

§ 23.425

surface load for both nose-up and nose-down pitching conditions is the sum of the balancing loads at V and the specified value of the normal load factor n , plus the maneuvering load increment due to the specified value of the angular acceleration.

[Amdt. 23-42, 56 FR 353, Jan. 3, 1991; 56 FR 5455, Feb. 11, 1991]

§ 23.425 Gust loads.

(a) Each horizontal surface, other than a main wing, must be designed for loads resulting from—

(1) Gust velocities specified in § 23.333(c) with flaps retracted; and

(2) Positive and negative gusts of 25 f.p.s. nominal intensity at V_F corresponding to the flight conditions specified in § 23.345(a)(2).

(b) [Reserved]

(c) When determining the total load on the horizontal surfaces for the conditions specified in paragraph (a) of this section, the initial balancing loads for steady unaccelerated flight at the pertinent design speeds V_F , V_C , and V_D must first be determined. The incremental load resulting from the gusts must be added to the initial balancing load to obtain the total load.

(d) In the absence of a more rational analysis, the incremental load due to the gust must be computed as follows only on airplane configurations with aft-mounted, horizontal surfaces, unless its use elsewhere is shown to be conservative:

$$\Delta L_{ht} = \frac{K_g U_{de} V a_{ht} S_{ht}}{498} \left(1 - \frac{d\epsilon}{d\alpha} \right)$$

where—

ΔL_{ht} =Incremental horizontal tailload (lbs.);

K_g =Gust alleviation factor defined in § 23.341;

U_{de} =Derived gust velocity (f.p.s.);

V =Airplane equivalent speed (knots);

a_{ht} =Slope of aft horizontal lift curve (per radian)

S_{ht} =Area of aft horizontal lift surface (ft²); and

$$\left(1 - \frac{d\epsilon}{d\alpha} \right) = \text{Downwash factor}$$

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as amended by Amdt. 23-7, 34 FR 13089 Aug. 13, 1969; Amdt. 23-42, 56 FR 353, Jan. 3, 1991]

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§ 23.427 Unsymmetrical loads.

(a) Horizontal surfaces other than main wing and their supporting structure must be designed for unsymmetrical loads arising from yawing and slipstream effects, in combination with the loads prescribed for the flight conditions set forth in §§ 23.421 through 23.425.

(b) In the absence of more rational data for airplanes that are conventional in regard to location of engines, wings, horizontal surfaces other than main wing, and fuselage shape:

(1) 100 percent of the maximum loading from the symmetrical flight conditions may be assumed on the surface on one side of the plane of symmetry; and

(2) The following percentage of that loading must be applied to the opposite side:

Percent=100-10(n-1), where n is the specified positive maneuvering load factor, but this value may not be more than 80 percent.

(c) For airplanes that are not conventional (such as airplanes with horizontal surfaces other than main wing having appreciable dihedral or supported by the vertical tail surfaces) the surfaces and supporting structures must be designed for combined vertical and horizontal surface loads resulting from each prescribed flight condition taken separately.

[Amdt. 23-14, 38 FR 31820, Nov. 19, 1973, as amended by Amdt. 23-42, 56 FR 353, Jan. 3, 1991]

VERTICAL SURFACES

§ 23.441 Maneuvering loads.

(a) At speeds up to V_A , the vertical surfaces must be designed to withstand the following conditions. In computing the loads, the yawing velocity may be assumed to be zero:

(1) With the airplane in unaccelerated flight at zero yaw, it is assumed that the rudder control is suddenly displaced to the maximum deflection, as limited by the control stops or by limit pilot forces.

(2) With the rudder deflected as specified in paragraph (a)(1) of this section, it is assumed that the airplane yaws to the overswing sideslip angle. In lieu of a rational analysis, an overswing angle