§ 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:

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

where—

$\Delta L_{ht}$=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);

$\alpha_{ht}$=Slope of aft horizontal lift curve (per radian);

$S_{ht}$=Area of aft horizontal lift surface (ft$^2$); and

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

equal to 1.5 times the static sideslip angle of paragraph (a)(3) of this section may be assumed.

(3) A yaw angle of 15 degrees with the rudder control maintained in the neutral position (except as limited by pilot strength).

(b) For commuter category airplanes, the loads imposed by the following additional maneuver must be substantiated at speeds from \( V_A \) to \( V_{D/M} \).

When computing the tail loads—

(1) The airplane must be yawed to the largest attainable steady state sideslip angle, with the rudder at maximum deflection caused by any one of the following:

(i) Control surface stops;

(ii) Maximum available booster effort;

(iii) Maximum pilot rudder force as shown below:
(2) The rudder must be suddenly displaced from the maximum deflection to the neutral position.

(c) The yaw angles specified in paragraph (a)(3) of this section may be reduced if the yaw angle chosen for a particular speed cannot be exceeded in—
§ 23.455 Ailerons.

(a) The ailerons must be designed for the loads to which they are subjected—

(1) In the neutral position during symmetrical flight conditions; and

(2) When rational methods are used for computing loads, the maneuvering loads of § 23.441 on the vertical surfaces and the one-g horizontal surface load, including induced loads on the horizontal surface and moments or forces exerted on the horizontal surfaces by the vertical surfaces, must be applied simultaneously for the structural loading condition.


AILERONS AND SPECIAL DEVICES

§ 23.445 Outboard fins or winglets.

(a) If outboard fins or winglets are included on the horizontal surfaces or wings, the horizontal surfaces or wings must be designed for their maximum load in combination with loads induced by the fins or winglets and moments or forces exerted on the horizontal surfaces or wings by the fins or winglets.

(b) If outboard fins or winglets extend above and below the horizontal surface, the critical vertical surface loading (the load per unit area as determined under §§ 23.441 and 23.443) must be applied to—

(1) The part of the vertical surfaces above the horizontal surface with 80 percent of that loading applied to the part below the horizontal surface; and

(2) The part of the vertical surfaces below the horizontal surface with 80 percent of that loading applied to the part above the horizontal surface.

(c) The end plate effects of outboard fins or winglets must be taken into account in applying the yawing conditions of §§ 23.441 and 23.443 to the vertical surfaces in paragraph (b) of this section.

(d) When rational methods are used for computing loads, the maneuvering loads of § 23.441 on the vertical surfaces and the one-g horizontal surface load, including induced loads on the horizontal surface and moments or forces exerted on the horizontal surfaces by the vertical surfaces, must be applied simultaneously for the structural loading condition.