

## § 23.61

liftoff point and the point at which the airplane is 35 feet above the takeoff surface as determined under § 23.57; or

(2) With all engines operating, 115 percent of the horizontal distance from the start of the takeoff to a point equidistant between the liftoff point and the point at which the airplane is 35 feet above the takeoff surface, determined by a procedure consistent with § 23.57.

[Amdt. 23-34, 52 FR 1827, Jan. 15, 1987, as amended by Amdt. 23-50, 61 FR 5185, Feb. 9, 1996]

### § 23.61 Takeoff flight path.

For each commuter category airplane, the takeoff flight path must be determined as follows:

(a) The takeoff flight path begins 35 feet above the takeoff surface at the end of the takeoff distance determined in accordance with § 23.59.

(b) The net takeoff flight path data must be determined so that they represent the actual takeoff flight paths, as determined in accordance with § 23.57 and with paragraph (a) of this section, reduced at each point by a gradient of climb equal to—

(1) 0.8 percent for two-engine airplanes;

(2) 0.9 percent for three-engine airplanes; and

(3) 1.0 percent for four-engine airplanes.

(c) The prescribed reduction in climb gradient may be applied as an equivalent reduction in acceleration along that part of the takeoff flight path at which the airplane is accelerated in level flight.

[Amdt. 23-34, 52 FR 1827, Jan. 15, 1987]

### § 23.63 Climb: General.

(a) Compliance with the requirements of §§ 23.65, 23.66, 23.67, 23.69, and 23.77 must be shown—

(1) Out of ground effect; and

(2) At speeds that are not less than those at which compliance with the powerplant cooling requirements of §§ 23.1041 to 23.1047 has been demonstrated; and

(3) Unless otherwise specified, with one engine inoperative, at a bank angle not exceeding 5 degrees.

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(b) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, compliance must be shown with § 23.65(a), § 23.67(a), where appropriate, and § 23.77(a) at maximum takeoff or landing weight, as appropriate, in a standard atmosphere.

(c) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category, compliance must be shown at weights as a function of airport altitude and ambient temperature, within the operational limits established for takeoff and landing, respectively, with—

(1) Sections 23.65(b) and 23.67(b) (1) and (2), where appropriate, for takeoff, and

(2) Section 23.67(b)(2), where appropriate, and § 23.77(b), for landing.

(d) For commuter category airplanes, compliance must be shown at weights as a function of airport altitude and ambient temperature within the operational limits established for takeoff and landing, respectively, with—

(1) Sections 23.67(c)(1), 23.67(c)(2), and 23.67(c)(3) for takeoff; and

(2) Sections 23.67(c)(3), 23.67(c)(4), and 23.77(c) for landing.

[Doc. No. 27807, 61 FR 5186, Feb. 9, 1996]

### § 23.65 Climb: All engines operating.

(a) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of 6,000 pounds or less maximum weight must have a steady climb gradient at sea level of at least 8.3 percent for landplanes or 6.7 percent for seaplanes and amphibians with—

(1) Not more than maximum continuous power on each engine;

(2) The landing gear retracted;

(3) The wing flaps in the takeoff position(s); and

(4) A climb speed not less than the greater of  $1.1 V_{MC}$  and  $1.2 V_{S1}$  for multi-engine airplanes and not less than  $1.2 V_{S1}$  for single-engine airplanes.

(b) Each normal, utility, and acrobatic category reciprocating engine-powered airplane of more than 6,000 pounds maximum weight and turbine engine-powered airplanes in the normal, utility, and acrobatic category

must have a steady gradient of climb after takeoff of at least 4 percent with

- (1) Take off power on each engine;
- (2) The landing gear extended, except that if the landing gear can be retracted in not more than seven seconds, the test may be conducted with the gear retracted;
- (3) The wing flaps in the takeoff position(s); and
- (4) A climb speed as specified in § 23.65(a)(4).

[Doc. No. 27807, 61 FR 5186, Feb. 9, 1996]

**§ 23.66 Takeoff climb: One-engine inoperative.**

For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category, the steady gradient of climb or descent must be determined at each weight, altitude, and ambient temperature within the operational limits established by the applicant with—

- (a) The critical engine inoperative and its propeller in the position it rapidly and automatically assumes;
- (b) The remaining engine(s) at takeoff power;
- (c) The landing gear extended, except that if the landing gear can be retracted in not more than seven seconds, the test may be conducted with the gear retracted;
- (d) The wing flaps in the takeoff position(s);
- (e) The wings level; and
- (f) A climb speed equal to that achieved at 50 feet in the demonstration of § 23.53.

[Doc. No. 27807, 61 FR 5186, Feb. 9, 1996]

**§ 23.67 Climb: One engine inoperative.**

(a) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, the following apply:

- (1) Except for those airplanes that meet the requirements prescribed in § 23.562(d), each airplane with a  $V_{SO}$  of more than 61 knots must be able to maintain a steady climb gradient of at least 1.5 percent at a pressure altitude of 5,000 feet with the—

- (i) Critical engine inoperative and its propeller in the minimum drag position;
  - (ii) Remaining engine(s) at not more than maximum continuous power;
  - (iii) Landing gear retracted;
  - (iv) Wing flaps retracted; and
  - (v) Climb speed not less than  $1.2 V_{S1}$ .
- (2) For each airplane that meets the requirements prescribed in § 23.562(d), or that has a  $V_{SO}$  of 61 knots or less, the steady gradient of climb or descent at a pressure altitude of 5,000 feet must be determined with the—

- (i) Critical engine inoperative and its propeller in the minimum drag position;
- (ii) Remaining engine(s) at not more than maximum continuous power;
- (iii) Landing gear retracted;
- (iv) Wing flaps retracted; and
- (v) Climb speed not less than  $1.2V_{S1}$ .

(b) For normal, utility, and acrobatic category reciprocating engine-powered airplanes of more than 6,000 pounds maximum weight, and turbine engine-powered airplanes in the normal, utility, and acrobatic category—

(1) The steady gradient of climb at an altitude of 400 feet above the takeoff must be measurably positive with the—

- (i) Critical engine inoperative and its propeller in the minimum drag position;
- (ii) Remaining engine(s) at takeoff power;
- (iii) Landing gear retracted;
- (iv) Wing flaps in the takeoff position(s); and
- (v) Climb speed equal to that achieved at 50 feet in the demonstration of § 23.53.

(2) The steady gradient of climb must not be less than 0.75 percent at an altitude of 1,500 feet above the takeoff surface, or landing surface, as appropriate, with the—

- (i) Critical engine inoperative and its propeller in the minimum drag position;
  - (ii) Remaining engine(s) at not more than maximum continuous power;
  - (iii) Landing gear retracted;
  - (iv) Wing flaps retracted; and
  - (v) Climb speed not less than  $1.2 V_{S1}$ .
- (c) For commuter category airplanes, the following apply:
- (1) *Takeoff; landing gear extended.* The steady gradient of climb at the altitude