

**§ 25.495**

with the pitching moment resisted by angular acceleration.

(c) A drag reaction lower than that prescribed in this section may be used if it is substantiated that an effective drag force of 0.8 times the vertical reaction cannot be attained under any likely loading condition.

(d) An airplane equipped with a nose gear must be designed to withstand the loads arising from the dynamic pitching motion of the airplane due to sudden application of maximum braking force. The airplane is considered to be at design takeoff weight with the nose and main gears in contact with the ground, and with a steady-state vertical load factor of 1.0. The steady-state nose gear reaction must be combined with the maximum incremental nose gear vertical reaction caused by the sudden application of maximum braking force as described in paragraphs (b) and (c) of this section.

(e) In the absence of a more rational analysis, the nose gear vertical reaction prescribed in paragraph (d) of this section must be calculated according to the following formula:

$$V_N = \frac{W_T}{A+B} \left[ B + \frac{f\mu AE}{A+B+\mu E} \right]$$

Where:

$V_N$ =Nose gear vertical reaction.

$W_T$ =Design takeoff weight.

$A$ =Horizontal distance between the c.g. of the airplane and the nose wheel.

$B$ =Horizontal distance between the c.g. of the airplane and the line joining the centers of the main wheels.

$E$ =Vertical height of the c.g. of the airplane above the ground in the 1.0 g static condition.

$\mu$ =Coefficient of friction of 0.80.

$f$ =Dynamic response factor; 2.0 is to be used unless a lower factor is substantiated. In the absence of other information, the dynamic response factor  $f$  may be defined by the equation:

$$f = 1 + \exp\left(\frac{-\pi\xi}{\sqrt{1-\xi^2}}\right)$$

Where:

$\xi$  is the effective critical damping ratio of the rigid body pitching mode about the

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main landing gear effective ground contact point.

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**§ 25.495 Turning.**

In the static position, in accordance with figure 7 of appendix A, the airplane is assumed to execute a steady turn by nose gear steering, or by application of sufficient differential power, so that the limit load factors applied at the center of gravity are 1.0 vertically and 0.5 laterally. The side ground reaction of each wheel must be 0.5 of the vertical reaction.

**§ 25.497 Tail-wheel yawing.**

(a) A vertical ground reaction equal to the static load on the tail wheel, in combination with a side component of equal magnitude, is assumed.

(b) If there is a swivel, the tail wheel is assumed to be swiveled 90° to the airplane longitudinal axis with the resultant load passing through the axle.

(c) If there is a lock, steering device, or shimmy damper the tail wheel is also assumed to be in the trailing position with the side load acting at the ground contact point.

**§ 25.499 Nose-wheel yaw and steering.**

(a) A vertical load factor of 1.0 at the airplane center of gravity, and a side component at the nose wheel ground contact equal to 0.8 of the vertical ground reaction at that point are assumed.

(b) With the airplane assumed to be in static equilibrium with the loads resulting from the use of brakes on one side of the main landing gear, the nose gear, its attaching structure, and the fuselage structure forward of the center of gravity must be designed for the following loads:

(1) A vertical load factor at the center of gravity of 1.0.

(2) A forward acting load at the airplane center of gravity of 0.8 times the vertical load on one main gear.

(3) Side and vertical loads at the ground contact point on the nose gear that are required for static equilibrium.

(4) A side load factor at the airplane center of gravity of zero.