Code of Federal Regulations

This Section of CFR is No Longer Current.

Sec. 25.351

Part 25 AIRWORTHINESS STANDARDS: TRANSPORT CATEGORY AIRPLANES	
Subpart C--Structure	Flight Maneuver and Gust Conditions

Sec. 25.351

Yawing conditions.

The airplane must be designed for loads resulting from the 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.* At speeds from V_{MC} to V_A , the following maneuvers must be considered. In computing the tail 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 surface stops, or by a 300-pound rudder pedal force, whichever is less.**]**
(2) With the rudder deflected as specified in subparagraph (1) of this paragraph, it is assumed that the airplane yaws to the resulting sideslip angle.
(3) With the airplane yawed to the static sideslip angle corresponding to the rudder deflection specified in subparagraph (1) of this paragraph, it is assumed that the rudder is returned to neutral.
(b) Lateral gusts. The airplane is assumed to encounter derived gusts normal to the plane of symmetry while in unaccelerated flight. The derived gusts and airplane speeds corresponding to conditions B' through J' (in Sec. 25.333(c)) (as determined by Secs. 25.341 and 25.345 (a)(2) or 25.345 (c)(2)) must be investigated. The shape of the gust must be as specified in Sec. 25.341. In the absence of a rational investigation of the airplane's response to a gust, the gust loading on the vertical tail surfaces must be computed as follows:

$$L_t = \frac{K_{gt} U_{de} V_{at} S_t}{498}$$

where--
L_t = vertical tail load (lbs.);

$$K_{gt} = \frac{0.88\mu_{gt}}{5.3 + \mu_{gt}} = \text{gust alleviation factor;}$$

$$\mu_{g_t} = \frac{2W}{\rho \bar{C}_t g a_t S_t}\left(\frac{K}{l_t}\right)^2 = \textit{lateral mass ratio}$$

U_{de} = derived gust velocity (fps);
ρ= air density (slugs/cu. ft
W = airplane weight (lbs.);
S_t = area of vertical tail (ft.^{2});
$\bar{C}_t$ = mean geometric chord of vertical surface (ft.);
a_t = lift curve slope of vertical tail (per radian);
K = radius of gyration in yaw (ft.);
l_t = distance from airplane c.g. to lift center of vertical surface (ft.);
g = acceleration due to gravity (ft./sec.^{2}); and
V = airplane equivalent speed (knots).

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