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FEDERAL AVIATION AGENCY
BUREAU OF FLIGHT STANDARDS
WASHINGTON 25, D. C.

January 16, 1961

CIVIL AIR REGULATIONS DRAFT RELEASE NO. 61-1

SUBJECT: Runway Slush Accountability for Takeoff Operations of Turbine-Powered Transport Category Airplanes

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The Bureau of Flight Standards of the Federal Aviation Agency has under consideration a proposed Special Civil Air Regulation covering the takeoff operations of turbine-powered transport category airplanes when wet snow, slush, and standing water are present on the runway. The reasons therefor are set forth in the explanatory statement of the attached proposal which is being published in the Federal Register as a notice of proposed rule making.

The Bureau of Flight Standards desires that all persons who will be affected by the requirements of this proposal be fully informed as to its effect upon them and is therefore circulating copies in order to afford interested persons ample opportunity to submit comments as they may desire.

Because of the large number of comments which we anticipate receiving in response to this draft release, we will be unable to acknowledge receipt of each reply. However, you may be assured that all comment will be given careful consideration.

It should be noted that comments must be submitted in duplicate to the Docket Section of the Federal Aviation Agency, and in order to insure consideration must be received by February 27, 1961.

George C. Prill

Director
Bureau of Flight Standards

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FEDERAL AVIATION AGENCY

BUREAU OF FLIGHT STANDARDS

/14 CFR Parts 4b, 10, 40, 41, 42, 43, SR-422, SR-422A, SR-422B/

/Regulatory Docket No. 628 ; Draft Release 61-17/

NOTICE OF PROPOSED RULE MAKING

Special Civil Air Regulation

Runway Slush Accountability for Takeoff Operations of Turbine-Powered Transport Category Airplanes

Pursuant to the authority delegated to me by the Administrator (§ 405.27, 14 CFR Part 405), notice is hereby given that the Federal Aviation Agency has under consideration a proposed Special Civil Air Regulation covering the takeoff operations of turbine-powered transport category airplanes when wet snow, slush, and standing water are present on the runway.

Interested persons may participate in the making of the proposed rules by submitting such written data, views, or arguments as they may desire. Communications should be submitted in duplicate to the Docket Section of the Federal Aviation Agency, Room B-316, 1711 New York Avenue, N. W., Washington 25, D. C. All Communications received on or before February 27,1961, will be considered by the Administrator before taking action upon the proposed rules. The proposals contained in this notice may be changed in the light of comments received. All comments submitted will be available, in the Docket Section, for examination by interested persons when the prescribed date for return of comments has expired.

Current regulations do not specifically provide for the adverse effects of precipitation on the runway on airplane performance.

Experience with the new turbine-powered airplanes indicates, however, that some provisions in this respect are necessary to insure safe operation of these airplanes during takeoff. For this reason, a policy was adopted in December 1959, revised March 1960, to restrict takeoff operations of turbojet airplanes in wet snow, slush, or standing water.

The subject was discussed at the FAA's Airworthiness Conference held in March 1960, and again at supplementary meetings held in July and October 1960. During these meetings it was determined that sufficient information on which to propose new regulations covering all aspects of takeoff operations is neither available nor capable of being obtained at this time. For example, very little is known of the effect of slush on the braking capacity of wheels and therefore on the accelerate-stop distance. However, there does appear to be sufficient data available (e.g., NASA Technical Note D-552) upon which to base an interim regulation for the takeoff acceleration case. During the October meeting, the ATA presented a proposal for consideration.

The ATA proposal excluded consideration of the one-engine-inoperative takeoff condition on the basis that the probability of an engine failure with slush on the runway is too remote to warrant consideration, and that such consideration would unnecessarily curtail aircraft operations because of the large adverse effect of slush on one-engine-inoperative takeoff performance. It also excluded consideration of turbopropeller airplanes on the basis that they are not appreciably affected by precipitation on

the runway surface. Finally, it provided that the first one-quarter inch of precipitation be allowed without penalty on the basis that the anticipated effect of this amount of slush, etc., will be absorbed by the all-engine takeoff-distance margin of 15 percent prescribed in Special Civil Air Regulations Nos. SR-422A and SR-422B.

The view that the probability of an engine failure in combination with slush on the runway is too remote to consider was not substantiated by statistical or other data. On the other hand, the fact that slush has a much larger adverse effect in the one-engine-inoperative case makes a catastrophic accident more probable when this combination does occur without having been taken into account.

The view regarding the relatively small susceptibility of turbopropeller airplanes to the adverse effects of slush, etc., was also unsubstantiated. While it is known that current turbopropeller airplanes operate at lower takeoff speeds than do current turbojet airplanes, which tends to lessen the retardation effects of slush, etc., on such airplanes, the precise extent to which slush, etc., has an adverse effect upon turbopropeller airplanes is not known. However, if, as is alleged, these effects are virtually eliminated by the airplane's takeoff-speed characteristics, the proposed accountability corrections and operational penalties would be correspondingly small.

The suggestion to ignore the first one-quarter inch of precipitation is related to the proposal to exclude the one-engine-inoperative case.

The magnitude of the performance correction for runway precipitation increases rapidly as the thrust to weight ratio of the airplane decreases. Thus, the correction for one-quarter inch may be within the existing performance margins for the all-engine-takeoff case, but is much more serious in the one-engine-inoperative case, particularly for twin-engine airplanes. The proposed regulation therefore does not specify a depth which may be ignored.

The rules proposed herein would supersede the policy presently in effect and would apply to turbopropeller as well as turbojet airplanes. Under the proposed rule, the maximum takeoff weights for all operators would have to be adjusted to reflect the adverse effects of wet snow, slush, or standing water on the takeoff distance and takeoff run performance, in addition to the factors currently prescribed in the certification and the operating rules; i.e., altitude, temperature, wind, and runway gradient.

The proposal contains a provision designed to prevent the use of special procedures which would adversely affect the airplane's takeoff performance beyond that resulting from the retardation effects of wet snow, slush, or standing water. Therefore, use of the approved takeoff speeds would be required for operations in slush, etc., unless the applicant intends to recertificate the airplane under the applicable airworthiness requirements to differentiate the conditions.

The proposal contemplates that the takeoff performance of each type airplane, and variations thereof, would be corrected so as to produce consistent weight adjustments under comparable operating conditions.

The proposal would also require that measurements of depths and densities be accomplished by an approved method. This will necessitate the submittal of industry recommendation to the FAA for review and approval. Such approval will be granted on the basis of simplicity consistent with the necessity of obtaining uniform and accurate measurements. Alternate methods must be compatible for the same reason.

In recognition that each type airplane, and variations thereof, will be affected to a different degree on a given runway, the proposal avoids prescribing specific locations on the runway for precipitation measurements.

No arbitrary limit on depth of precipitation, other than the range of reliable correction data, is considered necessary for performance purposes. However, the proposal recognizes that maximum depth limits may be necessary for those types of airplanes where spray can cause critical engine ingestion or damage to the airframe.

In consideration of the foregoing, it is proposed to promulgate the following Special Civil Air Regulation:

Contrary provisions of the Civil Air Regulations notwithstanding, no U. S. registered turbine-powered transport category airplane shall be taken off from any runway having precipitation consisting of wet snow, slush, or standing water on its surface, at a takeoff weight which

exceeds the takeoff weight established for such airplane under the provisions of this regulation.

1. The takeoff distance and/or takeoff run data for the airplane established for dry runway conditions shall be revised in an approved manner to account for the retardation effects of the precipitation on the runway. The retarding effect shall be determined by the method set forth in NASA Technical Note D-552 1/, or an approved equivalent method.

NOTE: NASA Technical Note D-552 is not applicable to precipitation depths in excess of those tested and reported therein.

2. The precipitation depth and density shall be measured by approved methods. The measurements shall be made at such points on the length and width of the runway as are necessary to obtain the maximum retardation effect of such precipitation on the particular type airplane and variation thereof. Density measurements of wet snow or slush are not required if a density of 1.65 slugs/ft^3 or higher is assumed.

3. Using the precipitation measurements and the revised takeoff data, the takeoff weight shall be determined in the same manner as that specified in the applicable operating rules for the determination of the takeoff weight for dry runway conditions.

4. Each operator shall establish for each type of airplane operated by him, the maximum precipitation depth limits at which the spraying of precipitation during takeoff will cause critical engine ingestion or airframe damage. No airplane shall be taken off when the depth of precipitation exceeds the maximum depth limit for such precipitation established by the operator.

5. Airplane operating procedures for takeoff with precipitation on the runway which differ from the procedures approved for dry runway conditions shall comply with the applicable airworthiness requirements.

These rules are proposed under the authority of sections 313(a), 601, 604 of the Federal Aviation Act of 1958 (72 Stat. 752, 775, 778; 49 U.S.C. 1354, 1421, 1424).

1/ Copies of NASA Technical Note D-552 may be obtained without charge from National Aeronautics & Space Administration, Code ETD, Washington 25, D. C.

George C. Price

Director,
Bureau of Flight Standards

Issued in Washington, D. C., on January 16, 1961.