

(f) Retardation means other than wheel brakes may be used if that means—

- (1) Is safe and reliable; and
- (2) Is used so that consistent results can be expected in service.

(g) If any device is used that depends on the operation of any engine, and the landing distance would be increased when a landing is made with that engine inoperative, the landing distance must be determined with that engine inoperative unless the use of other compensating means will result in a landing distance not more than that with each engine operating.

[Amdt. 23-21, 43 FR 2318, Jan. 16, 1978, as amended by Amdt. 23-34, 52 FR 1828, Jan. 15, 1987; Amdt. 23-42, 56 FR 351, Jan. 3, 1991; Amdt. 23-50, 61 FR 5187, Feb. 9, 1996]

§ 23.77 Balked landing.

(a) Each normal, utility, and acrobatic category reciprocating engine-powered airplane at 6,000 pounds or less maximum weight must be able to maintain a steady gradient of climb at sea level of at least 3.3 percent with—

- (1) Takeoff power on each engine;
- (2) The landing gear extended;
- (3) The wing flaps in the landing position, except that if the flaps may safely be retracted in two seconds or less without loss of altitude and without sudden changes of angle of attack, they may be retracted; and
- (4) A climb speed equal to V_{REF} , as defined in § 23.73(a).

(b) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of more than 6,000 pounds maximum weight and each normal, utility, and acrobatic category turbine engine-powered airplane must be able to maintain a steady gradient of climb of at least 2.5 percent with—

- (1) Not more than the power that is available on each engine eight seconds after initiation of movement of the power controls from minimum flight-idle position;
 - (2) The landing gear extended;
 - (3) The wing flaps in the landing position; and
 - (4) A climb speed equal to V_{REF} , as defined in § 23.73(b).
- (c) Each commuter category airplane must be able to maintain a steady gra-

dent of climb of at least 3.2 percent with—

- (1) Not more than the power that is available on each engine eight seconds after initiation of movement of the power controls from the minimum flight idle position;
- (2) Landing gear extended;
- (3) Wing flaps in the landing position; and
- (4) A climb speed equal to V_{REF} , as defined in § 23.73(c).

[Doc. No. 27807, 61 FR 5187, Feb. 9, 1996]

EFFECTIVE DATE NOTE: By Amdt. 23-62, 76 FR 75754, Dec. 2, 2011, § 23.77 was amended by revising the introductory text of paragraphs (b) and (c), effective Jan. 31, 2012. For the convenience of the user, the revised text is set forth as follows:

§ 23.77 Balked landing.

* * * * *

(b) Each normal, utility, and acrobatic category reciprocating engine-powered and single engine turbine powered airplane of more than 6,000 pounds maximum weight, and multiengine turbine engine-powered airplane of 6,000 pounds or less maximum weight in the normal, utility, and acrobatic category must be able to maintain a steady gradient of climb of at least 2.5 percent with—

* * * * *

(c) Each normal, utility, and acrobatic multiengine turbine powered airplane over 6,000 pounds maximum weight and each commuter category airplane must be able to maintain a steady gradient of climb of at least 3.2 percent with—

* * * * *

FLIGHT CHARACTERISTICS

§ 23.141 General.

The airplane must meet the requirements of §§ 23.143 through 23.253 at all practical loading conditions and operating altitudes for which certification has been requested, not exceeding the maximum operating altitude established under § 23.1527, and without requiring exceptional piloting skill, alertness, or strength.

[Doc. No. 26269, 58 FR 42156, Aug. 6, 1993]

CONTROLLABILITY AND
MANEUVERABILITY

§ 23.143 General.

(a) The airplane must be safely controllable and maneuverable during all flight phases including—

- (1) Takeoff;
- (2) Climb;
- (3) Level flight;
- (4) Descent;
- (5) Go-around; and
- (6) Landing (power on and power off) with the wing flaps extended and retracted.

(b) It must be possible to make a smooth transition from one flight condition to another (including turns and slips) without danger of exceeding the limit load factor, under any probable operating condition (including, for multiengine airplanes, those conditions normally encountered in the sudden failure of any engine).

(c) If marginal conditions exist with regard to required pilot strength, the control forces necessary must be determined by quantitative tests. In no case may the control forces under the conditions specified in paragraphs (a) and (b) of this section exceed those prescribed in the following table:

Values in pounds force applied to the relevant control	Pitch	Roll	Yaw
(a) For temporary application:			
Stick	60	30
Wheel (Two hands on rim)	75	50
Wheel (One hand on rim)	50	25
Rudder Pedal			150
(b) For prolonged application	10	5	20

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as amended by Amdt. 23-14, 38 FR 31819, Nov. 19, 1973; Amdt. 23-17, 41 FR 55464, Dec. 20, 1976; Amdt. 23-45, 58 FR 42156, Aug. 6, 1993; Amdt. 23-50, 61 FR 5188, Feb. 9, 1996]

§ 23.145 Longitudinal control.

(a) With the airplane as nearly as possible in trim at 1.3 V_{S1} , it must be possible, at speeds below the trim speed, to pitch the nose downward so that the rate of increase in airspeed allows prompt acceleration to the trim speed with—

- (1) Maximum continuous power on each engine;
- (2) Power off; and
- (3) Wing flap and landing gear—
 - (i) retracted, and

(ii) extended.

(b) Unless otherwise required, it must be possible to carry out the following maneuvers without requiring the application of single-handed control forces exceeding those specified in § 23.143(c). The trimming controls must not be adjusted during the maneuvers:

(1) With the landing gear extended, the flaps retracted, and the airplanes as nearly as possible in trim at 1.4 V_{S1} , extend the flaps as rapidly as possible and allow the airspeed to transition from 1.4 V_{S1} to 1.4 V_{SO} :

- (i) With power off; and
- (ii) With the power necessary to maintain level flight in the initial condition.

(2) With landing gear and flaps extended, power off, and the airplane as nearly as possible in trim at 1.3 V_{SO} : quickly apply takeoff power and retract the flaps as rapidly as possible to the recommended go around setting and allow the airspeed to transition from 1.3 V_{SO} to 1.3 V_{S1} . Retract the gear when a positive rate of climb is established.

(3) With landing gear and flaps extended, in level flight, power necessary to attain level flight at 1.1 V_{SO} , and the airplane as nearly as possible in trim, it must be possible to maintain approximately level flight while retracting the flaps as rapidly as possible with simultaneous application of not more than maximum continuous power. If gated flat positions are provided, the flap retraction may be demonstrated in stages with power and trim reset for level flight at 1.1 V_{S1} , in the initial configuration for each stage—

- (i) From the fully extended position to the most extended gated position;
- (ii) Between intermediate gated positions, if applicable; and
- (iii) From the least extended gated position to the fully retracted position.

(4) With power off, flaps and landing gear retracted and the airplane as nearly as possible in trim at 1.4 V_{S1} , apply takeoff power rapidly while maintaining the same airspeed.

(5) With power off, landing gear and flaps extended, and the airplane as nearly as possible in trim at V_{REF} , obtain and maintain airspeeds between 1.1 V_{SO} , and either 1.7 V_{SO} or V_{FE} , whichever is lower without requiring