

Code of Federal Regulations

▼ Sec. 25.571

Part 25 AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES	
Subpart C--Structure	Fatigue Evaluation

Sec. 25.571

Fatigue evaluation of flight structure.

(a) *Strength, detail design, and fabrication.* Those parts of the structure (including wings, fixed and movable control surfaces, the fuselage, and their related primary attachments), whose failure could result in catastrophic failure of the airplane, must be evaluated under the provisions of either paragraph (b) or (c) of this section.

(b) *Fatigue strength.* The structure must be shown by analysis, tests, or both, to be able to withstand the repeated loads of variable magnitude expected in service. In addition, the following apply:

(1) The evaluation must include--

- (i) The typical loading spectrum expected in service;
- (ii) Identification of principal structural elements and detail design points, the fatigue failure of which could cause catastrophic failure of the airplane; and
- (iii) An analysis or repeated load tests, or a combination of analysis and load tests, of principal structural elements and detail design points identified in subdivision (ii) of this subparagraph.

(2) The service history of airplanes of similar structural design, taking due account of differences in operating conditions and procedures, may be used.

(3) If substantiation of the pressure cabin by fatigue tests is required, the cabin, or representative parts of it, must be cycle-pressure tested, using the normal operating pressure plus the effects of external aerodynamic pressure combined with the flight loads. The effects of flight loads may be represented by an increased cabin pressure or may be omitted if they are shown to have no significant effect upon fatigue.

(c) *Fail safe strength.* It must be shown by analysis, tests, or both, that catastrophic failure or excessive structural deformation, that could adversely affect the flight characteristics of the airplane, are not probable after fatigue failure or obvious partial failure of a single principal structural element. After these types of failure of a single principal structural element, the remaining structure must be able to withstand static loads corresponding to the following:

(1) An ultimate maneuvering load factor of 2.0 at V_C .

(2) Gust loads as specified in Secs. 25.341 and 25.351(b), except that these gust

- loads are considered to be ultimate loads and the gust velocities are--
- (i) At speed V_B , 49 fps from sea level to 20,000 feet, thereafter decreasing linearly to 28 fps at 50,000 feet;
 - (ii) At speed V_C , 33 fps from sea level to 20,000 feet, thereafter decreasing linearly to 16.5 fps at 50,000 feet; and
 - (iii) At speed V_D , 15 fps from sea level to 20,000 feet, thereafter decreasing linearly to 6 fps at 50,000 feet.
- (3) Eighty percent of the limit loads resulting from the conditions specified in Sec. 25.427. These loads are considered to be ultimate loads.
- (4) Eighty percent of the limit maneuvering loads resulting from the conditions specified in Sec. 25.351(a), except that the load need not exceed 100 percent of the critical load obtained in compliance with Sec. 25.351(a), using a pilot effort of 180 pounds. This load is an ultimate load.

The loads prescribed in this paragraph must be multiplied by a factor of 1.15 unless the dynamic effects of failure under static load are otherwise considered. For a pressurized cabin, the normal operating pressures combined with the expected external aerodynamic pressures must be applied simultaneously with the flight loading conditions specified in this paragraph.

► Comments

▼ Document History

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