

(c) Except as provided in paragraph (d) of this section, there may be no buffeting condition, in normal flight, including configuration changes during cruise, severe enough to interfere with the control of the airplane, to cause excessive fatigue to the crew, or to cause structural damage. Stall warning buffeting within these limits is allowable.

(d) There may be no perceptible buffeting condition in the cruise configuration in straight flight at any speed up to  $V_{MO}/M_{MO}$ , except that stall warning buffeting is allowable.

(e) For an airplane with  $M_D$  greater than .6 or with a maximum operating altitude greater than 25,000 feet, the positive maneuvering load factors at which the onset of perceptible buffeting occurs must be determined with the airplane in the cruise configuration for the ranges of airspeed or Mach number, weight, and altitude for which the airplane is to be certificated. The envelopes of load factor, speed, altitude, and weight must provide a sufficient range of speeds and load factors for normal operations. Probable inadvertent excursions beyond the boundaries of the buffet onset envelopes may not result in unsafe conditions.

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**§ 25.253 High-speed characteristics.**

(a) *Speed increase and recovery characteristics.* The following speed increase and recovery characteristics must be met:

(1) Operating conditions and characteristics likely to cause inadvertent speed increases (including upsets in pitch and roll) must be simulated with the airplane trimmed at any likely cruise speed up to  $V_{MO}/M_{MO}$ . These conditions and characteristics include gust upsets, inadvertent control movements, low stick force gradient in relation to control friction, passenger movement, leveling off from climb, and descent from Mach to airspeed limit altitudes.

(2) Allowing for pilot reaction time after effective inherent or artificial speed warning occurs, it must be shown that the airplane can be recovered to a

normal attitude and its speed reduced to  $V_{MO}/M_{MO}$ , without—

(i) Exceptional piloting strength or skill;

(ii) Exceeding  $V_D/M_D$ ,  $V_{DF}/M_{DF}$ , or the structural limitations; and

(iii) Buffeting that would impair the pilot's ability to read the instruments or control the airplane for recovery.

(3) With the airplane trimmed at any speed up to  $V_{MO}/M_{MO}$ , there must be no reversal of the response to control input about any axis at any speed up to  $V_{DF}/M_{DF}$ . Any tendency to pitch, roll, or yaw must be mild and readily controllable, using normal piloting techniques. When the airplane is trimmed at  $V_{MO}/M_{MO}$ , the slope of the elevator control force versus speed curve need not be stable at speeds greater than  $V_{FC}/M_{FC}$ , but there must be a push force at all speeds up to  $V_{DF}/M_{DF}$  and there must be no sudden or excessive reduction of elevator control force as  $V_{DF}/M_{DF}$  is reached.

(4) Adequate roll capability to assure a prompt recovery from a lateral upset condition must be available at any speed up to  $V_{DF}/M_{DF}$ .

(5) With the airplane trimmed at  $V_{MO}/M_{MO}$ , extension of the speedbrakes over the available range of movements of the pilot's control, at all speeds above  $V_{MO}/M_{MO}$ , but not so high that  $V_{DF}/M_{DF}$  would be exceeded during the maneuver, must not result in:

(i) An excessive positive load factor when the pilot does not take action to counteract the effects of extension;

(ii) Buffeting that would impair the pilot's ability to read the instruments or control the airplane for recovery; or

(iii) A nose down pitching moment, unless it is small.

(b) *Maximum speed for stability characteristics,  $V_{FC}/M_{FC}$ .*  $V_{FC}/M_{FC}$  is the maximum speed at which the requirements of §§ 25.143(g), 25.147(f), 25.175(b)(1), 25.177(a) through (c), and 25.181 must be met with flaps and landing gear retracted. Except as noted in § 25.253(c),  $V_{FC}/M_{FC}$  may not be less than a speed midway between  $V_{MO}/M_{MO}$  and  $V_{DF}/M_{DF}$ , except that, for altitudes where Mach number is the limiting factor,  $M_{FC}$  need not exceed the Mach number at which effective speed warning occurs.

(c) *Maximum speed for stability characteristics in icing conditions.* The maximum speed for stability characteristics with the ice accretions defined in appendix C, at which the requirements of §§ 25.143(g), 25.147(f), 25.175(b)(1), 25.177(a) through (c), and 25.181 must be met, is the lower of:

- (1) 300 knots CAS;
- (2)  $V_{FC}$ ; or
- (3) A speed at which it is demonstrated that the airframe will be free of ice accretion due to the effects of increased dynamic pressure.

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#### § 25.255 Out-of-trim characteristics.

(a) From an initial condition with the airplane trimmed at cruise speeds up to  $V_{MO}/M_{MO}$ , the airplane must have satisfactory maneuvering stability and controllability with the degree of out-of-trim in both the airplane nose-up and nose-down directions, which results from the greater of—

- (1) A three-second movement of the longitudinal trim system at its normal rate for the particular flight condition with no aerodynamic load (or an equivalent degree of trim for airplanes that do not have a power-operated trim system), except as limited by stops in the trim system, including those required by § 25.655(b) for adjustable stabilizers; or

(2) The maximum mistrim that can be sustained by the autopilot while maintaining level flight in the high speed cruising condition.

(b) In the out-of-trim condition specified in paragraph (a) of this section, when the normal acceleration is varied from +1 g to the positive and negative values specified in paragraph (c) of this section—

(1) The stick force vs. g curve must have a positive slope at any speed up to and including  $V_{FC}/M_{FC}$ ; and

(2) At speeds between  $V_{FC}/M_{FC}$  and  $V_{DF}/M_{DF}$  the direction of the primary longitudinal control force may not reverse.

(c) Except as provided in paragraphs (d) and (e) of this section, compliance with the provisions of paragraph (a) of this section must be demonstrated in flight over the acceleration range—

- (1) -1 g to +2.5 g; or
- (2) 0 g to 2.0 g, and extrapolating by an acceptable method to -1 g and +2.5 g.

(d) If the procedure set forth in paragraph (c)(2) of this section is used to demonstrate compliance and marginal conditions exist during flight test with regard to reversal of primary longitudinal control force, flight tests must be accomplished from the normal acceleration at which a marginal condition is found to exist to the applicable limit specified in paragraph (b)(1) of this section.

(e) During flight tests required by paragraph (a) of this section, the limit maneuvering load factors prescribed in §§ 25.333(b) and 25.337, and the maneuvering load factors associated with probable inadvertent excursions beyond the boundaries of the buffet onset envelopes determined under § 25.251(e), need not be exceeded. In addition, the entry speeds for flight test demonstrations at normal acceleration values less than 1 g must be limited to the extent necessary to accomplish a recovery without exceeding  $V_{DF}/M_{DF}$ .

(f) In the out-of-trim condition specified in paragraph (a) of this section, it must be possible from an overspeed condition at  $V_{DF}/M_{DF}$  to produce at least 1.5 g for recovery by applying not more than 125 pounds of longitudinal control force using either the primary longitudinal control alone or the primary longitudinal control and the longitudinal trim system. If the longitudinal trim is used to assist in producing the required load factor, it must be shown at  $V_{DF}/M_{DF}$  that the longitudinal trim can be actuated in the airplane nose-up direction with the primary surface loaded to correspond to the least of the following airplane nose-up control forces:

(1) The maximum control forces expected in service as specified in §§ 25.301 and 25.397.

(2) The control force required to produce 1.5 g.

(3) The control force corresponding to buffeting or other phenomena of such