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REFERENCE

## PART 4b—AIRPLANE AIRWORTHINESS; TRANSPORT CATEGORIES

### Miscellaneous Amendments Resulting From the 1958 Annual Airworthiness Review

There are contained herein amendments as a result of the 1958 Annual Airworthiness Review.

The flight characteristics requirements are being amended to change the provisions relating to longitudinal trim and elevator control power. The currently effective regulations require sufficient elevator control power to fly the airplane at all speeds, powers, weights, and center of gravity positions for which the airplane is to be certificated. Transports of recent design are utilizing adjustable stabilizers and control power becomes a function of the stabilizer incidence setting. The amendments to §§ 4b.112 (c)(1), 4b.131(a), and 4b.151(a) are intended to make these provisions more appropriate for applications to adjustable stabilizers.

A number of changes to the structural provisions are being made. Section 4b.1 is being amended to include a definition of the term "zero fuel weight" which is frequently used in stating the structural limitations of an airplane. Amendments to §§ 4b.210(b)(2), 4b.213 (c), and figure 4b-2 are intended to eliminate possible inconsistencies in the relation between design speed $V_A$ and point $A$ on the maneuvering envelope, which resulted from previous amendments.

A proposal to reduce the required maneuvering load factor at the design dive speed $V_D$ was considered during the annual airworthiness review but is not being adopted at this time. Although previous operating statistics show that the probability of attaining a 2.5 load factor is less at speeds above $V_D$ than it is at lower speeds, there has been relatively little operating experience on turbine transports for which the cruising speed is closer to $V_D$. The proposal will be kept under study as operating statistics are obtained on turbine transports.

Section 4b.216(a) is being amended to specify engine torque loads appropriate for turbine engine installations. A new § 4b.217 is being added to specify strength criteria for speed control devices used in flight. Changes to §§ 4b.231, 4b.235, and 4b.236 provide more rational ground load requirements relating to coefficients of friction and deflated tire conditions.

A change to § 4b.421(a) requires structural test or analysis of the fuel tanks when subject to pressure developed under the most adverse condition of airplane roll and fuel load. On the basis of past experience, § 4b.421(c) is being revised to require nonmetallic tanks to be tested only for the vibration test of § 4b.421(b)(4), since this has been found to be the critical condition, except that compliance may be shown based on satisfactory operating experience with a similar tank in a similar installation.

With respect to design and construction, a number of changes are being made. On some high-speed airplanes, it is likely that control surface dampers will be necessary in order to show compliance with the flutter prevention requirements. Therefore, § 4b.308 is being revised to provide that it shall be possible to continue safe flight even though a single failure occurs in the flutter damper system. Section 4b.320 is being amended to include design safety criteria for power-operated control systems. This amendment is intended to insure continued safe flight and landing in the event certain failures occur in the control system and in the case of engine failure.

Section 4b.352 is being amended to specify which portion of the windshield is affected by the bird impact strength requirements and which portion is affected by the fragmentation requirements.

To provide appropriate emergency exit requirements for small transports, § 4b.362(c) is being amended to require at least one type IV exit on each side of the fuselage for a passenger capacity of up to 10 persons. A corresponding change is being made in the ditching exit requirements of § 4b.362(d).

In the powerplant installation requirements, § 4b.407 is being amended to extend the "fail-safe" concept to all types of thrust reversing systems intended for ground and/or inflight use. Sections 4b.410 and 4b.413 are being revised to simplify and clarify the statement of the fuel system and fuel flow requirements. Related changes to § 4b.430 clarify the definitions of main and emergency fuel pumps, delete the requirements that one pump for each engine must be engine driven, and eliminate the requirement for a bypass on fuel injection pumps for turbine engines.

Other amendments require cooling tests for turbine engine installations and means to indicate the functioning of the powerplant ice protection system.

A proposal to require the ability to regain full power or thrust within 20 seconds after engine malfunctioning occurs due to depletion of fuel in any tank was considered during the annual airworthiness review, but is not being adopted at this time. The objective of this proposal was to minimize the possibility of turbine engine flame-out during fuel tank switching. However, since there are several methods of accomplishing this objective, including systems designed to prevent such engine malfunctioning, further study is being given to this subject.

Other proposals being deferred for further study concern turbo-jet reverse thrust controls, the fire resistance of turbine engine installation diaphragms, and a means to indicate a clogged fuel filter condition (i.e., bypass operation) to the flight crew. The proposal on reverse thrust controls would have deleted the provision requiring a means to prevent inadvertent movement to a reverse thrust position, for systems which are approved for use in flight. Such systems are still in the development stage and additional evaluation is considered necessary to determine whether the previous proposal or some other change is appropriate. The proposal to permit fire-resistant in lieu of fire-proof diaphragms in certain turbine engine installations will be considered along with other changes in the powerplant fire protection requirements to make them suitable for isolated pod installations. The value of inflight indication of fuel filter clogging has been questioned in view of the fact that automatic filter bypass provisions cannot be controlled in flight and the military services are developing devices to indicate the occurrence of bypassing to maintenance personnel who can then service the filters.

Section 4b.603 is being amended to incorporate current terminology for flight and navigational instruments. However, a proposal which would require all critical air-speed limitations that vary with altitude to be displayed on the appropriate instrument is being deferred for further study. Where a number of such limitations exist, that proposal might be impractical or lead to confusion or undesirable differences in displaying air-speed limitations to pilots. At present, $V_{NE}$ is the only variable limit required to be indicated. A machmeter is being required for airplanes having compressibility limitations which are not otherwise indicated to the pilot in accordance with § 4b.732.

Section 4b.612 is being revised to clarify the power failure indicating means required for certain instruments. Section 4b.625 is being amended to cover new types of storage batteries as well as the conventional lead-acid types. A new § 4b.628 establishes criteria intended to minimize the hazards of lightning strikes on portions of the airplane which are insulated from the main airframe.

Another new § 4b.647 requires all new type transport category airplanes to be provided with individual flotation means for each occupant even though the airplane is not certificated for ditching. The requirement that life preservers shall be reversible is being deleted from § 4b.645(d), since it is expected that design features and instructions to insure correct donning will be covered in the appropriate Technical Standard Order. Since chunks of ice falling from aircraft have caused hazards to persons and property on the ground, a new § 4b.660 requires that fluid drains be designed to prevent the formation of ice on the airplane. A placard showing the air-speed limitations for various flap settings is being required because these limitations are no longer shown on the air-speed indicator.

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.

In consideration of the foregoing, Part 4b of the Civil Air Regulations (14 CFR Part 4b, as amended) is hereby amended as follows, effective October 1, 1959:

1. By amending § 4b.1(b)(4) by deleting the phrase "by the U.S. National Advisory Committee for Aeronautics" and inserting in lieu thereof "by the National Aeronautics and Space Administration (formerly the National Advisory Committee for Aeronautics)".

2. By amending § 4b.1(c) by redesignating subparagraph (8) as subparagraph (9) and inserting a new subparagraph (8) to read as follows:

**§ 4b.1 Definitions.**

* * * * *

(c) *Weights.* * * *

(8) *Zero fuel weight.* The zero fuel weight is the design maximum weight of the airplane with no disposable fuel and oil.

3. By amending § 4b.112(c)(1) to read as follows:

**§ 4b.112 Stalling speeds.**

* * * * *

(c) * * *

(1) From a speed sufficiently above the stalling speed to assure steady conditions, the elevator control shall be applied at a rate such that the airplane speed reduction does not exceed one mile per hour per second. This maneuver shall be performed with the airplane trimmed at a speed of $1.4V_{s_1}$, except that airplanes utilizing adjustable stabilizers may be trimmed at a speed selected by the applicant but not less than $1.2V_{s_1}$, nor greater than $1.4V_{s_1}$.

4. By amending § 4b.131(a) to read as follows:

**§ 4b.131 Longitudinal control.**

(a) It shall be possible at all speeds between the trim speed prescribed in § 4b.112(c)(1) and $V_{s_1}$ to pitch the nose downward so that a prompt recovery to this selected trim speed can be made with the following combination of airplane configurations:

(1) The airplane trimmed at the trim speed prescribed in § 4b.112(c)(1),

(2) The landing gear extended,

(3) The wing flaps in a retracted, and in an extended position,

(4) Power off, and maximum continuous power on all engines.

**§ 4b.151 [Amendment]**

5. By amending § 4b.151(a) by inserting in the last sentence after the words "control force" the phrase "and within the limits of elevator control power".

6. By amending § 4b.210(b)(2) to read as follows:

**§ 4b.210 General.**

* * * * *

(b) *Design air speeds.* * * *

(2) *Design maneuvering speed, $V_A$.* The design maneuvering speed, $V_A$, shall be equal to $V_{s_1}\sqrt{n}$ where $n$ is the limit positive maneuvering load factor at $V_C$ (see § 4b.211(a)) and $V_{s_1}$ is the stalling speed with flaps retracted. Both $V_A$ and $V_S$ shall be evaluated at the design weight and altitude under consideration. $V_A$ need not be greater than $V_C$ or the speed at which the positive $C_{N_{max}}$ curve intersects the positive maneuver load factor line, whichever is the lesser. (See figure 4b–2.)

7. By amending § 4b.210(c) by deleting the heading and the first sentence and inserting in lieu thereof the following, respectively:

(c) *Design fuel and oil loads.* The disposable load combinations shall include all fuel and oil loads in the range from zero fuel and oil to the maximum fuel and oil load selected by the applicant. * * *

8. By amending § 4b.210(c)(1) by inserting between the words "fuel" and "at" the phrase "and oil in the wing".

9. By amending § 4b.213(c) to read as follows:

**§ 4b.213 Symmetrical flight conditions.**

* * * * *

(c) *Maneuvering pitching conditions.* The following conditions involving pitching acceleration shall be investigated (see figure 4b–2):

(1) *Maximum elevator displacement at speed $V_A$.* The airplane shall be assumed to be flying in steady level flight (point $A_1$ on figure 4b–2) and the pitching control suddenly moved to obtain extreme positive pitching (nose up) except as limited by pilot effort in accordance with § 4b.220(a).

(2) *Checked maneuver at speeds between $V_A$ and $V_D$.* The airplane shall be assumed to be subjected to a checked maneuver from steady level flight (points $A_1$ to $D_1$ on figure 4b–2) and from the positive load factor (points $A_2$ to $D_2$ on figure 4b–2) as follows:

(i) A positive pitching acceleration (nose up), equal to at least the following value, shall be assumed to be attained concurrently with the airplane load factor of unity (points $A_1$ to $D_1$ on figure 4b–2) unless it is shown that lesser values could not be exceeded:

$$\frac{39}{V}n\,(n-1.5)\ \text{(radians/sec.}^2\text{)}$$

where $n$ is the positive load factor (see § 4b.211(a)(1)), at the speed under consideration, and $V$ is the airplane equivalent speed, knots.

(ii) A negative pitching acceleration (nose down) equal to at least the following value shall be assumed to be attained concurrently with the airplane positive maneuvering load factor (points $A_2$ to $D_2$ on figure 4b–2) unless it is shown that lesser values could not be exceeded:

$$-\frac{26}{V}n\,(n-1.5)\ \text{(radians/sec.}^2\text{)}$$

where $n$ is the positive load factor (see § 4b.211(a)(1)), at the speed under consideration, and $V$ is the airplane equivalent speed, knots.

(3) *Specified control displacement.* In lieu of subparagraph (2) of this paragraph, a checked maneuver based on a rational pitching control motion vs. time

profile may be established such that the design limit load factor as defined in b.211(a)(1) will not be exceeded. The ...plane response shall result in pitching accelerations not less than those specified in subparagraph (2) unless it is shown that lesser values cannot be exceeded.

**§ 4b.216 [Amendment]**

10. By amending § 4b.216(a) by adding at the end thereof a new sentence to read as follows: "For turbine propeller installations the limit torque shall be obtained by multiplying the mean torque by a factor of 1.25."

11. By amending § 4b.216(a)(3) by deleting the factor "2.0" and inserting in lieu thereof "1.6".

12. By adding a new § 4b.217 to read as follows:

**§ 4b.217 Speed control devices.**

When speed control devices (e.g., spoilers, drag flaps, etc.) are incorporated for use in en route conditions, the following conditions shall apply:

(a) The airplane shall be designed for the symmetrical maneuvers and gusts prescribed in § 4b.211 and the yawing maneuvers and lateral gusts in § 4b.215 with the device extended at all speeds up to the placard device extended speed.

(b) When the speed control device incorporates automatic operation or load limiting features, the airplane shall be designed for the maneuver and gust conditions prescribed in paragraph (a) of this section, at the speeds and corresponding device positions which the ...chanism permits.

**§ 4b.231 [Amendment]**

13. By amending § 4b.231(a)(1) by deleting the second sentence and inserting in lieu thereof: "It shall be acceptable to establish the coefficient of friction between the tires and the ground by considering the effects of skidding velocity and tire pressure, except that it need not be greater than 0.8."

**§ 4b.235 [Amendment]**

14. By amending § 4b.235(e)(2) by adding at the end thereof a new sentence to read as follows: "Where this condition results in a nose gear side load in excess of 0.8 times the vertical nose gear load, it shall be acceptable to limit the design nose gear side load to 0.8 times the vertical load with the unbalanced yawing moments assumed to be resisted by aircraft inertia forces."

**§ 4b.236 [Amendment]**

15. By amending § 4b.236(a) by adding at the end thereof a new sentence to read as follows: "A tandem strut gear arrangement shall be considered to be a multiple-wheel unit."

16. By amending § 4b.236(c) by amending the last sentence of the introductory paragraph to read as follows: "The ground reactions shall be applied to the wheels with inflated tires, except that for multiple-wheel gear units in...porating more than one shock strut, ...shall be permissible to use a rational distribution of the ground reactions between the deflated and inflated tires, taking into account the differences in shock strut extensions resulting from a deflated tire."

**§ 4b.308 [Amendment]**

17. By amending § 4b.308(a) by adding at the end thereof a new sentence to read as follows: "If control surface flutter dampers are installed to meet the requirements of this section, it shall be shown that a single failure in the flutter damper system will not preclude continued safe flight of the airplane at any speed up to $V_D$."

18. By amending § 4b.320 by redesignating the present paragraph as paragraph (a) and by adding a new paragraph (b) to read as follow:

**§ 4b.320 General.**

* * * * *

(b) Power boost and power-operated control systems shall be designed in accordance with the provisions of subparagraphs (1) and (2) of this paragraph.

(1) When a power boost or power-operated control system is used, an alternate system shall be immediately available such that any single failure in the power portion shall not preclude continued safe flight and landing. Such alternate system may be a duplicate power portion or a manually operated mechanical system. The power portion shall include the power source (e.g., hydraulic pumps), and such items as valves, lines, and actuators. The failure of mechanical parts (such as piston rods and links) and the jamming of power cylinders need not be considered if such failure or jamming is considered to be extremely remote.

(2) Both the primary and alternate systems shall be operable in the event of a single engine failure. For airplanes with more than two engines, at least one system shall be operable in the event of failure of any two engines. It shall be shown by analysis that in the event of loss of power on all engines, the airplane is not uncontrollable.

19. By amending § 4b.352(b) by deleting from the first sentence the opening phrase "The windshield, its supporting structure, and other structure in front of the pilots" and inserting in lieu thereof "The windshield panes which the pilots will be directly behind in the normal conduct of their duties and the supporting structures for such panes", and by deleting the last sentence.

20. By amending § 4b.352 by redesignating paragraph (c) as paragraph (d) and by adding a new paragraph (c) to read as follows:

**§ 4b.352 Windshields and windows.**

* * * * *

(c) 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 a low order. The provisions of this paragraph are intended to apply to all transparent panes in the cockpit section which appear in the front view of the aircraft, are inclined 15 degrees or more to the longitudinal axis of the aircraft, and have any portion located so that fragmentation thereof will constitute a hazard to the pilots.

**§ 4b.362 [Amendment]**

21. By amending § 4b.362(c)(1) by deleting the table thereunder and inserting in lieu thereof the following table:

| Passenger seating capacity | Emergency exits required on each side of the fuselage | | | |
|---|---|---|---|---|
| | Type I | Type II | Type III | Type IV |
| 1–10 inclusive | ------ | ------ | ------ | 1 |
| 11–19 inclusive | ------ | ------ | 1 | ------ |
| 20–39 inclusive | ------ | 1 | ------ | 1 |
| 40–59 inclusive | 1 | ------ | ------ | 1 |
| 60–79 inclusive | 1 | ------ | 1 | ------ |
| 80–109 inclusive | 1 | ------ | 1 | 1 |
| 110–139 inclusive | 2 | ------ | 1 | ------ |
| 140–179 inclusive | 2 | ------ | 2 | ------ |
| 180–219 inclusive | 2 | 2 | ------ | ------ |

22. By amending § 4b.362(d) by adding after the first sentence a new sentence to read as follows: "On airplanes with a passenger seating capacity of 10 or less, the minimum dimensions of the exit specified in paragraph (b)(4) of this section shall be acceptable."

23. By amending § 4b.362(g) by adding a new sentence at the end thereof to read as follows: "If it is necessary to pass through a doorway to reach any required emergency exit from any seat in the passenger cabin, the door shall be provided with a means to latch it in the open position. A suitable placard stating that the door is to be latched in the open position during takeoff and landing shall be installed."

24. By amending § 4b.407 to read as follows:

**§ 4b.407 Reversing systems.**

(a) Reversing systems intended for ground operation only shall be such that no single failure or malfunctioning of the system under all anticipated conditions of airplane operation will result in unwanted reverse thrust. Failure of structural elements need not be considered if occurrence of such failure is expected to be extremely remote.

(b) Turbo-jet reversing systems intended for inflight use shall be such that no unsafe condition will result during normal operations of the system, or from any failure or reasonably likely combination of failures of the reversing system, under all anticipated conditions of operation of the airplane. Failure of structural elements need not be considered if occurrence of such failure is expected to be extremely remote.

25. By amending § 4b.410(a) to read as follows:

**4b.410 General.**

(a) The fuel system shall be constructed and arranged in such a manner as to assure a flow of fuel at a rate and pressure which have been established for proper engine functioning under all likely operating conditions, including all maneuvers for which the airplane is intended. (For fuel system instruments see § 4b.604.)

26. By amending § 4b.413 to read as follows:

**4b.413 Fuel flow demonstration.**

(a) The fuel flow available for use by the engine shall be demonstrated to be at least 125 percent of the fuel flow required to develop the maximum horsepower or thrust selected for airplane certification, when the airplane is in operating conditions appropriate to the use of such power or thrust.

(b) The ability of the system to provide at least 100 percent of the fuel flow required by the engines shall be demonstrated when the airplane is in the operating condition, including attitude and altitude, which represents the most adverse condition from the standpoint of fuel feed which the airplane is designed to attain.

(c) During the demonstration prescribed in paragraphs (a) and (b) of this section, the following provisions shall apply:

(1) Fuel shall be delivered to the engine at a pressure within the limits specified in the engine type certificate.

(2) The quantity of fuel in the tank being considered shall not exceed the amount established as the unusable fuel supply for that tank, as determined by demonstrating compliance with the provisions of § 4b.416 (see also §§ 4b.420 and 4b.613(b)), together with whatever minimum quantity of fuel it may be necessary to add for the purpose of conducting flow test.

(3) Such main pumps shall be used as are necessary for each operating condition and airplane attitude for which the demonstrations are made. For each main pump so used, the demonstration shall be repeated, substituting the appropriate emergency pump, when required, for the main pump. (See § 4b.430(b).)

(4) If a fuel flowmeter is provided, the meter shall be blocked only during the flow test prescribed in paragraph (b) of this section and the fuel shall flow through the meter or its bypass.

(5) It shall be acceptable to conduct the demonstrations prescribed in paragraphs (a) and (b) of this section by a ground test on the airplane or on a representative mock-up of the fuel system.

**§ 4b.414 [Deletion]**

27. By deleting § 4b.414.

**§ 4b.415 [Amendment]**

28. By amending § 4b.415 by deleting the reference "§ 4b.414" and inserting in lieu thereof "§ 4b.413".

29. By amending § 4b.421(a) to read as follows:

**§ 4b.421 Fuel tank tests.**

(a) Fuel tanks shall be demonstrated by test to be capable of withstanding the more critical of the pressures resulting from the conditions of subparagraphs (1) and (2) of this paragraph without failure or leakage as mounted in the airplane. In addition, tank surfaces subjected to more critical pressures resulting from the conditions of subparagraphs (3) and (4) of this paragraph shall be demonstrated by means of either analyses or tests to be capable of withstanding such pressures.

(1) Internal pressures of 3.5 psi;

(2) 125 percent of the maximum air pressure developed in the tank from ram effect;

(3) Fluid pressures developed during maximum limit accelerations and deflections of the airplane with a full tank;

(4) Fluid pressures developed during the most adverse combination of airplane roll and fuel load.

30. By amending § 4b.421(b) by inserting the word "Metallic" at the beginning of the first sentence.

31. By amending § 4b.421(c) to read as follows:

(c) Nonmetallic tanks shall withstand the test specified in subparagraph (b)(4) of this section with fuel at a temperature of 110° F. except that this test shall not be required where satisfactory operating experience with a similar tank in a similar installation is shown. During the test a representative specimen of the tank shall be installed in supporting structure which simulates the installation in the airplane.

32. By amending § 4b.430 to read as follows:

**§ 4b.430 Fuel pumps.**

(a) *Main pumps.* (1) Any fuel pump that is required for proper engine operation or to meet the fuel system requirements of this subpart, except for the provisions of paragraph (b) of this section, shall be considered a main pump.

(2) Provision shall be made to permit the bypass of all positive displacement fuel pumps except fuel injection pumps approved as part of the engine.

(b) *Emergency pumps.* (1) Emergency pumps shall be provided and immediately available to permit supplying all engines with fuel in case of failure of any one main fuel pump except fuel injection pumps approved as part of the engine. This requirement is not intended to prohibit the use of another main pump as an emergency pump after failure of one main pump.

**§ 4b.431 [Deletion]**

33. By deleting § 4b.431.

34. By adding a new § 4b.455 to read as follows:

**§ 4b.455 Cooling of turbine engine installations.**

For turbine engine installations, tests shall be conducted to demonstrate that all powerplant components for which temperature limits have been established are cooled within those limits.

**§ 4b.461 [Amendment]**

35. By amending § 4b.461(c) by adding at the end thereof a new sentence to read as follows: "Means to indicate the functioning of the powerplant ice protection system shall be provided."

36. By amending § 4b.483 to read as follows:

**§ 4b.483 Lines and fittings.**

(a) All lines and fittings carrying flammable fluids in designated fire zones shall be fire-resistant, except as otherwise provided in this section. If flexible hose is used, the assembly of hose and end fittings shall be of an approved type. The provisions of this paragraph need not apply to those lines and fittings which form an integral part of the engine.

(b) Vent and drain lines and their fittings shall be subject to the provisions of paragraph (a) of this section unless a failure of such line or fitting will not result in, or add to, a fire hazard.

37. By amending § 4b.603 to read as follows:

**§ 4b.603 Flight and navigational instruments.**

(See § 4b.612 for installation requirements.)

(a) Air-speed indicating system. If the air-speed limitations vary with altitude, the air-speed indicator shall incorporate a maximum allowable air-speed indication showing the variation of $V_{NE}$ with altitude including compressibility limitations. (See § 4b.732.)

(b) Altimeter (sensitive or precision type),

(c) Rate-of-climb indicator (ver speed),

(d) Free air temperature indicator,

(e) Clock (sweep-second pointer type),

(f) Rate-of-turn indicator (gyroscopic type with integral bank or slip indicator),

(g) Bank and pitch indicator (gyroscopically stabilized),

(h) Direction indicator (gyroscopically stabilized magnetic and/or nonmagnetic type),

(i) Direction indicator (nonstabilized type magnetic compass),

(j) Machmeter for airplanes having compressibility limitations not otherwise indicated to the pilot in accordance with § 4b.732.

38. By amending § 4b.612(e) to read as follows:

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

* * * * *

(e) *Instruments utilizing a power supply.* The following shall apply to each instrument required in § 4b.603 (f), (g), and (h) which utilizes a power supply:

(1) Each instrument shall have a visual type of power failure indicating means, integral with or located adjacent to the instrument, to indicate when adequate power is not being supplied to the instrument (see note) to sustain proper instrument performance. The l r shall be sensed at or near the point w...re power enters the instrument. For elec-

tric instruments power shall be deemed adequate when voltage is between approved limits.

Each instrument shall be provided with two independent sources of power and a means of selecting either power source. When duplicate independent instruments are installed, power source selection need not be provided if each instrument has an independent power source.

(3) The installation and power supply system shall be such that failure of one instrument, or the energy supply from one source, or a fault in any part of the power distribution system, will not interfere with the proper supply of energy from the other source. (See also §§ 4b.606(c) and 4b.623.)

NOTE: The word "instrument" as used herein includes those devices which are physically contained in one unit and those devices which are composed of two or more physically separate units or components connected together; such as a remote indicating gyroscopic direction indicator which includes a magnetic sensing element, a gyroscopic unit, an amplifier, and an indicator connected together.

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

**§ 4b.613 Powerplant instruments.**

* * * * *

(f) *Fuel pressure indication.*

(1) Provisions shall be made to measure the fuel pressure, in all systems supplying reciprocating engines, at a point downstream of all fuel pumps except fuel injection pumps. (For instrument requirements see § 4b.604(e).)

(2) When necessary for the maintenance of the proper fuel delivery pressure, a connection shall be provided to transmit the carburetor air intake static pressure to the proper fuel pump relief valve connection. In such cases, to avoid erroneous fuel pressure reading, the gauge balance lines shall be independently connected to the carburetor inlet pressure.

40. By amending § 4b.625(d) to read as follows:

**§ 4b.625 Electrical equipment and installation.**

* * * * *

(d) Storage batteries shall be of such design and be so installed that:

(1) Safe oil temperatures and pressures are maintained during any probable charging or discharging condition. No uncontrolled increase in cell temperature shall result when the storage battery is recharged (after previous complete discharge) at maximum regulated voltage, during a flight of maximum duration, under the most adverse cooling conditions likely to occur in service. Tests to demonstrate compliance with this regulation shall not be required if satisfactory operating experience with similar batteries and installations has shown that maintaining safe cell temperatures and pressures presents no problem.

(2) Explosive or toxic gases emitted by the storage battery in normal operation, or as the result of any probable malfunction in the charging system or battery installation, shall not accumulate in hazardous quantities within the airplane.

(3) Corrosive fluids or gases which may be emitted or spilled from the storage battery shall not damage the surrounding airplane structure or adjacent essential equipment.

41. By adding a new § 4b.628 to read as follows:

**§ 4b.628 Lightning strike protection.**

Those portions of the airplane which are electrically insulated from the main body of the airplane shall be connected to the basic airframe through appropriate lightning arrestors, unless it is shown that a lightning strike on the insulated portion is improbable because of the shielding afforded by other portions of the airplane, or unless it is shown that a lightning strike on the insulated portion would not create a hazard to the airplane or its occupants.

**§ 4b.632 [Amendment]**

42. By amending § 4b.632(d) by deleting the word "noncombustible" and inserting in lieu thereof the word "flame-resistant".

**§ 4b.645 [Amendment]**

43. By amending § 4b.645(d) by deleting the last sentence thereof.

44. By adding a new § 4b.647 to read as follows:

**§ 4b.647 Flotation means.**

If the airplane is not equipped with life preservers in accordance with § 4b.645(d), an approved individual flotation means shall be provided for each occupant. Such flotation means shall be within easy reach of each occupant while seated and readily removable from the airplane.

45. By adding a new § 4b.660 to read as follows:

**§ 4b.660 Draining of fluids subject to freezing.**

When liquids subject to freezing are drained overboard either in flight or during group operation, drains shall be located and designed to prevent the formation of ice on the airplane as a result of such drainage.

46. By amending § 4b.738 by adding a new paragraph (e) to read as follows:

**§ 4b.738 Miscellaneous markings and placards.**

* * * * *

(e) *Air-speed placard.* A placard shall be installed in clear view of each pilot giving the maximum air speeds for flap extension to the takeoff, approach, and landing positions.

47. By amending Figure 4b-2 to read as follows:

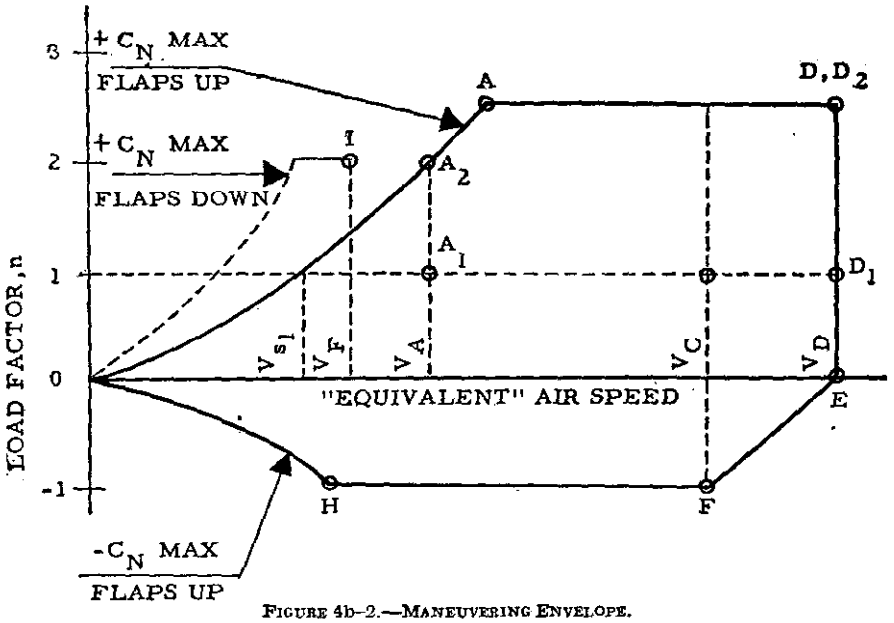



FIGURE 4b-2.—MANEUVERING ENVELOPE.

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E. R. QUESADA,
*Administrator.*

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