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UNITED STATES OF AMERICA
CIVIL AERONAUTICS BOARD
WASHINGTON, D. C.

Civil Air Regulations Amendment 4b-6
Effective: August 12, 1957
Adopted: July 8, 1957

AIRPLANE AIRWORTHINESS, TRANSPORT CATEGORIES

MISCELLANEOUS AMENDMENTS RESULTING FROM
THE 1956 ANNUAL AIRWORTHINESS REVIEW

There are contained herein amendments with respect to various issues stemming from the 1956 Annual Airworthiness Review.

Of the changes being made, the most extensive ones involve the powerplant provisions. Most of these are applicable to turbine engine installations. In this regard, there is included an amendment to § 4b.480 which designates as fire zones combustor, turbine, and tailpipe sections containing lines carrying flammable fluids or gases, but does not require the installation of a fire-extinguisher system in these sections if a fire occurring in any such sections can be demonstrated to be otherwise controlled. In addition, § 4b.485 is being amended to require fire detectors for all combustor, turbine, and tailpipe sections irrespective of whether they contain lines carrying flammable fluids or gases. The currently effective requirements specify the compressor and accessory sections of turbine engines as fire zones and make only certain provisions for fire zones applicable to the other sections. These changes should provide a reasonably high degree of fire protection for turbine powerplants.

Heretofore there have been no specific provisions in the regulations governing engine design for the protection against rotor blade failure. However, concurrently with this amendment Part 13 of the Civil Air Regulations is being amended to require that rotor cases be of such construction as to contain the damage resulting from rotor blade failure. In order to provide the necessary protection on airplanes which might use engines not incorporating this construction, there is included in new § 4b.401 (d) a provision to require such protection in the powerplant installation.

Concurrently with this amendment Part 13 is also being amended to minimize the probability of turbine rotor failure by requiring additional design precautions in respect of the turbine wheel and the relevant engine control systems. In this regard, a requirement is included in new § 4b.401 (e) to require design precautions in the powerplant installation to safeguard the airplane against turbine rotor failures when the airplane is equipped with engines not certificated in accordance with the criteria in the aforementioned amendment to Part 13.

There is also included a change to § 4b.604 which specifies the required instruments for turbine powerplants. No change is being made with respect to the instruments for reciprocating engines. The requirement for a reverse thrust indicator for turbo-propellers specifies early indication instead of either early or late as implied in the currently effective provisions for reciprocating engines. In view of the characteristic operation of the turbo-propeller in the ground fine and reverse pitch ranges, it is considered that an early indication would provide the more useful information to the pilots. The requirement for the reverse thrust indicator on turbo-jet installations specifies indication when the device is in the reverse position. It is intended to permit the use of either an early or a late indication. The Board considers that further study may be necessary on turbo-propeller installations utilizing reverse thrust power and on turbo-jet reverse thrust systems to determine whether a quantitative type of indicator should be required.

A new provision is being added (§ 4b.408) which requires, on turbo-propeller installations, the consideration of the single failure safety criterion in the design of propeller-drag limiting systems such as negative torque control systems and other back-up systems. This provision is not intended to require consideration of more than one component failure in any one of the systems at any given time, either during normal or emergency operation; investigation of all components, whether or not integral with the engine, is required.

There are included herein changes which extend the currently effective provisions governing intermittent maximum icing conditions so as to cover conditions which might be critical insofar as the turbine engine induction system is concerned. In this regard, the data are being extended in accordance with NACA Technical Note 2738 and involve a revision of Figure 4b-25a to cover drop diameters as low as 15 microns and a revision of Figure 4b-25c to cover distances down to 0.3 miles. The icing conditions prescribed in the currently effective regulations are applicable in the main to the airframe. The changes being made in § 4b.461 require the turbine powerplant to be subjected to the same icing conditions and require that the induction system be protected to prevent serious engine power loss. A similar requirement is incorporated with respect to certification of turbine engines by an amendment to Part 13 which is being made concurrently with this amendment.

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Additional changes to the powerplant provisions include consideration of turbine engine torque, caused by sudden engine stoppage, in the structural design of the engine mount (see § 4b.216 (a) (4)); of crash protection for fuselage fuel tanks (see § 4b.420 (f)); and of safety criteria for fuel dumping systems (see § 4b.437 (f)). It is considered that the storage of fuel in the fuselage section of the wing might pose serious fire hazards during a crash landing and, therefore, in order to minimize these hazards, the provisions in § 4b.420 (e) require that fuselage fuel tanks withstand without leakage the inertia forces prescribed in the currently effective regulations for emergency landing conditions. It is not intended by this requirement to prescribe any particular type of fuel tank design.

With respect to § 4b.236 there is being included a more specific requirement to account for the unsymmetrical loads on multiple-wheel landing gears. A change is being made to § 4b.335 (c) to permit greater flexibility in determining the required energy capacity for wheel brakes.

With respect to pressurization equipment and supply, § 4b.374 is being changed to require that airplanes equipped with pressurization systems maintain, at the maximum operating altitude under normal conditions, a cabin pressure altitude of not more than 8,000 feet and all airplanes certificated for operation above an altitude of 25,000 feet be able to maintain a cabin pressure altitude of not more than 15,000 feet in the event that any one pressurization system component becomes inoperative. In addition, the oxygen equipment requirements of § 4b.651 are being revised to make them more realistically applicable to airplanes which are intended to operate above 25,000 feet.

In addition, there are other less substantive changes being made with respect to personnel accommodations, emergency evacuation provisions, autopilot systems, etc. Further, there are included other changes which are relatively minor, clarifying, or of an editorial nature.

Interested persons have been afforded an opportunity to participate in the making of this amendment (21 F.R. 9217), and due consideration has been given to all relevant matter presented.

In consideration of the foregoing, the Civil Aeronautics Board hereby amends Part 4b of the Civil Air Regulations (14 CFR Part 4b, as amended) effective August 12, 1957.

1. By amending § 4b.1 (b) (1) by inserting between the words "atmosphere" and "defined" the following: "(see NACA Technical Note 3182)".

2. By amending § 4b.1 (b) (1) (iv) by deleting the expression "-67° F." and inserting in lieu thereof the expression "-69.7° F."

3. By amending § 4b.1 (b) (1) (v) by deleting the numerals "0.002378" and inserting in lieu thereof the numerals "0.002377".

4. By amending § 4b.1 (f) by changing the title of this paragraph, by amending subparagraphs (2) and (3), by redesignating subparagraphs (4) through (8) as subparagraphs (5) through (9), respectively, and by adding new subparagraph (4) to read as follows:

4b.1 Definitions. * * *

(f) Powerplant installation.[1/] * * *

(2) Take-off power or thrust.

(i) Take-off power for reciprocating engines is the brake horsepower developed under standard sea level conditions and under the maximum conditions of crankshaft rotational speed and engine manifold pressure approved for the normal take-off, and limited in use to a maximum continuous period as indicated in the approved engine specification.

(ii) Take-off power for turbine engines is the brake horsepower developed under static conditions at specified altitudes and atmospheric temperatures and under the maximum conditions of rotor shaft rotational speed and gas temperature approved for the normal take-off, and limited in use to a maximum continuous period as indicated in the approved engine specification.

(iii) Take-off thrust for turbine engines is the jet thrust developed under static conditions at specified altitudes and atmospheric temperatures and under the maximum conditions of rotor shaft rotational speed and gas temperature approved for the normal take-off, and limited in use to a maximum continuous period as indicated in the approved engine specification.

flames, or noxious gases from entering the flight crew's compartment. Furthermore, it requires that crew-emergency exits remain accessible under all loading conditions.

In conjunction with the establishment of Class "E" cargo compartments, § 4b.380(c) is being amended to provide protective breathing equipment for the crew when the aircraft contains such a compartment. Since the operating record reveals that heat sources in proximity to cargo constitute a fire hazard, § 4b.382 is also being amended to provide fire protection from sources of heat such as light bulbs, heater ducts, electrical appliances, and combustion heaters in all classes of compartments.

In addition to the foregoing, § 4b.383 (b), applicable to "B" compartments, is being amended by deleting the requirement that while the aircraft is in flight a member of the crew must be able to move by hand all contents of the compartment. This deletion is considered to be consistent with the requirements for Class "A" and "E" compartments.

Interested persons have been afforded an opportunity to participate in the making of this amendment (24 F.R. 128), and due consideration has been given to all relevant matter presented. Since this amendment is relaxatory in nature and imposes no additional burden on any person, it may be made effective upon publication in the FEDERAL REGISTER.

In consideration of the foregoing, the Administrator of the Federal Aviation Agency hereby adopts the following amendment to Part 4b of the Civil Air Regulations (14 CFR Part 4b, as amended) effective April 23, 1959:

1. By amending § 4b.380(c) by deleting the words "Class A or B" and inserting in lieu thereof "Class A, B, or E".

2. By amending § 4b.382 by adding a new paragraph (d) and a note thereunder, to read as follows:

(d) Sources of heat within the compartment shall be shielded and insulated to prevent igniting the cargo.

NOTE: Sources of heat likely to ignite cargo include light bulbs, combustion heaters, heater ducts, electrical appliances, etc.

3. By amending the introductory paragraph of § 4b.383(b) to read as follows:

Cargo and baggage compartments shall be classified as "B" if sufficient access is provided while in flight to enable a member of the crew to reach effectively all parts of the compartment and its contents with a hand fire extinguisher. Compliance shall be shown with the following:

4. By amending § 4b.383 by adding a new paragraph (e) to read as follows:

(e) *Class E.* On airplanes used for the carriage of cargo only it shall be acceptable to classify the cabin area as a Class "E" compartment. Compliance shall be shown with the following:

(1) The compartment shall be completely lined with fire-resistant material.

(2) The compartment shall be equipped with a separate system of an approved type smoke or fire detector to give warning at the pilot or flight engineer station.

(3) Means shall be provided to shut off the ventilating airflow to or within the compartment. Controls for such means shall be accessible to the flight crew in the crew compartment.

(4) Means shall be provided to exclude hazardous quantities of smoke, flames, or noxious gases from entering the flight crew compartment. (See § 4b.380(c) for protective breathing equipment.)

(5) Required crew emergency exits shall remain accessible under all cargo loading conditions.

(Sec. 313(a), 72 Stat. 752; 49 U.S.C. 1354(a). Interpret or apply secs. 601, 603; 72 Stat. 775, 776; 49 U.S.C. 1421, 1423)

Issued in Washington, D.C., on April 17, 1959.

E. R. QUESADA,
Administrator.

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Civil Air Regulations Amendment 4b-10
Effective: April 23, 1959
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PART 4B—AIRPLANE AIRWORTHINESS; TRANSPORT CATEGORIES

Cargo Compartment Classification "E" For All-Cargo Operations

The presently effective §§ 4b.382 and 4b.383 of Part 4b of the Civil Air Regulations prescribe design conditions for the protection of cargo and baggage compartments against fire. These requirements classify compartments into "A," "B," "C," and "D."

Class "A" and "B" compartments are those which provide access to all parts of the compartment to permit the use of hand fire extinguishers. In addition, Class "B" compartments require that all contents therein can be moved by hand. Class "C" and "D" compartments do not have this accessibility. Instead, Class "C" compartments are required to have a fire-extinguishing system capable of effectively flooding the entire compartment. Class "D" compartments are those in which the volume of air and its flow are so limited as to cause suppression of fire as a result of oxygen depletion.

An air carrier engaged in the carriage of cargo exclusively recommended to the Civil Aeronautics Board an amendment of the existing regulations to provide an additional classification of cargo compartments more specifically applicable to bulk loading of the main cabin area of an airplane engaged in all-cargo operations. The carrier indicated that the weight and bulk of the cargo to be carried in the main cabin make its movement by the crew impractical. Furthermore, the loss of cargo space by providing accessibility to all parts of the compartment and its contents results in an unnecessary economic burden. For these reasons, it is not practical to classify the main cabin as either an "A" or "B" compartment. Classification as a "C" compartment, considering the relatively large volume of the cabin, makes it impractical to carry a sufficient quantity of fire-extinguishing agent to flood effectively the entire cabin. Due to the large volume of the cabin, compliance with the conditions set forth for Class "D" Compartments also becomes extremely difficult because so much oxygen exists that prompt suppression of the fire through oxygen depletion is not attainable.

The Civil Aeronautics Board included a proposed change to the cargo and baggage compartment fire protection requirements of Part 4b in a notice of proposed rule making issued in Draft Release No. 58-1C, dated December 22, 1958. That proposal, although it appeared to cover the intent, did not define in detail the specific conditions applicable to bulk-loaded cabins. After further study and considering the comments on the draft release, it is found that setting forth specific conditions is necessary. Therefore, the amendment contained herein establishes a new Class "E" cargo compartment and prescribes the detailed design conditions applicable thereto.

An evaluation of Daily Mechanical Reports and air carrier incident reports disclosed that between 1951 and 1956 during 18,971,602 hours of passenger-carrying flight time there had been four inflight fires in baggage compartments. It was reported that one of these fires was attributed to the cargo coming in contact with a cockpit heater, one was caused by matches in a passenger's bag, and two resulted from baggage being loaded against unprotected light bulbs. Additionally, three fires, detected while loading passengers' baggage before departure, were found to be caused by matches in passengers' bags. During this same period, there were no incidents of fire in 572,443 hours of flight in all-cargo operations. In the period 1957-1958, one additional fire was reported in the Daily Mechanical Reports. The cause of this fire was found to have been due to baggage being placed against an unprotected light bulb.

It has been determined that this amendment will make fire prevention requirements for all-cargo aircraft more realistic, without any material reduction in safety. Accordingly, § 4b.383 of Part 4b of the Civil Air Regulations is being amended to provide for all-cargo operations the new Class "E" cargo compartment located in the main cabin of an airplane. Such compartment is required to be equipped with a smoke or fire detector system to warn the crew of smoke or fire, to be completely lined with fire-resistant material, to provide for control of ventilation by the crew within the compartment, and to provide means for excluding hazardous quantities of smoke,

(3) Maximum continuous power or thrust.

(i) Maximum continuous power for reciprocating engines is the brake horsepower developed in standard atmosphere at a specified altitude and under the maximum conditions of crankshaft rotational speed and engine manifold pressure, and approved for use during periods of unrestricted duration.

(ii) Maximum continuous power for turbine engines is the brake horsepower developed at specified altitudes, atmospheric temperatures, and flight speeds and under the maximum conditions of rotor shaft rotational speed and gas temperature, and approved for use during periods of unrestricted duration.

(iii) Maximum continuous thrust for turbine engines is the jet thrust developed at specified altitudes, atmospheric temperatures, and flight speeds and under the maximum conditions of rotor shaft rotational speed and gas temperature, and approved for use during periods of unrestricted duration.

(4) Gas temperature. Gas temperature for turbine engines is the temperature of the gas stream obtained as indicated in the approved engine specification.

5. By amending § 4b.210 by deleting the first sentence in the introductory paragraph and inserting in lieu thereof the following: "Flight load requirements shall be complied with at critical altitudes within the range selected by the applicant at all weights from the design minimum weight to the maximum weight appropriate to each particular flight condition, with any practicable distribution of disposable load within prescribed operating limitations stated in the Airplane Flight Manual. (See § 4b.740.)"

6. By amending § 4b.212 (b) by deleting the words "the supplementary" and inserting in lieu thereof the words "speeds up to the".

7. By amending § 4b.216 (a) by adding a new subparagraph (4) to read as follows:

4b.216 Supplementary flight conditions.

(a) Engine torque effects. * * *

(4) For turbine engine installations, the limit torque load imposed by sudden engine stoppage due to malfunction or structural failure (e.g., compressor jam-up) shall be considered in the design of the engine mounts and supporting structure.

8. By amending § 4b.216 (d) by deleting the word "tail" and inserting in lieu thereof the word "airplane".

9. By amending Figure 4b-11 by deleting the expression "$V_M = 0.25\ (n-1.0)\ W$" and inserting in lieu thereof the following "V_M = one-half the maximum vertical ground reaction obtained at each main gear in the level landing conditions."

10. By amending the introductory paragraph of § 4b.235 by adding a new sentence at the end thereof to read as follows: "In the conditions of paragraph (b) (1) and (2), it shall be acceptable to use a drag reaction lower than prescribed therein if it is substantiated that an effective drag force of 0.8 times the vertical reaction cannot be attained under any likely loading condition."

11. By amending § 4b.236 to read as follows:

4b.236 Unsymmetrical loads on multiple-wheel units.

(a) General. Multiple-wheel landing gear units shall be assumed to be subjected to the limit ground loads prescribed in this Subpart in accordance with the provisions of paragraphs (b) and (c) of this section.

(b) Distribution of limit loads to wheels; all tires inflated. The distribution of the limit loads among the wheels of the landing gears shall be established for all landing, taxying, and ground handling conditions, taking into account the effects of the factors enumerated in subparagraphs (1) through (6) of this paragraph.

(1) Number of wheels and their physical arrangement. In the case of truck type landing gear units, the effects of any see-saw motion of the truck during the landing impact shall be considered in determining the maximum design loads for the fore and aft wheel pairs.

(2) Differentials in tire diameters resulting from a combination of manufacturing tolerances, tire growth, and tire wear. It shall be acceptable to assume a maximum tire-diameter differential equal to 2/3 of the worst combination of diameter variations which is obtained when taking into account manufacturing tolerances, tire growth, and tire wear.

(3) Unequal tire inflation pressure, assuming the maximum variation to be ±5 percent of the nominal tire inflation pressure.

(4) A runway crown of zero and a runway crown having a convex upward shape which may be approximated by a slope of 1½ percent with the horizontal. Runway crown effects shall be considered with the nose gear unit on either slope of the crown.

(5) Airplane attitude.

(6) Structural deflections.

(c) Deflated tires. The effect of deflated tires on the structure shall be considered with respect to the loading conditions specified in subparagraphs (1), (2), and (3) of this paragraph taking into account the physical arrangement of the gear components. Consideration shall be given to the deflation of any one tire for all multiple wheel landing gear units and, in addition, to the deflation of any 2 critical tires for landing gear units employing 4 or more wheels per unit. The ground reactions shall be applied to the wheels with inflated tires.

(1) Landing conditions. For one deflated tire and for 2 deflated tires, the applied load to each gear unit shall be assumed to be 60 percent and 50 percent, respectively, of the limit load applied to each gear for each of the prescribed landing conditions except that, for the drift landing condition of § 4b.234, 100 percent of the vertical load shall be applied.

(2) Taxying and ground handling conditions. For one deflated tire and for 2 deflated tires, the applied side and/or drag load factor at the center of gravity shall be the most critical value up to 50 percent and 40 percent, respectively, of the limit side and/or drag load factors corresponding with the most severe condition resulting from consideration of the prescribed taxying and ground handling conditions except that, for the braked roll conditions of § 4b.235 (b) (1) and (2) (ii), the drag loads on each inflated tire shall not be less than those at each tire for the symmetrical load distribution with no deflated tires. Pivoting need not be considered.

(3) Towing conditions. For one deflated tire and for 2 deflated tires, the towing load, F_{TOW}, shall be 60 percent and 50 percent, respectively, of the load prescribed.

NOTE: In determining the total load on a gear unit with respect to the provisions of paragraphs (b) and (c) of this section, the transverse shift in the load centroid, due to unsymmetrical load distribution on the wheels, is normally neglected.

12. By amending § 4b.270 (b) (1) by inserting between the words "ultimate" and "load" the word "maneuver".

13. By amending § 4b.320 by adding a new sentence at the end thereof to read as follows: "An adjustable stabilizer shall incorporate means to permit, after the occurrence of any reasonably probable single failure of the actuating system, such adjustment as would be necessary for continued safety of the flight."

14. By amending s 4b.335 (c) by deleting so much of the first sentence as precedes the formula and inserting in lieu thereof the following: "The brake kinetic energy capacity rating of each main wheel-brake assembly shall not be less than the kinetic energy absorption requirement determined in accordance with this paragraph. The brake kinetic energy absorption requirements shall be based on a rational analysis of the sequence of events which are expected to occur during operational landings at maximum landing weight. This analysis shall include conservative values of airplane speed at which the brakes are applied, braking coefficient of friction between tires and runway, aerodynamic drag, propeller drag or powerplant forward thrust, and if more critical, the most adverse single engine or propeller malfunction. In lieu of a rational analysis it shall be acceptable to establish the kinetic energy absorption requirements for each main wheel brake assembly by the following "formula:"

15. By amending § 4b.337 by adding a new paragraph (d) to read as follows:

4b.337 Brakes. * * *

(d) Anti-skid devices. If anti-skid devices are installed, the devices and associated systems shall be such that no single probable malfunction will result in a hazardous loss of braking ability or directional control of the airplane.

16. By amending § 4b.352 (b) by adding a new sentence at the end thereof to read as follows: "Means shall be provided to minimize the danger to the pilots from flying windshield fragments due to bird impact unless it can be shown by analysis or test that the probability of occurrence of a critical fragmentation condition is of low order."

17. By amending § 4b.353 (e) (2) to read as follows:

4b.353 Controls. * * *

(e) * * *

(2) The landing gear control shall be located forward of the throttles and shall be operable by each of the pilots when seated with seat belts fastened.

18. By amending § 4b.356 (e) by inserting in the first sentence after the words "external doors" the words "for which the initial opening movement is outward".

19. By amending § 4b.358 (b) by adding a new subparagraph (5) to read as follows:

4b.358 Seats, berths, and safety belts. * * *

(b) Arrangement. * * *

(5) Seats for all crew members at flight deck stations shall incorporate provisions for the use of a shoulder harness and the seats with such provisions shall comply with the strength requirements of paragraph (c) of this section.

20. By amending § 4b.362 (e) (5) by inserting after the words "emergency exits" the words "for which the initial opening movement is outward".

21. By amending § 4b.371 (c) by adding a new sentence at the end thereof to read as follows: "If accumulation of hazardous quantities of smoke in the cockpit area is reasonably probable, smoke evacuation shall be readily accomplished starting with full pressurization and without depressurizing beyond safe limits (see § 4b.374 (b))."

22. By amending § 4b.374 to read as follows:

4b.374 Pressure equipment and supply. (See § 4b.477 (c).)

(a) Occupied cabins or compartments of airplanes shall be equipped to provide a cabin pressure altitude of not more than 8,000 feet at the maximum operating altitude of the airplane under normal operating conditions.

(b) Airplanes certificated for operation at altitudes over 25,000 feet shall be capable of maintaining a cabin pressure altitude of not more than 15,000 feet in the event of any reasonably probable failure or malfunction in the pressurization system.

23. By amending § 4b.401 by adding new paragraphs (d) and (e) to read as follows:

4b.401 Engines. * * *

(d) Rotor blade protection. Turbine powerplant installations shall include a means of protection such that the occurrence of rotor blade failure in any engine will not affect the operation of remaining engines nor jeopardize the continued safe operation of the airplane, unless the engine type certificate specifies that the engine rotor cases have been substantiated as capable of containing the damage resulting from rotor blade failure.

(e) Engine turbine rotor. Design precautions shall be taken to minimize the probability of jeopardizing the safety of the airplane in the event of engine turbine rotor failure, unless the engine type certificate specifies that the turbine rotors have been demonstrated to provide sufficient strength to withstand damage inducing factors such as those which might result from abnormal rotor speeds, temperature, or vibration and the design and functioning of the powerplant systems associated with engine control devices, systems, and instrumentation are such as to give reasonable assurance that those engine operating limitations which adversely affect turbine rotor structural integrity will not be exceeded in service.

24. By adding a new § 4b.408 to read as follows:

4b.408 Turbo-propeller-drag limiting systems. For turbo-propeller-powered airplanes, propeller-drag limiting systems shall be such that no single failure or malfunction of any of the systems during normal or emergency operation will result in propeller drag in excess of that for which the airplane was designed in compliance with § 4b.216 (d). Failure of structural elements of the drag limiting systems need not be considered if occurrence of such failure is expected to be extremely remote. (See also § 4b.310.)

25. By amending § 4b.420 by adding new paragraphs (e) and (f) to read as follows:

4b.420 General. * * *

(e) Fuel tanks located within the fuselage contour shall be capable of resisting rupture and retaining the fuel under the inertia forces prescribed for the emergency landing conditions in § 4b.260. In addition, these tanks shall be located in a protected position so that exposure of the tanks to scraping action with the ground will be unlikely.

(f) The augmentation liquid tank capacity available for the use of each engine shall be sufficient to permit operation of the airplane in accordance with the procedures for the use of liquid augmented powers which are established and approved with respect to compliance with the related requirements of this part. The computation of liquid consumption shall be based on the maximum approved rate appropriate for the desired engine output and shall include the effect of temperature on engine performance as well as any other factors that might cause a variation in the amount of liquid required.

26. By amending the introductory paragraph of § 4b.435 to read as follows:

4b.435 Fuel strainer. A fuel strainer shall be provided between the fuel tank outlet and the fuel metering device of the engine. The following provisions of this section shall be complied with:

27. By amending § 4b.437 by adding a new paragraph (f) to read as follows:

4b.437 Fuel jettisoning system. * * *

(f) The design of the fuel jettisoning system shall be such that any reasonably probable single malfunction in the system will not result in a hazardous condition due to unsymmetrical jettisoning or inability to jettison fuel.

28. By amending § 4b.440 (b) by inserting in the first sentence between the words "the" and "maximum" the word "approved" and by inserting in the second sentence after the word "range" the words "for reciprocating engines".

29. By amending § 4b.440 (c) by inserting after the word "provided" the words "for reciprocating engines".

30. By amending § 4b.460 (c) by inserting after the word "Each" the word "reciprocating".

31. By amending § 4b.460 by adding a new paragraph (g) to read as follows:

4b.460 General. * * *

(g) For turbine engines, the air inlet ducts shall be so located or protected as to minimize the ingestion of foreign matter during take-off, landing, or taxying.

32. By amending § 4b.461 by adding a new paragraph (c) to read as follows:

4b.461 Induction system de-icing and anti-icing provisions. * * *

(c) Turbine powerplants. Turbine-powered airplanes shall be capable of operation throughout the flight power range without accumulation of ice in the air induction system such as to adversely affect engine operation or cause a serious loss of power and/or thrust in the continuous maximum and intermittent maximum icing conditions as defined in § 4b.1 (b) (7) and (8).

33. By amending § 4b.474 by deleting paragraph (c).

34. By adding a new § 4b.474a to read as follows:

4b.474a Reverse thrust controls.

(a) Propeller reverse thrust controls shall incorporate a means to prevent their inadvertent movement to a reverse thrust position. The means provided shall incorporate a positive lock or stop at the flight idle position and shall require a separate and distinct operation by the crew in order to displace the control from the flight regime.

(b) Turbo-jet reverse thrust controls shall incorporate a means to prevent their inadvertent movement to a reverse thrust position. The means provided shall incorporate a positive lock or stop at the flight idle position and shall require a separate and distinct operation by the crew in order to displace the control from the forward thrust regime.

35. By amending § 4b.480 (a) by adding a new subparagraph (7) to read as follows:

4b.480 Designated fire zones.

(a) * * *

(7) Combustor, turbine, and tailpipe sections of turbine engine installations which contain lines or components carrying flammable fluids or gases, except that the fire extinguisher system specified in § 4b.484 need not be provided for such sections if it is demonstrated that any fire occurring therein can be otherwise controlled.

36. By amending the introductory paragraph of § 4b.483 to read as follows:

4b.483 Lines and fittings. All lines and fittings carrying flammable fluids or gases in designated fire zones shall comply with the provisions of paragraphs (a) through (c) of this section.

37. By amending § 4b.484 (a) (1) by deleting the reference "§ 4b.12" and inserting in lieu thereof the reference "§ 4b.11 (a)".

38. By amending the introductory paragraph of § 4b.485 to read as follows:

4b.485 Fire-detector systems. Quick-acting fire or overheat detectors of an approved type shall be provided in all designated fire zones and in the combustion, turbine, and tailpipe sections of turbine-engine installations, and they shall be sufficient in number and location to assure prompt detection of fire in such zones and sections. Fire detectors shall comply with the following provisions:

39. By amending § 4b.604 to read as follows:

4b.604 Powerplant instruments. (See § 4b.613 for installation requirements.)

(a) Carburetor air temperature indicator for each reciprocating engine.

(b) Cylinder head temperature indicator for each air-cooled reciprocating engine.

(c) Gas temperature indicator for each turbine engine.

(d) Manifold pressure indicator for each reciprocating engine.

(e) Fuel pressure indicator for each reciprocating engine to indicate the pressure under which the fuel is being supplied.

(f) Fuel pressure warning means for each engine or a master warning means for all engines with provision for isolating the individual warning means from the master warning means.

(g) Fuel flowmeter indicator for each turbine engine. For reciprocating engines, a fuel flowmeter or fuel mixture indicator for each engine not equipped with an automatic altitude mixture control.

(h) Fuel quantity indicator for each fuel tank.

(i) Augmentation liquid quantity indicator for each tank, which is appropriate to the manner in which the liquid is to be used in operations.

(j) Oil quantity indicator for each oil tank. (See § 4b.613 (d).)

(k) Oil pressure indicator for each independent pressure oil system of each engine.

(l) Oil pressure warning means for each engine or a master warning means for all engines with provision for isolating the individual warning means from the master warning means.

(m) Oil temperature indication for each engine.

(n) Tachometer for each reciprocating engine.

(o) Tachometer for each turbine engine to indicate the speed of the rotors for which limiting speeds have been established.

(p) Fire-warning indicators. (See § 4b.485.)

(q) Thrust indicator for each turbo-jet engine.

(r) A torque indicator for each turbine-propeller engine. A device for each reciprocating engine capable of indicating to the flight crew during flight any change in the power output if the engine is equipped with an automatic propeller feathering system, the operation of which is initiated by a power output measuring system, or if the total engine cylinder displacement is 2,000 cubic inches or more.

(s) Position indicating means for each propeller on a turbine engine to indicate to the flight crew when the propeller blade angle is below the flight low pitch position (see § 4b.613). For reciprocating engines, a means for each reversing propeller to indicate to the pilot when the propeller is in reverse pitch.

(t) Position indicating means for each turbine engine utilizing a thrust reversing device to indicate to the flight crew when the device is in the reverse thrust position.

40. By amending § 4b.605 by deleting paragraph (c).

41. By amending § 4b.612 (d) by amending subparagraphs (1) and (3) and by adding a new subparagraph (5) to read as follows:

4b.612 Flight and navigational instruments. * * *

(d) Automatic pilot system. * * *

(1) The system shall be so designed that the automatic pilot can be quickly and positively disengaged by the human pilots to prevent it from interfering with their control of the airplane.

(2) * * *

(3) The manually operated control(s) for the system's normal operation shall be readily accessible to the pilots. The quick release (emergency) controls shall be installed on both the pilots' control wheels, on the side of the wheel opposite from the throttles. Attitude controls shall operate in the same plane and sense of motion as specified for the cockpit controls in § 4b.353 (b) and Figure 4b-16. The direction of motion shall be plainly indicated on or adjacent to each control.

(4) * * *

(5) When the automatic pilot integrates signals from auxiliary controls or furnishes signals for operation of other equipment, positive interlocks and sequencing of engagement shall be provided to preclude improper operation. Protection against adverse interaction of integrated components resulting from a malfunction shall be provided.

42. By amending § 4b.613 by adding a new paragraph (e) to read as follows:

4b.613 Powerplant instruments. * * *

(e) Turbine-propeller blade position indicating means. The indicating means required for turbine propellers by § 4b.604 (s) shall initiate indication before the propeller blade has moved more than eight degrees below the flight low pitch stop. The source of the indication shall sense blade position directly.

43. By amending § 4b.622 (c) to read as follows:

4b.622 Generating system. * * *

(c) Means accessible in flight to appropriate crew members shall be provided for the independent disconnection of each electrical power source from the system. Controls for this purpose shall be grouped to permit expeditious disconnection of electrical power sources.

44. By amending § 4b.631 by adding a new paragraph (e) to read as follows:

4b.631 Landing lights. * * *

(e) A means shall be provided to indicate to the pilots when the landing lights are extended.

45. By amending § 4b.640 by deleting from the note the clause "including engine inlet duct lips and surfaces".

46. By amending Figures 4b-25a and 4b.25c.

47. By amending § 4b.645 by adding a new paragraph (e) to read as follows:

4b.645 Ditching equipment. * * *

(e) Life line. Provisions shall be made for the storage of life lines, one attached to each side of the fuselage and arranged so that they can be used to enable occupants to stay on the wing after a ditching.

48. By amending § 4b.651 (a) by adding a new sentence at the end thereof to read as follows: "Aircraft certificated for operation at altitudes over 25,000 feet shall be provided with oxygen dispensing equipment for each occupant, arranged so that the mask and oxygen are immediately available in the event of uncontrolled cabin pressure loss, unless it is demonstrated that the rate of cabin pressure reduction following any probable failure and the emergency descent rate of the airplane are such that this type of equipment will not be necessary for protection of the occupants."

49. By amending § 4b.651 (d) to read as follows:

4b.651 Oxygen equipment and supply. * * *

(d) Equipment standards for dispensing units. An individual dispensing unit shall be provided for each crew member and passenger for whom supplemental oxygen is required to be furnished. Dispensing units required for aircraft certificated for operation at altitudes above 25,000 feet shall cover the nose and mouth. Crew members on flight deck duty in airplanes certificated to operate above 25,000 feet shall be provided with demand equipment. All dispensing units for airplanes certificated to operate at altitudes of not more than 25,000 feet shall be designed to cover the nose, and at least 25 percent of the units required to be furnished shall, in addition, cover the mouth. Crew masks shall permit utilization of necessary communication equipment. (For crew masks to be used for protective breathing purposes see paragraph (h) of this section.)

(Sec. 205 (a), 52 Stat. 984; 49 U.S.C. 425 (a). Interpret or apply secs. 601, 603, 52 Stat. 1007, 1009, as amended; 49 U.S.C. 551, 553)

By the Civil Aeronautics Board:

/s/ M. C. Mulligan

M. C. Mulligan
Secretary

(SEAL)

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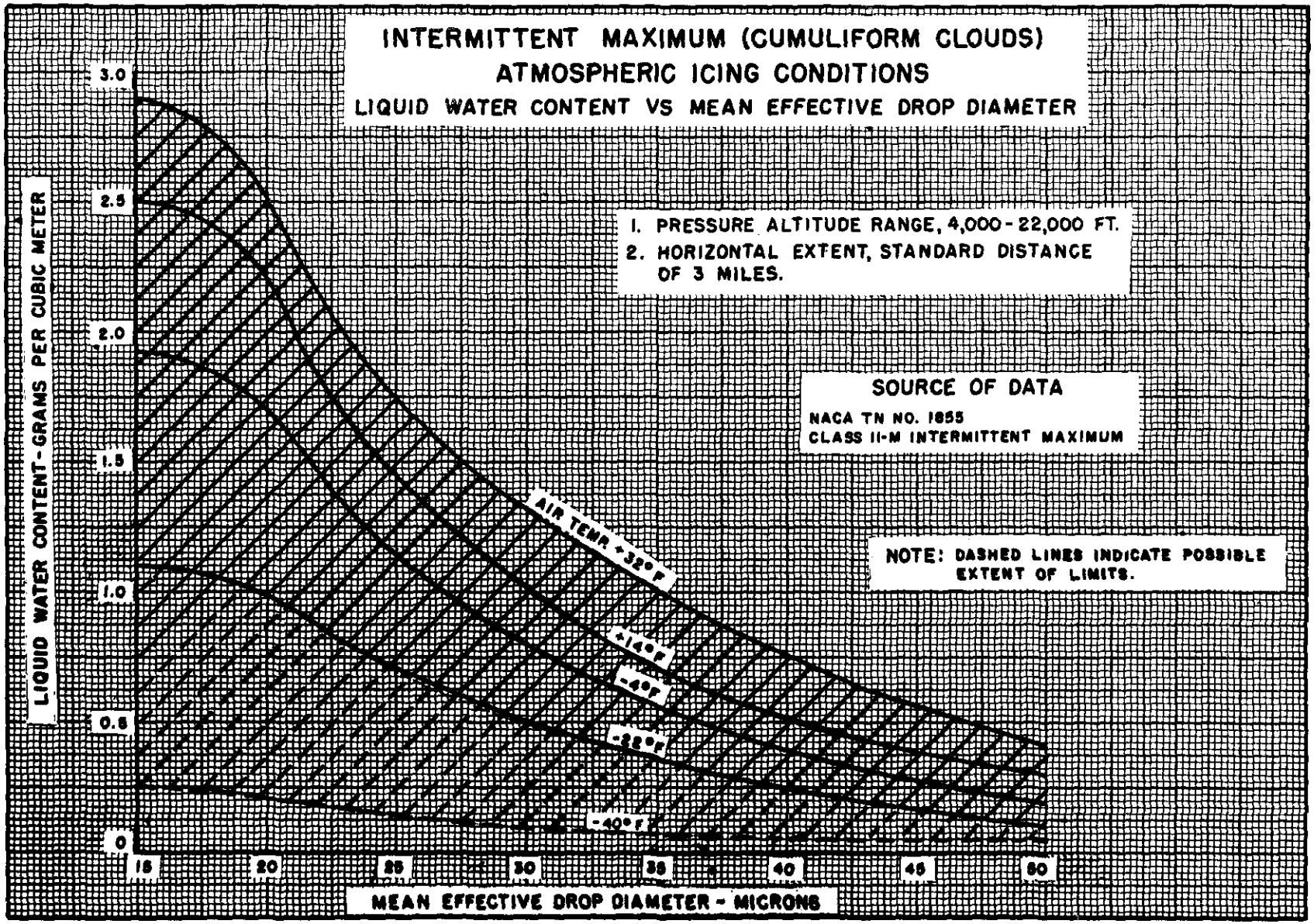

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FIGURE 4b-25a

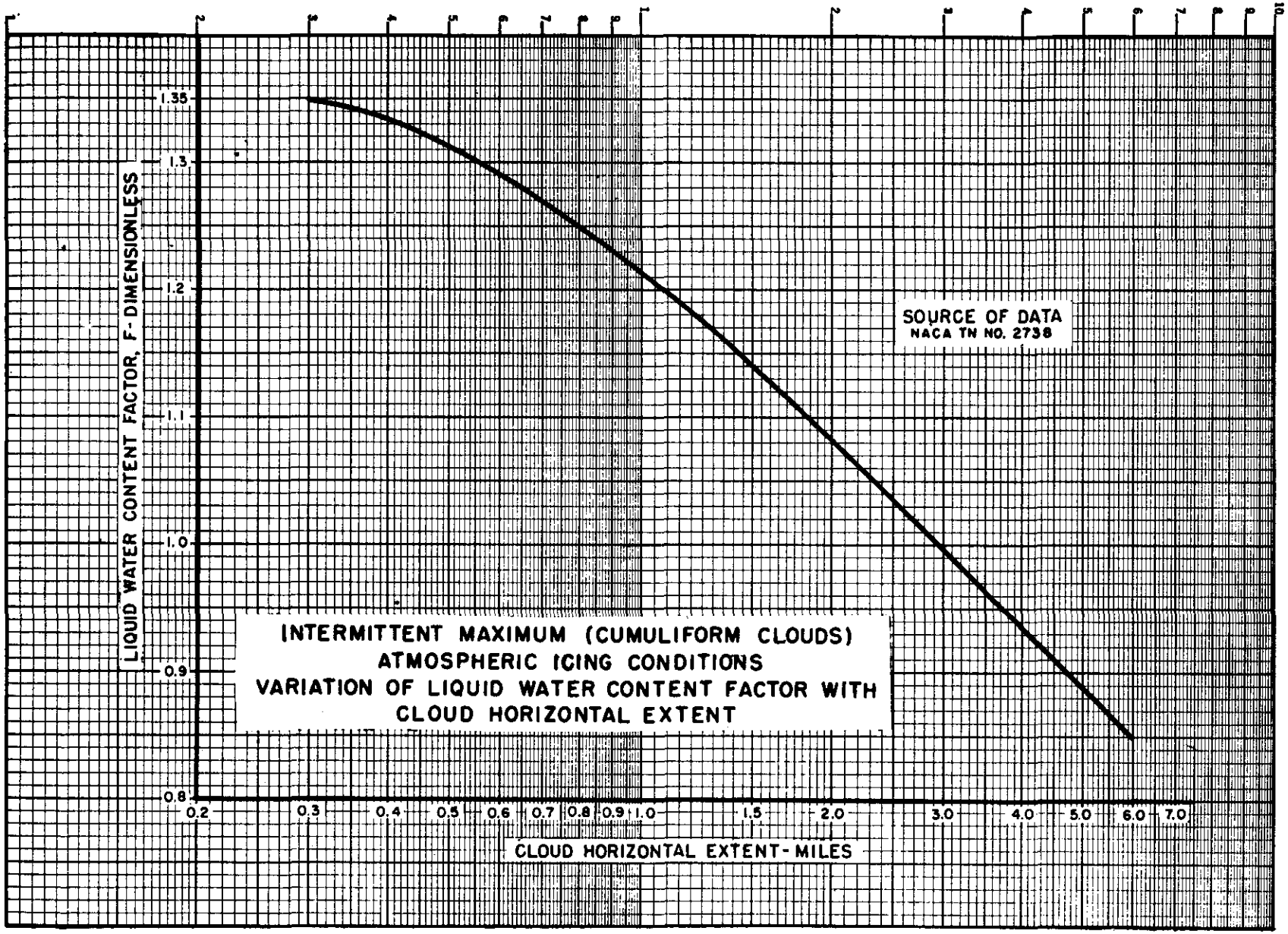

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FIGURE 4b-25c