U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: OPERATIONAL LANDING DISTANCES FOR WET RUNWAYS; TRANSPORT CATEGORY AIRPLANES
Date: 6/19/90
Initiated by: AFS-430
AC No: 121.195(d)-1A
Change:

1. PURPOSE. This advisory circular (AC) sets forth an acceptable means, but not the only means, of showing compliance with Federal Aviation Regulations (FAR) § 121.195(d) pertaining to operational landing distances on wet runways. It is for guidance purposes and provides an example of a method of compliance that has been found acceptable.

2. CANCELLATION. Advisory Circular 121.195(d)-1, dated 11/19/65, is cancelled.

3. RELATED FAR SECTIONS.

a. FAR § 121.195(d).

b. FAR § 25.125.

4. RELATED READING MATERIAL.

a. Advisory Circular 91-6A, Water, Slush, and Snow on the Runway.

b. Advisory Circular 150/5320-12A, Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces.

c. Advisory Circular 25-7, Flight Test Guide for Certification of Transport Category Airplanes.

5. BACKGROUND.

a. In determining safe operational runway lengths that provide for operational variables not included in type certification tests, FAR § 121.195(b) requires a runway length adequate to allow a full-stop landing (based on the type certification tests) within 60 percent of the effective length of the runway. The operational variables include runway surface conditions, piloting techniques, tire and brake deterioration, atmospheric instability such as gusts or windshear, crosswinds, approach to touchdown, flightpath deviations, and others. FAR § 121.195(d) requires an additional 15 percent runway length for operations into wet or slippery runways.

b. As an alternative to the additional 15 percent runway length requirement, FAR § 121.195(d) allows operational wet runway distances to be used if they are based "on a showing of actual operating landing techniques on wet runways." However, this alternative distance can never be less than the factored dry runway distances required by FAR § 121.195(b).

c. Normally the operating environmental condition associated with a wet runway is an Instrument Flight Rules condition requiring an instrument approach. Other factors pertinent to successful wet runway operations include runway surface maintenance, Minimum Equipment List (MEL) control of items related to stopping performance, weather reporting, and flightcrew procedures and training. The objective of the guidance material in this AC is to ensure that critical variables associated with actual inservice wet runway performance are considered to the degree that any approvals in accordance with the alternative provision of FAR § 121.195(d) are appropriately conservative.

6. ACCEPTABLE MEANS OF ESTABLISHING OPERATIONAL LANDING DISTANCES ON WET RUNWAYS. An acceptable method of obtaining approval under FAR § 121.195(d) is to establish landing field lengths subject to the following:

a. Flight Test Requirements.

(1) Testing should be conducted on the runway for which approval is being sought, or a runway that is shown to be equivalent. Data to be used in making an equivalency finding should be coordinated with the Federal Aviation Administration, Northwest Mountain Region, Transport Airplane Directorate (ANM-100), 17900 Pacific Highway South, C-68966, Seattle, Washington 98168.

(2) For new models, or where additional data are required for existing models, tests must be conducted.

b. Flight Test Conditions.

(1) The braking coefficient of friction obtained from not less than six landing tests conducted in accordance with FAR § 25.125 and subject to the additional provisions listed below should be used to establish the ground braking distances.

(i) The landing should be preceded by a stabilized approach not to exceed an angle of 3° down to the 50-foot height and at a calibrated airspeed not less than 1.4 V_{S0}.

(ii) The average touchdown rate of descent should not exceed 6 feet per second. Longitudinal control and brake application procedures must be such that they can be consistently applied to yield a nose gear touchdown rate of descent that does not exceed 8 feet per second.

(iii) The runway should be level, smooth, hard-surfaced, and well-soaked. (Areas of measurable water depth are acceptable for testing.)

(2) The wheels should be fitted with tires that are worn to a point where no more than 20 percent of the original tread depth remains. Tires may be changed between tests provided they are within specified limits.

(3) The main landing gear tire pressure should be set to not less than the maximum pressure corresponding to the actual test weight.

c. Airplane Flight Manual.

(1) Airplane Flight Manual (AFM) distances should be established that represent the distance traversed from the 50-foot height to full stop, subject to the following:

(i) Airborne distance from the 50-foot height to touchdown should be calculated based on a time increment of 7 seconds or the air time certificated under FAR § 25.125 plus an additional 2 seconds, whichever is greater; a speed at the 50-foot height of 1.4 V_{S0}; and a speed at touchdown calculated from the ratio V_{TD}/V_{50} = 0.96. Note: It is not intended that the actual operational approach speed be altered for approval under this AC.

(ii) Transition distance from touchdown to the point where all approved deceleration devices are operative should be calculated based on the speed at touchdown from paragraph 6c(1)(i) and on the time increment and speed ratio certificated under FAR § 25.125.

(iii) Ground braking distance in the approved deceleration configuration should be based on the braking coefficient of friction determined under paragragh 6b and the deceleration parameters certificated under FAR § 25.125. Credit for reverse thrust will not be given.

(iv) Distances established in accordance with paragraphs 6c(1)(i), (ii), and (iii) should be increased by a factor to assure operational safety. Multiplying the basic distances by 1.15 is considered appropriate for this purpose.

(v) The distances established under the criteria in this AC must not be less than the distances determined under FAR § 121.195(b).

(2) Operational landing distances in accordance with this AC that account for the operational variables listed under the discussion of FAR § 25.125 in AC 25-7 must be made available in the performance information section of the AFM.

(3) The AFM should contain a statement to the effect that: "The landing performance of this airplane has been evaluated in accordance with AC 121.195(d)-1A and found suitable for the runways specified in the following list. This finding does not constitute operational approval to base the landing performance requirements on these distances."

7. FAR PART 121 OPERATIONAL APPROVALS OF AIRCRAFT WITH OPERATIONAL LANDING PERFORMANCE DATA ON WET RUNWAYS.

a. Operators may apply to use wet runway operational performance data determined in accordance with this AC under the provisions of FAR § 121.195.

The operations may be approved by issuance of operations specifications under Part C by listing the provisions and limitations which must be met for each runway where this performance is approved. Operations specifications should be coordinated with the Federal Aviation Administration, Technical Programs Division (AFS-400), Flight Standards Service, 800 Independence Avenue, SW., Washington, DC 20591, prior to issuance.

b. Eligibility. To be eligible for approval in Part C of the operations specifications, the runway must:

(1) Be the runway the flight testing of paragraph 6 was conducted on, or a runway shown to have equivalent wet surface braking characteristics, or a runway that is grooved or porous friction course overlayed.

(2) Be maintained under an approved program equivalent to the criteria in AC 150/5320-12A which is acceptable to the Federal Aviation Administration Flight Standards Service. For foreign airports, an agreement should be obtained between the operator and the airport operator specifying the equivalent minimum level of runway surface maintenance to be accomplished. These agreements should specify the inspection frequency, maintenance frequency, and notification to the operator if the required friction levels cannot be maintained.

(3) Be equipped with serviceable runway and touchdown markings for daytime operations and serviceable lighting systems if night operations are authorized. Either an approved approach path indicator (such as a Visual Approach Slope Indicator or Precision Approach Path Indicator) or an electronic glidepath which provides an acceptable threshold crossing height for the aircraft used should be installed and serviceable.

c. Training and Currency. The operators' approved training programs and operating manuals should address the following factors:

(1) The approved training and qualification program should specify those requirements necessary to assure that flightcrews and dispatchers are cognizant of the visual aid, MEL, and aircraft configuration requirements for operations on operational performance runways. These training and qualification requirements should also assure that flightcrews and dispatchers are cognizant of the runways where operational performance is authorized.

(2) The required aircraft configuration should be specified in the operating manuals to include the allowable flap settings, other necessary configuration requirements (such as limits on engine-out approaches), and pertinent MEL items such as windshield wipers, thrust reversers, antiskid systems, etc.

(3) Pilots in command should not be approved for these operations if they have less than 100 hours as pilot in command in the airplane type being used.

(4) Unless Phase II approved simulators with approved visual models for the operational performance runways are used, actual landings using the operational performance techniques should be accomplished by each pilot prior to conducting line operations at these runways. Each pilot authorized to perform the landing using special operational performance must have completed at least one landing (actual or simulated) on the authorized operational performance runways within the last 90 days in each type of aircraft authorized to use the special operational performance. Special performance landing currency may be reestablished in an approved simulator or by completing a line check.

d. Weather. Operations using special operational performance should not be conducted on any runway unless the following special weather requirements can be met:

(1) Windshear or Thunderstorms. There should be no significant windshear or thunderstorms which affect the use of the special performance runway(s), such as:

(i) Significant windshear reported by a Low Level Windshear Alert System, or

(ii) Pilot reports of significant windshear, or

(iii) Thunderstorms observed or reported within 5 nautical miles of the final approach path or the missed approach path for the operational performance runway being used.

(2) Visibility/RVR/RVV. The reported visibility/Runway Visual Range (RVR)/Runway Visibility Value (RVV) for the operational performance runway being used shall not be less than 1 statute mile (RVR 5000).

(3) Winds. The crosswind component (including gust values) must not exceed 15 knots and tailwind components must not exceed 0 knots.

e. Runway Braking Effectiveness. There should be no snow, slush, ice, frost, or standing water (other than isolated patches which do not impact braking effectiveness) observed or reported on the special operational performance runway within the width necessary for safe operations. Braking effectiveness must be at least "good" (e.g., not "fair," "poor," or "nil") and there shall be no current reports of hydroplaning or slippery runway surfaces.

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