

- (1) 70 percent of the dry runway braking coefficient of friction used to determine the dry runway accelerate-stop distance; or
- (2) The wet runway braking coefficient defined in paragraph (c) of this

section, except that a specific anti-skid system efficiency, if determined, is appropriate for a grooved or porous friction course wet runway, and the maximum tire-to-ground wet runway braking coefficient of friction is defined as:

<u>Tire Pressure (psi)</u>	<u>Maximum Braking Coefficient (tire-to-ground)</u>
50	$\mu_{U/GMAX} = 0.1470 \left(\frac{V}{100}\right)^5 - 1.050 \left(\frac{V}{100}\right)^4 + 2.673 \left(\frac{V}{100}\right)^3 - 2.683 \left(\frac{V}{100}\right)^2 + 0.403 \left(\frac{V}{100}\right) + 0.859$
100	$\mu_{U/GMAX} = 0.1106 \left(\frac{V}{100}\right)^5 - 0.813 \left(\frac{V}{100}\right)^4 + 2.130 \left(\frac{V}{100}\right)^3 - 2.200 \left(\frac{V}{100}\right)^2 + 0.317 \left(\frac{V}{100}\right) + 0.807$
200	$\mu_{U/GMAX} = 0.0498 \left(\frac{V}{100}\right)^5 - 0.398 \left(\frac{V}{100}\right)^4 + 1.140 \left(\frac{V}{100}\right)^3 - 1.285 \left(\frac{V}{100}\right)^2 + 0.140 \left(\frac{V}{100}\right) + 0.701$
300	$\mu_{U/GMAX} = 0.0314 \left(\frac{V}{100}\right)^5 - 0.247 \left(\frac{V}{100}\right)^4 + 0.703 \left(\frac{V}{100}\right)^3 - 0.779 \left(\frac{V}{100}\right)^2 - 0.00954 \left(\frac{V}{100}\right) + 0.614$

Where—

- Tire Pressure=maximum airplane operating tire pressure (psi);
- $\mu_{U/GMAX}$ =maximum tire-to-ground braking coefficient;
- V=airplane true ground speed (knots); and
- Linear interpolation may be used for tire pressures other than those listed.

(e) Except as provided in paragraph (f)(1) of this section, means other than wheel brakes may be used to determine the accelerate-stop distance if that means—

- (1) Is safe and reliable;
- (2) Is used so that consistent results can be expected under normal operating conditions; and
- (3) Is such that exceptional skill is not required to control the airplane.

(f) The effects of available reverse thrust—

- (1) Shall not be included as an additional means of deceleration when determining the accelerate-stop distance on a dry runway; and
- (2) May be included as an additional means of deceleration using recommended reverse thrust procedures when determining the accelerate-stop distance on a wet runway, provided the requirements of paragraph (e) of this section are met.

(g) The landing gear must remain extended throughout the accelerate-stop distance.

(h) If the accelerate-stop distance includes a stopway with surface characteristics substantially different from those of the runway, the takeoff data must include operational correction factors for the accelerate-stop distance. The correction factors must account for the particular surface characteristics of the stopway and the variations in these characteristics with seasonal weather conditions (such as temperature, rain, snow, and ice) within the established operational limits.

(i) A flight test demonstration of the maximum brake kinetic energy accelerate-stop distance must be conducted with not more than 10 percent of the allowable brake wear range remaining on each of the airplane wheel brakes.

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§ 25.111 Takeoff path.

(a) The takeoff path extends from a standing start to a point in the takeoff at which the airplane is 1,500 feet above the takeoff surface, or at which the transition from the takeoff to the en route configuration is completed and V_{FTO} is reached, whichever point is higher. In addition—

- (1) The takeoff path must be based on the procedures prescribed in § 25.101(f);

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(2) The airplane must be accelerated on the ground to V_{EF} , at which point the critical engine must be made inoperative and remain inoperative for the rest of the takeoff; and

(3) After reaching V_{EF} , the airplane must be accelerated to V_2 .

(b) During the acceleration to speed V_2 , the nose gear may be raised off the ground at a speed not less than V_R . However, landing gear retraction may not be begun until the airplane is airborne.

(c) During the takeoff path determination in accordance with paragraphs (a) and (b) of this section—

(1) The slope of the airborne part of the takeoff path must be positive at each point;

(2) The airplane must reach V_2 before it is 35 feet above the takeoff surface and must continue at a speed as close as practical to, but not less than V_2 , until it is 400 feet above the takeoff surface;

(3) At each point along the takeoff path, starting at the point at which the airplane reaches 400 feet above the takeoff surface, the available gradient of climb may not be less than—

(i) 1.2 percent for two-engine airplanes;

(ii) 1.5 percent for three-engine airplanes; and

(iii) 1.7 percent for four-engine airplanes; and

(4) Except for gear retraction and automatic propeller feathering, the airplane configuration may not be changed, and no change in power or thrust that requires action by the pilot may be made, until the airplane is 400 feet above the takeoff surface.

(d) The takeoff path must be determined by a continuous demonstrated takeoff or by synthesis from segments. If the takeoff path is determined by the segmental method—

(1) The segments must be clearly defined and must be related to the distinct changes in the configuration, power or thrust, and speed;

(2) The weight of the airplane, the configuration, and the power or thrust must be constant throughout each segment and must correspond to the most critical condition prevailing in the segment;

(3) The flight path must be based on the airplane's performance without ground effect; and

(4) The takeoff path data must be checked by continuous demonstrated takeoffs up to the point at which the airplane is out of ground effect and its speed is stabilized, to ensure that the path is conservative relative to the continuous path.

The airplane is considered to be out of the ground effect when it reaches a height equal to its wing span.

(e) For airplanes equipped with standby power rocket engines, the takeoff path may be determined in accordance with section II of appendix E.

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§ 25.113 Takeoff distance and takeoff run.

(a) Takeoff distance on a dry runway is the greater of—

(1) The horizontal distance along the takeoff path from the start of the takeoff to the point at which the airplane is 35 feet above the takeoff surface, determined under § 25.111 for a dry runway; or

(2) 115 percent of the horizontal distance along the takeoff path, with all engines operating, from the start of the takeoff to the point at which the airplane is 35 feet above the takeoff surface, as determined by a procedure consistent with § 25.111.

(b) Takeoff distance on a wet runway is the greater of—

(1) The takeoff distance on a dry runway determined in accordance with paragraph (a) of this section; or

(2) The horizontal distance along the takeoff path from the start of the takeoff to the point at which the airplane is 15 feet above the takeoff surface, achieved in a manner consistent with the achievement of V_2 before reaching 35 feet above the takeoff surface, determined under § 25.111 for a wet runway.

(c) If the takeoff distance does not include a clearway, the takeoff run is