

(2) It is possible to prevent over-speeding of the rotor without exceptional piloting skill.

(d) *Emergency high pitch.* If the main rotor high pitch stop is set to meet paragraph (b)(1) of this section, and if that stop cannot be exceeded inadvertently, additional pitch may be made available for emergency use.

(e) *Main rotor low speed warning for helicopters.* For each single engine helicopter, and each multiengine helicopter that does not have an approved device that automatically increases power on the operating engines when one engine fails, there must be a main rotor low speed warning which meets the following requirements:

(1) The warning must be furnished to the pilot in all flight conditions, including power-on and power-off flight, when the speed of a main rotor approaches a value that can jeopardize safe flight.

(2) The warning may be furnished either through the inherent aerodynamic qualities of the helicopter or by a device.

(3) The warning must be clear and distinct under all conditions, and must be clearly distinguishable from all other warnings. A visual device that requires the attention of the crew within the cockpit is not acceptable by itself.

(4) If a warning device is used, the device must automatically deactivate and reset when the low-speed condition is corrected. If the device has an audible warning, it must also be equipped with a means for the pilot to manually silence the audible warning before the low-speed condition is corrected.

(Secs. 313(a), 601, 603, 604, and 605 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, 1424, and 1425); and sec. 6(c) of the Dept. of Transportation Act (49 U.S.C. 1655(c)))

[Doc. No. 5084, 29 FR 16150, Dec. 3, 1964, as amended by Amdt. 29-3, 33 FR 965, Jan. 26, 1968; Amdt. 29-15, 43 FR 2326, Jan. 16, 1978]

#### PERFORMANCE

##### § 29.45 General.

(a) The performance prescribed in this subpart must be determined—

(1) With normal piloting skill and;

(2) Without exceptionally favorable conditions.

(b) Compliance with the performance requirements of this subpart must be shown—

(1) For still air at sea level with a standard atmosphere and;

(2) For the approved range of atmospheric variables.

(c) The available power must correspond to engine power, not exceeding the approved power, less—

(1) Installation losses; and

(2) The power absorbed by the accessories and services at the values for which certification is requested and approved.

(d) For reciprocating engine-powered rotorcraft, the performance, as affected by engine power, must be based on a relative humidity of 80 percent in a standard atmosphere.

(e) For turbine engine-powered rotorcraft, the performance, as affected by engine power, must be based on a relative humidity of—

(1) 80 percent, at and below standard temperature; and

(2) 34 percent, at and above standard temperature plus 50 °F.

Between these two temperatures, the relative humidity must vary linearly.

(f) For turbine-engine-power rotorcraft, a means must be provided to permit the pilot to determine prior to take-off that each engine is capable of developing the power necessary to achieve the applicable rotorcraft performance prescribed in this subpart.

(Secs. 313(a), 601, 603, 604, and 605 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, 1424, and 1425); and sec. 6(c), Dept. of Transportation Act (49 U.S.C. 1655(c)))

[Doc. No. 5084, 29 FR 16150, Dec. 3, 1964, as amended by Amdt. 29-15, 43 FR 2326, Jan. 16, 1978; Amdt. 29-24, 49 FR 44436, Nov. 6, 1984]

##### § 29.49 Performance at minimum operating speed.

(a) For each Category A helicopter, the hovering performance must be determined over the ranges of weight, altitude, and temperature for which takeoff data are scheduled—

(1) With not more than takeoff power;

(2) With the landing gear extended; and

## § 29.51

(3) At a height consistent with the procedure used in establishing the takeoff, climbout, and rejected takeoff paths.

(b) For each Category B helicopter, the hovering performance must be determined over the ranges of weight, altitude, and temperature for which certification is requested, with—

- (1) Takeoff power;
- (2) The landing gear extended; and
- (3) The helicopter in ground effect at a height consistent with normal takeoff procedures.

(c) For each helicopter, the out-of-ground effect hovering performance must be determined over the ranges of weight, altitude, and temperature for which certification is requested with takeoff power.

(d) For rotorcraft other than helicopters, the steady rate of climb at the minimum operating speed must be determined over the ranges of weight, altitude, and temperature for which certification is requested with—

- (1) Takeoff power; and
- (2) The landing gear extended.

[Doc. No. 24802, 61 FR 21898, May 10, 1996; 61 FR 33963, July 1, 1996]

### § 29.51 Takeoff data: general.

(a) The takeoff data required by §§ 29.53, 29.55, 29.59, 29.60, 29.61, 29.62, 29.63, and 29.67 must be determined—

(1) At each weight, altitude, and temperature selected by the applicant; and

(2) With the operating engines within approved operating limitations.

(b) Takeoff data must—

- (1) Be determined on a smooth, dry, hard surface; and
- (2) Be corrected to assume a level takeoff surface.

(c) No takeoff made to determine the data required by this section may require exceptional piloting skill or alertness, or exceptionally favorable conditions.

[Doc. No. 5084, 29 FR 16150, Dec. 3, 1964, as amended by Amdt. 29-39, 61 FR 21899, May 10, 1996]

### § 29.53 Takeoff: Category A.

The takeoff performance must be determined and scheduled so that, if one engine fails at any time after the start of takeoff, the rotorcraft can—

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(a) Return to, and stop safely on, the takeoff area; or

(b) Continue the takeoff and climbout, and attain a configuration and airspeed allowing compliance with § 29.67(a)(2).

[Doc. No. 24802, 61 FR 21899, May 10, 1996; 61 FR 33963, July 1, 1996]

### § 29.55 Takeoff decision point (TDP): Category A.

(a) The TDP is the first point from which a continued takeoff capability is assured under § 29.59 and is the last point in the takeoff path from which a rejected takeoff is assured within the distance determined under § 29.62.

(b) The TDP must be established in relation to the takeoff path using no more than two parameters; e.g., airspeed and height, to designate the TDP.

(c) Determination of the TDP must include the pilot recognition time interval following failure of the critical engine.

[Doc. No. 24802, 61 FR 21899, May 10, 1996]

### § 29.59 Takeoff path: Category A.

(a) The takeoff path extends from the point of commencement of the takeoff procedure to a point at which the rotorcraft is 1,000 feet above the takeoff surface and compliance with § 29.67(a)(2) is shown. In addition—

(1) The takeoff path must remain clear of the height-velocity envelope established in accordance with § 29.87;

(2) The rotorcraft must be flown to the engine failure point; at which point, the critical engine must be made inoperative and remain inoperative for the rest of the takeoff;

(3) After the critical engine is made inoperative, the rotorcraft must continue to the takeoff decision point, and then attain  $V_{TOSS}$ ;

(4) Only primary controls may be used while attaining  $V_{TOSS}$  and while establishing a positive rate of climb. Secondary controls that are located on the primary controls may be used after a positive rate of climb and  $V_{TOSS}$  are established but in no case less than 3 seconds after the critical engine is made inoperative; and