

§ 23.1507

- (2) Not more than the lesser of—
  - (i) 0.9  $V_D$  established under § 23.335; or
  - (ii) 0.9 times the maximum speed shown under § 23.251.

(b) The maximum structural cruising speed  $V_{NO}$  must be established so that it is—

- (1) Not less than the minimum value of  $V_C$  allowed under § 23.335; and

- (2) Not more than the lesser of—
  - (i)  $V_C$  established under § 23.335; or
  - (ii) 0.89  $V_{NE}$  established under paragraph (a) of this section.

(c) Paragraphs (a) and (b) of this section do not apply to turbine airplanes or to airplanes for which a design diving speed  $V_D/M_D$  is established under § 23.335(b)(4). For those airplanes, a maximum operating limit speed ( $V_{MO}/M_{MO}$ -airspeed or Mach number, whichever is critical at a particular altitude) must be established as a speed that may not be deliberately exceeded in any regime of flight (climb, cruise, or descent) unless a higher speed is authorized for flight test or pilot training operations.  $V_{MO}/M_{MO}$  must be established so that it is not greater than the design cruising speed  $V_C/M_C$  and so that it is sufficiently below  $V_D/M_D$  and the maximum speed shown under § 23.251 to make it highly improbable that the latter speeds will be inadvertently exceeded in operations. The speed margin between  $V_{MO}/M_{MO}$  and  $V_D/M_D$  or the maximum speed shown under § 23.251 may not be less than the speed margin established between  $V_C/M_C$  and  $V_D/M_D$  under § 23.335(b), or the speed margin found necessary in the flight test conducted under § 23.253.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as amended by Amdt. 23-7, 34 FR 13096, Aug. 13, 1969]

EFFECTIVE DATE NOTE: By Amdt. 23-62, 76 FR 75762, Dec. 2, 2011, § 23.1505 was amended by revising paragraph (c), effective Jan. 31, 2012. For the convenience of the user, the revised text is set forth as follows:

§ 23.1505 Airspeed limitations.

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(c)(1) Paragraphs (a) and (b) of this section do not apply to turbine airplanes or to airplanes for which a design diving speed  $V_D/M_D$  is established under § 23.335(b)(4). For those airplanes, a maximum operating limit speed ( $V_{MO}/M_{MO}$  airspeed or Mach number, whichever is critical at a particular altitude) must

be established as a speed that may not be deliberately exceeded in any regime of flight (climb, cruise, or descent) unless a higher speed is authorized for flight test or pilot training operations.

(2)  $V_{MO}/M_{MO}$  must be established so that it is not greater than the design cruising speed  $V_C/M_C$  and so that it is sufficiently below  $V_D/M_D$ , or  $V_{DF}/M_{DF}$  for jets, and the maximum speed shown under § 23.251 to make it highly improbable that the latter speeds will be inadvertently exceeded in operations.

(3) The speed margin between  $V_{MO}/M_{MO}$  and  $V_D/M_D$ , or  $V_{DF}/M_{DF}$  for jets, may not be less than that determined under § 23.335(b), or the speed margin found necessary in the flight tests conducted under § 23.253.

§ 23.1507 Operating maneuvering speed.

The maximum operating maneuvering speed,  $V_O$ , must be established as an operating limitation.  $V_O$  is a selected speed that is not greater than  $V_S\sqrt{n}$  established in § 23.335(c).

[Doc. No. 26269, 58 FR 42165, Aug. 6, 1993]

§ 23.1511 Flap extended speed.

(a) The flap extended speed  $V_{FE}$  must be established so that it is—

- (1) Not less than the minimum value of  $V_F$  allowed in § 23.345(b); and
- (2) Not more than  $V_F$  established under § 23.345(a), (c), and (d).

(b) Additional combinations of flap setting, airspeed, and engine power may be established if the structure has been proven for the corresponding design conditions.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964; 30 FR 258, Jan. 9, 1965, as amended by Amdt. 23-50, 61 FR 5192, Feb. 9, 1996]

§ 23.1513 Minimum control speed.

The minimum control speed  $V_{MC}$ , determined under § 23.149, must be established as an operating limitation.

§ 23.1519 Weight and center of gravity.

The weight and center of gravity limitations determined under § 23.23 must be established as operating limitations.

§ 23.1521 Powerplant limitations.

(a) *General.* The powerplant limitations prescribed in this section must be established so that they do not exceed the corresponding limits for which the engines or propellers are type certificated. In addition, other powerplant

limitations used in determining compliance with this part must be established.

(b) *Takeoff operation.* The powerplant takeoff operation must be limited by—

(1) The maximum rotational speed (rpm);

(2) The maximum allowable manifold pressure (for reciprocating engines);

(3) The maximum allowable gas temperature (for turbine engines);

(4) The time limit for the use of the power or thrust corresponding to the limitations established in paragraphs (b)(1) through (3) of this section; and

(5) The maximum allowable cylinder head (as applicable), liquid coolant and oil temperatures.

(c) *Continuous operation.* The continuous operation must be limited by—

(1) The maximum rotational speed;

(2) The maximum allowable manifold pressure (for reciprocating engines);

(3) The maximum allowable gas temperature (for turbine engines); and

(4) The maximum allowable cylinder head, oil, and liquid coolant temperatures.

(d) *Fuel grade or designation.* The minimum fuel grade (for reciprocating engines), or fuel designation (for turbine engines), must be established so that it is not less than that required for the operation of the engines within the limitations in paragraphs (b) and (c) of this section.

(e) *Ambient temperature.* For all airplanes except reciprocating engine-powered airplanes of 6,000 pounds or less maximum weight, ambient temperature limitations (including limitations for winterization installations if applicable) must be established as the maximum ambient atmospheric temperature at which compliance with the cooling provisions of §§ 23.1041 through 23.1047 is shown.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964; 30 FR 258, Jan. 9, 1965, as amended by Amdt. 23-21, 43 FR 2319, Jan. 16, 1978; Amdt. 23-45, 58 FR 42165, Aug. 6, 1993; Amdt. 23-50, 61 FR 5192, Feb. 9, 1996]

#### § 23.1522 Auxiliary power unit limitations.

If an auxiliary power unit is installed, the limitations established for the auxiliary power must be specified

in the operating limitations for the airplane.

[Doc. No. 26269, 58 FR 42166, Aug. 6, 1993]

#### § 23.1523 Minimum flight crew.

The minimum flight crew must be established so that it is sufficient for safe operation considering—

(a) The workload on individual crewmembers and, in addition for commuter category airplanes, each crewmember workload determination must consider the following:

(1) Flight path control,

(2) Collision avoidance,

(3) Navigation,

(4) Communications,

(5) Operation and monitoring of all essential airplane systems,

(6) Command decisions, and

(7) The accessibility and ease of operation of necessary controls by the appropriate crewmember during all normal and emergency operations when at the crewmember flight station;

(b) The accessibility and ease of operation of necessary controls by the appropriate crewmember; and

(c) The kinds of operation authorized under § 23.1525.

[Amdt. 23-21, 43 FR 2319, Jan. 16, 1978, as amended by Amdt. 23-34, 52 FR 1834, Jan. 15, 1987]

#### § 23.1524 Maximum passenger seating configuration.

The maximum passenger seating configuration must be established.

[Amdt. 23-10, 36 FR 2864, Feb. 11, 1971]

#### § 23.1525 Kinds of operation.

The kinds of operation authorized (e.g. VFR, IFR, day or night) and the meteorological conditions (e.g. icing) to which the operation of the airplane is limited or from which it is prohibited, must be established appropriate to the installed equipment.

[Doc. No. 26269, 58 FR 42166, Aug. 6, 1993]

#### § 23.1527 Maximum operating altitude.

(a) The maximum altitude up to which operation is allowed, as limited by flight, structural, powerplant, functional or equipment characteristics, must be established.