FEDERAL AVIATION AGENCY

FLIGHT STANDARDS SERVICE

[14 CFR Special Civil Air Regulations Nos. SR–422, SR–422A, SR–422B]
[Notice 63–28; Docket No. 1866]

NOTICE OF PROPOSED RULE MAKING

SPECIAL OPERATING LIMITATIONS FOR TURBOJET TRANSPORT CATEGORY AIRPLANES

Notice is hereby given that there is under consideration a proposal to amend certain operating rules of Special Civil Air Regulations Nos. SR–422, SR–422A, and SR–422B, which are used in determining the minimum runway lengths for takeoff and landing. The proposal would affect only operators of turbojet airplanes under Parts 40, 41, and 42. For the purpose of determining the minimum runway length for takeoff, the proposed amendment would require the addition of a constant distance margin of 800 feet to the accelerate-stop distance. For landing, the proposal would require increased lengths of the runway at alternate airports at all times and increased lengths of runway at the airport of destination when weather reports and forecasts indicate that the runways will be wet or icy at the estimated time of arrival.

Interested persons are invited to participate in the making of the proposed rule by submitting such written data, views or arguments as they may desire. Communications should identify the notice or docket number and be submitted in duplicate to the Federal Aviation Agency, Office of the General Counsel: Attention Rules Docket, Room A–103, 1711 New York Avenue, N.W., Washington 25, D.C. All communications received on or before September 23, 1963, will be considered by the Administrator before taking action upon the proposed rule. The proposals contained in this notice may be changed in the light of comments received. All comments submitted will be available, both before and after the closing date for comments, in the Rules Docket for examination by interested persons.

Sections 4T.115 and 4T.122 of the SR–422 series regulations set forth requirements for establishing accelerate-stop and landing distances respectively. Sections 40T.81 and 40T.84 of the SR–422 series regulations set forth operational runway lengths for takeoff and the operating limitations for landings at the destination and alternate airports respectively. The FAA and industry have recognized that some takeoff and landing runway lengths, especially when operating under adverse runway conditions (wet, snow, slush, icy, etc.), are inadequate. Some airlines are applying special factors to takeoff distance and landing runway lengths to account for operations under these adverse runway conditions.

An attempt was made to account for operations under adverse runway conditions by proposing rationalized requirements for accelerate-stop and landing distances in a proposed Special Civil Air Regulation No. SR–422C, issued as a Notice of Conference dated May 4, 1962. The proposed SR–422C basically was intended to reflect a rationalization of the type certification requirements to the extent that the required demonstrations would utilize operational practices and procedures, would require runway surface and crosswind accountability, and would grant performance credit for the use of deceleration devices including arresting gear. It was contemplated that certain provisions of SR–422C would be made retroactive to presently operated turbine-powered airplanes. Two months after proposed SR–422C was issued, a Notice of Withdrawl was sent out cancelling the Notice of Conference and stating that the FAA would conduct a flight test program to determine the effect of the proposed SR–422C. Subsequently, it was concluded that the contemplated flight test evaluation was not economically feasible and an alternate approach was explored of those provisions in SR–422C which were intended to be made applicable to presently operated airplanes. There is included in this notice a proposed alternate approach which treats the most important safety problems and which is simple in concept and application and does not require an additional testing.

Accelerate-stop distance. The accelerate-stop distance determined in accordance with § 4T.115 is a requirement which is considered to result in the absolute minimum level of safety. There are no built-in safety margins to account for normal operational variations other than 50 percent headwind and 150 percent tailwind accountability. As a result thereof, airline pilots have stated that they cannot reproduce the certificated accelerate-stop distances for turbojet airplanes during air carrier operations. There is a need, therefore, to increase the accelerate-stop runway lengths to account for some of the expected operational variations.

The accelerate-stop distance determined in accordance with § 4T.115 is based on an all-engines-operating acceleration to the critical engine failure speed V_1, and a subsequent stop from this point on a dry runway. The accelerate-stop tests are normally conducted with new tires and brakes and with full knowledge of the

test pilot. The type certification procedure used in the past has permitted immediate brake application upon recognition of the engine failure at V_1 speed followed by subsequent actions on the part of the pilot, after appropriate time delays, to bring the airplane to a stop. There are no arbitrary factors applied to the accelerate-stop distance to account for operational variations; i.e., pilot technique, runway surface conditions, etc.

The takeoff distance requirements of § 4T.117, in contrast to the accelerate-stop requirements, contain built-in safety margins. The 35-foot height at the end of the takeoff distance specified in all SR–422 series regulations and the application of the 115 percent factor to the all-engine-takeoff distance specified in SR–422A and SR–422B are margins which allow for reasonably expected operational variations. The takeoff distances, however, also include wind accountability as in accelerate-stop distances.

In airline operations, airplanes are operated at times with tires and brakes that do not provide maximum braking action. If an engine failure occurs at V_1 speed during airline operations, there is a time period during which the pilot decides whether to abort or continue the takeoff and also a reaction time to initiate braking. These operational variations (presently unaccounted for during type certification tests) tend to lower the level of safety because operational accelerate-stop distances would be longer than those obtained during type certification. The airlines have stated that the takeoff distances to the 35-foot height have more safety margins included therein than the accelerate-stop distance, even at speeds lower than V_1. Since the introduction of turbojet equipment, airline pilots have been indoctrinated with the idea that they cannot stop these airplanes within the specified accelerate-stop distances if an engine failure occurs at V_1 speed. This becomes of utmost concern when operating from runway length limited airports. The airlines, therefore, have trained their pilots to be "go-minded" if an engine fails near V_1.

The effective runway length required for accelerate-stop distance can be exactly equal to the runway length. No allowance need be made for the runway consumed in positioning the airplane. The distance from the end of the runway to where the airplane is positioned on the runway varies with pilot technique and taxiway arrangements. It is conceivable that some pilots position the airplane with the tail over the end of the runway. The location of the taxiway and runup pad with respect to the end of the runway and even the position of the airplane on the runup pad may result in the positioning of the airplane an appreciable distance from the starting end of the runway.

In consideration of these facts, it is proposed to require 800 feet to be added to the accelerate-stop distances determined in accordance with § 4T.115 to arrive at the minimum runway length required for takeoff of turbojet airplanes. Six hundred feet of the 800 feet are considered the minimum distance traveled during a time period of 3 seconds following recognition of engine failure. The 3 seconds are considered to be a minimum time period for a decision and reaction time on the part of airline pilots before initiating the stopping action. Four seconds are considered to be an average time period for an average pilot to recognize the precise difficulty, to decide on the appropriate corrective action, and to initiate this action. Two hundred feet of the 800 feet are considered to be the average amount of runway consumed in positioning the airplane at the starting end of the runway. The addition of the 800 feet to the accelerate-stop distance does not preclude the operator from lowering the currently established V_1 speeds and adjusting the required takeoff runway lengths accordingly.

Air carriers are currently operating in accordance with an FAA policy, which provides for increased takeoff runway lengths, and thus indirectly for increased runway lengths for an aborted takeoff, when runways are covered with standing water, wet snow, or slush. These increases are based on the deteriorating effect that these mediums have on an airplane's acceleration capability. No consideration, therefore, is being given in this notice to account for increased accelerate-stop distances due to operations under adverse runway conditions (wet snow, slush, etc.).

Landing distances. The currently required landing runway lengths for turbojet airplanes are considered adequate for dry runway operations but not for wet or slippery runway conditions. A recent regional survey indicated that most of the major airlines operating turbojet equipment apply some correction factor for landing on slippery or wet runways. By this action, the airlines indicate that the presently required landing runway lengths for turbojet operations on adverse runways are inadequate and as such tend to bring about a lowered level of safety. An FAA policy sets forth conditions for approval of turbojet operations with 200–½ landing minimums. It requires that the landing runway lengths be increased 1,000 feet or 15 percent, whichever is greater, when these low minimums are utilized. There is a need, therefore, to increase the required minimum runway lengths for turbojet airplanes for landings to account for operations on adverse runways.

The landing distance determined in accordance with § 4T.122 is based on a steady gliding approach which allows the airplane to cross the threshold at a height of 50 feet and a speed of 1.3 V_s. The landing distance is the horizontal distance from the 40-foot height to the point where the airplane comes to rest on a dry runway utilizing maximum operational braking. This landing distance, as determined during type certification tests, is then increased by dividing it by a factor of 0.6 to obtain the required minimum runway length for landing at the airport of destination. The 0.6 factor accounts for operational variations; i.e., excess threshold height and touchdown speed, variations in piloting technique, adverse runway conditions, etc.

In the realization that the performance regulations for turbine-powered transport airplanes were subject to reevaluation on the basis of experience, the Agency has been collecting operational data on landings of large turbojet airplanes, mostly in actual air carrier service. Some of these data stem from phototheodolitic measurements performed by the Agency and eval-

uated in Flight Standards Service Release No. 470. Additional data were derived from measurements taken in the United Kingdom and elsewhere. Further data were gained from more limited tests, including some conducted by the Agency to establish braking and friction characteristics on wet or slippery runways. On the basis of an analysis of all presently available data, it is concluded that in actual operations large turbojet airplanes require 1,300 more feet under wet runway conditions.

Since the presently required 0.6 factor is considered a necessary margin for landing operations under adverse runway conditions when operating the airplane in accordance with type certification procedures, we believe that the 1,300-foot additional distance actually being achieved in turbojet operational landings is consuming most of this margin. To restore this margin for turbojet airplanes, an equivalent of 1,200 feet should be added to the required landing runway lengths. Since for the airplanes involved in the analysis, the required runway length at higher weights was in the neighborhood of 6,500 feet, the addition of 1,200 feet is equivalent to changing the factor from 0.6 to 0.5.

In consideration of these facts, it is proposed to require that landing distances for turbojets be scheduled with a factor of 0.5 when the runways at the airport of destination are apt to be wet (visible moisture) or icy. Compliance would be determined on the basis of weather reports and forecasts at the time of dispatch. The landing runway lengths for dry runways would continue to be based on the 0.6 factor.

The increase in runway lengths found necessary on the basis of the conducted analysis of operational practices applies equally to alternate airports. In this case, however, it would not be practical, nor sufficient, to allow scheduling for either dry or wet runways. It is being proposed, therefore, to increase the required runway lengths at alternate airports by establishing a factor of 0.6 in lieu of the present 0.7. In this manner, operational safety would be increased including those instances when an airplane is dispatched on the basis of a dry runway, but the actual runway conditions at the time of landing at the airport of destination are so unfavorable that a landing at an alternate would be preferble.

To permit orderly application of the proposed rules in actual operations, it is proposed to make them effective six months after adoption of the resulting amendments.

This proposal is subject to the FAA Recodification Program announced in Draft Release 61-25 (26 F.R. 10698). The final rule, if adopted, may be in the recodified form; however, the recodification itself will not alter the substantive contents proposed herein.

These regulatory changes are proposed under the authority of sections 313(a), 601, 603, and 604 of the Federal Aviation Act of 1958 (49 U.S.C. 1354, 1421, 1423, 1424).

In consideration of the foregoing, it is proposed to amend Special Civil Air Regulations Nos. SR-422, SR-422A, and SR-422B as hereinafter set forth and to require compliance with the resulting amendments by not later than six months after adoption.

1. By amending § 40T.81(c) of Special Civil Air Regulation No. SR-422 to read as follows:

40T.81 *Airplane's certificate limitations.*

* * * * *

(c) No airplane shall be taken off at a weight which exceeds the weight at which, in accordance with the minimum distances for takeoff scheduled in the Airplane Flight Manual, compliance with subparagraphs (1) and (2) of this paragraph is shown. These distances shall correspond with the elevation of the airport, the runway to be used, the effective runway gradient, and the ambient temperature and wind component existing at the time of takeoff. (See §§ 4T.123(a)(3) and 4T.743(a).)

(1) For turbopropeller transport airplanes, the accelerate-stop distance shall not be greater than the length of the runway. For turbojet airplanes, the accelerate-stop distance plus 800 feet shall not be greater than the length of the runway.

(2) The takeoff distance shall not be greater than the length of the runway.

2. By amending § 40T.81(c) of Special Civil Air Regulation No. SR-422A to read as follows:

40T.81 *Airplane's certificate limitations.*

* * * * *

(c) No airplane shall be taken off at a weight which exceeds the weight at which, in accordance with the minimum distances for takeoff scheduled in the Airplane Flight Manual, compliance with subparagraphs (1) through (3) of this paragraph is shown. These distances shall correspond with the elevation of the airport, the runway to be used, the effective runway gradient, and the ambient temperature and wind component existing at the time of takeoff. (See §§ 4T.123(a)(3) and 4T.743(a).)

(1) For turbopropeller transport airplanes, the accelerate-stop distance shall not be greater than the length of the runway. For turbojet airplanes, the accelerate-stop distance plus 800 feet shall not be greater than the length of the runway.

(2) The takeoff distance shall not be greater than the length of the runway plus the length of the clearway if present, except that the length of the clearway shall not be greater than one-half of the length of the runway.

(3) The takeoff run shall not be greater than the length of the runway.

3. By amending § 40T.81(c)(1) of Special Civil Air Regulation No. SR-422B to read as follows:

40T.81 *Airplane's certificate limitations.*

* * * * *

(c) * * *

(1) For turbopropeller transport airplanes, the accelerate-stop distance shall not be greater than the length of the runway plus the length of the stopway if present. For turbojet airplanes, the accelerate-stop distance plus 800 feet shall not be greater than the length of the runway plus the length of the stopway if present.

4. By amending § 40T.84 of Special Civil Air Regulations Nos. SR–422, SR–422A, and SR–422B by adding a clause at the end of paragraph (b) and by adding a new paragraph (c) to read as follows:

40T.84 *Landing limitations.*

* * * * *

(b) *Alternate airport.* * * * for turbopropeller airplanes and 60 percent of the effective length of the runway for turbojet airplanes.

(c) *Wet or slippery runways.* When the appropriate weather reports and forecasts, or a combination thereof, indicate that the runways at the airport of destination may be wet (visible moisture) or icy at the estimated time of arrival, the provisions of paragraph (a) of this section shall apply to all turbojet airplanes, except that 50 percent in lieu of the 60 percent of the effective length of the runway shall be applicable.

Issued in Washington, D.C., on July 15, 1963.

G. S. Moore
Director,
Flight Standards Service.