U. S. DEPARTMENT OF COMMERCE

# CIVIL AERONAUTICS JOURNAL

ISSUED TWICE MONTHLY BY THE CIVIL AERONAUTICS AUTHORITY

Volume 1 | WASHINGTON, SEPTEMBER 1, 1940 | Number 17

## Domestic Civil Aircraft Production Up 41% in First Half

*Output of domestic civil craft totals 2,328 units during first 6 months of 1940 as compared with 1,627 aircraft in 1939 half*

Reflecting an increased demand for improved performance in aircraft, especially in the light plane classification, domestic civil aircraft production during the first half of this year showed a substantial increase over the corresponding 1939 period and was nearly treble the output during the first half of 1938.

Production for the first 6 months of 1940 totaled 2,289 domestic civil aircraft as compared with 1,627 in the 1939 period, an increase of 41 percent. Only 853 aircraft in the same category were produced in the first half of 1938.

The increased demand for light planes with improved performance was demonstrated by the gain in production of single-engine aircraft with power plants of 51 to 70 horsepower from 466 in the first half of 1939 to 1,496 in the corresponding period of this year. In the like period of 1938 only 7 such aircraft were made.

The same trend was made apparent by increases in output of single-engine aircraft of 71–100 horsepower, although not on so large a scale. The 1940 six-month production of such craft was 290,

(*See AIRCRAFT PRODUCTION, page 413*)

## Government to Train 100 Student Pilots for Aviation Weather Service

*C. A. A. and Weather Bureau Undertake Joint Project To Provide Instruction at 5 Schools This Fall*

Plans for the recruiting and training of 100 new experts in aviation weather service at Government expense during the coming school year have been announced by Robert H. Hinckley, Assistant Secretary of Commerce. The project was initiated for national defense purposes.

(*See WEATHER EXPERTS, page 413*)

## Aldrin Named Special Consultant to Administrator

Edwin E. Aldrin, aeronautical engineer, veteran Army and civilian flier, and contributor to numerous phases of technical development in aviation, has been appointed special consultant to Col. Donald H. Connolly, Administrator of Civil Aeronautics.

(*See ALDRIN, next page*)

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## Aldrin

(*Continued from preceding page*)

He will advise with Colonel Connolly and with Assistant Secretary of Commerce Robert H. Hinckley on varied aspects of planning and establishing a national air policy relating to airports, airways, pilot training, and technical development.

An aeronautical engineer since 1916 and an active flier since 1919, Colonel Aldrin was in engineering or military aviation for 11 years, and for the past decade had been a consultant and adviser to aircraft and equipment manufacturers, high-octane-fuel producers, air lines, foundations, and technical organizations.

He is a lieutenant colonel and pilot in the reserve attached to the United States Army Air Corps, and was formerly assistant executive director at Wright Field, having organized the Air Service Engineering School and later becoming assistant commandant. At one time he was Chief of the Airplane Section Material Division.

# Gust Load Factor Principles

*Aircraft Airworthiness Section Report Discusses Basic Theories To Inform Pilots*

A simplified presentation of basic gust load factor theories, designed to supply information requested frequently by pilots, has been prepared by the Aircraft Airworthiness Section.

The report (No. 7), written by Francis R. Shanley, special consultant to the Section, has proven of such value that it is being used in conjunction with Aircraft Airworthiness Report No. 10 [1] in the ground school work under the Civilian Pilot Training Program.

Comments or suggestions on the material covered in the report will be appreciated. Communications should be addressed to the Aircraft Airworthiness Section, Civil Aeronautics Authority, Washington, D. C. The text of the report follows:

### *Gust Load Factor Principles*

Although many excellent papers on gust loads are available, it is felt that a simplified presentation of the basic gust load factor theories may be worthwhile. This is particularly true in view of the fact that the theory has recently been extended, with results that have a direct bearing on the gust load factor requirements. The following explanation also covers several points that seem to be of special interest to pilots, as indicated by questions frequently presented to the Aircraft Airworthiness Section.

1. Simplified Load Factor Formula

The original gust load factor formula (reference 1) was developed from some simple assumptions and is consequently very straightforward and easy to understand. Before striking the gust, the airplane is usually assumed to be in level flight at some speed, $V$, and is therefore operating at a load factor of 1.0. This means, of course, that the wings are developing an upward air load substantially equal to the entire weight of the airplane. If the airplane now enters a "sharp-edged" current of air having an upward velocity $V$, the effect is to increase the angle of attack almost instantaneously. This increases the *lift coefficient* of the wing and results in an increase in air load, which can easily be computed if we know the wing area and the slope of the lift curve (the latter is simply a measure of the rate at which the lift increases as the angle of attack changes). The increased *load*, divided by the airplane *weight*, gives the increase in *load factor* that must be added to the original load factor of 1.0 (See formula in CAR 04.2121.)

It is easy to see that the increase in air load will be directly proportional to the wing area. On the contrary, a given increase in air load will cause a lower load *factor* on a heavy airplane than on a light one (since the load factor is equal to the load divided by the weight). We find, therefore, that the load *factor* added by a gust is *inversely proportional* to the *wing loading*. The lightly loaded airplane will therefore register higher gust accelerations than when heavily loaded. But this does not mean greater loads on the wings, as the air *load* added by the gust is the same as before. As a matter of fact, reducing the weight of the airplane actually reduces the *total* gust load, as the wings are less highly loaded before striking the gust.

[1] Aircraft Airworthiness Report No. 10, containing airplane load factor information for pilots, was carried in full in Air Commerce Bulletin No. 4, p. 91.

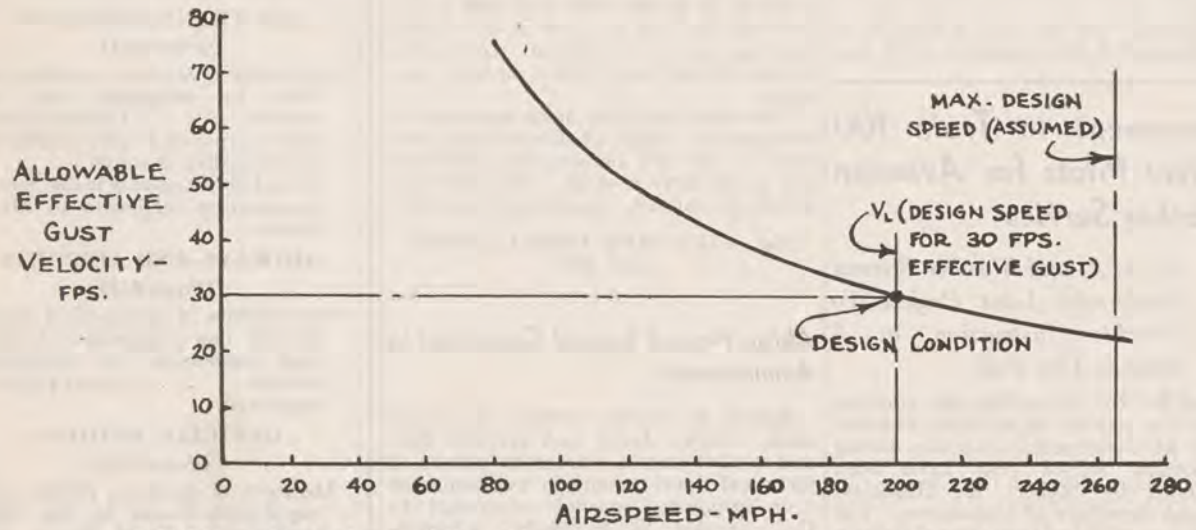


FIGURE 1.—**Variation in Allowable Effective Gust Velocity With Airplane Speed.**

2. Airspeed Effects

It might be expected that the load factor added by a gust would increase as the square of the airplane speed. This is not true, however, as a given gust velocity has less effect on the angle of attack when the airplane speed is increased. The net result is that the added load factor is *directly proportional to the airplane speed.* (This is indicated by the gust formula in CAR 04.2121.) As a result of this fact it becomes necessary to specify an airplane speed in connection with the gust load factor requirements. Conversely, once an airplane has been designed for a certain gust velocity at a given speed, it is capable of withstanding higher gusts at lower speeds, and vice versa. The pilot should make use of this fact in operating in gusty weather. Since it is impossible to know just what gust velocity is likely to be encountered in rough air, the safest procedure is to *reduce the speed of the airplane.* Figure 1 shows how this works out in actual cases. It should be noted that reducing the *weight* of the airplane will not usually permit operations at higher gust velocities, as the nacelles (or similar "fixed weight" structure) may be critical for the reduced weight condition (CAR 04.2160).

3. Gradient Effects

As previously mentioned, the simple gust load factor formula is based on the assumption that the airplane enters a "sharp-edged" gust. Such a gust might be visualized, in miniature, as an ascending column of smoke with well-defined edges. R. V. Rhode has shown (reference 2) that such "sharp-edged" gusts are probably very rare, at least when we consider gusts of sufficient extent and velocity as to be critical for an airplane. To get a better picture of what actually happens to the airplane, the theory has been worked out for gusts that have certain "gradients"; that is, the velocity of the gust increases from zero to some definite value as the airplane penetrates into it. In such cases we have to consider the fact that the airplane starts moving upward as soon as the gust acts on it. This upward motion tends to offset the upward gust velocity. By the time the airplane reaches the maximum gust velocity, it has acquired enough upward speed to cause a considerable reduction in the load predicted by the "sharp-edged" formula.

It has also been found (reference 2) that even a "sharp-edged" gust tends to act like a "gradient" gust, due to the fact that the increase in lift "lags" behind the increase in angle of attack and thereby permits the airplane to acquire some upward velocity before the full effect of the gust is felt.

In reference 2 the load factors for various types of airplanes have been worked out to find the difference between the "sharp-edged" and "gradient" formulas. The actual values depend somewhat on the size of the airplane and particularly on the wing loading. Taking a typical airplane having a wing loading of 20 p. s. f., neglecting the "lag" effect increases the actual load factor for a "sharp-edged" gust by about 40 percent. In other words, the use of a 30 f. p. s. gust velocity in the "sharp-edged" formula actually amounts to designing the airplane for a *true* sharp-edged gust of about 42 feet per second.

Now if we consider a gust with a gradient, the effect is even more noticeable. Assuming that the gust reaches its full value 100 feet beyond the point where the airplane first strikes it, the load factor is reduced to about 65 percent of the value predicted by the original formula. The true gust velocity in this case would be about 55 percent greater than that used in the unmodified gust load factor formula. (A more complete discussion of Rhode's report is given by E. P. Warner in reference 3.)

4. Gust Statistics

As explained in reference 2, our knowledge of gusts has been obtained largely from measurements of accelerations experienced in flight. The $V$–$g$ recorder (described in above reference) gives a record of the maximum acceleration obtained, against the airplane speed. Knowing the speed and the acceleration we can insert these in the gust formula and compute the "effective" gust velocity. If the unmodified "sharp-edged" gust formula is used for this purpose, the calculated gust velocity will be smaller than the actual gust that caused the load factor. This is actually the way the present values for

(*See GUST LOAD REPORT, page 417*)

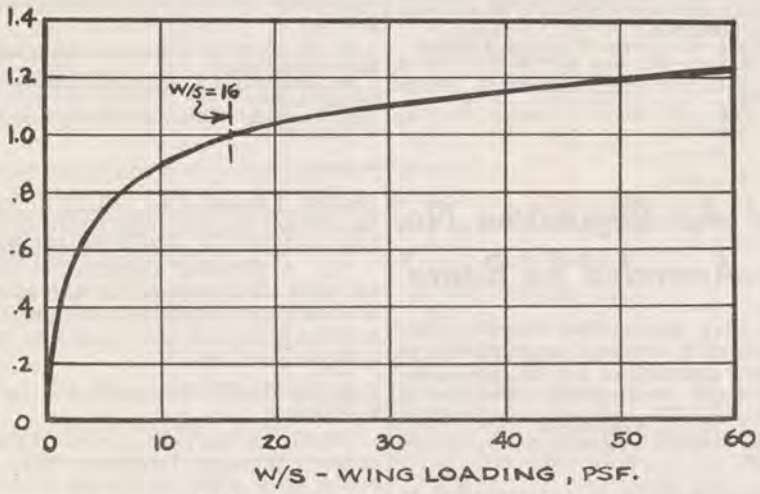


FIGURE 2.—**Modifying Factor to Account for Gradient Effect.**

### Airways Communications Instrumental in Saving Girl's Life

Departing from the prosaic routine of directing airway traffic, two Civil Aeronautics Authority communications operators recently employed their communications facilities as an instrumentality in saving the life of an injured girl. The following official report tells the story simply and completely:

"On July 20, Miss Dolores Saval, aged 19, was injured while working at her mother's ranch about 20 miles south of our (C. A. A.) Buffalo Valley, Nev., field. Miss Saval fell and the jagged ends of broken glass cut two arteries in her wrist and forearm. She was rushed by car to the Buffalo Valley field where first aid was given. This action failed to stop the steady flow of blood and it was evident that skilled medical attention was necessary to save her life. * * * The Buffalo Valley field is isolated, being located about 35 miles south of Battle Mountain in desert country.

"The Buffalo Valley station communicated with Elko by point-to-point radio in an effort to have a private plane make a special flight to take Miss Saval to Elko, but no aircraft was available. The Elko radio operator then contacted an Army B18A over Humboldt Field, en route from Hamilton Field to Elko. Through his efforts, the bomber stopped at Buffalo Valley, picked up Miss Saval, and carried her to Elko, making the flight in 39 minutes. Miss Saval was taken to the hospital where the necessary medical treatment was given. Later, her condition was reported favorable.

"Communication Operator Paul G. Ressler was responsible for initiating the action at Buffalo Valley. Communication Operator Earl P. Shobe was on duty at Elko. Through his efforts the Army bomber was contacted. Letters of commendation are being addressed to the operators concerned."

# 15,000 Pilots to End Preliminary C. P. T. P. Training in September

This month the first third of the 45,000 new-pilot goal which has been set for the Civilian Pilot Training Program during the current fiscal year will complete the preliminary controlled flight instruction course. Past performance indicates that more than 90 percent of these students will receive their private pilot's certificates.

Thus, another 15,000 new pilots will be added to the reservoir of trained civilian aircraft operators being built up under the C. P. T. P. This new class, plus the nearly 10,000 who completed their instruction last June, brings the grand total of new pilots who have been trained under the program to approximately 25,000.

On the basis of available statistics, it cannot be determined accurately to what use the new pilots will put the knowledge gained under the program. However, a "sample" poll conducted by the Civil Aeronautics Authority among the 313 students who received their private pilot's licenses after completing the first experimental phase of the flight training program gives a cross-section view of the future courses that may be followed by these youths.

Under this experimental phase, 330 youths received flight training during the second semester of the 1938–39 school year. Of the total, 313 received private pilot's certificates in June 1939. From the C. A. A. poll of the 313 new pilots, 232 returns were received.

Seventy-three of the number answering—the largest single group—stated they had already applied or would apply for service in the Army Air Corps. A close second was a group of 66 who said they planned to enter commercial aviation.

Of the answers received, 46 of the new pilots planned to make use of their pilot's certificates for personal pleasure, and another 19 said they had applied for entrance into the Navy air arm. Another group of 29 stated they either had no preference or were uncertain as to future activities. Eight of the pilots revealed they had already bought their own airplanes, and another 95 were planning to do so as soon as they became financially able.

### *Designation of Medical Examiners*

During the month of July 1940 the following physicians officially were authorized to act as medical examiners for the Civil Aeronautics Authority in the cities named:

ARIZONA.—Dr. Paul S. Causey, 517 Tenth Street, Douglas.

COLORADO.—Dr. Edward R. Phillips, Medical Building, Delta.

FLORIDA.—Dr. Arthur W. Knox, 212 North Park Avenue, Sanford.

ILLINOIS.—Dr. Lewis Ent, 308 Eighth Street, Cairo, and Dr. Leonard V. Sellett, 125 Marquette Street, La Salle.

INDIANA.—Dr. Albert H. Held, 405 Jackson Street, Huntingburg.

LOUISIANA.—Dr. Francis U. Darby, Roumain Building, Baton Rouge.

MASSACHUSETTS.—Dr. Roger E. Hubbard, 267 Main Street, Greenfield.

MINNESOTA.—Dr. Youbert T. Johnson, 5 West Lake Street, Minneapolis.

MISSOURI.—Dr. Spencer L. Freeman, Grim Building, 115 East Washington Street, Kirksville.

MONTANA.—Dr. G. Byron Wright, 704 Main Street, Kalispell, and Dr. Robert E. Walker, Lott Hospital, Livingston.

NEBRASKA.—Dr. George W. Ainlay, Fairbury.

NEW MEXICO.—Dr. Roy L. Curry, 105 West Fourth Street, Clovis, and Dr. Wendell H. Peacock, Farmington.

NEW YORK.—Dr. Roger S. Mitchell, 191 Glen Street, Glens Falls.

NORTH CAROLINA.—Dr. James G. Johnston, 617 Professional Building, Charlotte.

PENNSYLVANIA.—Dr. Stuart D. Scott, 118 South Pittsburgh Street, Connellsville, Dr. Floyd Uhler, 340 Bushkill Street, Easton, and Dr. Belford C. Blaine, 204 West Market Street, Pottsville.

SOUTH CAROLINA.—Dr. W. G. Bishop, Greenwood.

SOUTH DAKOTA.—Dr. Henrik Tillisch, Brookings Clinic, Brookings.

TEXAS.—Dr. David L. White, San Marcos.

UTAH.—Dr. J. Russell Smith, 45 North University Avenue, Provo.

VIRGINIA.—Dr. Emanuel Greenspon, 2803 Madison Avenue, Newport News.

ALASKA.—Dr. R. Edward Smith, Kotzebue.

The following named physicians have been authorized to make physical examinations of airline transport pilots:

Dr. E. Garnsey Brownell, 157 East Seventy-second Street, New York, N. Y.

Dr. Walter Krumbach, Casilla 3492, Santiago, Chile, South America.

The following named physicians no longer are conducting physical examinations:

Dr. Albert J. Herbolsheimer, 431 La Salle Building, Minneapolis, Minn.

Dr. James E. Reece, Post Office Building, Farmington, N. Mex.

Dr. James D. Wilson, 606 West Cedar Street, Rawlins, Wyo.

# Civil Air Regulation No. 65 Amended by Board

The Civil Aeronautics Board on July 30 adopted a series of amendments to Civil Air Regulation No. 65, governing the renewal and special issuance of certificates. The amendments, which became effective September 1, are as follows:

1. Section 20.34 (a) is amended to read as follows:

"(a) STUDENT PILOT.—(1) No solo flight time is required, but if the certificate presented for endorsement authorizes the holder to fly solo or solo cross country, the certificate shall not be endorsed unless the holder presents with his application for endorsement a written statement, made within 60 days preceding application, by a certificated flight instructor that the holder is competent to fly solo or solo cross country, as the case may be.

"(2) A physical examination identical with that required for the issuance of the student pilot certificate within the 14 months preceding the expiration of the endorsement period."

2. Section 20.34 (b) is amended to read as follows:

"(b) SOLO PILOT.—(1) Fifteen hours of solo flight time within the endorsement period in aircraft of each type for which endorsement is sought, and if endorsement is sought for more than one aircraft weight and engine classification, 5 hours of solo flight time shall have been logged in aircraft of each such weight and engine classification.

"(2) A physical examination identical with that required for the issuance of a solo pilot certificate within the 14 months preceding the expiration of the endorsement period."

3. Section 20.35 is amended to read as follows:

"20.35. EFFECT OF EXPIRED CERTIFICATES: SPECIAL ISSUANCE.—(a) The holder of a pilot certificate of private grade or higher, which has expired be-

*(See C. A. R. AMENDMENTS, page 418)*

## SPECIAL NOTICE

**Attention of all concerned is called to a correction in Civil Aeronautics Bulletin No. 22, Digest of the Civil Air Regulations for Student and Private Pilots (Second Edition), June 1940.**

**On page 27, figure 3, in the diagram of "Overtaking Aircraft," it is indicated that the distance between aircraft shall be 300 feet. This indication is erroneous. No aircraft, other than military aircraft of the United States engaged in military maneuvers, shall be flown closer than 500 feet to any other aircraft in flight, except that by prearrangement two or more civil aircraft may be flown in formation closer than 500 feet to each other.**

# Manufacturing and Production

## Aircraft Production

(*Continued from page 409*)

as against 96 in 1939, and 34 in 1938. Conversely, production of single-engine aircraft of 50 horsepower and under declined sharply, the output totaling only 256 units this year, as against 877 in the first half of 1939.

Classified according to weight, the aircraft production figures demonstrate the increased air mindedness of the American public, which has taken form in sharp expansion in the numbers of persons who are learning or have learned to pilot an airplane.

The statistics show for the first half of this year an output of 1,411 aircraft weighing 1,300 pounds or less and 1,339 in the 1939 period. Both 1940 and 1939 show large gains over the 566 aircraft of this class produced in the first half of 1938.

These planes of the so-called "flivver" type are used extensively in flight instruction, and are being purchased in increasing quantities by private individuals for personal pleasure.

Production of multiengine aircraft of 601–1,800 horsepower—the classification which includes most of the airline transport airplanes—also showed a comparatively sharp increase. Output during the first half of this year was 72 planes, against 42 in the first half 1939, and 26 in the like period 1938.

Aircraft production for the first half of 1940, with comparisons for the like periods of 1939 and 1938, grouped according to types, weight and engine classification, and engine horsepower, is shown in the following tables:

TABLE A.—*Domestic Civil Aircraft Production by Types*

| | January-June | | |
|---|---|---|---|
| | 1938 | 1939 | 1940 |
| Landplanes: | | | |
| 1–2 place: | | | |
| Single engine | 656 | 1,390 | 1,786 |
| Multiengine | 3 | 4 | 2 |
| 3–5 Place: | | | |
| Single engine | 149 | 160 | 396 |
| Multiengine | 1 | 5 | 3 |
| 6–20 Place: Multiengine | 18 | 10 | 11 |
| 22-place and over: Multiengine | 15 | 28 | 66 |
| Seaplanes: | | | |
| Single engine | 7 | 20 | 10 |
| Multiengine | 1 | 8 | 0 |
| Amphibians: | | | |
| Single engine | 2 | 0 | 1 |
| Multiengine | 1 | 1 | 0 |
| Unclassified | 0 | 1 | 14 |
| Total single engine | 814 | 1,571 | 2,207 |
| Total multiengine | 39 | 56 | 82 |
| **Grand total** | **853** | **1,627** | **2,289** |

***For Aircraft Radio Equipment Approvals, See Page 417.***

TABLE B.—*Domestic Civil Aircraft Production, by Weight and Engine Classification*

| | January-June | | |
|---|---|---|---|
| | 1938 | 1939 | 1940 |
| Class I—not more than 1,300 pounds | 566 | 1,339 | 1,411 |
| Class IIS—1,300–4,000—Single engine | 228 | 109 | 740 |
| Class IIM—1,300–4,000—Multiengine | 1 | 3 | 0 |
| Class IIIS—4,000–10,000—Single engine | 20 | 19 | 42 |
| Class IIIM—4,000–10,000—Multiengine | 12 | 12 | 10 |
| Class IVS—10,000–25,000—Single engine | 0 | 3 | 0 |
| Class IVM—10,000–25,000—Multiengine | 25 | 30 | 67 |
| Class V—Gross excess—25,000 | 1 | 11 | 5 |
| Unclassified | 0 | 1 | 14 |
| **Total** | **853** | **1,627** | **2,289** |

## Weather Experts

(*Continued from page 409*)

The training is the joint undertaking of two offices of the Department of Commerce—the Civil Aeronautics Authority's Civilian Pilot Training Program, which will provide funds for tuition and expense of students; and the United States Weather Bureau, which will prescribe the qualifications of those admitted to the course and provide the course of study, with emphasis on weather forecasting for defense purposes.

The instruction will be given at the five American universities or institutions which are offering accredited graduate courses in meteorology for the coming school year, with classes scheduled to begin in September. The schools which will participate are: Massachusetts Institute of Technology, California Institute of Technology, the University of California at Los Angeles, the University of Chicago, and New York University.

"The program is a further specialization, in another field identified with aviation, for graduates of the primary course in Civilian Pilot Training," Hinckley pointed out.

"One of modern aviation's greatest needs is highly trained personnel in weather forecasting, and this small group will be of especial value because it has had actual flight training," he continued.

To be admitted to this instruction course, an applicant must meet the following requirements:

1. He must have completed the Civilian Pilot Training Program primary course in 1939 or 1940.

2. He must have successfully completed a full 4-year course leading to a bachelor's degree in a college or university of recognized standing with at least 30 semester hours' credit in mathematics through calculus and physics.

3. He must agree, upon successful completion of the 1-year course, to accept employment in the Army or Navy reserves or the Weather Bureau.

4. He must be physically qualified for such service.

Applications must be on file with the Weather Bureau at Washington, D. C., not later than September 5. They should be accompanied by a transcript of the applicant's college record and a statement of his preference of schools in the order of preference.

TABLE C.—*Domestic Civil Aircraft Production, by Engine Horsepower*

| | January-June | | |
|---|---|---|---|
| | 1938 | 1939 | 1940 |
| 50 horsepower and under: | | | |
| Single engine | 566 | 877 | 256 |
| Multiengine | 1 | 2 | 1 |
| 51–70 horsepower: Single engine | 7 | 466 | 1,496 |
| 71–100 horsepower: Single engine | 34 | 96 | 290 |
| 101–165 horsepower: | | | |
| Single engine | 100 | 64 | 78 |
| Multiengine | 0 | 1 | 0 |
| 166–225 horsepower: | | | |
| Single engine | 3 | 5 | 14 |
| Multiengine | 0 | 1 | 3 |
| 226–300 horsepower: | | | |
| Single engine | 74 | 42 | 21 |
| Multiengine | 6 | 3 | 0 |
| 301–600 horsepower: | | | |
| Single engine | 22 | 18 | 37 |
| Multiengine | 6 | 8 | 6 |
| 601–1,800 horsepower: | | | |
| Single engine | 8 | 2 | 1 |
| Multiengine | 26 | 42 | 72 |
| Unclassified | | 1 | 14 |
| Total single engine | 814 | 1,570 | 2,207 |
| Total multiengine | 39 | 57 | 82 |
| **Grand Total** | **853** | **1,627** | **2,289** |

# Air Transportation

## Air Carrier Operations Statistics for 1939

Because of the wide interest in the operations of United States airlines, the CIVIL AERONAUTICS JOURNAL here presents traffic statistics of the carriers for the year 1939, broken down into companies and further separated as to individual air routes.

Table A shows major statistical breakdowns for the various routes of the 18 domestic air carriers operating at some time during 1939, with total operations results for the airlines last year. Also included in table A are statistics for all airlines operating in and out of the United States, the Territories, or the possessions. Table B includes monthly operations totals for all these carriers, both domestic and foreign.

TABLE A.—*Air Carrier Operations Statistics for the Year 1939*

| Operator | Routes operated | Months operated | Revenue miles flown | Revenue passengers carried | Revenue passenger miles flown | Express carried (pounds) | Express pound-miles flown | Mail pound-miles flown | Revenue passenger load factor (percent) |
|---|---|---|---|---|---|---|---|---|---|
| | **DOMESTIC** | | | | | | | | |
| Airline Feeder System, Inc. | Newark to Westfield | 4 | 682 | 2 | 229 | 0 | 0 | 0 | 1.26 |
| American Airlines, Inc. | Dallas to Los Angeles | 12 | 3,133,670 | 30,821 | 28,820,315 | 261,980 | 298,236,249 | 1,192,108,765 | |
| | New York-Newark to Chicago | 12 | 5,477,137 | 168,234 | 68,013,453 | 1,278,762 | 642,216,601 | 1,016,068,335 | |
| | Boston to New York-Newark | 12 | 1,813,658 | 144,137 | 28,291,467 | 374,732 | 69,727,285 | 127,905,605 | |
| | Boston to Cleveland | 12 | 603,729 | 19,887 | 2,995,965 | 66,412 | 8,740,385 | 13,632,526 | |
| | Cleveland to Nashville | 12 | 737,920 | 29,803 | 5,838,623 | 90,905 | 20,637,957 | 47,501,065 | |
| | New York-Newark to Fort Worth. | 12 | 4,449,124 | 65,010 | 39,818,805 | 364,975 | 335,790,429 | 1,161,208,466 | |
| | Washington to Chicago | 12 | 1,459,488 | 44,892 | 16,904,191 | 113,901 | 38,512,044 | 124,092,944 | |
| | Chicago to Fort Worth | 12 | 1,461,451 | 38,973 | 16,677,396 | 180,116 | 99,859,731 | 259,194,336 | |
| | Total | | 19,136,177 | 541,757 | 207,360,215 | 2,731,783 | 1,513,720,681 | 3,941,712,042 | 64.64 |
| Boston-Maine Airways, Inc. | Boston to Caribou via Bangor | 12 | 395,892 | 11,439 | 1,668,436 | 19,411 | 2,810,385 | 14,023,101 | |
| | Boston to Montreal | 12 | 327,264 | 6,938 | 1,143,361 | 11,459 | 1,361,328 | (1) | |
| | Total | | 723,156 | 18,377 | 2,811,797 | 30,870 | 4,171,713 | 14,023,101 | 38.86 |
| Braniff Airways, Inc. | Chicago to Dallas | 12 | 1,313,592 | 19,231 | 8,719,196 | 120,071 | 78,765,825 | 331,285,826 | |
| | Amarillo to Brownsville | 12 | 1,995,926 | 40,142 | 10,547,001 | 163,275 | 46,704,929 | 167,867,666 | |
| | Houston to Corpus Christi and San Antonio. | 12 | 177,407 | 2,874 | 549,506 | 2,080 | 398,948 | 0 | |
| | Total | | 3,486,925 | 62,247 | 19,815,703 | 285,426 | 125,869,702 | 499,153,492 | 58.80 |
| Chicago & Southern Airlines, Inc. | Chicago to New Orleans | 12 | 1,765,342 | 23,353 | 9,241,554 | 115,728 | 56,411,769 | 192,632,929 | 52.35 |
| Continental Air Lines, Inc. | Denver to El Paso | 12 | 791,192 | 5,834 | 1,765,579 | 14,591 | 3,814,179 | 31,686,553 | |
| | Pueblo to Wichita | 6¼ | 152,280 | 1,020 | 386,451 | 1,521 | 535,236 | 11,092,490 | |
| | Total | | 943,472 | 6,854 | 2,152,030 | 16,112 | 4,349,415 | 42,779,043 | 34.98 |
| Delta Air Corporation | Charleston to Fort Worth | 12 | 1,587,923 | 29,391 | 7,852,095 | 61,767 | 21,181,947 | 139,320,220 | 49.45 |
| Eastern Air Lines, Inc. | New York-Newark to New Orleans. | 12 | 2,920,169 | 57,780 | 27,166,183 | 385,827 | 193,873,651 | 621,633,381 | |
| | New York-Newark to Miami | 12 | 4,470,718 | 118,213 | 49,283,203 | 496,683 | 347,768,142 | 1,055,956,581 | |
| | Chicago to Miami | 12 | 1,928,291 | 41,830 | 19,137,898 | 173,902 | 83,653,200 | 306,000,827 | |
| | New Orleans to Houston | 12 | 659,570 | 10,860 | 3,588,595 | 57,682 | 19,171,812 | 68,521,616 | |
| | Atlanta to Tampa; Tallahassee to Memphis. | 12 | 559,910 | 8,185 | 2,278,709 | 11,684 | 3,463,594 | 33,304,942 | |
| | Houston to San Antonio and Brownsville. | 12 | 442,055 | 6,277 | 1,449,704 | 14,386 | 3,646,522 | 19,124,263 | |
| | Total | | 10,980,713 | 243,145 | 102,904,292 | 1,140,164 | 651,576,921 | 2,104,541,610 | 52.90 |
| Inland Air Lines, Inc. | Cheyenne to Great Falls | 12 | 648,211 | 6,040 | 1,569,549 | 15,685 | 3,901,906 | 14,945,989 | |
| | Cheyenne to Huron | 12 | 360,144 | 2,717 | 703,450 | 8,178 | 2,092,088 | 17,920,748 | |
| | Total | | 1,008,355 | 8,757 | 2,272,999 | 23,863 | 5,993,994 | 32,866,737 | 22.54 |
| Marquette Airlines, Inc. | St. Louis to Detroit | 12 | 264,776 | 2,194 | 537,138 | 0 | 0 | 0 | 26.87 |
| Mid-Continent Airlines, Inc. | Minneapolis - Sioux City - Bismarck-Kansas City-Tulsa. | 12 | 1,173,810 | 16,634 | 4,194,216 | 55,960 | 12,284,791 | 67,131,589 | 38.29 |
| National Airlines, Inc. | Daytona Beach to Miami | 12 | 349,922 | 6,008 | 889,938 | 14,125 | 1,722,156 | 17,089,583 | |
| | Jacksonville to New Orleans | 12 | 365,848 | 3,927 | 1,253,307 | 6,619 | 2,228,102 | 18,496,263 | |
| | Total | | 715,770 | 9,935 | 2,143,245 | 20,744 | 3,950,258 | 35,585,846 | 31.00 |
| Northwest Airlines, Inc. | Chicago to Winnipeg | 12 | 2,016,166 | 52,424 | 18,341,788 | 289,191 | 102,895,994 | 581,321,313 | |
| | Fargo to Seattle | 12 | 3,132,087 | 35,579 | 16,407,458 | 126,446 | 99,206,097 | 577,551,368 | |
| | Total | | 5,148,253 | 88,003 | 34,749,246 | 415,637 | 202,102,091 | 1,158,872,681 | 47.23 |

[1] Included in total above.

## TABLE A.—*Air Carrier Operations Statistics for the Year 1939*—Continued

| Operator | Routes operated | Months operated | Revenue miles flown | Revenue passengers carried | Revenue passenger miles flown | Express carried (pounds) | Express pound-miles flown | Mail pound-miles flown | Revenue passenger load factor (percent) |
|---|---|---|---|---|---|---|---|---|---|
| Pennsylvania Central Airlines Corp. | Norfolk to Detroit | 12 | 2,157,387 | 85,578 | 14,939,825 | 453,685 | 83,503,546 | 204,958,072 | |
| | Detroit to Milwaukee | 12 | 616,494 | 23,781 | 3,503,159 | 83,560 | 13,491,719 | 18,458,986 | |
| | Washington to Buffalo | 12 | 200,063 | 2,262 | 531,985 | 8,514 | 945,506 | 3,819,351 | |
| | Pittsburgh to Buffalo | 12 | 112,155 | 1,660 | 361,880 | 1,539 | 335,503 | 0 | |
| | Pittsburgh to Baltimore | 12 | 156,123 | 5,135 | 1,102,699 | 18,853 | 3,607,851 | 0 | |
| | Detroit to Sault Ste. Marie | 12 | 230,455 | 3,887 | 753,197 | 20,776 | 1,863,397 | 3,706,207 | |
| | Total | | 3,472,677 | 122,303 | 21,192,745 | 586,927 | 103,747,522 | 230,942,616 | 61.23 |
| Transcontinental & Western Air, Inc. | New York-Newark to Los Angeles. | 12 | 11,029,176 | 181,482 | 94,428,343 | 1,028,888 | 733,209,344 | 2,805,200,872 | |
| | Dayton to Chicago | 12 | 376,242 | 11,016 | 2,632,972 | 69,233 | 17,035,371 | 27,469,191 | |
| | Boulder City to San Francisco | 12 | 356,658 | 3,718 | 1,552,608 | 4,873 | 2,303,659 | 11,656,530 | |
| | Phoenix to Las Vegas | 12 | 201,295 | 3,356 | 377,710 | 4,974 | 368,285 | 3,322,814 | |
| | Kansas City to New York via Chicago. | ⅓ | 74,768 | 1,375 | 657,409 | 6,490 | 3,074,878 | 7,075,635 | |
| | Total | | 12,038,139 | 200,947 | 99,649,042 | 1,114,458 | 755,991,537 | 2,854,725,042 | 49.65 |
| United Air Lines Transport Corp. | New York-Newark to San Francisco. | 12 | 12,314,002 | 161,312 | 104,097,910 | 1,632,981 | 1,512,560,872 | 4,546,408,847 | |
| | San Diego to Seattle | 12 | 3,836,991 | 99,662 | 36,616,978 | 857,746 | 226,348,304 | 611,408,398 | |
| | Salt Lake City to Seattle | 12 | 1,370,054 | 20,812 | 7,803,888 | 85,608 | 47,287,567 | 212,972,192 | |
| | Cheyenne to Denver | 12 | 202,795 | 4,444 | 435,512 | 29,404 | 2,881,592 | 9,779,325 | |
| | Total | | 17,723,842 | 286,230 | 148,954,288 | 2,405,757 | 1,789,078,335 | 5,380,568,762 | 61.01 |
| Western Air Express Corporation. | San Diego to Salt Lake City | 12 | 1,519,904 | 21,925 | 8,833,449 | 331,266 | 148,573,418 | 423,165,108 | |
| | Salt Lake City to Great Falls | 12 | 745,767 | 8,150 | 2,202,092 | 29,730 | 7,779,737 | 47,286,398 | |
| | Total | | 2,265,671 | 30,075 | 11,035,541 | 360,996 | 156,353,155 | 470,451,506 | 40.04 |
| Wilmington-Catalina Airline, Ltd. | Wilimington to Airline | 12 | 135,840 | 26,886 | 806,580 | 148,107 | 4,443,210 | 0 | 59.74 |
| | **Total domestic routes** | | **82,571,523** | **1,717,090** | **677,672,955** | **9,514,299** | **5,411,227,041** | [2][3] **17,169,782,735** | **56.10** |
| | **FOREIGN AND TERRITORIAL** | | | | | | | | |
| Canadian Colonial Airways, Inc.[4] | New York to Montreal | 12 | 374,581 | 9,402 | 3,079,143 | 8,789 | ([5]) | [6] 33,423 | 50.51 |
| Inter-Island Airways, Ltd. | Honolulu to Hilo | 12 | 332,289 | 17,538 | 2,636,572 | 81,155 | 13,582,970 | 4,475,519 | |
| | Honolulu to Port Allen | 12 | 78,126 | 4,300 | 506,400 | 24,538 | 2,877,439 | ([1]) | |
| | Total | | 410,415 | 21,838 | 3,142,972 | 105,693 | 16,460,409 | [2] 4,475,519 | 56.74 |
| Marine Airways, Inc. | Juneau to Sitka and Chichagof | 12 | 41,448 | 1,078 | 109,668 | 5,600 | 533,850 | 0 | 52.60 |
| Pan American Airways System.[7] | New York to Marseilles | 4 | | | | | | | |
| | New York to Southampton | 4 | | | | | | | |
| | New York to Lisbon | 8 | 568,960 | 5,318 | 7,984,831 | 3,248 | ([5]) | [6] 67,564 | |
| | Baltimore-New York to Bermuda. | 12 | | | | | | | |
| | San Francisco to Hong Kong via Hawaii and Philippine Islands. | 12 | 810,321 | 1,583 | 5,382,919 | 36,067 | ([5]) | [6] 60,433 | |
| | Juneau to Fairbanks via Whitehorse. | 12 | 340,199 | 1,883 | 1,138,901 | 19,477 | ([5]) | [6] 43,934 | |
| | Fairbanks to Nome and Bethel | 12 | | | | | | | |
| | Miami to Buenos Aires | 12 | | | | | | | |
| | Miami to Nassau | 12 | | | | | | | |
| | Miami to Barranquilla | 12 | | | | | | | |
| | Miami to Merida | 12 | | | | | | | |
| | Brownsville to Cristobal | 12 | | | | | | | |
| | Cristobal to Balboa | 12 | 4,616,209 | 109,396 | 48,062,349 | 1,116,779 | ([5]) | [6] 724,527 | |
| | Cristobal to Port of Spain | 12 | | | | | | | |
| | Cristobal to Medellin | 12 | | | | | | | |
| | San Juan via Kingston to Cristobal. | 12 | | | | | | | |
| | Port au Prince to Maricaibo | 12 | | | | | | | |
| | Rio de Janeiro via Asuncion to Buenos Aires. | 12 | | | | | | | |
| | Total | | 6,335,689 | 118,180 | 62,569,000 | 1,175,571 | ([5]) | [6] 896,458 | 54.32 |
| Pan American-Grace Airways, Inc. | Cristobal, Canal Zone, to Buenos Aires, Argentina, via Santiago, Chile, and Bolivia. | 12 | 1,242,407 | 10,665 | 9,267,818 | 102,303 | ([5]) | [6] 47,264 | 50.48 |
| | **Total foreign and territorial routes.** | | **8,404,540** | **161,163** | **78,168,601** | **1,397,956** | ([5]) | [6][8] **977,145** | **53.95** |
| | **Grand total** | | **90,976,06** | **31,878,253** | **755,841,556** | **10,912,255** | ([5]) | | **55.87** |

[1] Included in total above.
[2] Mail pound-miles flown by Inter-Island Airways, Ltd., listed under "Foreign and Territorial," have been added to the total for domestic mail pound-miles flown as the mail carried by this company is under a domestic mail contract.
[3] Mail pound-miles flown does not include 5,685,598 miles flown by All American Aviation Co. for experimental mail pick-up service and 238,860 miles flown by Eastern Air Lines autogiro service between Philadelphia and Camden.
[4] Does not include the operations of Canadian Colonial Airways, Ltd., which in previous years have been included with Canadian Colonial Airways, Inc.
[5] Not available.
[6] Pounds.
[7] Does not include the following Pan American Airways affiliated companies: Pan Air do Brasil, Cia Mexicana de Aviacion, and Cia Nacional Cubana de Aviacion, which in previous years have been included with Pan American Airways statistics.
[8] Does not include mail carried under contract with foreign governments.

## TABLE B.—*Air Carrier Operations Statistics, by Months, for Year 1939, Divided as to Domestic and Foreign and Territorial Operations*

| | January | February | March | April | May | June | July | August | September | October | November | December | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of operating carriers: | | | | | | | | | | | | | |
| Domestic | 18 | 18 | 18 | 18 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | |
| Foreign and territorial | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | |
| Total | 23 | 23 | 23 | 23 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | |
| Revenue passengers carried: | | | | | | | | | | | | | |
| Domestic | 80, 344 | 72, 496 | 106, 349 | 118, 687 | 149, 291 | 164, 578 | 170, 913 | 179, 051 | 178, 219 | 178, 421 | 157, 931 | 160, 810 | 1, 717, 090 |
| Foreign and territorial | 12, 167 | 14, 848 | 16, 637 | 13, 370 | 10, 534 | 10, 505 | 12, 965 | 16, 747 | 13, 172 | 11, 970 | 12, 116 | 16, 132 | 161, 163 |
| Total | 92, 511 | 87, 344 | 122, 986 | 132, 057 | 159, 825 | 175, 083 | 183, 878 | 195, 798 | 191, 391 | 190, 391 | 170, 047 | 176, 942 | 1, 878, 253 |
| Revenue passenger-miles flown: | | | | | | | | | | | | | |
| Domestic | 34, 471, 795 | 31, 064, 140 | 44, 474, 610 | 47, 450, 733 | 57, 483, 927 | 63, 693, 991 | 66, 054, 539 | 68, 118, 164 | 69, 082, 813 | 70, 122, 138 | 60, 638, 606 | 65, 017, 499 | 677, 672, 955 |
| Foreign and territorial | 5, 058, 810 | 5, 422, 025 | 6, 424, 719 | 5, 876, 464 | 5, 355, 319 | 5, 494, 066 | 6, 523, 883 | 8, 096, 242 | 8, 165, 365 | 7, 146, 610 | 6, 610, 321 | 7, 994, 777 | 78, 168, 601 |
| Total | 39, 530, 605 | 36, 486, 165 | 50, 899, 329 | 53, 327, 197 | 62, 839, 246 | 69, 188, 057 | 72, 578, 422 | 76, 214, 406 | 77, 248, 178 | 77, 268, 748 | 67, 248, 927 | 73, 012, 276 | 755, 841, 556 |
| Available passenger-seat-miles flown: | | | | | | | | | | | | | |
| Domestic | 73, 725, 933 | 68, 068, 526 | 84, 962, 733 | 87, 470, 221 | 104, 844, 126 | 107, 654, 134 | 113, 459, 234 | 115, 285, 505 | 112, 571, 606 | 115, 752, 540 | 109, 957, 406 | 114, 117, 613 | 1, 207, 869, 577 |
| Foreign and territorial | 10, 554, 206 | 10, 160, 980 | 11, 265, 701 | 11, 420, 749 | 11, 092, 700 | 10, 923, 402 | 13, 670, 879 | 14, 450, 796 | 13, 534, 498 | 12, 889, 688 | 11, 602, 399 | 13, 334, 399 | 144, 900, 393 |
| Total | 84, 280, 135 | 78, 229, 506 | 96, 228, 434 | 98, 890, 972 | 115, 936, 826 | 118, 577, 536 | 127, 130, 113 | 129, 736, 301 | 126, 106, 104 | 128, 642, 228 | 121, 559, 805 | 127, 452, 012 | 1, 352, 769, 970 |
| Revenue passenger-load factor: | | | | | | | | | | | | | |
| Domestic (percent) | 46. 76 | 45. 64 | 52. 35 | 54. 25 | 54. 83 | 59. 17 | 58. 22 | 59. 09 | 61. 37 | 50. 58 | 55. 15 | 56. 97 | 56. 10 |
| Foreign and territorial (percent) | 47. 93 | 53. 36 | 57. 03 | 51. 45 | 48. 28 | 50. 30 | 47. 72 | 56. 03 | 60. 33 | 55. 44 | 56. 97 | 59. 97 | 53. 95 |
| Total (percent) | 46. 90 | 46. 64 | 52. 89 | 53. 93 | 54. 20 | 58. 35 | 57. 09 | 58. 75 | 61. 26 | 60. 06 | 55. 32 | 57. 29 | 55. 87 |
| Express carried (pounds): | | | | | | | | | | | | | |
| Domestic | 577, 982 | 564, 928 | 685, 274 | 663, 884 | 725, 061 | 824, 630 | 725, 922 | 933, 965 | 981, 461 | 948, 501 | 844, 413 | 1, 038, 278 | 9, 514, 299 |
| Foreign and territorial | 41, 297 | 93, 759 | 112, 956 | 117, 428 | 114, 440 | 119, 699 | 116, 820 | 137, 921 | 186, 730 | 135, 123 | 98, 384 | 123, 393 | 1, 397, 956 |
| Total | 619, 279 | 658, 687 | 798, 230 | 781, 312 | 839, 507 | 944, 329 | 842, 742 | 1, 071, 886 | 1, 168, 191 | 1, 083, 624 | 942, 797 | 1, 161, 671 | 10, 912, 255 |
| Express pound-miles flown: | | | | | | | | | | | | | |
| Domestic | 354, 500, 080 | 349, 218, 080 | 415, 083, 212 | 400, 501, 211 | 409, 938, 146 | 457, 946, 817 | 394, 088, 272 | 491, 914, 099 | 536, 701, 889 | 529, 988, 948 | 476, 224, 512 | 595, 121, 775 | 5, 411, 227, 041 |
| Foreign and territorial | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) |
| Revenue miles flown: | | | | | | | | | | | | | |
| Domestic | 5, 453, 093 | 5, 031, 767 | 6, 125, 164 | 6, 267, 595 | 7, 122, 347 | 7, 182, 963 | 7, 541, 305 | 7, 638, 796 | 7, 441, 690 | 7, 625, 880 | 7, 407, 864 | 7, 733, 059 | 82, 571, 523 |
| Foreign and territorial | 630, 376 | 598, 022 | 677, 901 | 667, 963 | 666, 675 | 704, 926 | 752, 391 | 776, 613 | 742, 532 | 733, 275 | 709, 388 | 744, 478 | 8, 404, 540 |
| Total | 6, 083, 469 | 5, 629, 789 | 6, 803, 065 | 6, 935, 558 | 7, 789, 02 2 | 7, 887, 88 9 | 8, 293, 6 96 | 8, 415, 409 | 8, 184, 222 | 8, 359, 155 | 8, 117, 252 | 8, 477, 537 | 90, 976, 063 |
| Mail carried (pounds): | | | | | | | | | | | | | |
| Domestic | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) |
| Foreign and territorial | 67, 844 | 68, 599 | 79, 248 | 69, 219 | 71, 816 | 73, 535 | 78, 544 | 80, 998 | 84, 136 | 89, 513 | 95, 251 | 118, 442 | 977, 145 |
| Mail pound-miles flown: | | | | | | | | | | | | | |
| Domestic | [2]1,243,868, 119 | [2]1,220,711, 135 | [2]1,447,382, 546 | [2]1,355,973, 784 | [2]1,434,236, 026 | [2]1,426,340, 778 | [2]1,384,677, 064 | [2]1,485,104, 221 | [2]1,420,648, 823 | [2]1,508,469, 281 | [2]1,471,881, 619 | [2]1,770,489, 339 | [2]17,169,782, 735 |
| Foreign and territorial | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) |

[1] Not available.

[2] Mail pound-miles flown by Inter-Island Airways, Ltd., are included in the total for "domestic mail pound-miles flown" as the mail carried by this company is under a domestic mail contract.

# Tri-State Aviation Corporation Gets Certificate for Loop-Shaped Route

Tri-State Aviation Corporation on August 3 was granted a certificate of convenience and necessity by the Civil Aeronautics Board for the transportation of air express over a loop-shaped route originating and ending at Morgantown, W. Va., with intermediate points at Elkins, Charleston, and Parkersburg, W. Va., and a second route from Morgantown, via Martinsburg, W. Va., to Baltimore, Md. The company, which had suspended operations on September 1, 1939, pending issuance of such a certificate, is allowed 120 days after the grant in which to resume its service.

Request of the air carrier for a certificate authorizing the operation of a route between Pittsburgh, Pa., and Morgantown, and the inclusion as additional terminal points, Wheeling, Beckley, Princeton, and Clarksburg, W. Va., and Cumberland, Md., was denied by the Board on the basis of lack of continuity of previous operation, as required by the "grandfather clause" of the Civil Aeronautics Act.

Disagreeing with an examiner's report that the service on the two routes approved had been inadequate and inefficient, the Board found that such service had met the requirements of air transportation where only property was involved. It stated, however, that the carrier's contention in its application that its combined operation by plane and trucks should be considered, was not a recognizable one.

"It is clear," said the Board, "that the service to which Congress referred (in the Civil Aeronautics Act) is service by aircraft and not by other, or combined means of transportation. It is obvious that there must be some point beyond which the replacement of aircraft by trucks would have to be considered as giving the operation the primary character of a motor carrier. Accordingly, in this case, we have confined our consideration to the question of the continuity of applicant's operations by aircraft during the grandfather period."

## Board Cites Seasonal Traffic Factor in Granting Certificate to Mayflower

Holding that the general purpose of section 401 (e) of the Civil Aeronautics Act is to preserve the right of airlines to continue those services which had become well established by reason of prior operations, the Civil Aeronautics Board on August 2 granted a certificate of convenience and necessity to Mayflower Airlines, Inc., for the transportation of passengers and express between Boston and Nantucket, Mass., with intermediate points at Provincetown, Hyannis, and Oak Bluffs, Mass.

Mayflower's service had been based on summer traffic demands in a region which is largely a resort area, but it also had operated a charter service at other times of the year when the demand existed.

"Seasonal traffic demands exist in all forms of transportation and seasonal modification of transportation services so as to conform to those demands is a common practice," the Board stated in awarding the certificate.

## Gust Load Report

(*Continued from page 411*)

gust requirements were obtained and the design values for gusts are therefore "effective" values. In general, however, the design loads obtained in reversing the process will be correct, provided we use the same formula in both cases.

Two major discrepancies must be considered in using gust statistics. First, the gradient effect may be different for the airplane being designed than for the airplanes on which the statistics were collected. The main factor causing this discrepancy is the wing loading. Assuming that most of our gust statistics were collected at wing loadings of about 16 p. s. f., we need to know whether they can be applied to airplanes of much higher or lower wing loading. For this purpose a gust factor curve has been derived from the data of reference 2 and is given in CAAM 04, figure I–2 (reproduced here as fig. 2). This curve shows that the effective gust for airplanes of light wing loading (below 16 p. s. f.) is considerably reduced because of the gradient effect. On the other hand, the effective gust tends to become greater as the wing loadings are increased much beyond 16 p. s. f. The requirements already include the factor for wing loadings less than 16. CAAM 04 also recommends its use in the higher wing loading range.

5. Reporting Gust Load Factors

These principles, although elementary, should be kept in mind in reporting gust load factors, as the accelerometer reading cannot be translated into an equivalent load or gust velocity unless the actual weight (or wing loading) and speed are known. Another point to be noted is that an accelerometer reading gives the acceleration at the point where the instrument is located and this value may be quite different from that at the center of gravity. A high value of acceleration may mean very little in terms of actual load factor, if the reading was taken at some distance from the center of gravity.

It might also be worth mentioning at this point that the *motion* of the airplane is not a direct indication of the magnitude of the loads on it. A relatively small load acting for a considerable time

(*See GUST LOAD REPORT, page 420*)

## *Aircraft Radio Equipment Approved for Scheduled Air Carrier Use*

During the month of July the following units of aircraft radio equipment were approved by the Civil Aeronautics Authority for scheduled air carrier use and issued type certificates:

| Certificate No. | Manufacturer | Unit | Date |
|---|---|---|---|
| 257 | Western Electric Co | Type 25–C radio receiver, R. F. unit | July 24 |
| 258 | do | Type 25–C radio receiver, power unit | Do. |
| 500 | do | Type 25–B transmitter, R. F. unit | July 31 |
| 501 | do | Type 25–B transmitter, power unit | Do. |
| 284 | Collins Radio Co | Type 17F–9 aircraft transmitter | Do. |
| 297 | T. L. Siebenthaler Manufacturing Co | Type 78 azimuth bearing indicator | July 16 |

The following authorized modifications to type certificates approving aircraft radio equipment for scheduled air carrier use were issued during the month of July:

SPERRY GYROSCOPE COMPANY

| Type certificate | Data sheet | Unit and modification | Modification authorized |
|---|---|---|---|
| 400 | 213–A | Part No. 643666 control unit. Modify sensitivity control and tuning meter to improve operating features | July 26 |

WESTERN ELECTRIC COMPANY

| | | | |
|---|---|---|---|
| 141 | 121–D | 27–A marker beacon receiver. Minor changes to provide mounting of parts and stabilization of unit; change resistor value to reduce vibrator load; install sensitivity control; remove auxiliary power switches and excess wiring | July 24 |

# Airways and Airports

## Aeronautical Charts

During July the following new editions of aeronautical charts were issued by the United States Coast and Geodetic Survey. Pilots are warned that the previous editions of the same charts are canceled and are now obsolete.

### *New Edition of Regional Aeronautical Chart*

*1-M.*—June 1940. Size, 22 by 35 inches. Located in latitude 44°–49° N. and longitude 114°–125° W., covering an area of about 197,000 square miles. Includes an accumulation of changes since the last edition.

### *New Edition of Direction Finding Chart*

*23-DF.*—July 1940. Size, 24 by 40 inches. Located in latitude 37°–47° N. and longitude 67°–92° W., an area of some 343,000 square miles. Includes an accumulation of changes since last edition.

### *New Editions of Sectional Aeronautical Charts*

*Albuquerque.*—July 1940. Size, 20 by 45 inches. Located in latitude 34°–36° N. and longitude 102°–108° W., an area of about 53,000 square miles. Gives relocation of Albuquerque radio range and the addition of civil airways.

*Bellingham.*—July 1940. Size, 20 by 32 inches. Located in latitude 46°–48° N. and longitude 120°–125° W., an area of about 29,000 square miles. New radio range at Bellingham, radio range at Seattle realigned, and civil airways added.

*Chattanooga.*—July 1940. Size, 20 by 45 inches. Located in latitude 34°–36° N. and longitude 84°–90° W., an area of about 54,000 square miles. The new radio range at Muscle Shoals shown and civil airways revised.

*Miami.*—July 1940. Size, 26 by 38 inches. Located in latitude 24°–28° N. and longitude 80°–83° W., an area of about 25,000 square miles. Civil airways and new radio range at Fort Myers added.

*Mobile.*—July 1940. Size, 20 by 47 inches. Located in latitude 30°–32° N. and longitude 84°–90° W., an area of about 57,000 square miles. Radio ranges added at Dothan and Crestview, beacons added on the New Orleans to Jacksonville airway, and civil airways added.

*Seattle.*—July 1940. Size, 20 by 32 inches. Located in latitude 46°–48° N. and longitude 120°–125° W., an area of about 47,000 square miles. Includes radio ranges realigned at Ellensburg and Seattle.

*Sioux City.*—July 1940. Size, 20 by 40 inches. Located in latitude 42°–44° N. and longitude 96°–102° W., an area of about 49,000 square miles. Sioux City new radio range added as well as beacons on the lighted airway Omaha to Bismark.

Copies of aeronautical charts may be obtained from the Coast and Geodetic Survey, Washington, D. C., and from recognized dealers at major cities and airports. Regional and direction finding (DF) charts sell for 75 cents each and sectional charts for 40 cents. On orders grossing $10 or more a 33⅓ percent discount is allowed.

### *Recognized Dealers*

The Coast and Geodetic Survey has announced the following changes in its list of recognized dealers authorized to sell charts:

*Aviation sales and service*, P. Hubert, proprietor, municipal airport, St. Petersburg, Fla.

*Manager*, municipal airport, P. O. Box 28, Shreveport, La.

*Howard G. Mayes*, manager, Mayes Field, Huntington, W. Va.

### *Suspensions*

The following dealers have been suspended as recognized dealers in aeronautical charts of the Coast and Geodetic Survey:

*S. W. Magill*, municipal airport, St. Petersburg Fla.

*Airport manager*, municipal airport, Jackson, Miss.

## Airport Projects Approved

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

BIRMINGHAM, ALA.—$73,526 for W. P. A. project for construction of a concrete and steel hangar with lean-to's on each side at municipal airport.

BIRMINGHAM, ALA.—$33,368 for W. P. A. project to provide a taxiway and warm-up apron and increase the capacity of the heating system in the existing hangar for the Alabama National Guard at municipal airport.

BLOOMINGTON, ILL.—$864 for N. Y. A. project for overhaul of the lighting system, cones and fixtures; landing area conditioning; removal of trees; hangar repair; and other items of a maintenance nature at municipal airport.

BRIDGEPORT, CONN.—$580,318 for W. P. A. project for grading, drainage, hard-surfacing runways, lighting, fencing, and incidental and appurtenant work of municipal airport. This supersedes previous approval dated December 22, 1939.

CHARLOTTE, N. C.—$60,177 for W. P. A. project for extending the N.-S. strip 1,500 feet and the NE.-SW. strip 800 feet; paving four turn arounds and take-off strips; paving an apron, and extending boundary lighting system at municipal airport.

GADSDEN, ALA.—$67,385 for W. P. A. project for clearing and grubbing, earth moving, fence construction, fabrication and placement of cone markers and corner markers, seeding, and erection of a stone, concrete, and steel truss hangar at municipal airport.

LAKE CITY, FLA.—$136,659 for W. P. A. project for clearing and grubbing, grading, ditch excavation, subdrainage, paving, sprigging, and affiliated work at Lake City Airport.

MERIDIAN, MISS.—$193,586 for W. P. A. project for grading and paving new E.-W. and NW.-SE. runways, extending the existing SW.-NE. runway, building a levee, and preparing an emergency landing strip at municipal airport.

*(See AIRPORT PROJECTS, page 420)*

## C. A. R. Amendment

*(Continued from page 412)*

cause of failure to secure the necessary flight time, may, upon application to any inspector, have the expired certificate endorsed as conveying the privileges of a student pilot certificate until one year from the date of original expiration. After such endorsement, the holder may exercise all the privileges incident to a student pilot certificate which has been endorsed to permit solo cross country flight, and may operate aircraft of the type, weight, and engine classification specified in the rating record attached to his expired certificate.

"(b) The holder of such an expired pilot certificate, if application is made within the year following its expiration, may secure a new private pilot certificate with the type, weight, and engine ratings previously held by showing that, as of the date of application, he has met the requirements (as set forth in sec. 20.34 (c)) for periodic endorsement of a private pilot certificate with such ratings.

"(c) The holder of an expired limited-commercial or commercial pilot certificate may secure a new certificate of the same grade, and with the ratings previously held.

"(1) If application is made within 90 days after the expiration of his certificate, by showing that, as of the date of application, he has met the requirements (as set forth in sec. 20.34 (d) or (e)) for periodic endorsement of the certificate with such ratings;

"(2) If the application is made within 1 year after the expiration of his certificate, by meeting the requirements specified in paragraph (1) and, in addition, passing the flight test prescribed for such a certificate and ratings."

4. Section 20.37 is amended to read as follows:

"20.37 OPERATION DURING PHYSICAL DEFICIENCY.—A certificated pilot shall not operate any aircraft during the period of any known physical deficiency which would render him during that period unable to meet the physical requirements with which he complied in order to secure his certificate: *Provided, however*, That the holder of at least a private pilot certificate may operate an aircraft otherwise than for hire during the period of a temporary physical deficiency if the aircraft is equipped with fully functioning dual controls and the other control seat is occupied by another pilot who holds at least a private pilot certificate. The time during which the aircraft is so operated may be included in the time necessary for renewal of the certificate of the pilot having the temporary physical deficiency."

5. Section 20.38 is amended to read as follows:

"20.38 SURRENDER.—Except as provided in section 20.35, a holder of a pilot certificate shall, upon request, surrender such certificate to any officer or employee of the Administrator if it has been suspended or revoked, or expired."

# CIVIL AERONAUTICS BOARD

# OFFICIAL ACTIONS

## Abstracts of Opinions, Orders, and Regulations

FOR THE PERIOD AUGUST 1–15, 1940

### *Orders*

**Order No. 607: TWA granted petition for reconsideration of order and opinion of Board.**

The Board on August 2 granted petition of Transcontinental & Western Air, Inc., for reconsideration of, and argument on, order and opinion of the Board (order No. 578).

**Order No. 610: Revoked student pilot certificate of Glen E. Courtwright.**

The Board on August 2 revoked student pllot certificate No. 72398 held by Glen E. Courtwright, Lincoln, Ill., for piloting an aircraft on a civil airway without being possessed of a pilot certificate and other violations of the Civil Air Regulations.

**Order No. 611: Reopened hearing in application of Eastern Air Lines.**

The Board on August 3 reopened hearing in the matter of the application of Eastern Air Lines, Inc., for a temporary certificate of convenience and necessity.

**Order No. 612: Dismissed show cause order of Randon M. Reid.**

The Board on August 6 dismissed order No. 488 requiring Randon M. Reid, Dallas, Tex., holder of commercial pilot certificate No. 38906, to show cause why his certificate should not be revoked or suspended (opinion and order).

**Order No. 613: Approved temporarily interlocking relationships of Richard du Pont, Arthur Davis, and Lytle Adams and All American.**

The Board on August 8 approved temporarily interlocking relationships in the matter of Richard C. du Pont, Arthur P. Davis, and Lytle S. Adams and All American Aviation, Inc., and other companies.

**Opinions of the Civil Aeronautics Board Now Published Separately**

The full text of opinions of the Civil Aeronautics Board no longer are published in the CIVIL AERONAUTICS JOURNAL. All opinions in economic proceedings now are printed individually. Arrangements will be made to supply to subscribers of the JOURNAL copies of all such opinions up to the date of expiration of current subscriptions.

Opinions in cases of suspension, revocation, or denial of airman certificates will be made available in mimeographed form only.

As in previous issues, however, the JOURNAL will carry an abstract of all rules, regulations, and orders and a syllabus of all opinions issued by the Board during the half month ending 2 weeks prior to the date of publication. Verbatim copies of these, with the exception of opinions in economic proceedings, may be obtained on request to the Publications and Statistics Division, Civil Aeronautics Authority, Washington, D. C. Persons other than current subscribers may obtain economic opinions by ordering copies directly from the Superintendent of Documents, Government Printing Office, Washington, D. C. Arrangements will be made with the Superintendent of Documents to provide for the separate subscription, at a flat fee, for each series which will complete a bound volume. Details will be announced when arrangements are completed.

**Order No. 614: Eastern permitted to withdraw application for certificate authorizing transportation of mail by autogiro.**

The Board on August 9 granted request of Eastern Air Lines, Inc., to withdraw its application for a temporary certificate of public convenience and necessity authorizing the transportation of mail by autogiro to and from the rooftop of the Philadelphia Post Office Building and the Philadelphia Airport.

**Order No. 615: All American temporarily exempted from certain provisions in its certificate for route AM–49 and title IV of the act.**

The Board on August 7 exempted temporarily All American Aviation, Inc., from certain provisions contained in its certificate of public convenience and necessity for route AM–49 and from certain provisions contained in title IV of the act.

**Order No. 616: Suspended for 30 days commercial pilot certificate of Richard M. Roberson.**

The Board on August 13 suspended for a period of 30 days commercial pilot certificate No. 55012, held by Richard M. Roberson, Mangum, Okla., for giving flying instruction to student pilots while holder of private pilot certificate, although he was not possessed of an instructor rating.

**Order No. 617: Suspended for 30 days private pilot certificate of James M. Stroud.**

The Board on August 13 suspended for a period of 30 days private pilot certificate No. 65131, held by James M. Stroud, Ordway, Colo., for piloting an aircraft with persons aboard who occupied a control seat of said aircraft without the dual controls thereof having been made inoperative although neither he nor the passengers possessed a pilot certificate valid for such operation.

**Order No. 618: Approved holding of interlocking positions by Virgil Edwards Chenea.**

The Board on August 13 approved the holding by Virgil Edwards Chenea of certain interlocking positions included in the application of Pan American Airways, Inc.

**Order No. 619: Granted Penn-Central permission to intervene in applications of Eastern and Braniff.**

The Board on August 13 granted Pennsylvania-Central Airlines Corporation permission to intervene in the applications of Eastern Air Lines, Inc., and Braniff Airways, Inc., for certificates of public convenience and necessity between St. Louis, Mo., Evansville, Ind., Louisville, Ky., and Washington, D. C., and between Kansas City, Jefferson City, and St. Louis, Mo., Evansville, Ind., Louisville and Lexington, Ky., and Washington, D. C.

**Order No. 620: Approved interlocking relationships of Sherman Mills Fairchild, Pan American, and certain aircraft manufacturers.**

The Board on August 14 approved interlocking relationships of Sherman Mills Fairchild in Pan American Airways Systems and certain aircraft manufacturers.

## *Regulations*

**Regulation No. 103: Pan American authorized to issue free transportation to members of the press on San Francisco-Auckland flight.**

The Board on August 8 authorized Pan American Airways Co. to issue free transportation for representatives of the press on flight from San Francisco, Calif., to Auckland, New Zealand, and return.

**Regulation No. 104: Adopted Amendment No. 2 of section 228.1 of the Economic Regulations.**

The Board on August 12 adopted amendment No. 2 of section 228.1 of the Economic Regulations entitled "Free Travel for Postal Employees."

## *Gust Load Report*

(*Continued from page 417*)

can produce a greater change of position than a violent load briefly applied, yet the latter load may come closer to breaking the airplane. Likewise, a lightly loaded airplane may react quite violently to gusts without building up critical loads in the structure.

(*Gust load factors are discussed from a design viewpoint in Aircraft Airworthiness Section Report No. 6*)

REFERENCES

1. National Advisory Committee for Aeronautics Technical Note No. 374: Preliminary Study of Applied Load Factors in Bumpy Air, 1931.
2. R. V. Rhode: "Gust Loads on Airplanes," *S. A. E. Journal*, March 1937.
3. E. P. Warner: "How Hard Is a Bump?" *Aviation Magazine*, February 1937.

## *Airport Projects*

(*Continued from page 418*)

MEMPHIS, TENN.—$30,312 for W. P. A. project for construction of three-story office building, together with necessary landscaping and affiliated work at municipal airport.

MOLINE, ILL.—$6,516 for N. Y. A. project for reconstruction and repair of buildings and landscaping at municipal airport.

NEW HAVEN, CONN.—$595,103 for W. P. A. project for grading, drainage, paving and incidental and appurtenant work at municipal airport. This supersedes previous W. P. A. project authorizing the expenditure of $155,656 in Federal funds.

ROSWELL, N. MEX.—$111,430 for W. P. A. project for earthmoving, placement of drain tile, base course surfacing and oil mixing, together with installation of lighting system to develop four all-weather runways at Roswell, N. Mex., Airport.

SAN ANTONIO, TEX.—$6,929 for W. P. A. project for removal of hangar from Brooks Field and reconstruction of said hangar on Stinson Field.

SHERIDAN, WYO.—$87,627 for W. P. A. for work necessary to develop a new graded, drained and lighted NW–SE strip at municipal airport.

SOUTH BEND, IND.—$225,825 for W. P. A. project for relocating four small hangars, resurfacing existing runways and constructing new runways, together with affiliated items of grading, landscaping, sanitary sewer installations, and paving aprons and roadways at St. Joseph County Airport-Bendix Field

WILKES-BARRE, PA.—$2,761.92 for N. Y. A. project for removal of debris and sediment from the airport deposited by recent floods, together with construction of concrete sidewalks and landscaping at Wyoming Valley Airport.



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