

§ 23.21

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this section and in limited acrobatic operations. Limited acrobatic operation includes:

(1) Spins (if approved for the particular type of airplane); and

(2) Lazy eights, chandelles, and steep turns, or similar maneuvers, in which the angle of bank is more than 60 degrees but not more than 90 degrees.

(c) The acrobatic category is limited to airplanes that have a seating configuration, excluding pilot seats, of nine or less, a maximum certificated takeoff weight of 12,500 pounds or less, and intended for use without restrictions, other than those shown to be necessary as a result of required flight tests.

(d) The commuter category is limited to propeller-driven, multiengine airplanes that have a seating configuration, excluding pilot seats, of 19 or less, and a maximum certificated takeoff weight of 19,000 pounds or less. The commuter category operation is limited to any maneuver incident to normal flying, stalls (except whip stalls), and steep turns, in which the angle of bank is not more than 60 degrees.

(e) Except for commuter category, airplanes may be type certificated in more than one category if the requirements of each requested category are met.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as amended by Amdt. 23-4, 32 FR 5934, Apr. 14, 1967; Amdt. 23-34, 52 FR 1825, Jan. 15, 1987; 52 FR 34745, Sept. 14, 1987; Amdt. 23-50, 61 FR 5183, Feb. 9, 1996]

Subpart B—Flight

GENERAL

§ 23.21 Proof of compliance.

(a) Each requirement of this subpart must be met at each appropriate combination of weight and center of gravity within the range of loading conditions for which certification is requested. This must be shown—

(1) By tests upon an airplane of the type for which certification is requested, or by calculations based on, and equal in accuracy to, the results of testing; and

(2) By systematic investigation of each probable combination of weight and center of gravity, if compliance

cannot be reasonably inferred from combinations investigated.

(b) The following general tolerances are allowed during flight testing. However, greater tolerances may be allowed in particular tests:

Item	Tolerance
Weight .....	+5%, -10%.
Critical items affected by weight .....	+5%, -1%.
C.G .....	±7% total travel.

§ 23.23 Load distribution limits.

(a) Ranges of weights and centers of gravity within which the airplane may be safely operated must be established. If a weight and center of gravity combination is allowable only within certain lateral load distribution limits that could be inadvertently exceeded, these limits must be established for the corresponding weight and center of gravity combinations.

(b) The load distribution limits may not exceed any of the following:

- (1) The selected limits;
- (2) The limits at which the structure is proven; or
- (3) The limits at which compliance with each applicable flight requirement of this subpart is shown.

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

§ 23.25 Weight limits.

(a) *Maximum weight.* The maximum weight is the highest weight at which compliance with each applicable requirement of this part (other than those complied with at the design landing weight) is shown. The maximum weight must be established so that it is—

- (1) Not more than the least of—
  - (i) The highest weight selected by the applicant; or
  - (ii) The design maximum weight, which is the highest weight at which compliance with each applicable structural loading condition of this part (other than those complied with at the design landing weight) is shown; or
  - (iii) The highest weight at which compliance with each applicable flight requirement is shown, and
- (2) Not less than the weight with—
  - (i) Each seat occupied, assuming a weight of 170 pounds for each occupant for normal and commuter category airplanes, and 190 pounds for utility and

acrobatic category airplanes, except that seats other than pilot seats may be placarded for a lesser weight; and

(A) Oil at full capacity, and

(B) At least enough fuel for maximum continuous power operation of at least 30 minutes for day-VFR approved airplanes and at least 45 minutes for night-VFR and IFR approved airplanes; or

(i) The required minimum crew, and fuel and oil to full tank capacity.

(b) *Minimum weight.* The minimum weight (the lowest weight at which compliance with each applicable requirement of this part is shown) must be established so that it is not more than the sum of—

(1) The empty weight determined under § 23.29;

(2) The weight of the required minimum crew (assuming a weight of 170 pounds for each crewmember); and

(3) The weight of—

(i) For turbojet powered airplanes, 5 percent of the total fuel capacity of that particular fuel tank arrangement under investigation, and

(ii) For other airplanes, the fuel necessary for one-half hour of operation at maximum continuous power.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964, as amended by Amdt. 23-7, 34 FR 13086, Aug. 13, 1969; Amdt. 23-21, 43 FR 2317, Jan. 16, 1978; Amdt. 23-34, 52 FR 1825, Jan. 15, 1987; Amdt. 23-45, 58 FR 42156, Aug. 6, 1993; Amdt. 23-50, 61 FR 5183, Feb. 9, 1996]

**§ 23.29 Empty weight and corresponding center of gravity.**

(a) The empty weight and corresponding center of gravity must be determined by weighing the airplane with—

(1) Fixed ballast;

(2) Unusable fuel determined under § 23.959; and

(3) Full operating fluids, including—

(i) Oil;

(ii) Hydraulic fluid; and

(iii) Other fluids required for normal operation of airplane systems, except potable water, lavatory precharge water, and water intended for injection in the engines.

(b) The condition of the airplane at the time of determining empty weight

must be one that is well defined and can be easily repeated.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964; 30 FR 258, Jan. 9, 1965, as amended by Amdt. 23-21, 43 FR 2317, Jan. 16, 1978]

**§ 23.31 Removable ballast.**

Removable ballast may be used in showing compliance with the flight requirements of this subpart, if—

(a) The place for carrying ballast is properly designed and installed, and is marked under § 23.1557; and

(b) Instructions are included in the airplane flight manual, approved manual material, or markings and placards, for the proper placement of the removable ballast under each loading condition for which removable ballast is necessary.

[Doc. No. 4080, 29 FR 17955, Dec. 18, 1964; 30 FR 258, Jan. 9, 1965, as amended by Amdt. 23-13, 37 FR 20023, Sept. 23, 1972]

**§ 23.33 Propeller speed and pitch limits.**

(a) *General.* The propeller speed and pitch must be limited to values that will assure safe operation under normal operating conditions.

(b) *Propellers not controllable in flight.* For each propeller whose pitch cannot be controlled in flight—

(1) During takeoff and initial climb at the all engine(s) operating climb speed specified in § 23.65, the propeller must limit the engine r.p.m., at full throttle or at maximum allowable takeoff manifold pressure, to a speed not greater than the maximum allowable takeoff r.p.m.; and

(2) During a closed throttle glide, at  $V_{NE}$ , the propeller may not cause an engine speed above 110 percent of maximum continuous speed.

(c) *Controllable pitch propellers without constant speed controls.* Each propeller that can be controlled in flight, but that does not have constant speed controls, must have a means to limit the pitch range so that—

(1) The lowest possible pitch allows compliance with paragraph (b)(1) of this section; and

(2) The highest possible pitch allows compliance with paragraph (b)(2) of this section.