U. S. DEPARTMENT OF COMMERCE

CIVIL AERONAUTICS JOURNAL

ISSUED TWICE MONTHLY BY THE CIVIL AERONAUTICS AUTHORITY

VOLUME 1 | WASHINGTON, DECEMBER 1, 1940 | NUMBER 23

Assistant Secretary Hinckley Discusses Airport Program Before Municipal Group

Retraces Efforts Leading up to Present Clarified Federal Policy and Tells of Future Requirements

"The combined best efforts of all who can be of help are not going to provide this country with enough landing facilities to take care of the enormous growth of American civil aviation, once the current emergency has been taken care of," is the opinion of Assistant Secretary of Commerce Robert H. Hinckley.

Mr. Hinckley set forth this belief in an address on A National Airport Program before the American Municipal Association in Chicago on November 14. He discussed at length the work being done by the Civil Aeronautics Administration on the $40,000,000 airport program already authorized by Congress, pointing out that this is only a part of the well-rounded, long-range program that is required to meet the Nation's airport needs.

Reviewing the efforts that have been made in the past toward determination of the Federal attitude toward construction of airports, Mr. Hinckley declared that more progress has been made toward clearing up the Federal airport policy during the past 6 months than had been made in the entire previous history of American aviation.

Turning again to the current program, he pointed out that the C. A. A. has set up a number of points of policy. "It will not buy land, or improve any privately owned airport. It will not build buildings. It will require a public sponsor to operate and maintain a public field, and to guarantee future protection of the approach areas, preferably by zoning regulations.

"Let me hasten to add," he continued, "that even if the scope of this year's program is limited, the interest of the C. A. A. is not. Defense requirements doubtless will force us to omit, this year, many municipal airports which from a standpoint of commercial aviation may be relatively more important. But most of the fields which are improved will be convertible back to civil aviation, and aviation as a whole will gain materially.

"There is also a determination, in Washington, to supplement and expand this program as far as possible through the work of other Federal agencies. For example, the C. A. A. is not going to spend any of the precious money in order to relieve cities of sponsors' contributions already pledged on W. P. A. airport projects. I think you will realize that it is only fair to the hundreds of communities which already have carried through such projects.

"Moreover, it will stretch this year's accomplishments over more locations, and this is vital. The airport shortage is acute right now. I need not tell you

(*See* HINCKLEY, *page 490*)

Aero Advisory Council Names Executive Committee

The newly formed Aeronautical Advisory Council for the Department of Commerce, at its second meeting, completed permanent organization and adjourned to meet again at the call of its chairman.

Frank A. Tichenor, aviation publisher New York, was elected permanent chairman; Thomas A. Morgan, manufacturer, New York, first vice chairman; and Dr. Clark Millikan, aviation scientist, Los Angeles, second vice chairman.

Named on the Council's executive committee, in addition to the three named above, were Milton Knight, Toledo manufacturer; Edmund T. Allen, Seattle pilot and engineer; William Burden, New York investment expert, Casey Jones, Newark flight school operator; Laurence Sharples, Philadelphia flying association executive, and John Jouett, Washington aircraft manufacturers association executive.

Army and Navy Absorbing C. P. T. Trainees for Air Instruction

The C. A. A.'s far-flung Civilian Pilot Training Program, enlarged and altered last June to create a reservoir of citizen fliers on which the armed forces could draw for pilot material, already has fed more than 2,600 of its trainees to Army and Navy air training centers, according to Jesse H. Jones, Secretary of Commerce.

Secretary Jones said the figures have just been compiled in a canvass of 571 commercial flight centers which participated in the training up to September. The number has been increased since September to more than 700 centers, but the 18,000 students now in training will not complete their civilian courses until February.

Army air schools have drawn 1,935 of the civilian volunteer pilots and the Navy 701, the survey shows.

(*See* PILOT TRAINING, *page 501*)

275773—40

U. S. DEPARTMENT OF COMMERCE

CIVIL AERONAUTICS JOURNAL

ISSUED TWICE MONTHLY BY THE CIVIL AERONAUTICS AUTHORITY

Vol. 1 DECEMBER 1, 1940 No. 23

PUBLISHED WITH THE APPROVAL OF THE DIRECTOR OF THE BUREAU OF THE BUDGET

Issued on the 1st and 15th of each month. Subscription $1 (foreign $1.50) per year. Single copies 5 cents. Sold by the Superintendent of Documents U. S. Government Printing Office, Washington, D. C

IN THIS ISSUE

Aeronautical Legislation

The Seventy-Sixth Congress at its third session enacted into law a number of bills affecting aeronautics. Because of heightened interest in aviation coincident with current national defense measures, the CIVIL AERONAUTICS JOURNAL presents a list of those bills which already have become law; a list of C. A. A. appropriation laws passed at this session; and a list of pending aeronautical legislation.

Laws Already Passed

Public Law No. 426. Approved March 5, 1940. To facilitate the procurement of aircraft for national defense.

Public Law No. 635. Approved June 15, 1940. To authorize the construction or acquisition of naval aircraft, the construction of certain public works, and for other purposes.

Public Law No. 671. Approved June 28, 1940. To expedite national defense, and for other purposes.

Public Law No. 674. Approved June 29, 1940. To provide for the administration of the Washington National Airport, and for other purposes.

Public Law No. 703. Approved July 2, 1940. To expedite the strengthening of the national defense.

Public Law No. 721. Approved July 2, 1940. Extending the jurisdiction of the Civil Aeronautics Authority over certain air-mail services, and for other purposes.

Public Law No. 774. Approved August 27, 1940. Relating to transportation of foreign mail by aircraft.

Public Law No. 775. Approved August 27, 1940. Increasing the number of naval aviators in the line of the Regular Navy and Marine Corps, and for other purposes.

Public Law No. 795. Approved October 4, 1940. To further amend section 13a of the National Defense Act so as to authorize officers detailed for training and duty as aircraft observers to be so rated, and for other purposes.

Public Law No. 856. Approved October 14, 1940. Authorizing special arrangements in the transportation of mail within the Territory of Alaska.

Public Res. No. 105. Approved October 10, 1940. Authorizing the participation of the United States in the celebration of a Pan American Aviation Day, to be observed on December 17, of each year, the anniversary of the first successful flight of a heavier-than-air machine.

C. A. A. Appropriation Laws

Public Law No. 459. Approved April 18, 1940. Independent Office Appropriation Act, 1941.

Public Law No. 667. Approved June 26, 1940. First Supplemental National Defense Appropriation Act, 1941.

Public Law No. 812. Approved October 9, 1940. First Supplemental Civil Functions Appropriation Act, 1941.

Public Res. No. 88. Approved June 26, 1940. Emergency Relief Appropriation Act, fiscal year 1941.

Pending Aeronautical Legislation

Air Line Pilots' Reserve (S. 4155).
Air Markers, appropriation for (H. R. 10199).
Airports, Federal aid in construction (S. 4146; H. R. 10067).
Airports tied in with highways (S. 4195).
Civilian pilot training (H. R. 9827).
Department of, created (H. R. 10049, 10121).
Division of Aviation Education in Office of Education (S. 4041; H. R. 9974).
Landing areas, development of (S. 3620; H. R. 9049).
Lighter-than-air craft, development for foreign commerce (H. R. 7700, 7701, 7725).
Salvage and life-saving at sea, provision for (S. 4225).
Training certificates, issue and redemption of, by Civil Aeronautics Authority (S. 3793; H. R. 9786).

Hinckley

(*Continued from page 489*)

that the airlines, which now use 185 fields, could serve some 50 other communities if there were adequate airports. Doubtless you know that the armed forces are occupying about 100 civil airports now or soon. Civilian pilot training also is on the increase."

Illustrating the national need for airports, Mr. Hinckley pointed out that air transport has grown from a very shaky industry to a very sound one in the past 2 years. The passenger business of the airlines has increased 90 percent in those 2 years; their mail business by one-third; their express business by one half—airline profits have increased from about $1,500,000 in 1938 to $6,000,000 in 1940, he said.

In private flying—non-air-carrier operations—the record is just as good. The number of miles flown has nearly doubled. The number of airplanes has increased more than 50 percent, and now includes nearly 16,000 aircraft. The number of certificated civilian pilots, of all grades, has jumped from 20,000 to 55,000, an increase of well over 150 percent. Consumption of fuel has increased 60 percent. Last year there were only 26,000 civilian pilots in the country; next year there will be about 100,000, he added.

He called attention to the restrictions of the present program which limit the work to not more than 250 locations, and the sole criterion of selection is importance of the project to national defense. This will be determined by the concerted opinion of the Secretaries of War, Navy, and Commerce. The C. A. A. long-range plan, he said, envisaging future requirements, calls for a system of 4,000 landing areas, with additional investments in excess of $550,000,000 in the next 6 years.

Mr. Hinckley stated that it is useless for a community to try to "sell" a project in Washington. "The armed forces already have listed, as of major importance, several times as many airports as current money can build," he added.

Concluding, he pointed out that Federal airways experts estimate a volume of air traffic by 1945 that will be from 20 to 30 times what it is today.

"Our research people are conducting experiments with new-type small airplanes which already indicate a safety factor far above anything known before, and which the average man can learn to fly in a fraction of the time formerly required. These experiments are not as yet complete, and I do not wish to make any statement about them except that the day of easy, safe, cheap flying for the average citizen is *much nearer than you think.* This will mean a tremendous volume of civil flying that is not very compatible, considering the safety factor, with scheduled air transport of passengers, mail, express, and freight. Particularly is this true of training—of instructional flying. In general it also is true of all types of small-plane private flying, because the bulk of such aircraft do not have two-way radio equipment.

(*See* HINCKLEY, *page 501*)

Private Flying

C. P. T. P. Refresher Course Requirements Are Announced

Applicants Must Have Completed Ground Study Identical With That Prescribed for Private Course; Training To Begin in Early 1940

Applicants for solo and amateur and private pilot refresher courses under the Civilian Pilot Training program during the 1940 fall session must have successfully completed in an approved school the 72-hour course of ground study prescribed for the private course.

Flight training under this phase of the C. P. T. P. will be offered to eligible applicants early next year, when those now taking the ground instruction course will have completed their training.

Applicants for the solo and amateur refresher courses must be between the ages of 19 and 26, must meet the requirements of Commercial C. P. T. flight physical examination, and must hold active or inactive solo or amateur pilot certificates or possess the equivalent in certified aeronautical experience. They must have satisfactorily completed one-half or more of the necessary credits leading to a degree in an institution whose credits are accepted by the United States military service from applicants for military flight training.

For the private pilot refresher course, applicants also must be between the ages of 19 and 26, meet the requirements for Commercial C. P. T. flight physical examination, and must have satisfactorily completed one-half or more of the necessary credits leading to a degree in an institution whose credits are accepted by the United States military services for military flight training.

In addition, applicants for this training must hold or have held private pilot certificates not obtained in the controlled private (preliminary) flight course of the C. P. T. P.

Instruction in the solo and amateur refresher course consists of 25 to 30 hours of flight training in the controlled private course, qualifying the trainee for a private pilot certificate.

Instruction in the private pilot refresher course consists of 10 to 15 hours of flight training in the controlled private course standardizing the trainee as a private pilot under the C. P. T. P.

Information concerning these courses and application forms may be obtained from the acting superintendent of civil pilot training in the seven Civil Aeronautics Administration regions.

Pilots Urged to Keep Plane Position Lights in Proper Condition

The Certificate and Inspection Division has written letters to two pilots groups asking that they urge their members to pay more attention to the proper maintenance of their aircraft lights. The organizations to whom the letters were sent are the Airplane Owners & Pilots Association and the Private Fliers Association.

The ability of aircraft position lights to serve as adequate warning of the location of other aircraft at night is a function of the brilliance of such lights, the Division pointed out. Lights which are neglected and not properly maintained will show a very great decrease in candlepower output, the variation after but a few months service being usually between 25 and 50 percent of the original intensity. Under these circumstances the lights are obviously incapable of meeting the minimum performance requirements specified by the Civil Air Regulations.

As a guide to the proper maintenance of these lights, the following procedures have been recommended:

1. *Cleaning of cover glasses.*—It is recommended that owners disassemble their light units and thoroughly wash the cover glasses with soap and warm water. Rinsing and drying should be complete because if a soap solution is allowed to dry, it forms a slight coating thus reducing the efficiency of the light.

2. *Replacement of lamps.*—the lamps should be examined and replaced with new lamps if they have become darkened due to age. Darkening is an indication of impending burn-outs. In the replacement of lamps, if the socket is loose and the lamp may be rotated, the unit should be returned to the light manufacturer for positioning of the socket.

3. *Cleaning of reflectors.*—The reflectors should also be washed, using soap and water in the case of Alzac reflectors, and cleaning with some non-abrasive silver polish in the case of silvered reflectors. Owners can identify which type of reflector is used in their particular lights as the latter type of reflector (silvered) turns a blue-black color due to a chemical reaction, usually as a result of compounds in the air containing sulphur. This coat of tarnish can only be removed by polishing materials and not by the use of soap and water. This latter treatment will suffice for the Alzac reflector, however, as the reflector's efficiency is reduced by an accumulation of dirt and not by a chemical reaction resulting in the formation of the tarnish.

●

DESIGNATION OF MEDICAL EXAMINERS

During the month of October 1940 the following-named physicians were officially authorized to make physical examinations for the Administration.

CALIFORNIA.—Dr. Thomas Reich, 3115 Webster Street, Oakland, and Dr. George F. Keiper, 206 Bank of America Building, Visalia.

FLORIDA.—Dr. Francis D. Pierce, 420 Sweet Building, Fort Lauderdale.

MAINE.—Dr. Sylvester J. Beach, 704 Congress Street, Portland.

MINNESOTA.—Dr. Omer Edward Snyker, Baehr Building, Ely.

MISSOURI.—Dr. Jacob H. Summers, 201 NW. Commercial Street, Lebanon.

NEBRASKA.—Dr. Chauncey M. Pierce, 346 Main Street, Chadron.

NEW MEXICO.—Dr. Robert O. Brown, 125 East Palace Avenue, Santa Fe.

NEW YORK.—Dr. George W. McCormick, 239 Heberton Avenue, Staten Island, and Dr. Edwin F. Comstock, 22 West State Street, Wellsville.

PENNSYLVANIA.—Dr. Wendell J. Stainsby, Geisinger Memorial Hospital, Danville, and Dr. Roland Sumner Murt, 257 East Princess Street, York.

SOUTH DAKOTA.—Dr. Arthur W. Spiry, 412 Main Street, Mobridge.

TEXAS.—Dr. Marcellus A. Walker, Jr., First National Bank Building, Paris, and Dr. Otto J. Juhl, Jr., Vernon Clinic, Vernon.

VIRGINIA.—Dr. Roger G. Magruder, 308 East Market Street, Charlottesville.

WYOMING.—Dr. Doyle Joslin, 210 N. S. Bank Building, Rock Springs.

Airline Medical Examiners

Dr. Wade Hampton Miller, 1306 Bryant Building, Kansas City, Mo.

Dr. Luther H. Kice, Professional Building, Hempstead, Long Island, N. Y.

The following-named physicians no longer are making examinations for the Administration:

Dr. George H. Ham, Los Angeles, Calif.
Dr. Ward C. Zeller, Visalia, Calif.
Dr. Carl W. Robbins, Eugene, Oreg.
Dr. William H. Price, Charleston, S. C.
Dr. George A. Sarchet, Mobridge, S. Dak.
Dr. Robert C. Stokes, Vernon, Tex.
Dr. Andrew D. Hart, Charlottesville, Va.

CAMPAIGN AGAINST CRASHES!

AIR SAFETY

Don't Fly a "Sick" Airplane, Civil Aeronautics Board Says

Report Points Out Menace of Improperly Maintained Aircraft; More Individual Accident Data and Comments

The Civil Aeronautics Board, continuing its policy of discussing many common faults in aircraft operation which have caused accidents, sometimes fatal, now turns its attention to "sick" airplanes.

The Board cites the dangers of operating faulty aircraft, and stresses the duties of airport operators and the pilots themselves in regard to their airplanes. Improper maintenance can cover a multitude of sins, most of which can be charged to negligence, the Board points out.

« »

A SICK AIRPLANE, LIKE A SICK MAN, SHOULD NOT BE MADE TO WORK.—An improperly maintained airplane is a menace not only to its pilot but to every cubic foot of air through which it flies and to every square foot of ground over which it flies.

One of the first duties of airport operators is to be sure that aircraft operating from their bases are airworthy. Pilots, for their own safety and well-being and in consideration for fellow beings, never should fly improperly maintained aircraft.

Improper maintenance can cover a multitude of sins, most of which can be charged to negligence. One of the least excusable of these is failure to maintain a proper reserve of fuel—plainly, running out of gas. Another source is failure to correct conditions revealed in line inspections, collections of moisture after an aircraft has remained on a field overnight may cause malfunctioning of engine parts; improper wire connections may cause failure in flight; tears or strains in surfaces, if not corrected, usually lead to trouble; and many are the pilots who have paid with injury and repair bills the price of a misplaced pin here or there.

Winter air is smooth for flying but it also is cold. In the months ahead, cold air will add problems to operation. Don't add to these problems by overlooking the effects winter is likely to have on your aircraft. Among some of the things to remember are: Before using your cabin heater, take it completely apart, clean it and check it for weak spots; check heater and exhaust manifolds for leaks, to insure against carbon-monoxide fumes entering the cabin; and always make certain, before each flight, that snow, ice, or moisture has not been allowed to accumulate at any point on the plane.

Contact This Reminder.—When you are sick you usually stay in bed. You don't go to work. Treat the airplane the same way for a longer life. When it is "sick" get it well again before you force it to work.

Following are additional individual accident reports prepared by the Board. These reports discuss the crashes, list the probable causes, contributing factors, and in many cases include comments on the lesson to be derived from the report.

IMPROPER ENGINE MAINTENANCE CAUSES FATAL STALL.—An attempted return to the airport, following low altitude engine failure, caused the fatal crash of limited commercial pilot, John F. Cullen, near Medford, Wis., on July 21, 1940. Cullen had reached an altitude of about 60 feet following take-off when his engine stopped. He attempted to turn back to the field but the aircraft stalled and fell into a left spin and crashed. The aircraft, a Porterfield CP–40, was demolished. Subsequent investigation showed the engine to have been improperly maintained. A low grade of fuel had been used; improper spark plugs were installed; and appreciable amounts of foreign matter and water were present in the carburetor and gascolator.

Probable Cause.—Pilot stalled the aircraft during a turn at low altitude following engine failure.

Contributing Factor.—Improper maintenance of the aircraft.

Comment.—1. Aircraft engines are certificated for certain grades of fuel. It is poor economy to use lower grades.

2. Even a high grade fuel is of little value if the fuel contains foreign matter and water.

3. The engine cannot be considered airworthy with improper spark plugs or other parts not approved by the C. A. A.

4. Attempting to return to the field following engine failure on take-off is definitely poor practice.

TURN NEAR GROUND ENDS IN CRASH.—As he attempted a turn at a dangerously low altitude, student pilot, Sherman C. Taylor, met with an accident near Vincennes, Ind., on December 3 which resulted in serious injury to himself and his passenger, Edward McCarty. Student Pilot Taylor, in an Ox–5-powered Curtiss Robin, had hopped from O'Neill Airport at Vincennes to the farm owned by his passenger. Here he circled at very low altitude, just above the tops of trees and fences. The right wing struck the ground in a right turn just after the aircraft had passed over a fence.

Probable Cause.—Action of the pilot in attempting a turn at dangerously low altitude.

Contributing Factor.—Inexperience of pilot.

Comment.—Another student carrying a passenger in violation of the regulations.

FATAL CRASH OCCURS AFTER STALL IN LOW CLIMBING TURN.—A stall during a turn at low altitude caused the death of passenger Austin Williams and the serious injury of private pilot Virgil H. Seiveno near Otay, Calif., on July 19. The two had taken off from the National City, Calif., Airport in a 100-horsepower California Cub D–2 (one of two such aircraft manufactured in 1929) for a local pleasure flight. Evidence indicates that Seiveno flew downwind over the Navy Emergency field at Otay Mesa at an altitude of about 200 feet and then executed a climbing right turn to an altitude of approximately 500 feet. Immediately thereafter a left turn was attempted, during which a stall and subsequent spin developed. The plane crashed in a dive after partial recovery from the spin.

Probable Cause.—Pilot stalled the aircraft during a turn at low altitude.

Contributing Factor.—Inexperience of the pilot.

STRUCTURAL FAILURE CAUSES FATAL CRASH.—A wing failed as student pilot, Marion F. Wainwright, attempted recovery from a tailspin near Belleville, Ill., on April 21, and a crash resulted which brought fatal injuries to himself and his passenger, Forest Able,

Jr., East St. Louis, Ill. Wainwright was flying a Nicholas-Beazley, for which the airworthiness certificate had expired. He was engaged in a local flight and had put his plane through two spins, to the left and then to the right, from an altitude of approximately 1,500 feet. The air pressure which was exerted on the left wing as the pilot attempted to come out of the right-hand spin caused it to fold up and the aircraft dived to the ground. Investigation showed the left outer lift strut bolt on the wing had broken at a point just back of its lock nut.

Probable Cause.—Failure in flight of a lift strut fitting.

Comment.—1. Acrobatics while carrying passenger in violation of regulations.

2. Uncertificated aircraft be flown in violation of regulations.

RECKLESS ACROBATIC FLIGHT ENDS IN CRASH.—A plane engaged in acrobatic flight on September 27, 1939, at the Mississippi County fairgrounds, near Blytheville, Ark., struck a wire attached to a trapeze artist's apparatus and crashed, resulting in serious injuries to student pilot, Jack R. Thornton, and minor injury to his passenger, Alfred E. Gardner. The student pilot was flying low, performing acrobatics over the fairgrounds in a Piper J-2 aircraft. In the course of this flying, the plane struck a wire extended from the top of a 124-foot pole to a pole 12 feet high. The aircraft fell to the ground and was demolished.

Probable Cause.—Failure of the pilot to observe and avoid an obstruction while flying at a dangerously low altitude.

Contributing Factor.—Recklessness of pilot.

Comment.—1. A student pilot has no right to carry passengers.

2. No pilot has a right to indulge in stunt flying at low altitude without special permission of the C. A. A.

3. No person has the right to endanger the lives of others.

ILLEGAL PASSENGER HAUL SPELLS DEATH FOR TWO.—A loss of control during a turn at low altitude resulted in a crash and fatal injuries to student pilot, William V. Aurien, and his passenger, Clark C. Jones, near Robertson, Mo., on July 16. After having executed figure eights at an altitude of about 400 feet, over foothills approximately 200 feet high, Pilot Aurien lost control. The aircraft fell into a nearly vertical dive and crashed. The pilot had failed to maintain flying speed while making a turn about 200 feet above the crest of the hills. The aircraft, an Aeronca KC received major damage.

Probable Cause.—Loss of control during a turn at low altitude.

Comment.—This student was carrying a passenger in violation of civil air regulations.

Civil Aeronautics Board Finds Lightning Probable Cause of Penn-Central Crash

Report on First Major Air Transport Accident States There Was No Evidence of Structural or Mechanical Failure in Lovettsville, Va., Airliner Crash

The coincidence of an intense lightning flash close to the plane, and the plane's abrupt dive to the ground with the absence of any other convincing evidence, moved the Civil Aeronautics Board to assign the disabling of the pilots by this lightning discharge as the probable cause of the crash of the Pennsylvania Central Airline's trip No. 19 near Lovettsville, Va., on August 31.

"Lightning," the Board's report stated, "may have temporarily blinded the pilots or the pressure wave resulting from the lightning may have subjected the pilots to acoustical shock or concussion; may have smashed the cockpit windows, or may have caused other damage to the structure and controls of the airplane through mechanical effect.

"In view of the absence of persuasive evidence that the accident was caused by structural failure of the airplane, mechanical failure of its motors, fire, heavy rainfall, or sabotage, we are left with turbulence, and lightning as the two major possibilities on the present record. While it has been found that the airplane was flying through turbulent air at the time of the accident, it seems highly improbable that turbulence alone could account for the loss of 5,000 feet before recovery of level flight. It is possible, of course, that involuntary interference by the jump-seat occupant, who may have been thrown into the cockpit, could have accounted for the inability of the pilots to regain control once it had been lost.

"Especially in view of the absence of persuasive evidence indicating any other probable cause of the accident, we are greatly impressed by the evidence of the coincidence of the lightning flash seen to be in close proximity to the airplane and the immediate descent of the airplane. Nor is this impression altered by the fact that all-metal aircraft are commonly struck by lightning with no injurious results and that the character of the lightning discharge as well as its effect upon the airplane and crew in the present instance must be regarded as an extremely unusual occurrence.

In its findings of probable facts, the Board pointed out that there was found no failure of the engines, no sabotage, no actual lightning strike on the plane, no fire previous to impact, and no deviation from either Government regulations or company procedure in the conduct of the flight. There was no spinning of the plane in its dive, which was estimated at somewhat over 300 miles per hour at an angle of 30°.

Recommendatons for Research

The Board made certain recommendations for continued research shown to be needed as a result of this accident.

1. The possible effects of lightning upon aircraft. The difficulties of this are recognized, but much has been accomplished in the past 20 years and particular attention should be given to the optical quality of flashes, the nature of their blinding effect, and means of protection against them by use of special windshield glass. Possible mechanical effect on aircraft in flight, and

2. Extension of research on atmospheric turbulence, with special attention to structure at maximum intensity, effects on flight performance and control, predictability of turbulent areas and movements, and other associated phenomena. It is hoped priority can be given such studies by the Weather Bureau, the N. A. C. A., and other Government and private agencies.

3. Development of a system for compilation and correlation of pilot experiences with turbulence or other unusual atmospheric conditions.

4. Immediate reporting to the nearest Weather Bureau station of unusual or unpredicted weather conditions encountered in flight by all pilots for the benefit of other pilots.

INSTRUCTOR, STUDENT INJURED AS PLANE STALLS IN SIMULATED FORCED LANDING.—A stall during a gliding turn at low altitude caused the crash near St. Louis, Mo., on June 3, in which instructor Oswald Dow and student pilot Eldred Epple were seriously injured. Instructor Dow and student pilot Epple were on a practice flight, during which Dow demonstrated a series of turns and then, while flying down-wind, simulated a forced landing by closing the throttle. The student made a proper turn into the wind and was in the landing approach when the instructor interrupted the maneuver by opening the throttle. After the student had placed the airplane in a climbing attitude and attained an altitude of approximately 100 feet, the instructor again closed the throttle to simulate a power failure following take-off. The student attempted a turn down-wind and the aircraft stalled before the instructor could regain control and fell to the ground on its nose. The aircraft, a Piper-J3F, received major damage.

Probable Cause.—Student pilot stalled the aircraft while executing a gliding turn at low altitude.

Contributing factor.—Failure of the instructor properly to supervise a student instruction flight.

Airways and Airports

Report Gives Data on Climatic and Wind Conditions

A report of wind and climatic conditions at 182 airports during periods of restricted visibility, intended for use in planning airport runways, extensions, air-navigation facilities, and instrument landing systems, has been published by the Civil Aeronautics Administration.

The study covers a 5-year period from 1934 to 1938, inclusive, and is based on information supplied through the cooperation of the United States Weather Bureau and the Work Projects Administration, covering up to 24 daily observations at each airport. From this information the C. A. A. developed a type of wind rose [1] chart portraying the results pictorially and showing related data in convenient reference form.

The data, including the charts, have been compiled in C. A. A. Technical Development Note No. 22, dated July 1940, entitled "Low Visibility Airport Windrose Summaries," by Robert W. Knight, Chief, Air Transport Section.

"Surface wind roses of a large number of airports have been available for the past several years, and this information has enabled airport engineers to design airports and plan runway directions advantageously in accordance with the prevailing winds at each location," Mr. Knight wrote in describing the report. "Such data have been quite sufficient up to the present.

"With the advent of reliable instrument-landing equipment, however, it now becomes necessary to determine the direction and velocity of prevailing winds during conditions of restricted visibility as a separate study, since these are not necessarily in agreement with surface winds under other conditions of weather," he continued. "By the use of such information it is possible to plan new airport runways, runway extensions, instrument-landing systems, and other air-navigation facilities to the best advantage for bad-weather approaches and landings."

The study from which the report was prepared was in progress for more than a year, during which time about 7,000,000 weather observations were reviewed. The report contains charts covering most of the airports in the United States for which weather data were available. The number of airports included in the study was limited only by the availability of sufficient data for each location; therefore, omission of certain cities was due to the lack of such data, or of sufficient data to draw any worthwhile conclusions. It is believed preferable, Mr. Knight said, to eliminate the chart for an airport entirely rather than to present a distorted picture due to insufficient data or the occurrence of only one or two conditions of restricted visibility during a period of several years.

Charts for C. A. A. Intermediate Fields are being compiled separately as are the charts for certain airports in Alaska, Hawaii, Puerto Rico, and other possessions of the United States.

Copies of the report are available to interested parties. Communications should be directed to the Correspondence Unit, Civil Aeronautics Administration, Washington, D. C.

[1] A wind rose, according to the U. S. Weather Bureau, "Glossary of Meteorological Terms," is (1) a diagram showing the relative frequency and sometimes also the average strength of the winds blowing from different directions; (2) a diagram showing the average relation between winds from different directions and the occurrence of other meteorological phenomena.

State Cooperation Sought in Protection for Airport Approaches

In connection with its general Nationwide airport program, the Civil Aeronautics Administration is conducting a continuing program of promotion and education to secure proper zoning of the property around public airports, preventing obstruction of their aerial approaches. The maintenance of clear approaches to airports is properly the function and responsibility of the States and their political subdivisions, according to Airport Section officials, and this educational program is being carried forward in an effort to bring about a more widespread realization of this fact and the necessary legislative action that would result.

As part of this program, whenever a W. P. A. airport project is approved by the Administrator, a letter is sent to the chief executive official of the political subdivision sponsoring the project, calling attention to this problem and stating that it may, unless solved, "make ineffective or depreciate not only this proposed Federal expenditure but the total investment of public funds" represented by the airport.

In describing the problem, it is stated that, "This problem is that of protecting the aerial approaches of airports against obstruction, a problem occasioned by the fact that, without such protection, buildings, transmission lines, other structures and objects of natural growth may be expected to be erected, altered or allowed to grow in the vicinity of an airport to heights making them obstructions or hazards to the landing and taking-off of aircraft at such airport.

"Such obstruction of approaches * * * would not only endanger the lives and property of users of the airport and the occupants of land in its vicinity, but in effect reduce the area usable for landing and taking-off, thus threatening and perhaps destroying the utility of the airport and the public investment therein. Obviously it would become increasingly difficult, if not impossible, to justify expenditures of Federal funds for the development of airports, the approaches of which are not adequately protected," the letter points out.

Another phase of this program has been the preparation of a preliminary draft of a uniform Airport Zoning Enabling Act, with a view to recommending enactment of such legislation by the many State legislatures convening next January. This preliminary draft is now being circulated among experts for their comment and criticism.

The Airport Section also has prepared a drawing illustrating its present approach recommendations, including those as to the maximum heights (above elevation of landing area) to which structures and other objects located in airport approach areas should be erected. Another phase of the program is the distribution by the C. A. A. of excerpts from its Airport Survey report to Congress of March 1939, concerning airport approaches and zoning. All of this material is available to anyone interested, upon request to the Airport Section.

AERONAUTICAL CHARTS

During October 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 now are obsolete.

Regional charts, a series of 17 scaled at 1: 1,000,000, sell for 40 cents each; direction finding charts, a series of 6 scaled at 1: 2,000,000, sell for 40 cents each; and sectional charts, a series of 87 scaled at 1: 500,000, sell for 25 cents each. On orders grossing $10 or more, including assortments a 33⅓ percent discount is allowed.

New Regional Aeronautical Chart

7-M.—October 1940. Size, 26 by 43 inches. Located in latitude 38°–44° N., longitude 102°–114° W., covering an area of about 245,000 square miles. This new chart, the eleventh issued of this series of 17

(*See* AERONAUTICAL CHARTS, *page 501*)

Manufacturing and Production

Flight Load Factors

AIRCRAFT AIRWORTHINESS SECTION REPORT CONSIDERS POSSIBLE IMPROVEMENTS IN THE MANEUVERING LOAD FACTOR REQUIREMENTS FOR SMALLER AIRCRAFT

Aircraft Airworthiness Section Report No. 8, MANEUVERING LOAD FACTORS discusses the question of maneuvering load factors for small and medium-sized airplanes.

It is being used in the Civilian Pilot Training Program, along with Report No. 7 and Report No. 10, for instruction in flight load factors.[1] Full text of the report follows:

Flight Load Factors

1. INTRODUCTION.

In Aircraft Airworthiness Section Report No. 6, a brief history of the load factor requirements was presented and recommendations were made concerning gust load factors. The maneuvering load factor requirements for large airplanes (about 3,000 pounds) were also discussed. Aircraft Airworthiness Section Report No. 7 gave a simplified discussion of gust load factor principles. This paper will take up the question of maneuvering load factors for small and medium-sized airplanes.

2. BASIC CONSIDERATIONS.

There are so many different considerations to be kept in mind in connection with the maneuvering load factor requirements that it might be well to begin by listing the most important of these, as follows:

(*a*) Adequate strength to withstand maneuvers imposed in training or acrobatic flying.
(*b*) Provision for "overloading" in long-distance operation or special flights.
(*c*) Desirability of being able to change engine power without changing load factor.
(*d*) Desirability of conforming more closely with foreign requirements (for reciprocal agreements).
(*e*) Simplification of load factor calculation and application.
(*f*) Need for operation limitations to avoid overloading of the structure in flight.

3. REQUIRED STRENGTH.

The first question to be considered is whether the present system of load factors provides adequate strength for such flight maneuvers as the pilot is likely to perform. This question can only be answered by making some assumptions as to the severity of the maneuvers involved, or by the statistical method of examining accident records.

[1] Report No. 8 covers Part II of the subject. Report No. 6, published in CIVIL AERONAUTICS JOURNAL, No. 19, dated October 1, covered load factor information for large airplanes.

NEW TYPE APPROVALS

[Approval numbers and dates of assignment in parentheses]

Type Certificates

Propellers

Pilot, A101, wood, 5 feet 11¾ inches diameter, 2 feet 8 inches pitch, 40 horsepower, 2,550 revolutions per minute (750, 10–29–40).

Pilot, A103, wood, 6 feet ½ inch diameter, 2 feet 10 inches pitch, 65 horsepower, 2,550 revolutions per minute (751, 10–29–40).

U. S. Air Industries, 5726, wood, 6 feet 4 inches diameter, 4 feet 3 inches pitch, 65 horsepower, 2,350 revolutions per minute (752, 10–29–40).

Gardner, 3829, wood, 6 feet 4 inches diameter, 3 feet 0 inches pitch, 65 horsepower, 2,200 revolutions per minute (753, 10–31–40).

Airworthiness Certificates

Aircraft

Interstate, S–1 Cadet, 2 place closed land monoplane. Engine, Continental A–50–8 (2–558, 10–28–40).

New Models Added To Old Type Approvals

[Approval numbers and dates of approval of new models in parentheses]

Engines

Continental, W–670–6A, 7 cylinders radial air cooled, 220 horsepower at 2,075 revolutions per minute at sea level pressure altitude. (Approved Type Certificate No. 162, 10–21–40.)

Pratt & Whitney, Wasp Jr. T1B1, 9 cylinders radial air cooled, 400 horsepower at 2,200 revolutions per minute at 5,000-feet pressure altitude. (Approved Type Certificate No. 123, 10–23–40.)

Wright, Cyclone 718C9GB1, 9 cylinders radial air cooled, 775 horsepower at 2,300 revolutions per minute at 17,300-feet pressure altitude. (Approved Type Certificate No. 192, 10–28–40.)

Appliances

American Airlines, Safety belts, models CD–220, CD–238, CDS–460, CDS–576, CDS–855, CDS–864, and CDS–886. Approved for one person. (Type Certificate No. 107, 10–28–40.)

In Aircraft Airworthiness Section Report No. 6, it was shown that all attempts to derive a "load factor formula" have been relatively unsuccessful, probably due to the impossibility of evaluating the pilot's reactions and his degree of confidence in the airplane. Figure 1 of Report No. 6 shows that all previous revisions of the maneuvering load factor requirements have actually been more or less inconsequential and that present requirements are not greatly different from those of 10 years ago.

In view of the obvious difficulty of anticipating the pilot's handling of the airplane, it seems advisable to consider attacking the problem from a different angle, that of *operation*. This point of view has recently been very well expressed by Dr. Pugsley, of the British Air Ministry, as follows (reference 1):

> "A third and incidental point derives from this. When the civil aeroplane accident statistics published for this country and the United States Army are reviewed, one cannot help being impressed by the fact that the greater proportion of accidents are attributed to other-than-material causes, such as personnel, handling qualities, weather and airport conditions. In some ways this points to the relative success of past structure and engine design, but it seems to call also for the direction of special attention from the safety standpoint to operational and related matters. Such action would be consistent with the trend of our national efforts to reduce road transport accidents, and would be in effect an application of the argument for 'balance' made in our preliminary remark on accuracy."

Applying this line of reasoning to the problem of maneuvering load factors, it seems reasonable to assume that almost *any* method of determining design load factors would be suitable, *provided* there was a sure way to insure that these load factors would not be exceeded in flight. This brings up the question of operating limitations, as it is obvious that we cannot afford to design commercial airplanes to withstand the maximum accelerations that could be obtained by the pilot at high speeds. (See Aircraft Airworthiness Section Report No. 6, p. 5.)

Before going into the problem of operating limitations, a few remarks on the statistical situation might be in order. If there were enough failures of airplanes in flight, it might be thought possible to use these statistics as a direct basis for specifying load factors. To a certain extent this is true, but we are, fortunately, hampered by a lack of accidents resulting from inadequate strength in flight. Even if such statistics were available in considerable quantities, the problem of determining the exact cause of the failure would still be very difficult. Perhaps the airplane might have

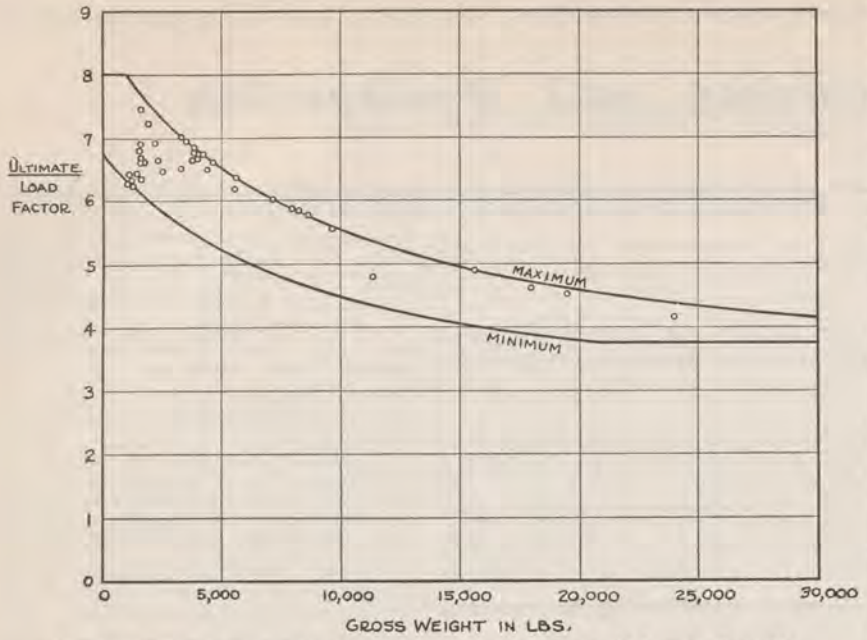

Figure 1.—Required maneuvering load factors for several airplanes (high angle of attack).

been in a poor state of repair or the pilot failed to use reasonable discretion. Evidently we cannot hope to rely entirely on the statistical method in attempting to improve the present requirements.

Accident statistics collected to date do, however, indicate a trend that causes the Aircraft Airworthiness Section some concern. There seems to be an increasing number of cases in which small airplanes have experienced some form of structural failure or damage during severe flight maneuver. Accident reports usually reveal that the pilot was diving at a relatively high speed and that the failure occurred during the pull-out. Extensive structural tests and examinations have failed to reveal any reason for the increase in such accidents except the possible change in manner of operation. This is borne out by the fact that the airplane types involved have been widely used for a long time and had previously indicated no need for extra strength.

This trend toward more severe maneuvering of small airplanes has been evident for some time and has possibly been accelerated by the recent increase in private flying activity. The publicity attracted by stunting also tends to build up a greater degree of confidence in the ability of small airplanes to withstand severe maneuvers. A typical report by an observer at an air meet reads somewhat as follows:

> ". . . for pilots there was great interest in watching the stunting of small airplanes; one boy . . . did slow rolls, an outside loop, and inverted flying . . ."

In view of the change in the *operational* picture that seems to be occurring, the Aircraft Airworthiness Section feels that definite steps must be taken as soon as possible to effect a better balance between operations and load factor requirements. Various ways in which this might be done will now be taken up in greater detail.

4. Strength of Present Airplanes.

Before discussing any possible revision of the requirements, it is of interest to see what can reasonably be expected of airplanes designed to the load factors now required. Figure 1 shows the present ultimate maneuvering load factor (for Condition I) plotted against gross weight. The required load factors for various United States airplanes are also indicated on this chart. (Note that in some cases the gust load factor might be higher than the values shown and would therefore have to be used in design.)

It will be noted that most design factors for airplanes up to 5,000 pounds gross weight lie between 6 and 7, and that there are apparently no cases of load factors below 6.0 in this range. An ultimate load factor of 6 corresponds to a *limit* load factor of 4 (using the required factor of safety of 1.5). It appears, therefore, that most airplanes under 5,000 pounds ought to be capable of being operated up to actual load factors of at least 4 without experiencing any noticeable permanent deformation of the structure and certainly without a complete failure of any structural member.

An actual load factor of 4 "g" ought to be sufficient to enable a pilot to perform any of the elementary and intermediate maneuvers. A skilled pilot who was aware of the strength limitations of his airplane could no doubt perform almost any acrobatic maneuver without exceeding 4g.

This is further verified by actual measurements of accelerations such as reported in reference 2. In this report it was shown that the most probable acceleration factor in a wide variety of maneuvers was in the order of 3. There were practically no cases where the acceleration exceeded 4 'g".' The tests made included turns, dive and pull-out, half-roll and dive, upward roll, slow roll, snap roll, half loop and roll-out, normal loop, and "rocket" loop. In the last-named maneuver there was one case (in 26) when the acceleration exceeded 4 "g" (actual value 4.4). The conclusion of this report is worth repeating here, even though the actual values of load factors may not be entirely accurate for modern airplanes:

> "For maneuvers correctly performed by skilled pilots, the average maximum acceleration is of the order of 3 "g" . . . There is evidence to show that higher values would be obtained by unskillful or inexperienced pilots."

We can also turn to a classical report on this subject written over 14 years ago (reference 3) and quote some of the observations that still seem to be true today:

> "The accelerations in suddenly pulling out of a dive are greater than those due to any maneuver started at the same speed . . ."
>
> "The results of the different loops show that the loads which occur in this maneuver depend upon how abruptly the pilot pulls back on the control stick when starting a loop at any given speed. In the recovering from the upside down position at the top of the loop, the pilot tends to allow the airplane to dive farther than is necessary and then pulls out too abruptly. In case the airplane stalls in the upside-down position, the tendency to do this is even greater, because the pilot is anxious to regain flying speed. Then, after regaining flying speed, he recovers as quickly as possible in order to avoid unnecessary loss of altitude. This, of course, imposes greater loads than are actually necessary."

Finally we can examine the V–g records obtained from six different types of small commercial airplanes over a considerable period of operation. Disregarding the possibility that the load factors might have been caused by gust, the maximum values shown on various records are about 2.9 "g". This was exceeded in only one case, which went to 3.2 "g". Perhaps the fact that the majority of these airplanes were flown by skilled pilots (C. A. A. inspectors) accounts for the close agreement with the conclusions of the British report (reference 2).

Summarizing the above observations on operational limits for present-day commercial airplanes, it appears that for all airplanes small enough to be considered highly maneuverable (up to 5,000 lbs. gross weight) there is no necessity for increasing the maneuvering load factors for *normal* operations. In fact, it appears that a constant value of 4 *limit*, or 6 *ultimate*, would be adequate for all flight maneuvers, *provided* that the pilot is aware of this acceleration limitation and *further* provided that he is skillful enough to prevent the airplane from exceeding it.

5. Basis for Load Factors.

In Aircraft Airworthiness Section Report No. 6 it was shown how the use of power loading as a basis for load factors has gradually become more difficult to handle rationally. Figure 1 of that report shows that the present tendency is to "narrow" the range of load factors toward a single curve depending only on gross weight (as used in most foreign requirements). Figure 1 of this paper shows also that the use of power loading as a variable does not actually cause a variation in ultimate load factor of more than about 1.0 (6 to 7). In view of the advantage of simplification, it is therefore of interest to *consider dispensing with power loading entirely*, as a basis for determining the maneuvering load factor.

For *normal* operations of small airplanes it would seem that a *limit* load factor of 4, with a corresponding *ultimate* load factor of 6 would be entirely satisfactory. In the small weight range covered by these airplanes there also seems to be no basis for a variation of load factor with gross weight, at least up to weights of about 5,000 pounds. There remains the problem of preventing failures of airplanes that are either deliberately (through ignorance or lack of discretion) or unintentionally (through lack of skill) subjected to actual load factors considerably greater than 4. This problem can be, and should be, attacked both from the *operations* standpoint and by revising the airworthiness requirements. Leaving the matter of operations to be taken up later, we can consider ways and means of providing for unusually severe pull-up load factors on commercial airplanes. This seems to indicate the need for an "acrobatic" category.

6. Acrobatic Categories.

Most foreign requirements include one or more "acrobatic" categories, in which the required *ultimate* load factors are generally around 9 or 10. Military aircraft, of course, fall into various categories which depend on the purpose and use of the airplane. In this country the original load factor requirements were based on power loading, with the idea that highly-powered airplanes would naturally be used for acrobatic flying. While this method has provided rather high load factors and has therefore been satisfactory for highly-powered airplanes, it does not preclude the possibility of using low-powered airplanes in a violent manner. On the other hand, the use of high power does not necessarily imply acrobatic flying, as the main object in some types of operation might be to improve the take-off with a heavy load.

The present system therefore does not seem to permit the widest possible range of "airworthy" operations for commercial airplanes, while it fails to offer a basis for restricting the operation of "low load factor" airplanes to normal flying (i. e., straight flying and carefully performed acrobatic maneuvers). In addition, the use of power loading as a basis for load factor determination has always created difficult administrative problems, as there is a constant tendency to increase the power for most designs, resulting in higher load factors for an airplane already constructed. If an "acrobatic" category can be established without too much difficulty, it should therefore offer a solution to a number of new and old problems.

It should be noted that the word "acrobatic," although widely used, is probably somewhat unfortunate when used to classify airplanes. It has already been shown that any commercial airplane designed for *normal* requirements can be used for acrobatic flying if *properly handled*. The real need for a special category is to provide extra strength against unusually abrupt pull-ups at high speeds. For the present, however, we shall continue to use the word ACROBATIC, with the understanding that it implies no restrictions of the NORMAL category, except as to load factor developed.

It might be supposed that the establishment of a category requiring higher load factors would imply a corresponding increase in structural weight. On the contrary, it is possible for many present-day airplanes to develop "acrobatic" load factors without exceeding the loads for which they were designed. The answer to this lies in the *operating weight*. For instance, a *limit* load factor of 4 on a 2,000-pound airplane corresponds to a total air load of 8,000 pounds on the wing. But if the airplane is flown at an actual weight of 1,500 pounds, it would require a *limit* load factor of 8000/1500, or 5.33, to produce the same total load on the wing. (This gives an *ultimate* load factor of 5.33×1.5, or 8.0). Actually the allowable increase in load factor is even greater for the wing structure itself, as the comparison should be based on the *net* weight, that is, the weight of the airplane less wings. If, for example, the wing weighed 300 pounds, the increase in load factor would be in the ratio of 1700/1200 or 1.42. This would give allowable load factors of approximately 5.7 *limit* and 8.5 *ultimate*. These factors are comparable to those used for the acrobatic categories of various foreign countries. (British requirements specify 9 *ultimate*.)

It can be seen that one airplane type could qualify for both NORMAL and ACROBATIC categories, operating at an increased weight in the normal category. This system is actually followed in several foreign countries and represents a logical answer to the problem of rating aircraft that may be used for widely different purposes.

The Aircraft Airworthiness Section feels that an "acrobatic" category should definitely be established as a part of the solution to the *operation* problem. The actual values of load factors to be specified should probably be in the order of 6 *limit* and 9 *ultimate*, although it might be reasonable to consider a reduction in the required factor of safety to something less than 1.5. (This could be illustrated, for instance, by *limit* and *ultimate* load factors of 6 and 8, respectively.) To get a better idea of what load factors can be developed by existing airplanes at reduced weight, certain information is requested in the attached questionnaire blank. With sufficient information of this type, it should be possible to set up an "acrobatic" category that would permit the majority of present commercial airplanes to meet the higher load factor requirements simply by decreasing the pay load.

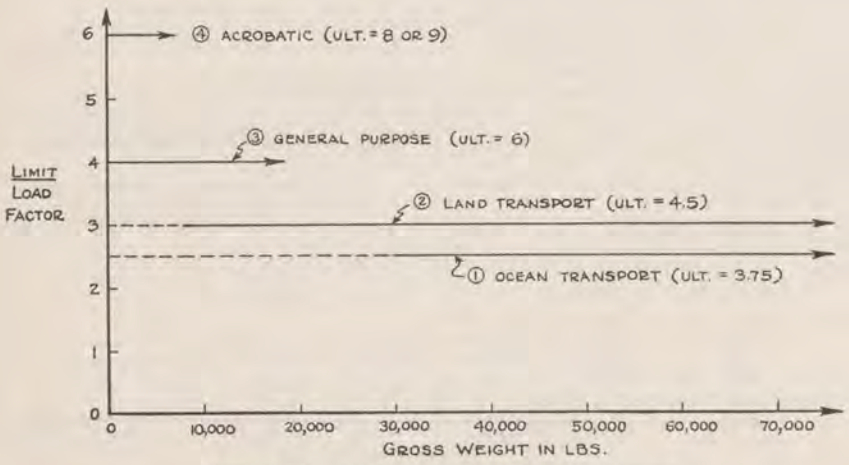

Figure 2.—Graphical representation of operation classes.

7. Operations Categories.

Before taking up the question of operation limitations, the problem of *transition* from one category to another will be discussed To give a clearer picture of how the maneuvering load factor requirements for all airplanes would be affected by the suggestions made to date in these reports, we shall include the recommendations of Aircraft Airworthiness Section Report No. 6. To emphasize that *operation* is the real basis for classification, the classes will be designated accordingly, as follows: (Note that "NORMAL" has been replaced by "GENERAL PURPOSE," to avoid an impression that other types of operation are *not* normal.)

Class of operation	Typical load factors	
	Limit	Ultimate
(1) Ocean transport	2.5	3.75
(2) Land transport	3.0	4.5
(3) General purpose	4.0	5.0
(4) Acrobatic flying	6.0	9.0 (or 8.0)

It is important to note that these classes or categories are independent of the type of airplane and refer only to the manner of operation. It therefore becomes possible to consider dispensing not only with *power loading*, but also with *gross weight* as a basis for determining the maneuvering load factors. This simply means that the operation classes would be set up independently of the gross weight and could be visualized as indicated on figure 2. In this figure the dotted lines indicate "improbable" design ranges, in which the suitability of the airplane from an *operating* standpoint might be questioned.

Under a system of this type, an airplane could be designed to comply with requirements for one or more classes of operation. It would be necessary to define clearly the nature of the operations represented by the various classes and to take steps toward insuring that the necessary restrictions on loading, speeds, pull-ups, etc. were complied with. The designer would be free to make his own choice of category, knowing in advance the nature of the operating limitations involved.

It is interesting to note that this general method of determining design load factors has been employed by all military agencies from the very beginning. The answer is, of course, that military operations naturally fall into definite classes, for which certain load factors are required. Going back over the history of the United States civil requirements (see Aircraft Airworthiness Section Report No. 6), it can be seen that the greatest difficulty encountered in originally specifying suitable load factors was the lack of definite classes of operation. At that time (13 years ago) civil aeronautics had not developed to a point where such classes of operation existed, and most airplane types were of about the same gross weight and speed. There was probably no specific need for a "high-strength" category, and certainly no anticipation of ocean transport operation in airplanes weighing over 50,000 pounds. Even at that time, however, the use of gross weight and power loading was actually an indirect method of classifying airplanes as to *operation*. Failure to recognize this fundamental basis for the United States load-factor requirements has probably led many investigators to attempt a "rationalization" process in which the load factors would come out as definite functions of weight, power loading, and other variables. As pointed out in Aircraft Airworthiness Section Report No. 6, the results of such attempts have usually been discouraging, as far as practical conclusions are concerned.

The operations picture has changed so greatly in the past ten years that it does not seem possible to establish a single curve of load factor against gross weight which would represent "normal" operations with any degree of rationality. Such a process literally amounts to guessing what types of operations are likely to be undertaken with an airplane of given weight, regardless of all other considerations. This is really a matter to be settled by the *operator:* the use of strength categories then becomes a convenient means of determining under what operating conditions the airplane is "airworthy."

To illustrate this by a typical example, we might assume that a 2,000-pound airplane is designed primarily for the "general purpose" category (*ultimate* load factor of 6). It might be found possible to comply with the "acrobatic" category by reducing the gross weight to 1,500 pounds, possibly making a few minor changes in the structure. On the other hand, if some pilot wished to make a nonstop cross-country flight in this airplane, he would probably have to overload it to a weight greater than 2,000 pounds. It would be possible to operate up to a weight of around 2,500 pounds by dropping into the LAND TRANSPORT class and accepting the operating restrictions set up for that class. The "gust" loads change very little with changes in gross weight, but in any case this could be taken care of by modifying ROUGH AIR placard suggested in Aircraft Airworthiness Section Report No. 6.

Each operations category would, of course, have certain requirements other than load factors (such as landing speed, etc.). The basic idea of operations categories could therefore be used in connection with other airworthiness requirements, as well as for load factors. As a matter of fact, the present requirements for equipment, performance, and many other phases of airworthiness are already based to a large extent on the type of operation involved.

It should be noted that the use of different load factors for large landplanes and flying boats (proposed in Aircraft Airworthiness Section Report No. 6) has been replaced in this report by the LAND TRANSPORT and OCEAN TRANSPORT categories. This divorces the operation categories entirely from the airplane type and thereby permits a reduction of load factor for *landplanes* that are used for long distance flights over water. The reasons for requiring lower load factors for ocean transport *operations* should be more obvious than reasons for permitting flying boats to have lower factors. As mentioned in Aircraft Airworthiness Section Report No. 6, there seems to be certain operational differences that would warrant the use of somewhat lower load factors for long-distance flights over water. Such flights are usually started from points relatively free from obstructions; bad weather is avoided, at least for a considerable distance (after which the fuel load would be appreciably reduced); and the operator usually wants to utilize every possible pound of pay load, in view of the large percentage of useful load absorbed by fuel and oil weight. Under such conditions the use of a slightly lower load factor actually amounts to permitting a certain degree of overloading during the first part of the flight. At the end of about 6 hours flight the airplane would probably be operating in the next higher (land transport) category, due to the reduction in weight of fuel.

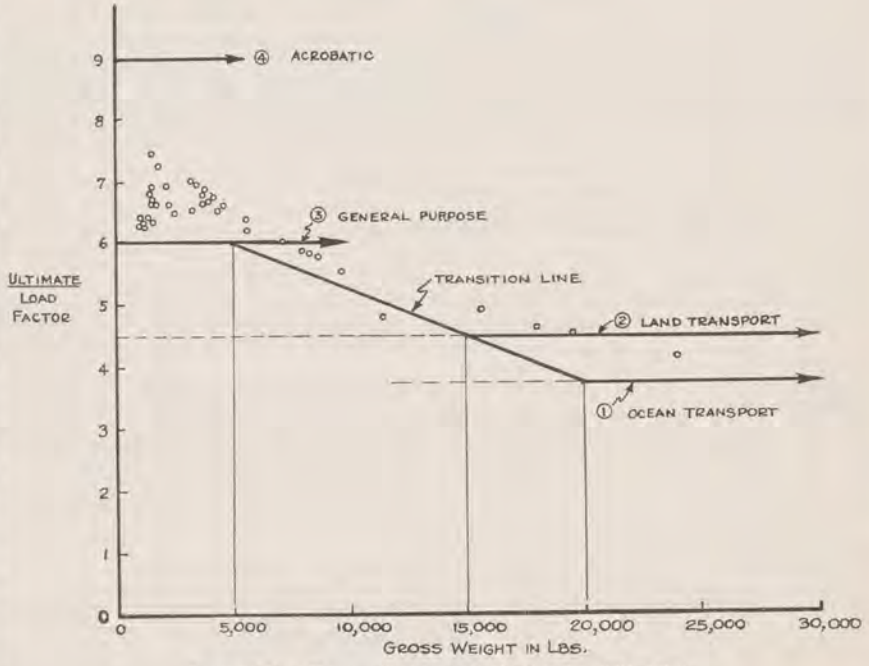

Figure 3 (a).—Proposed maneuvering load factors (ultimate).

8. Modifications of Category System.

The idea of setting up independent classes or categories based entirely upon operation depends, for its success, on maintaining operations within the restrictions imposed by the various categories. This proposal must be regarded, therefore, as an objective that can be reached only through a general acceptance of the "operational" basis of airworthiness rating. As far as "large" airplanes are concerned, there seems to be no reason why the system could not be adopted immediately, as the transport operators already maintain a close control over operations. Furthermore, the load factors for present airplanes would not be changed in this weight range. The proposed LAND TRANSPORT and OCEAN TRANSPORT classes therefore seem to be suitable for immediate adoption for "large" airplanes (approximately 30,000 pounds gross weight or more).

Going to the other end of the weight range and considering airplanes less than 5,000 pounds gross weight, adoption of the upper two categories (GENERAL PURPOSE and ACROBATIC) would seem to be in order. This would amount to a slight reduction of the minimum *ultimate* load factor for present airplanes in this class. It would also introduce the ACROBATIC category for the first time. It is felt that the presence of an ACROBATIC category would more than offset the reduction in load factor for certain airplanes, as it would represent an important step toward more intelligent operation of small airplanes. The manner in which various airplanes would be affected can be observed from figure 3, which shows the proposed categories, together with points representing the required maneuvering load factors for the majority of United States commercial airplanes. (It should be remembered that in some of these cases the actual design load factors may be higher than indicated, as *gust* loads might have been critical.)

Finally we must consider the range of gross weights between 5,000 and 30,000 pounds. From figure 3 (a) it can be seen that such airplanes might be classed either as GENERAL PURPOSE or LAND TRANSPORT. If the latter classification were used, the load factor would in some cases become considerably less than that now required (see fig. 3). Until a better conception of the operations classes is established, it is felt that it would be inadvisable to permit the use of LAND TRANSPORT load factors in cases involving a large reduction below present requirements. To guard against this, it is proposed to adopt a "transition line" such as shown on figure 3 (a). This line would establish a lower limit for maneuvering load factors in the "intermediate" weight range.

The line shown in figure 3 (a) has been drawn so as to lie slightly below the required values for most existing airplanes. (The single exception is a cargo airplane.)

The load-factor lines for the two lower categories in figure 3 (a) have been extended into the "intermediate" region by broken lines. This is to signify that the "transition line" may eventually be abandoned entirely. It might also be interpreted to mean that airplanes in this range may be operated in the lower categories for *special purposes*; i. e., with specific approval for the operations in question. This would afford a more rational solution to the problem of authorizing long-distance flights in small or medium-sized airplanes. The case of the "cargo" airplane previously mentioned could also be handled in this manner, as it would seem reasonable to permit the immediate use of the TRANSPORT categories even for smaller airplanes, when used for cargo-carrying purposes only.

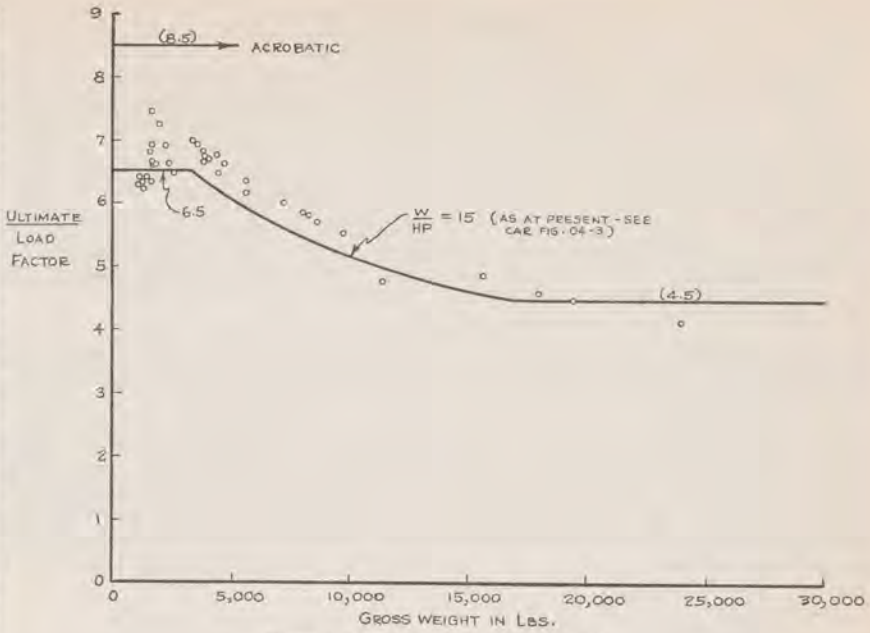

Figure 3 (b).—Alternate proposal to 3 (a).

Summarizing the possible revisions of the maneuvering load-factor requirements, it seems best to set up, as an objective, categories or classes based on the *operation* of the airplane. The load factors for each class would be independent of both power loading and gross weight, as indicated on figure 3 (a). Pending the final use of such a system it seems possible to adopt it as a basis for present revisions, simply by establishing a "transition line" representing the approximate variation of load factors with gross weight for present airplanes. This line would constitute a lower limit for load factors until the idea of operations categories had become well established. In the meantime, it would be possible to utilize the load factors in the range below the "transition line" for special purposes, such as cargo-carrying, long-distance flight, etc. The suggested revisions seem to cover, in a satisfactory manner, all the basis considerations listed under section 2 of this paper. (Please refer again to this list and use it as a basis for comparing the proposed requirements with the existing system.) An alternative proposal is shown in figure 3 (b). This consists in utilizing the present load factors for a power loading of 15 in place of the straight "transition line" of figure 3 (a). The upper limit in the low weight range has also been raised to 6.5 (instead of 6) and the acrobatic factor is shown as 8.5. This proposal is added to indicate other means of solving the problem, as there is admittedly no one system that can be said to be entirely rational.

9. Factors of Safety.

The present requirements provide for both "yield" and "ultimate" factors of safety. These are defined in CAR 04.122, .123, .200, .201. At present the ultimate factor of safety has a minimum value of 1.5, which may be further increased in certain cases (CAR 04.270). The "yield" factor has actually never been made effective, as the specified value is 1.0. In writing Chapter 04 of the Civil Air Regulations, the terms "yield factor of safety" and "yield load" (CAR 04.125) were included, as it was anticipated that it would sometime be necessary to make the "yield" load greater than the "limit" load. This amounts to saying that if an airplane is to be rated as airworthy for a certain "limit" load, there should probably be a factor of safety against yielding under this load. The purpose of such a factor would be to take care of minor inaccuracies in the stress analysis or variations in material sizes. (Material *properties* are taken care of by using guaranteed minimum values as a basis for design.)

Since the basis for the proposed load-factor revisions is an *operational* one, it implies certain known limits for load factors, speeds, etc. As soon as our present *limit* load factors come to be used as actual flight limits, the need for a "yield" factor of safety will become more important. Most foreign requirements specify such a factor (usually at least 1.15) and the question has frequently come up in attempting to effect recipro-

cal agreements. It therefore appears that such a factor should be introduced at the same time that any revisions toward an operational basis are adopted.

A factor of 1.10 is proposed for this purpose. Taking the "small airplane" class as an example, the use of a *limit* load factor of 4.0, together with a *yield* factor of safety of 1.10, would amount to designing for a *yield* load factor of 4.4. This is already met by most airplanes in the "small airplane" class (up to 5,000 pounds). This can be seen from figures 1 or 3 (a) by noting that a yield load factor of 4.4 would amount to an *ultimate* factor of 6.6 under the existing system. This requirement, in the most unfavorable case, could do no more than increase the required *yield* load (for tension members) by about 5 percent. It is doubtful whether any structural members of existing airplanes would be affected by such a change. In any case this particular requirement (yield factor of 1.10) would not need to be made retroactive.

The adoption of a *yield* factor of safety would thus have several definite advantages. First, it would permit a higher "placard" acceleration to be used (if it is ever found necessary to specify one). Second, it would bring the United States requirements into closer agreement with foreign requirements, most of which specify a *yield* factor of safety (1.15 or more). This would no doubt facilitate reciprocal agreements. Finally, it would tend to offset the decrease in load factor proposed for the GENERAL PURPOSE class.

10. Foreign Requirements.

To get an idea of the reciprocal agreement situation we can plot the proposed load factors against those of the I. C. A. N. (British, Canadian, Italian, etc.) and note the differences. Figure 4 shows the load factors for the GENERAL PURPOSE and LAND TRANSPORT classes, including the transition line between the two classes. Note that the United States load factors are higher than the "international" ones in nearly all cases except for ultimate factors, in which case they are lower in the low weight range and again in the higher weight range. At weights around 10,000 pounds the *ultimate* factors are about the same. Yield load factors are very nearly the same, the United States proposal being higher over the entire range. Since the *yield* load factors represent the actual "usable" strength of the airplane, they probably form the best basis for comparison. It is interesting to note that the ultimate load factors would also be in very good agreement if the foreign requirement for factor of safety were reduced to about 1.75, instead of 2.0.

No curves need be drawn to show a comparison for the "acrobatic" category, as the proposed value of .9 *ultimate* agrees exactly with the British and Canadian acrobatic load factor. The Netherlands have two categories above the "NORMAL", one at 7.5 *ultimate* and the other at 10 *ultimate*.

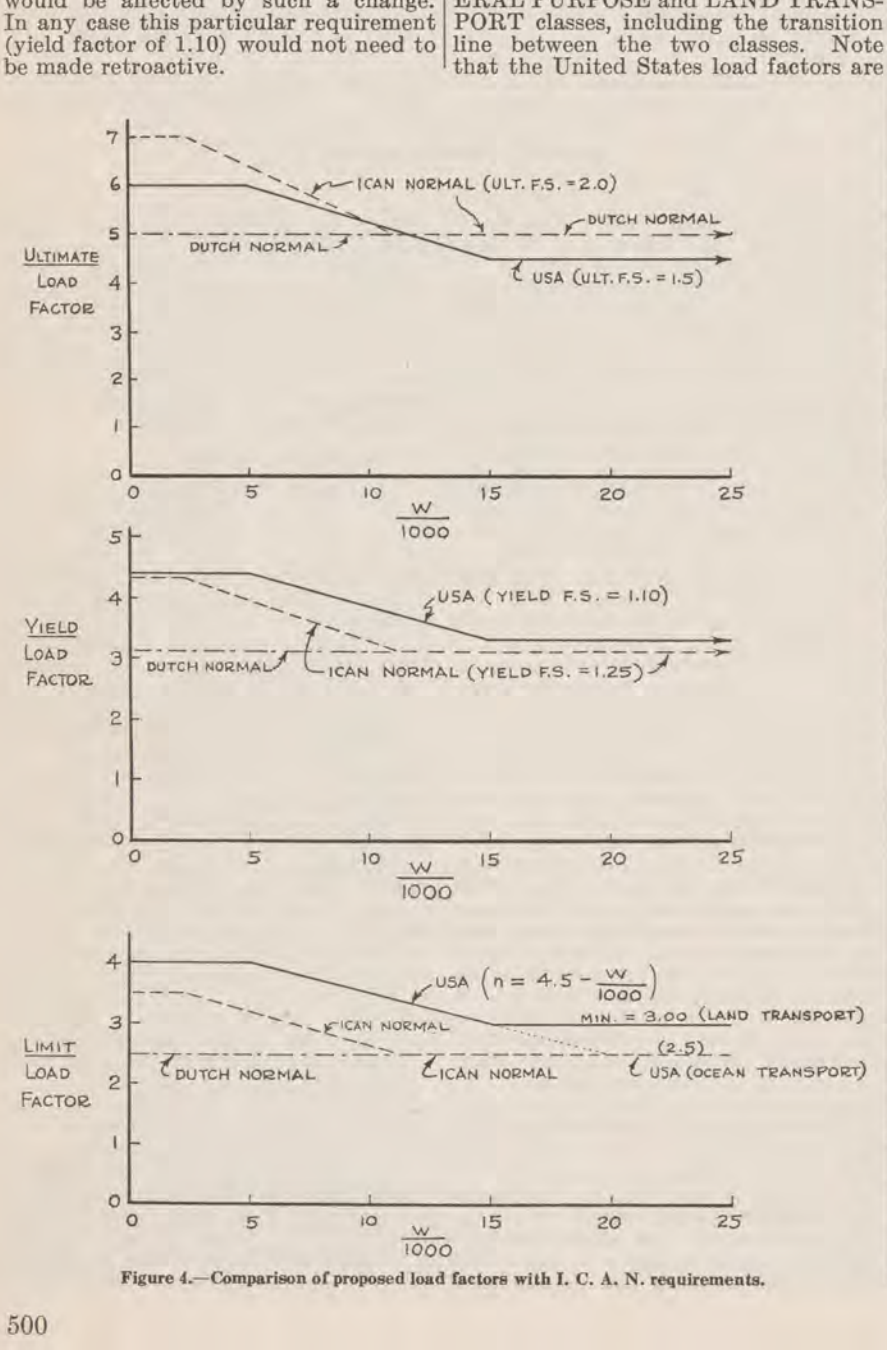

Figure 4.—Comparison of proposed load factors with I. C. A. N. requirements.

11. Stress Analysis.

If it should eventually become possible to secure an airworthiness certificate for an airplane in more than one operations category, the amount of stress analysis required is of interest. Without going into this problem in detail, it can be shown that the original stress analysis (for the basic category) can be extended to cover other gross weight conditions with very little error. Utilizing the principles of the "n-q" diagram (Aircraft Airworthiness Section Report No. 5), the "strength lines" at reduced (or increased) weights can be relocated simply by changing the load factor scale, leaving the dynamic pressure (airspeed) scale unchanged. An analysis of this type will show that the allowable gross weight for higher (or lower) load factors can be determined as a direct ratio of the required load factors. Certain modifications could be introduced to take advantage of wing inertia loads, etc., and some short supplementary analyses might have to be made. After the category system had once been established, it would be a simple matter to take care of all these points in the original design and analysis. If the category system were to be adopted, the Civil Aeronautics Authority Manual (04) would be revised accordingly and would include simplified methods of proving compliance with the requirements for other categories.

The question of design speeds could be left largely to the designer, if operations limits were reasonably well observed. Gust load factors would not be greatly affected by a change in category and in any case would be taken care of by the ROUGH AIR placard. The only remaining questions of any importance would be control surface loads and landing loads. It is not anticipated that any appreciable increase in the strength of present control surfaces would be required to enter the ACROBATIC category. This will be investigated in a subsequent paper. For landing loads there would be no

question in going to a "higher" category. In the opposite case it might be found possible to reduce the required landing load factor. These points can all be taken up in greater detail after the reactions of the industry to the general proposal are obtained.

12. OPERATION LIMITS.

Since the adoption of a system of categories without reference to gross weight or power will depend greatly on the *operation* of the airplanes, this subject will be taken up in greater detail in Report No. 9. Regardless of what changes in load factors are accomplished, the Aircraft Airworthiness Section has concluded that a definite program must be undertaken to inform pilots of the flight limitations of commercial aircraft and to eliminate improper use of such aircraft by inexperienced or unskillful pilots. This is necessitated by the great increase in private flying activity and the growing use of small airplanes in exhibition and "stunt" flying. The proposal to base load factors on categories determined by definite flight limits must therefore be considered as anticipating the increased emphasis that will be placed on this phase of airworthiness in the future. (See Reports Nos. 9 and 10 for suggested steps in this direction.)

13. RECOMMENDATIONS.

(*a*) Consider the eventual elimination of both power loading and gross weight from the determination of load factors.

(*b*) Set up *operation* classes or categories, with constant load factors for each class, as shown in figure 2.

(*c*) Pending final adoption of the operations basis for airworthiness rating, use a "transition" curve for the intermediate weight range, such as shown on Figure 3 (a or b).

(*d*) Reduce *ultimate* load factors slightly for the GENERAL PURPOSE category, but adopt a "yield" factor of safety of at least 1.10 for all classes and flight conditions (figure 3 (a)).

(*e*) Recommend the eventual adoption of the same basic categories and factors of safety by all countries.

(*f*) Work up simplified methods of using a basic stress analysis for proof of strength in any category.

(Note that recommendation (b) together with changes proposed in Report No. 4, would result in a single minimum value of *limit* load factor for all airplanes in a given class and *at all speeds*. This should simplify the operations problem, as it should be easy for pilots to become familiar with only four minimum values of *limit* load factor, such as: 2.5, 3.0, 4.0, 6.0.)

REFERENCES

1. A. G. Pugsley, "Structural Research in Aeronautics," *Aircraft Engineering*, June 1939.
2. E. Fin and A. E. Woodward Nutt, "Accelerations on Aircraft During Maneuvers," R. & M. 1392.
3. J. H. Doolittle, "Accelerations in flight," NACA Report No. 203. 1925.

Pilot Training

(*Continued from page 489*)

These figures include only those students who are now in military training or have been definitely accepted and are awaiting orders to report, Secretary Jones explained.

He said the flight centers reported an additional 677 who have applied for military aviation but have not yet been accepted, but that these were not included in the above totals.

Flight instructors from C. P. T. training schools also are providing an important reservoir of highly-trained manpower, the Secretary said, pointing out that 518 of them already have left the program to serve the armed forces or the airlines. Of these, 254 have been accepted by Army primary schools, 163 by the air lines, 63 by Canadian aviation schools and 38 have returned to active military duty. This, he explained, is more than 40 percent of the teaching force of 1,200 in the civilian program.

"To fill these gaps in the C. P. T. teaching force," Mr. Jones explained, "the Civil Aeronautics Administration is constantly improving and rerating new instructors. Several hundred are under training at almost any given time, and these are being added steadily to the reservoir of skilled defense manpower."

The C. P. T. has two types of courses; a preliminary course of ground school and 35 hours on light airplanes, followed—for the highest-ranking graduates—by a secondary course on heavier airplanes designed as a "feeder" to the armed forces.

(*Continued on page 503*)

Hinckley

(*Continued from page 490*)

"Therefore, it is going to be absolutely essential that private flying is provided with airports of its own. This type of flying will be primarily recreational in character, and therefore primarily local. These facilities will be entirely your local responsibility. Your main outside benefits will come—believe it or not—from air tourist travel. I firmly believe that in 5 or 6 years, cities will be competing for this specific type of tourist trade.

"I believe that inevitably you will have to provide purely recreational landing fields, and that the only question is *when* you are going to do it. You *can* do it, of course. Anybody who travels over this country by air and looks at the perfectly astounding number of golf courses, baseball and foot ball fields, tennis and basketball courts, knows that.

"It seems to me that what is coming is a sort of recreational air park, with a good turf landing field and servicing facilities, a sort of community-center clubhouse with concessions, and some other types of public recreation at the same spot. There could be a small auxiliary field for flying model planes. There could be game courts or a swimming pool.

"That is why I suggest that, if you have misgivings over your present airport, you would be wise to convert it to private and recreational flying. For the big commercial airports of tomorrow are going to exceed even our present ideas. I can remember, back about 1926, when most people felt that 1,500-foot runways were good enough for any purpose. Now we want them more than a mile long for the top traffic, and already the big new airports are being laid out for dual, parallel runways. There is a school of thought even more advanced than this, which takes the position that solid landing mats will replace even the best of runways in the near future.

"I have made these statements with the full knowledge that some of you will regard me as a sort of official Buck Rogers. In reply, I would refer almost any of you to your own airport, and ask you whether its needs have exceeded your estimates or expectations.

"Well, your airport problems up to this point are only the palest shadow of what they will be from this day forward, unless you take note of the trend and move to take care of it."

●

Aeronautical Charts

(*Continued from page 494*)

regional charts, covers the area on sectional aeronautical charts Pocatello, Casper, Salt Lake City, Cheyenne, Grand Junction, and Denver. Lithographed in 13 colors, it gives airports, names of airports, beacons, compass roses, isogonic lines, weather broadcast, etc., in red; radio ranges in pink; flight lines in purple; railroads and topographic features in black; water in blue; areas of cities in yellow; and elevation gradients in five tints.

New Edition of Direction Finding Aeronautical Chart

21-DF.—October 1940. Size, 28 by 36 inches. Located in latitude 37°-49° N., longitude 102°-125° W., an area of some 987,000 square miles. Accumulation of changes since last edition.

New Editions of Sectional Aeronautical Chart

BOISE.—September 1940. Size, 20 by 40 inches. Located in latitude 42°-44° N., longitude 114°-120° W., an area of about 47,000 square miles. Issued as new edition because of accumulated changes since the last edition.

CHARLOTTE.—October 1940. Size, 20 by 45 inches. Located in latitude 34°-36° N., longitude 78°-84° W., an area of about 54,000 square miles. Raleigh and Florence radio ranges realined and an accumulation of other changes.

DETROIT.—November 1940. Size, 20 by 41 inches. Located in latitude 42°-44° N., longitude 78°-84° W., an area of about 49,000 square miles. Radio range added at Selfridge Field, Windsor, and London, and accumulation of other changes.

SAN ANTONIO.—October 1940. Size, 20 by 43 inches. Located in latitude 28°-30° N., and longitude 94°20′-99°40′ W., and area of about 52,000 square miles. Relocation of San Antonio radio range and addition of Stinson and Yoakum radio ranges.

Recognized Dealer

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

Sioux Skyways, Inc., Sioux Falls, S. Dak.

CIVIL AERONAUTICS BOARD

OFFICIAL ACTIONS

Abstracts of Opinions, Orders, and Regulations

FOR THE PERIOD NOVEMBER 1–15, 1940

ORDERS

ORDER NO. 710: *Pacific Alaska temporarily exempted from provisions of its certificate of Seattle-Juneau route.*

The Board on November 1 temporarily exempted Pacific Alaska Airways from the provisions of its certificate for the Seattle-Juneau route insofar as said certificate requires it to transport persons between Seattle and Juneau and to transport persons, property, and mail to and from Ketchikan.

ORDER NO. 711: *Resolution of Air Traffic Conference of America relating to foreign reservations approved.*

The Board on November 5 approved a resolution of the Air Traffic Conference of America (contract C. A. B. No. 122) relating to foreign reservations, cable costs.

ORDER NO. 712: *Resolution of Air Traffic Conference of America relating to rerouting of passengers approved.*

The Board on November 5 approved a resolution of the Air Traffic Conference of America (contract C. A. B. No. 129) relating to rerouting of passengers.

ORDER NO. 713: *Denied application of Pan American to furnish free transportation to a member of the Export Managers Club.*

The Board on November 5 denied the application of Pan American Airways Co. (Nevada) for a special authorization to furnish free transportation to a member of the Export Managers Club of New York from San Francisco, Calif., to Auckland, New Zealand, and return.

ORDER NO. 714: *Directed Harold Thompson to show cause why his private pilot certificate should not be revoked or further suspended.*

The Board on November 8 directed Harold S. Thompson, Swampscott, Mass., to appear before an examiner of the Board and show cause why his private pilot certificate No. 94124 should not be revoked or further suspended for piloting an aircraft carrying passengers for hire and other violations of the Civil Air Regulations.

ORDER NO. 715: *Private pilot certificate of Charles G. Pierce revoked.*

The Board on November 8 revoked private pilot certificate No. 46674, held by Charles G. Pierce, Fort Morgan, Colo., for piloting an aircraft between sunset and sunrise when said aircraft was not equipped with proper navigation lights in violation of the Civil Air Regulations.

ORDER NO. 716: *Private pilot certificate of William Dawes Van Arsdale revoked.*

The Board on November 8 revoked private pilot certificate No. 39737–40, held by William Dawes Van Arsdale, Raleigh, N. C., for piloting an aircraft on a civil airway over a congested area at an altitude of 300 feet and other violations of the Civil Air Regulations.

ORDER NO. 717: *Student pilot certificate of Leo J. Hoffman revoked.*

The Board on November 8 revoked student pilot certificate No. 122935, held by Leo J. Hoffman, Houston, Tex., for piloting an aircraft on a civil airway carrying a person other than a certificated instructor and other violations of the Civil Air Regulations.

ORDER NO. 718: *Private pilot certificate of Walter H. Shamblin revoked.*

The Board on November 8 revoked private pilot certificate No. 61124, held by Walter H. Shamblin, Tuscaloosa, Ala., for piloting an aircraft acrobatically on a civil airway with two passengers aboard when neither he nor his passengers were equipped with proper parachutes, in violation of the Civil Air Regulations.

ORDER NO. 719: *Revoked student pilot certificate held by Donald A. Quidley.*

The Board on November 12 revoked student pilot certificate No. S–56801, held by Donald A. Quidley, Charleston, S. C., for piloting an aircraft acrobatically at an altitude of less than 1,000 feet and other violations of the Civil Air Regulations.

ORDER NO. 720: *Revoked student pilot certificate held by Lewis Edward Walters.*

The Board on November 12 revoked student pilot certificate No. 65575, held by Lewis Edward Walters, Kansas City, Kans., for piloting an aircraft carrying a passenger other than a certificated instructor in violation of the Civil Air Regulations.

ORDER NO. 721: *Revoked student pilot certificate held by Edward S. Griffith.*

The Board on November 12 revoked student pilot certificate No. S–112817, held by Edward S. Griffith, Carver, Mass., for piloting an aircraft carrying a passenger other than a certificated instructor in violation of the Civil Air Regulations.

ORDER NO. 722: *Approved interlocking relationships of Richard C. du Pont and All American Aviation.*

The Board on November 12 approved interlocking relationships of Richard C. du Pont and All American Aviation, Inc.

ORDER NO. 723: *Granted United Air Lines Transport Corporation permission to intervene in the matter of the application of American Airlines.*

The Board on November 12 granted United Air Lines Transport Corporation permission to intervene in the matter of the application of American Airlines, Inc., for an amendment of its certificates of public convenience and necessity to combine routes 4 and 23 into a single route.

ORDER No. 724: *Permitted International Air Lines to withdraw its application.*

The Board on November 12 permitted International Air Lines to withdraw its application for a certificate of public convenience and necessity for a route between San Diego, Calif., and Mazatlan, Mexico, filed with the Board on November 4, 1940.

ORDER No. 725: *Student pilot certificate of Willard M. Tozier revoked.*

The Board on November 12 revoked student pilot certificate No. S–102353, held by Willard M. Tozier, Plaistow, N. H., for piloting an aircraft on a civil airway carrying a passenger other than a certificated instructor in violation of the Civil Air Regulations.

ORDER No. 726: *Student pilot certificate of Marcus Berger revoked.*

The Board on November 12 revoked student pilot certificate No. S–110100, held by Marcus Berger, Jonesboro, Ark., for piloting an aircraft carrying a passenger in violation of the Civil Air Regulations.

ORDER No. 727: *Brazilian flyer granted permission to fly in United States.*

The Board on November 12 granted application of the Brazilian Government for permission for Maj. Orsini de Araujo Coriolano to fly a Beechcraft in the continental United States.

ORDER No. 728: *Instituted proceeding re necessity for air-transportation service to and from Fort Stockton, Tex.*

The Board on November 13 instituted a proceeding in the matter of the amendment of a certificate of convenience and necessity to provide for air-transportation service to the city of Fort Stockton, Tex.; consolidated said proceeding with proceeding of applications of Continental Air Lines, Inc., Braniff Airways, Inc., Essair, Inc., and Transcontinental & Western Air, Inc., for certificates of convenience and necessity and granted petition of city of Fort Stockton, Tex., and county of Pecos, Tex., leave to intervene in above-named matter.

ORDER No. 729: *Instituted proceedings to determine whether the public requires air-transportation service to and from Alpine, Tex.*

The Board on November 13 instituted a proceeding to determine whether the public convenience and necessity requires air-transportation service to and from Alpine, Tex., and consolidated said proceeding for purposes of hearing with applications of Continental Air Lines, Inc., Braniff Airways, Inc., Essair, Inc., Transcontinental & Western Air, Inc., and the petition of the city of Fort Stockton, Tex., and county of Pecos, Tex.

ORDER No. 730: *Instituted proceeding to determine whether the public convenience requires air-transportation service to and from Brownwood, Tex.*

The Board on November 13 instituted proceeding to determine whether the public convenience and necessity requires air-transportation service to and from Brownwood, Tex., and consolidated this matter for purposes of hearing with the proceeding on air-transportation service to and from Alpine, Tex.

ORDER No. 731: *Changed effective date of order issued fixing rates of compensation for transportation of mail by United Air Lines Transport Corporation.*

The Board on November 14 changed the effective date of supplemental order issued by the Board on August 26, 1940, in the matter of the petition of United Air Lines Transport Corporation for an order fixing fair and reasonable rates of compensation for the transportation of mail by aircraft over routes No. 1, 11, 12, and 17.

ORDER No. 732: *Authorized Mid-Continent to temporarily suspend service at Aberdeen, S. Dak.*

The Board on November 15 authorized Mid-Continent Airlines, Inc., to suspend service temporarily at Aberdeen, S. Dak., for a period of 60 days beginning on November 15.

ORDER No. 733: *Reopened proceeding for further evidence regarding contract and operating results experiences by T. W. A. in operation of route of Marquette.*

The Board on November 15 reopened proceeding for the purpose of receiving additional evidence respecting the contract and operating results experienced by Transcontinental & Western Air, Inc., in the operation of the route of Marquette Airlines, Inc., since August 15, 1940.

ORDER No. 734: *Denied applications of Braniff, Eastern and Chicago and Southern airlines for certificates of convenience and necessity*

The board on November 15 denied the applications of Braniff Airways, Inc., Eastern Air Lines, Inc., and Chicago and Southern Air Lines, Inc., for certificates of public convenience and necessity authorizing air transportation of persons, property, and mail between Kansas City, Mo., and Memphis, Tenn. (Order accompanied by opinion—Dockets 196, 9–401–B–4, 368.)

REGULATIONS

REGULATION No. 124: *Adopted amendment No. 1 of section 238.1 of the Economic Regulations.*

The Board on November 8 adopted amendment No. 1 of section 238.1 of the Economic Regulations regarding applications for certificates of convenience and necessity.

REGULATION No. 125: *The Board on November 12 adopted amendment No. 80 to the Civil Air Regulations, striking section 60.320, concerning identification marks, and inserting a new section 60.320. Full text of the amendment follows:*

Effective November 12, 1940, the Civil Air Regulations, as amended, are amended as follows:

By striking the last sentence of section 60.320 and inserting in lieu thereof the following:

"On aircraft other than conventional airplanes or gliders or on conventional aircraft where the design or dimensions of the wing prevent the display of the identification mark in the manner prescribed in these regulations, the identification mark shall be displayed in a manner satisfactory to the Administrator."

REGULATION No. 126: *Adopted Amendment No. 81 of the Civil Air Regulations, amending sections 21.1500 (a), 21.174 (e), and striking section 21.45 of Part 21. The full text of the amendment follows:*

Effective November 15, 1940, Part 21, as amended, of the Civil Air Regulations, is amended by:

1. Amending Section 21.1500 (a) to read as follows:

"**21.1500 (a)** The provisions of Parts 01, 21, 27, 40, 60, 61, and 98, together with such Parts of the provisions of Part 04 as are pertinent to the operations of air carrier aircraft."

2. Amending Section 21.174 (e) to read as follows:

"**21.174** (e) Altitudes and permissible errors in §§ 21.170 through 21.173 are applicable when flight tests are conducted in aircraft of a gross weight in excess of 10,000 pounds, otherwise those in 20.147 apply."

3. Striking Section 21.45 and attendant note.

●

Pilot Training

(*Continued from page 501*)

The survey shows that more than 55 percent of the students completing the secondary course already have been accepted by the Army or Navy, while more than 2,000 trainees of the first, or preliminary, course have been accepted without taking the secondary.

"This is particularly impressive," Mr. Jones pointed out, "when it is realized that out of 20,705 who have completed only the preliminary course, a very substantial number still are in school, completing their college courses. The bulk of these will finish college next June, and more than 3,000 of them are taking the secondary course at this time."

Mr. Jones said the rate at which trainees of the civilian program offer themselves for military training is likely to increase throughout the remainder of the fiscal year.

"The C. A. A. program is operating now on a much greater scale than ever before," he pointed out. "More than 15,000 preliminary students and 3,000 secondary students who began training at the opening of the school will finish in February. At that time 15,000 more preliminary students and 5,000 more secondary students will start the courses, scheduled for completion in June.

Status of Parts of the Civil Air Regulations and Amendments

As of December 1, 1940

All persons affected by the Civil Air Regulations, including those preparing for examination for certificates, may obtain the parts required from the Publications and Statistics Division, Civil Aeronautics Administration, Washington, D. C., without charge.

Only Parts Actually Needed Should Be Requested

For example, *pilots* are governed in general by parts 01, 20, and 60; *aircraft mechanics* by parts 01, 04, 15, 18, 24, and section 60.32; and *aircraft engine mechanics* by parts 01, 04, 13, 14, 18, and 24.

How To Order Parts

Those persons not affected by the C. A. R., but desiring all or any part of the Regulations for other purposes, may obtain them in the manner herein described. Those parts on which a price is listed in the tabulation below are on sale by the Superintendent of Documents, United States Government Printing Office, Washington, D. C., and are not available for free distribution.

Eventually, all parts will be placed on sale; meanwhile, parts not yet on sale (carrying remark, in tabulation below, "order from C. A. A. only") may be obtained without charge from the C. A. A., upon demonstration of valid interest on the applicant's part.

Bound volumes of the complete Civil Air Regulations are no longer available.

Important: Amendments

All amendments to the Civil Air Regulations are printed in the Official Actions section of the Civil Aeronautics Journal, as released. (Occasional amendments, too long to print in full, are abstracted to describe fully the nature and purpose of the amendment's provisions so that the individual may determine whether he need order the full text.)

All amendments must be ordered from the C. A. A. There is no charge for amendments. The Superintendent of Documents does not handle any amendments.

The tabulation below carries in the right-hand column the numbers of all amendments to each part issued subsequent to the date of publication of that part. When ordering parts from the C. A. A., all effective amendments are automatically included. But, when ordering parts from the Superintendent of Documents, the amendments to each part, as listed below, **must be ordered separately from the C. A. A.** to bring the part up to date and to make it accurate and complete.

Note.—Part numbers not included in the list below are unassigned.

Part No.	Title	Effective date	Remarks	Price	Amendments to date
	AIRCRAFT				
00.	CANCELLED		Now incorporated in Part 01		
01.	AIRCRAFT REGISTRATION AND AIRWORTHINESS CERTIFICATES.	July 15, 1940	In stock at C. A. A. and on sale at G. P. O	$0.05	68, 75.
02.	TYPE AND PRODUCTION CERTIFICATES.	do	do	.05	75.
03.	CANCELLED		Now incorporated in Part 01		
04.	AIRPLANE AIRWORTHINESS	May 31, 1938	In stock; order from C. A. A. only		601–A–1, 4, 5, 14, 26, 28, 48, 56, 69, 75.
13.	AIRCRAFT ENGINE AIRWORTHINESS.	do	Reprint, including amendments, to be available soon from C. A. A.		
14.	AIRCRAFT PROPELLER AIRWORTHINESS.[1]	do	do		
15.	AIRCRAFT EQUIPMENT AIRWORTHINESS.[1]	do	do		
18.	REPAIR AND ALTERATION OF AIRCRAFT.	do	do		
	AIRMEN				
20.	PILOT CERTIFICATES	May 1, 1940	In stock at C. A. A. and on sale at G. P. O	$0.05	54, 63, 65, 67, 75, 82.
21.	AIRLINE PILOT RATING		Revision in preparation: to be available soon from C. A. A.		
23.	CANCELLED		Now incorporated in Part 51		
24.	MECHANIC CERTIFICATES	May 1, 1940	In stock at C. A. A. and on sale at G. P. O	.05	44, 61, 73, 75. 82.
25.	CANCELLED		Now incorporated in Part 24		
26.	AIR-TRAFFIC CONTROL-TOWER OPERATOR CERTIFICATES.	Oct. 4, 1940	In stock at C. A. A. and on sale at G. P. O	.05	
27.	AIRCRAFT DISPATCHER CERTIFICATES.	July 15, 1940	do	.05	74, 75.
	AIR CARRIERS				
40.	AIR CARRIER OPERATING CERTIFICATION (INTERSTATE).	May 31, 1938	In stock; order from C. A. A. only		601–A–1, 3, 6, 12, 29, 51, 56, 75, 79.
	AIR AGENCIES				
50.	FLYING SCHOOL RATING[1]	Oct. 4, 1940	In stock at C. A. A. and on sale at G. P. O	$0.05	
51.	GROUND INSTRUCTOR RATING	May 1, 1940	In stock at C. A. A. and on sale at G. P. O	.05	75.
52.	REPAIR STATION RATING	do	do	.05	75.
53.	MECHANIC SCHOOL RATING[1]	do	do	.05	75.
	AIR NAVIGATION				
60.	AIR TRAFFIC RULES	Oct. 4, 1940	In stock at C. A. A. and on sale at G. P. O	$0.10	76, 77, 80.
61.	SCHEDULED AIR CARRIER RULES (INTERSTATE).	May 31, 1938	In stock; order from C. A. A. only		601–A–1, 51, 52, 62, 75.
	MISCELLANEOUS[2]				
98.	DEFINITIONS	May 31, 1938	Out of stock. (General revision in preparation.)		601–A–1, 41, 75.
99.	MODE OF CITATION OF REGULATIONS.	do	In stock; order from C. A. A. only		601–A–1.

[1] Supplementary Manual for this part available; order from C. A. A. only.
[2] Parts 90.–96., inclusive, have been cancelled.

U. S. GOVERNMENT PRINTING OFFICE: 1940