

taking into account, as separate conditions, the effects of—

(1) Propeller slipstream corresponding to maximum continuous power at the design flap speeds V_F , and with takeoff power at not less than 1.4 times the stalling speed for the particular flap position and associated maximum weight; and

(2) A head-on gust of 25 feet per second velocity (EAS).

(c) If flaps or other high lift devices are to be used in en route conditions, and with flaps in the appropriate position at speeds up to the flap design speed chosen for these conditions, the airplane is assumed to be subjected to symmetrical maneuvers and gusts within the range determined by—

(1) Maneuvering to a positive limit load factor as prescribed in § 25.337(b); and

(2) The vertical gust and turbulence conditions prescribed in § 25.341(a) and (b).

(d) The airplane must be designed for a maneuvering load factor of 1.5 g at the maximum take-off weight with the wing-flaps and similar high lift devices in the landing configurations.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25-46, 43 FR 50595, Oct. 30, 1978; Amdt. 25-72, 55 FR 37607, Sept. 17, 1990; Amdt. 25-86, 61 FR 5221, Feb. 9, 1996; Amdt. 25-91, 62 FR 40704, July 29, 1997; Amdt. 25-141, 79 FR 73468, Dec. 11, 2014]

§ 25.349 Rolling conditions.

The airplane must be designed for loads resulting from the rolling conditions specified in paragraphs (a) and (b) of this section. Unbalanced aerodynamic moments about the center of gravity must be reacted in a rational or conservative manner, considering the principal masses furnishing the reacting inertia forces.

(a) *Maneuvering.* The following conditions, speeds, and aileron deflections (except as the deflections may be limited by pilot effort) must be considered in combination with an airplane load factor of zero and of two-thirds of the positive maneuvering factor used in design. In determining the required aileron deflections, the torsional flexibility of the wing must be considered in accordance with § 25.301(b):

(1) Conditions corresponding to steady rolling velocities must be investigated. In addition, conditions corresponding to maximum angular acceleration must be investigated for airplanes with engines or other weight concentrations outboard of the fuselage. For the angular acceleration conditions, zero rolling velocity may be assumed in the absence of a rational time history investigation of the maneuver.

(2) At V_A , a sudden deflection of the aileron to the stop is assumed.

(3) At V_C , the aileron deflection must be that required to produce a rate of roll not less than that obtained in paragraph (a)(2) of this section.

(4) At V_D , the aileron deflection must be that required to produce a rate of roll not less than one-third of that in paragraph (a)(2) of this section.

(b) *Unsymmetrical gusts.* The airplane is assumed to be subjected to unsymmetrical vertical gusts in level flight. The resulting limit loads must be determined from either the wing maximum airload derived directly from § 25.341(a), or the wing maximum airload derived indirectly from the vertical load factor calculated from § 25.341(a). It must be assumed that 100 percent of the wing air load acts on one side of the airplane and 80 percent of the wing air load acts on the other side.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25-23, 35 FR 5672, Apr. 8, 1970; Amdt. 25-86, 61 FR 5222, Feb. 9, 1996; Amdt. 25-94, 63 FR 8848, Feb. 23, 1998]

§ 25.351 Yaw maneuver conditions.

The airplane must be designed for loads resulting from the yaw maneuver conditions specified in paragraphs (a) through (d) of this section at speeds from V_{MC} to V_D . Unbalanced aerodynamic moments about the center of gravity must be reacted in a rational or conservative manner considering the airplane inertia forces. In computing the tail loads the yawing velocity may be assumed to be zero.

(a) With the airplane in unaccelerated flight at zero yaw, it is assumed that the cockpit rudder control is suddenly displaced to achieve the resulting rudder deflection, as limited by:

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(1) The control system on control surface stops; or

(2) A limit pilot force of 300 pounds from V_{MC} to V_A and 200 pounds from V_C/M_C to V_D/M_D , with a linear variation between V_A and V_C/M_C .

(b) With the cockpit rudder control deflected so as always to maintain the maximum rudder deflection available within the limitations specified in paragraph (a) of this section, it is assumed that the airplane yaws to the overswing sideslip angle.

(c) With the airplane yawed to the static equilibrium sideslip angle, it is assumed that the cockpit rudder control is held so as to achieve the maximum rudder deflection available within the limitations specified in paragraph (a) of this section.

(d) With the airplane yawed to the static equilibrium sideslip angle of paragraph (c) of this section, it is assumed that the cockpit rudder control is suddenly returned to neutral.

[Amdt. 25–91, 62 FR 40704, July 29, 1997]

§ 25.353 Rudder control reversal conditions.

Airplanes with a powered rudder control surface or surfaces must be designed for loads, considered to be ultimate, resulting from the yaw maneuver conditions specified in paragraphs (a) through (e) of this section at speeds from V_{MC} to V_C/M_C . Any permanent deformation resulting from these ultimate load conditions must not prevent continued safe flight and landing. The applicant must evaluate these conditions with the landing gear retracted and speed brakes (and spoilers when used as speed brakes) retracted. The applicant must evaluate the effects of flaps, flaperons, or any other aerodynamic devices when used as flaps, and slats-extended configurations, if they are used in en route conditions. Unbalanced aerodynamic moments about the center of gravity must be reacted in a rational or conservative manner considering the airplane inertia forces. In computing the loads on the airplane, the yawing velocity may be assumed to be zero. The applicant must assume a pilot force of 200 pounds when evaluating each of the following conditions:

(a) With the airplane in unaccelerated flight at zero yaw, the flightdeck rudder control is suddenly and fully displaced to achieve the resulting rudder deflection, as limited by the control system or the control surface stops.

(b) With the airplane yawed to the overswing sideslip angle, the flightdeck rudder control is suddenly and fully displaced in the opposite direction, as limited by the control system or control surface stops.

(c) With the airplane yawed to the opposite overswing sideslip angle, the flightdeck rudder control is suddenly and fully displaced in the opposite direction, as limited by the control system or control surface stops.

(d) With the airplane yawed to the subsequent overswing sideslip angle, the flightdeck rudder control is suddenly and fully displaced in the opposite direction, as limited by the control system or control surface stops.

(e) With the airplane yawed to the opposite overswing sideslip angle, the flightdeck rudder control is suddenly returned to neutral.

[Docket No. FAA–2018–0653, Amdt. No. 25–147, 87 FR 71210, Nov. 22, 2022]

EFFECTIVE DATE NOTE: At 87 FR 71210, Nov. 22, 2022, § 25.353 was added, effective Jan. 23, 2023.

SUPPLEMENTARY CONDITIONS

§ 25.361 Engine and auxiliary power unit torque.

(a) For engine installations—

(1) Each engine mount, pylon, and adjacent supporting airframe structures must be designed for the effects of—

(i) A limit engine torque corresponding to takeoff power/thrust and, if applicable, corresponding propeller speed, acting simultaneously with 75% of the limit loads from flight condition A of § 25.333(b);

(ii) A limit engine torque corresponding to the maximum continuous power/thrust and, if applicable, corresponding propeller speed, acting simultaneously with the limit loads from flight condition A of § 25.333(b); and

(iii) For turbopropeller installations only, in addition to the conditions specified in paragraphs (a)(1)(i) and (ii)