

## § 25.679

## 14 CFR Ch. I (1-1-10 Edition)

### § 25.679 Control system gust locks.

(a) There must be a device to prevent damage to the control surfaces (including tabs), and to the control system, from gusts striking the airplane while it is on the ground or water. If the device, when engaged, prevents normal operation of the control surfaces by the pilot, it must—

(1) Automatically disengage when the pilot operates the primary flight controls in a normal manner; or

(2) Limit the operation of the airplane so that the pilot receives unmistakable warning at the start of takeoff.

(b) The device must have means to preclude the possibility of it becoming inadvertently engaged in flight.

### § 25.681 Limit load static tests.

(a) Compliance with the limit load requirements of this Part must be shown by tests in which—

(1) The direction of the test loads produces the most severe loading in the control system; and

(2) Each fitting, pulley, and bracket used in attaching the system to the main structure is included.

(b) Compliance must be shown (by analyses or individual load tests) with the special factor requirements for control system joints subject to angular motion.

### § 25.683 Operation tests.

It must be shown by operation tests that when portions of the control system subject to pilot effort loads are loaded to 80 percent of the limit load specified for the system and the powered portions of the control system are loaded to the maximum load expected in normal operation, the system is free from—

(a) Jamming;

(b) Excessive friction; and

(c) Excessive deflection.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25-23, 35 FR 5675, Apr. 8, 1970]

### § 25.685 Control system details.

(a) Each detail of each control system must be designed and installed to prevent jamming, chafing, and interference from cargo, passengers, loose objects, or the freezing of moisture.

(b) There must be means in the cockpit to prevent the entry of foreign objects into places where they would jam the system.

(c) There must be means to prevent the slapping of cables or tubes against other parts.

(d) Sections 25.689 and 25.693 apply to cable systems and joints.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25-38, 41 FR 55466, Dec. 20, 1976]

### § 25.689 Cable systems.

(a) Each cable, cable fitting, turnbuckle, splice, and pulley must be approved. In addition—

(1) No cable smaller than 1/8 inch in diameter may be used in the aileron, elevator, or rudder systems; and

(2) Each cable system must be designed so that there will be no hazardous change in cable tension throughout the range of travel under operating conditions and temperature variations.

(b) Each kind and size of pulley must correspond to the cable with which it is used. Pulleys and sprockets must have closely fitted guards to prevent the cables and chains from being displaced or fouled. Each pulley must lie in the plane passing through the cable so that the cable does not rub against the pulley flange.

(c) Fairleads must be installed so that they do not cause a change in cable direction of more than three degrees.

(d) Clevis pins subject to load or motion and retained only by cotter pins may not be used in the control system.

(e) Turnbuckles must be attached to parts having angular motion in a manner that will positively prevent binding throughout the range of travel.

(f) There must be provisions for visual inspection of fairleads, pulleys, terminals, and turnbuckles.

### § 25.693 Joints.

Control system joints (in push-pull systems) that are subject to angular motion, except those in ball and roller bearing systems, must have a special factor of safety of not less than 3.33 with respect to the ultimate bearing strength of the softest material used as a bearing. This factor may be reduced

to 2.0 for joints in cable control systems. For ball or roller bearings, the approved ratings may not be exceeded.

[Amdt. 25-72, 55 FR 29777, July 20, 1990]

**§ 25.697 Lift and drag devices, controls.**

(a) Each lift device control must be designed so that the pilots can place the device in any takeoff, en route, approach, or landing position established under § 25.101(d). Lift and drag devices must maintain the selected positions, except for movement produced by an automatic positioning or load limiting device, without further attention by the pilots.

(b) Each lift and drag device control must be designed and located to make inadvertent operation improbable. Lift and drag devices intended for ground operation only must have means to prevent the inadvertent operation of their controls in flight if that operation could be hazardous.

(c) The rate of motion of the surfaces in response to the operation of the control and the characteristics of the automatic positioning or load limiting device must give satisfactory flight and performance characteristics under steady or changing conditions of airspeed, engine power, and airplane attitude.

(d) The lift device control must be designed to retract the surfaces from the fully extended position, during steady flight at maximum continuous engine power at any speed below  $V_F + 9.0$  (knots).

[Amdt. 25-23, 35 FR 5675, Apr. 8, 1970, as amended by Amdt. 25-46, 43 FR 50595, Oct. 30, 1978; Amdt. 25-57, 49 FR 6848, Feb. 23, 1984]

**§ 25.699 Lift and drag device indicator.**

(a) There must be means to indicate to the pilots the position of each lift or drag device having a separate control in the cockpit to adjust its position. In addition, an indication of unsymmetrical operation or other malfunction in the lift or drag device systems must be provided when such indication is necessary to enable the pilots to prevent or counteract an unsafe flight or ground condition, considering the effects on flight characteristics and performance.

(b) There must be means to indicate to the pilots the takeoff, en route, approach, and landing lift device positions.

(c) If any extension of the lift and drag devices beyond the landing position is possible, the controls must be clearly marked to identify this range of extension.

[Amdt. 25-23, 35 FR 5675, Apr. 8, 1970]

**§ 25.701 Flap and slat interconnection.**

(a) Unless the airplane has safe flight characteristics with the flaps or slats retracted on one side and extended on the other, the motion of flaps or slats on opposite sides of the plane of symmetry must be synchronized by a mechanical interconnection or approved equivalent means.

(b) If a wing flap or slat interconnection or equivalent means is used, it must be designed to account for the applicable unsymmetrical loads, including those resulting from flight with the engines on one side of the plane of symmetry inoperative and the remaining engines at takeoff power.

(c) For airplanes with flaps or slats that are not subjected to slipstream conditions, the structure must be designed for the loads imposed when the wing flaps or slats on one side are carrying the most severe load occurring in the prescribed symmetrical conditions and those on the other side are carrying not more than 80 percent of that load.

(d) The interconnection must be designed for the loads resulting when interconnected flap or slat surfaces on one side of the plane of symmetry are jammed and immovable while the surfaces on the other side are free to move and the full power of the surface actuating system is applied.

[Amdt. 25-72, 55 FR 29777, July 20, 1990]

**§ 25.703 Takeoff warning system.**

A takeoff warning system must be installed and must meet the following requirements:

(a) The system must provide to the pilots an aural warning that is automatically activated during the initial portion of the takeoff roll if the airplane is in a configuration, including