority's aircraft airworthiness section and its inspection personnel at the plants of several manufacturers.

Copies of Aircraft Airworthiness Section Report No. 15 may be obtained from the Correspondence Unit, Civil Aeronautics Authority, Washington, D. C.

CIVIL AERONAUTICS AUTHORITY

OFFICIAL



ACTIONS

OPINIONS, ORDERS AND REGULATIONS

FOR THE PERIOD JANUARY 1-15, 1940

CORRECTION

The Official Actions section of the previous issue of the JOURNAL (vol. 1, No. 2, dated January 15, 1940), was labelled "For the period January 1-15, 1940." This was in error and should have been "For the period December 16-31, 1939." This issue of the JOURNAL carries the Official Actions of the Authority for the period January 1-15, 1940.

ABSTRACTS

Order No. 318: Violations referred to the Attorney General for judicial action.

The Authority on January 2 referred the following case to the Attorney General for judicial action for certain violations of the Civil Aeronautics Act of 1938 and the Civil Air Regulations:

T. N. Church, Fayetteville, N. C.—For piloting an aircraft on a civil airway while not possessed of a valid pilot certificate and for failure to report an aircraft accident.

Order No. 319: Chicago & Southern Air Lines Memphis-Kansas City application consolidated with other proceedings.

The Authority on January 4 consolidated the application of Chicago & Southern Air Lines, Inc., for a certificate of convenience and necessity authorizing air transportation between Memphis, Tenn., and Kansas City, Mo., via Springfield, Mo., into one proceeding with the applications of Braniff Airways, Inc., and Eastern Air Lines, Inc., covering the same route.

Order No. 320: Interlocking directorship of Harry A. Carson approved.

The Authority on January 5 revised a previous order (serial No. 315) approving interlocking relationships of certain Boston-Maine Airways' officials by the addition of Harry A. Carson.

C. A. A. OPINIONS

C. A. A. Opinions—Vol. I—Temporary Page No. XXIV

DOCKET No. 45-401-E-1

CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY, CANADIAN COLONIAL AIRWAYS, INC.

In the matter of the application of Canadian Colonial Airways, Inc., for a certificate of public convenience and necessity to be issued under section 401 (e) (1) of the Civil Aeronautics Act of 1938.

Decided January 9, 1940

Applicant found entitled, under section 401 (e) (1) of the Civil Aeronautics Act of 1938, to a certificate of public convenience and necessity authorizing it to engage in air transportation with respect to persons, property, and mail between the terminal point New York, N. Y., the intermediate point Albany, N. Y., and the terminal point Montreal, Canada.

APPEARANCES:

Hamilton O. Hale, Alexander C. Dick, and Robert G. Thach for the applicant.

Edward C. Sweeney and William J. Madden for the Civil Aeronautics Authority.

OPINION

BY THE AUTHORITY:

Canadian Colonial Airways, Inc., by application filed October 20, 1938, and amendment thereto filed January 7, 1939, seeks a certificate of public convenience and necessity under section 401 (e) (1) of the Civil Aeronautics Act of 1938 authorizing it to engage

* * * as an air carrier of persons, property, and mail from New York (Port Newark, Newark, N. J.) via Albany, N. Y., in the United States to Montreal, in the Dominion of Canada, and to engage as an air carrier of persons, property, mail and Canadian mail (as may be authorized by the Canadian Government) from Montreal, Canada via Albany to New York, N. Y. (Port

Newark, Newark, N. J.), and between any combination of two or more of said points, on schedule flights, * * *

By amendment, filed January 7, 1939, applicant requested that Burlington, Vt., be designated as an intermediate point in the certificate for which application was made, but since that request was withdrawn at the hearing, it is no longer necessary to consider the same.

The application herein is governed by the so-called "grandfather" clause, section 401 (e) (1) of the Civil Aeronautics Act of 1938, which requires that a certificate of public convenience and necessity shall be issued to an applicant upon proof only that during the so-called "grandfather" period¹ it was an air carrier continuously operating as

¹ From May 14, 1938, to August 22, 1938, the effective date of sec. 401.

C. A. A. Opinions—Vol. I— Temporary
Page No. XXV

such (except as to interruptions of service over which it had no control), unless the service it rendered for such period was inadequate and inefficient.

The application was filed within the statutory period and due notice thereof was given to the public and those air carriers designated by the Authority to receive such notice. A public hearing upon the application was held before an examiner of the Authority whose report was duly filed and served. Exceptions and a brief in support thereof were filed by counsel for the Authority, and an opposing brief was filed by counsel for the applicant.

Proof that the applicant was an air carrier involves, under the act, proof that during the "grandfather" period it was a citizen of the United States within the meaning of section 1 (13) of the act. Applicant introduced evidence that it was duly incorporated under the laws of Delaware and that all of its board of directors and other managing officers during the period May 14, 1938, to August 22, 1938, were citizens of the United States with the exception of Mr. H. O. Young, a Canadian citizen, who was a vice president and director. During the period in question, there were from four to five directors and four officers. With regard to the ownership and control of the voting interest in the applicant corporation, its president testified that during the "grandfather" period there were 139,887.5 shares of its common stock outstanding, entitled to one vote each. This stock was held by between 14,000 and 15,000 stockholders. Applicant introduced in evidence an affidavit of its stock transfer agent to the effect that said agent had found from an examination of the stockholders' records of applicant during the "grandfather" period, that more than 75 per centum of the voting interest of applicant was in the names of persons whose addresses were at points within the United States or its possessions, and that to the best of his information and belief less than 1 per centum of the voting interest of applicant was, during said period, in the names of persons whose addresses were at points outside the United States or its possessions. The Authority accordingly finds that during the "grandfather" period the applicant was a citizen of the United States within the meaning of section 1 (13) of the act.

On the issue of its status as an air carrier and of its continuous operation as such during the period from May 14 to August 22, 1938, appli-

Note on the Arrangement of These Pages

This part of the CIVIL AERONAUTICS JOURNAL will be devoted in each issue to presenting a record of the official actions taken by the Civil Aeronautics Authority. Digests of all orders and regulations will be carried in outer columns under the title "Abstracts." Persons having specific interest in any of these orders may obtain complete verbatim copies by writing to the Director of Statistics and Information, Civil Aeronautics Authority, Washington, D. C.

In the inner columns will be carried verbatim copies of all opinions accompanying Authority actions. They are set in exactly the same type and format as will be used in bound volumes of such opinions to be issued in the future. The first part of Volume I of C. A. A. Opinions, which will include all opinions of the Authority from its organization to the date upon which it is ready for the presses, is now being prepared. After that date opinions as printed in the JOURNAL will be organized into divisions equivalent to pages in the ultimate bound volume and will carry at the head of each such division the actual page number it will bear in that volume. Thus reference to opinions by volume and page can be made within a few weeks after the opinion has been issued.

Until enough progress has been made on the first part of Volume I, finally to determine the volume page numbers of current opinions, opinions will be organized in the JOURNAL by pages but will carry mere temporary numbers in Roman numerals.

ABSTRACTS

(Continued)

Order No. 321: Additional time granted for return flight of Canadian aircraft.

The Authority on January 5, granted an extension of time for return flight to Canada of a Canadian registered aircraft of the Grumman Aircraft Engineering Corporation and authorized a flight to Miami, Fla., and return. (Previous order serial No. 308.)

Order No. 322: Canadian Colonial Airways granted certificate of public convenience and necessity.

(For full text of opinion and order see Docket No. 45-401-(E)-1, p. 48.)

Order No. 323: Walter J. Fitch, Jr., prohibited from carrying passengers for 60 days.

The Authority on January 9, suspended for a period of 60 days, limited commercial pilot certificate No. 22398,

ABSTRACTS

(Continued)

held by Walter J. Fitch, Jr., Coshocton, Ohio, insofar as said certificate authorizes the navigation of aircraft with passengers aboard, for giving flight instruction for hire without holding a valid instructor rating.

Order No. 324: Private pilot certificate of Walter E. Dicke revoked.

The Authority on January 12, revoked private pilot certificate No. 49591, issued to Walter E. Dicke, Carthage, Mo., for piloting an aircraft, carrying three passengers, acrobatically over the Carthage, Mo., Airport at a height less than 100 feet above the ground, and other violations of the Civil Air Regulations.

Order No. 325: Temporary student pilot certificate of Robert J. Hanley revoked.

The Authority on January 12, revoked the temporary student pilot certificate, held by Robert J. Hanley, West Los Angeles, Calif., for piloting an aircraft on a civil airway outside an area within a 25-mile radius of the point of take-off, and other violations of the Civil Air Regulations.

Order No. 326: Solo pilot certificate of Charles P. Loring suspended for 60 days.

The Authority on January 12, suspended for a period of 60 days from November 25, 1939, solo pilot certificate No. 50183, held by Charles P. Loring, Auburn, Maine, for piloting an aircraft carrying a person other than a certificated instructor actually giving instruction, and other violations of the Civil Air Regulations.

Order No. 327: Offers accepted in compromise of civil penalties for violations.

The Authority on January 12, accepted certain offers in compromise of civil penalties incurred for violations of the Civil Aeronautics Act of 1938 and the Civil Air Regulations as follows:

Norbert C. Barwasser, Moline, Ill.—For piloting an aircraft on a civil airway without being possessed of a pilot certificate and other violations—\$50;

Kneale R. Chamberlain, St. Joseph, Mo.—For piloting an aircraft on a civil airway without being possessed of a valid pilot certificate—\$25;

Ennis E. Edwards, Cincinnati, Ohio.—For piloting an aircraft on a civil airway without being possessed of a valid pilot certificate—\$100;

Charles O. Gilbert, Boise, Idaho.—For piloting an aircraft on a civil airway carrying persons other than certificated instructors actually giving instruction—\$100; and

Charles E. Jacobsson, Jr. Bethel, Alaska.—For piloting a certificated aircraft without being possessed of a pilot certificate, and other violations—\$100.

cant introduced evidence to show that throughout that period it operated one round trip daily except Sunday from New York to Montreal via Albany and return. On July 1, 1938, an additional round-trip schedule, nonstop, between New York and Montreal was inaugurated. The aircraft and crews with which all of applicant's schedules during the so-called grandfather period were flown were furnished to applicant by American Airlines, Inc., under lease-pur-

C. A. A. Opinions—Vol. I—^{Temporary}Page No. XXVI

chase agreements, each of which contained a provision under which applicant might, and eventually did, acquire title to the aircraft. Maintenance and overhaul of the aircraft, as well as the services of dispatchers and of a flight superintendent, were also provided by American Airlines, Inc. Necessary turn-around work and emergency repairs were done by the employees of applicant's wholly owned subsidiary in Montreal under supervision, however, of American Airlines' maintenance supervisor in Newark.

The fact that applicant conducted its operations with equipment furnished it under lease-purchase agreements with another air carrier under the circumstances stated, does not affect its status as an air carrier, nor the continuity of its operation as such within the meaning of section 401 (e) (1) of the act.

The operation which is the subject matter of this proceeding was conducted by applicant under an arrangement with Canadian Colonial Airways, Ltd. (hereinafter called the limited company), applicant's wholly owned subsidiary. Under this arrangement the "responsibility, accountability, and liability for the operation of the air line" north-bound on all flights was to be borne by the applicant and all revenues received on account of such flights were to be for account of applicant. On the south-bound flights which stopped at Albany, expenses and revenues of the flight from Montreal to Albany were to be entirely for the account of the limited company and from Albany to New York were to be divided equally between both companies. On nonstop south-bound flights all expenses and revenues were to be for the account of the limited company. We regard the intercompany financial arrangement between applicant and its wholly owned subsidiary as affecting neither applicant's status as an air carrier nor the continuity of its operation during the period May 14 to August 22, 1938. The intercompany arrangement between applicant and its wholly owned subsidiary merely related to the financing of an undertaking which must be regarded as forming a single operation. The apportionment of revenues and expenses between the two corporations interested in the service has no bearing on any of the issues to be disposed of in this proceeding.

Accordingly, the Authority finds that applicant was an air carrier continuously operating as such (except as to interruptions of service over which the applicant had no control) during the period May 14 to August 22, 1938.

On the issue of the adequacy and efficiency of the service, applicant introduced evidence to show that during the period May 14 to August 22, 1938, it flew 98.5 percent of its scheduled mileage, that its passenger load factor was approximately 50 percent, and that it carried such mail as was delivered to it by the Post Office Department during

that period. The operation was conducted with Douglas Model DC2 aircraft, carrying a crew of two, a captain and first officer. The operation was conducted without damage to aircraft or injury to passengers. The Authority accordingly finds that service rendered by applicant for the period May 14 to August 22, 1938, was not inadequate and inefficient.

Since the operation conducted by applicant was pursuant to a contract for the carriage of mail over the route on which it operated, which is known as FAM route 1, the terminal and intermediate points to be included in the certificate to be issued herein are controlled by the provisions of clause B, section 401 (e) (1) of the act. Said clause provides that the certificate shall authorize the applicant to engage in air transportation "between the terminal and intermediate points between which the applicant or its predecessor was authorized by the Postmaster General prior to the effective date of this section, to engage in the transportation of mail." Applicant was authorized by its mail contract:

1. To carry all mails offered, * * * from Landing Point (n. o.) at New York, N. Y. (or such other point in the United States as may be designated by the Post Office Department) by Albany, N. Y., to Montreal, Canada (or such other point in that country as may be acceptable to its Government and designated by the Post Office Department), one way, * * *.

The language of the statute does not require that the limitation on the direction in which service was to be rendered under the mail contract be carried forward into the certificate herein to be issued. Since that language provides that the certificate shall authorize service *between* certain points, a limitation on the direction of flights would appear to be justified only for special reasons not here shown to exist.

The fact that applicant's operations during the period May 14 to August 22, 1938, were actually conducted from Newark, and not New York, is also without significance. The terminal point named in the mail contract is controlling as to the terminal point to be named in the certificate.

The applicant is therefore entitled to a certificate of public convenience and necessity authorizing it to engage in scheduled air transportation carrying passengers, property, and mail between the terminal point New York, N. Y., the intermediate point Albany, N. Y., and the terminal point Montreal, Canada, without limitation upon the direction of flights.

An appropriate order will be entered.

Hinckley, Branch, Warner, Members of the Authority, concurred in the above opinion. Ryan, Mason, Members, did not take part in the decision.

ORDER

Canadian Colonial Airways, Inc., having filed application for a certificate of public convenience and necessity under section 401 (e) (1) of the Civil Aeronautics Act of 1938; a full public hearing thereon having been held, and the Authority, upon consideration of the record of such proceedings, having issued its opinion containing its findings of fact, conclusions, and decision, which is attached hereto

ABSTRACTS

(Continued)

Order No. 328: Interlocking relationships approved.

The Authority on January 12, approved interlocking relationships in the matter of Mark T. McKee and Pan American Airways, Inc., and subsidiaries.

Order No. 329: Interlocking relationships approved.

The Authority on January 12, approved interlocking relationships in the matter of John Sylvester Woodbridge, James Clawson Roop, and Pan American Airways, Inc., subsidiaries.

Order No. 330: Application dismissed.

The Authority on January 12, dismissed application of John Sylvester Woodbridge, Pan American Airways, Inc., and subsidiaries for approval of an interlocking relationship, in view of action taken in Order 329, approving relationship.

Order No. 331: Interlocking relationships approved.

The Authority on January 12, approved interlocking relationships of Harold J. Roig, Robert H. Patchin, William F. Cogswell, and Pan American-Grace Airways, Inc.

Order No. 332: Flight over United States territory by Canadian aircraft approved.

The Authority on January 12, approved application of Trans-Canada Air Lines for permission to fly Lockheed aircraft, bearing Canadian registration identification marks, over United States territory en route from Toronto, Canada, to New York, N. Y., and return, subject to certain terms and conditions.

Order No. 333: Temporary approval given existing interlocking relationships.

The Authority on January 15, authorized the temporary holding of existing interlocking relationships in the following instances:

Ernest Eden Norris,
George D. Brooke,
L. Warrington Baldwin, and
Railway Express Agency, Inc.

The order stated final action could not be taken until the Authority had decided upon the pending application of Railway Express Agency, Inc., for a certificate of public convenience and necessity.

ABSTRACTS

(Continued)

REGULATIONS

Regulation No. 53: CAR amended to correct names of New York municipal airports.

The Authority on January 12, adopted amendment No. 32 of the Civil Air Regulations changing the names of the control airports designated as "Floyd Bennett Field" and "New York Municipal Airport" to "New York Municipal Airport, Floyd Bennett Field" and "New York Municipal Airport, LaGuardia Field."

Regulation No. 54: Pan American authorized to issue free transportation to United States meteorologists.

The Authority on January 12, authorized Pan American Airways Co. (of Delaware) to issue free transportation, subject to space available, to two assistant meteorologists of the United States Weather Bureau to the island of Bermuda and to Horta, the Azores, and Lisbon, Portugal, and return, for the purpose of conferring with meteorologists of the respective foreign governments and of Pan American Airways Co. (of Delaware) stationed at those points.

Instrument Landing Program

(Continued from page 38)

to have been well made. Closer grouping of the three frequencies utilized, if it later appears practically possible, may ultimately prove desirable and this point is being given further attention by the Civil Aeronautics Authority. Microwave equipment, now being developed, involves much higher frequencies with certain advantages in this connection. There is some sentiment in favor of using a relatively low frequency on the localizer, but, all things considered, the group does not feel that a final satisfactory solution lies in this direction.

In regard to what is desirable in procedure for the immediate future, there is general agreement on many points. It is generally agreed that pilots should be given extended opportunities to become familiar with the use of instrument landing systems, and that these should be such that probable future improvements will not essentially alter the general nature of the demand placed on the pilot but will merely make it easier for him to operate satisfactorily.

It is generally agreed that the systems which can now be commercially installed and used are not ideal, and that their principal faults lie in limitation on the glide path, on size of antenna equipment, and on portability. It is agreed that the microwave glide-path equipment, which has recently been under intensive study and development, offers great promise for improving these

and made a part hereof; and finding that its action in this matter is necessary pursuant to said opinion:

IT IS ORDERED, That there be issued to Canadian Colonial Airways, Inc., a certificate of public convenience and necessity authorizing it, subject to the provisions of such certificate, to engage in air transportation with respect to persons, property, and mail between the terminal point New York, N. Y., the intermediate point Albany, N. Y., and the terminal point Montreal, Canada.

IT IS FURTHER ORDERED, That the exercise of the privileges granted by the certificate to be issued shall be subject to the terms, conditions, and limitations prescribed by sections 238.3, 238.4, and 238.5 of the Authority's Economic Regulations, all amendments thereto, and such other terms, conditions, and limitations as may from time to time be prescribed by the Authority.

IT IS FURTHER ORDERED, That said certificate shall be issued in the form attached hereto, and shall be signed on behalf of the Authority by the Chairman of the Authority, and shall have affixed thereto the seal of the Authority, attested by the Secretary. Said certificate shall be made effective from the 22d day of August 1938.

aspects of the system, and that it also offers promise of advantages in lesser weight of plane equipment, decrease of aerodynamic drag of antenna systems, and freedom from error due to alteration of receiver sensitivity. It is agreed, however, that the microwave system is not now ready for extensive use and that it requires further developmental work, experimental installations, and field experience.

It is agreed that installations of equipment such as can now be definitely specified and obtained from the industry under contract in a reasonable time would aid in air-transport activities, and hence be of benefit to the public, but it is also agreed that these should not be made so extensively or adopted in such a way as to impede the introduction of desirable modifications, and in particular the later prompt adoption of microwave techniques, if and when they are obtainable commercially in reliable form, and if they prove on test to be as advantageous as now appears.

Recommendations

1. It is recommended that the standardization of instrument landing equipment attempted at this time shall be regarded as above and not as complete and final; and that, in the sense defined it involve the general adoption of radio instrument landing systems composed of a localizer beam, localizer beam markers, and a glide path beam as essential elements.

2. The conference group regard it as a desirable step for the Civil Aeronautics Authority to proceed with the installation of approximately 10 systems, at selected airports, substantially as recently demonstrated and improved at Indianapolis, and with the approximately straight line portion of the glide path extended to 5 miles, or more if possible. These systems should be utilized to give pilots extensive practice in their use, and for such limited use in air transport operations as the Civil Aeronautics Authority may consider safe and reasonable. These systems should preferably be so installed that they may be readily modified by replacing the glide path equipment with later

equipment, if such becomes available, capable of furnishing a longer and straighter glide path. More than the number of systems now proposed by the Civil Aeronautics Authority should not be installed until sufficient experience has been had with this system and a review made of the then state of the art.

3. It is recommended that the development of microwave equipment be expedited by all agencies as far as practicable, both in regard to the improvement of the individual items of equipment involved, and the installation for field test and experience of the complete apparatus. In particular, it is recommended that the Government agencies involved purchase and install such equipment as soon as possible on an experimental basis, and test it completely under service conditions. If funds adequate for this purpose are not now available in any single agency, it is recommended that this experimental installation be accomplished by joint action.

4. It is recommended that further intense study be given to the nature of the indicating instruments to be used on the plane, and that no particular form of indicating instrument be considered as standard until this matter has been fully explored. In this study the opinions of experienced pilots who have had opportunity to become familiar with the use of various types of instruments should be given particular weight.

5. It is recommended that the Civil Aeronautics Authority, in proceeding with the service installations now contemplated and with its future plans, install equipment as far as practicable of such nature that it will be readily possible to construct portable equipment, when necessary, capable of producing essentially the same pattern of radio beams for instrument landing purposes.

The report was signed by V. Bush, chairman, Oliver E. Buckley, Gano Dunn, W. F. Durand, Joseph Erlanger, B. Gherardi, L. J. Henderson, J. C. Hunsaker, and Max Mason of the National Academy of Sciences' conference group on standardization of airplane instrument landing equipment.