exceeding a pull control force of 50 pounds; and

(3) Any changes in force that the pilot must apply to the pitch control to maintain speed with increasing sideslip angle must be steadily increasing with no force reversals, unless the change in control force is gradual and easily controllable by the pilot without using exceptional piloting skill, alertness, or strength.

(j) For flight in icing conditions before the ice protection system has been activated and is performing its intended function, it must be demonstrated in flight with the most critical of the ice accretion(s) defined in Appendix C, part II, paragraph (e) of this part and Appendix O, part II, paragraph (d) of this part, as applicable, in accordance with § 25.21(g), that:

(1) The airplane is controllable in a pull-up maneuver up to 1.5 g load factor; and

(2) There is no pitch control force reversal during a pushover maneuver down to 0.5 g load factor.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25–42, 43 FR 2321, Jan. 16, 1978; Amdt. 25–84, 60 FR 30749, June 9, 1995; Amdt. 25–108, 67 FR 70826, Nov. 26, 2002; Amdt. 25–121, 72 FR 44667, Aug. 8, 2007; Amdt. 25–129, 74 FR 38339, Aug. 3, 2009; Amdt. 25–140, 79 FR 65525, Nov. 4, 2014]

### § 25.145 Longitudinal control.

(a) It must be possible, at any point between the trim speed prescribed in § 25.103(b)(6) and stall identification (as defined in § 25.201(d)), to pitch the nose downward so that the acceleration to this selected trim speed is prompt with

(1) The airplane trimmed at the trim speed prescribed in § 25.103(b)(6);

(2) The landing gear extended;

(3) The wing flaps (i) retracted and (ii) extended; and

(4) Power (i) off and (ii) at maximum continuous power on the engines.

(b) With the landing gear extended, no change in trim control, or exertion of more than 50 pounds control force (representative of the maximum short term force that can be applied readily by one hand) may be required for the following maneuvers:

(1) With power off, flaps retracted, and the airplane trimmed at 1.3 $V_{SR1}$, extend the flaps as rapidly as possible while maintaining the airspeed at approximately 30 percent above the reference stall speed existing at each instant throughout the maneuver.

(2) Repeat paragraph (b)(1) except initially extend the flaps and then retract them as rapidly as possible.

(3) Repeat paragraph (b)(2), except at the go-around power or thrust setting.

(4) With power off, flaps retracted, and the airplane trimmed at 1.3 $V_{SR1}$, rapidly set go-around power or thrust while maintaining the same airspeed.

(5) Repeat paragraph (b)(4) except with flaps extended.

(6) With power off, flaps extended, and the airplane trimmed at 1.3 $V_{SR1}$, obtain and maintain airspeeds between $V_{SW}$ and either 1.6 $V_{SR1}$ or $V_{FE}$, whichever is lower.

(c) It must be possible, without exceptional piloting skill, to prevent loss of altitude when complete retraction of the high lift devices from any position is begun during steady, straight, level flight at 1.08 $V_{SR1}$ for propeller powered airplanes, or 1.13 $V_{SR1}$ for turbojet powered airplanes, with—

(1) Simultaneous movement of the power or thrust controls to the go-around power or thrust setting;

(2) The landing gear extended; and

(3) The critical combinations of landing weights and altitudes.

(d) If gated high-lift device control positions are provided, paragraph (c) of this section applies to retractions of the high-lift devices from any position from the maximum landing position to the first gated position, between gated positions, and from the last gated position to the fully retracted position. The requirements of paragraph (c) of this section also apply to retractions from each approved landing position to the control position(s) associated with the high-lift device configuration(s) used to establish the go-around procedure(s) from that landing position. In addition, the first gated control position from the maximum landing position must correspond with a configuration of the high-lift devices used to establish a go-around procedure from a landing configuration. Each gated control position must require a separate and distinct motion of the control to pass through the gated position and

must have features to prevent inadvertent movement of the control through the gated position. It must only be possible to make this separate and distinct motion once the control has reached the gated position.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25–23, 35 FR 5671, Apr. 8, 1970; Amdt. 25–72, 55 FR 29774, July 20, 1990; Amdt. 25–84, 60 FR 30749, June 9, 1995; Amdt. 25–98, 64 FR 6164, Feb. 8, 1999; 64 FR 10740, Mar. 5, 1999; Amdt. 25–108, 67 FR 70827, Nov. 26, 2002]

### § 25.147 Directional and lateral control.

(a) *Directional control; general*. It must be possible, with the wings level, to yaw into the operative engine and to safely make a reasonably sudden change in heading of up to 15 degrees in the direction of the critical inoperative engine. This must be shown at 1.3 $V_S$R1 for heading changes up to 15 degrees (except that the heading change at which the rudder pedal force is 150 pounds need not be exceeded), and with—

(1) The critical engine inoperative and its propeller in the minimum drag position;

(2) The power required for level flight at 1.3 $V_S$R1, but not more than maximum continuous power;

(3) The most unfavorable center of gravity;

(4) Landing gear retracted;

(5) Flaps in the approach position; and

(6) Maximum landing weight.

(b) *Directional control; airplanes with four or more engines*. Airplanes with four or more engines must meet the requirements of paragraph (a) of this section except that—

(1) The two critical engines must be inoperative with their propellers (if applicable) in the minimum drag position;

(2) [Reserved]

(3) The flaps must be in the most favorable climb position.

(c) *Lateral control; general*. It must be possible to make 20° banked turns, with and against the inoperative engine, from steady flight at a speed equal to 1.3 $V_S$R1, with—

(1) The critical engine inoperative and its propeller (if applicable) in the minimum drag position;

(2) The remaining engines at maximum continuous power;

(3) The most unfavorable center of gravity;

(4) Landing gear (i) retracted and (ii) extended;

(5) Flaps in the most favorable climb position; and

(6) Maximum takeoff weight.

(d) *Lateral control; roll capability*. With the critical engine inoperative, roll response must allow normal maneuvers. Lateral control must be sufficient, at the speeds likely to be used with one engine inoperative, to provide a roll rate necessary for safety without excessive control forces or travel.

(e) *Lateral control; airplanes with four or more engines*. Airplanes with four or more engines must be able to make 20° banked turns, with and against the inoperative engines, from steady flight at a speed equal to 1.3 $V_S$R1, with maximum continuous power, and with the airplane in the configuration prescribed by paragraph (b) of this section.

(f) *Lateral control; all engines operating*. With the engines operating, roll response must allow normal maneuvers (such as recovery from upsets produced by gusts and the initiation of evasive maneuvers). There must be enough excess lateral control in sideslips (up to sideslip angles that might be required in normal operation), to allow a limited amount of maneuvering and to correct for gusts. Lateral control must be enough at any speed up to $V_{FC}/M_{FC}$ to provide a peak roll rate necessary for safety, without excessive control forces or travel.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25–42, 43 FR 2321, Jan. 16, 1978; Amdt. 25–72, 55 FR 29774, July 20, 1990; Amdt. 25–108, 67 FR 70827, Nov. 26, 2002; Amdt. 25–115, 69 FR 40527, July 2, 2004]

### § 25.149 Minimum control speed.

(a) In establishing the minimum control speeds required by this section, the method used to simulate critical engine failure must represent the most critical mode of powerplant failure with respect to controllability expected in service.

(b) $V_{MC}$ is the calibrated airspeed at which, when the critical engine is suddenly made inoperative, it is possible to maintain control of the airplane