ICAO

Circular 355

Assessment, Measurement and Reporting of Runway Surface Conditions

Approved by and published under the authority of the Secretary General

INTERNATIONAL CIVIL AVIATION ORGANIZATION

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FOREWORD

1. PURPOSE

1.1 This circular aims to provide an overarching conceptual understanding of the surface friction characteristics that contribute to controlling an aircraft via the critical tire-to-ground contact area. The intent is to provide broad and fundamental concepts and guidance to support maintenance of surface friction characteristics and the global reporting system and format for assessing and reporting runway surface conditions applicable as of 5 November 2020.

1.2 The global reporting format for assessing and reporting runway surface conditions is outlined in amendments to the following documents:

- Annex 3 — *Meteorological Service for International Air Navigation*
- Annex 6 — *Operation of Aircraft,* Part I — *International Commercial Air Transport — Aeroplanes* and Part II — *International General Aviation — Aeroplanes*
- Annex 8 — *Airworthiness of Aircraft*
- Annex 14 — *Aerodromes*, Volume I — *Aerodrome Design and Operations*
- Annex 15 — *Aeronautical Information Services*
- *Procedures for Air Navigation Services (PANS) — Aerodromes* (PANS-Aerodromes, Doc 9981)
- *Procedures for Air Navigation Services (PANS) — Aeronautical Information Management* (PANS-AIM, Doc 10066)
- *Procedures for Air Navigation Services (PANS) — Air Traffic Management* (PANS-ATM, Doc 4444)
- *Aeroplane Performance Manual* (Doc 10064)
- *Airport Services Manual*, Part 2 — *Pavement Surface Conditions*, Part 8 — *Airport Operational Services* and Part 9 — *Airport Maintenance Practices* (Doc 9137)

1.3 This circular addresses the following issues:

a) surface friction characteristics of pavements and runway surface contaminants;

b) how surface characteristics relate to aircraft performance;

c) assessment of runway surface conditions;

d) reporting and dissemination of runway surface conditions; and

e) the need for appropriate training of personnel involved in c) and d).

2. BACKGROUND

2.1 In the early 1950s, aerodrome requirements for jet aircraft were discussed, including the need to ensure that runways had reasonable surface friction characteristics for braking efficiency.

2.2 The Standing Committee on Performance was set up in 1951 to develop specifications for transport aircraft performance suitable for inclusion in two Annexes to the Convention on International Civil Aviation: Annexes 6 and 8. The Committee was able to work out a complete performance code and defined a reference dry and wet surface.

2.3 In 1954, the Air Routes and Ground Aids (AGA) Committee exchanged technical views on specific problems, including concerns about icy runway operations, following the introduction of turbojet operations. These discussions were summarized and published in 1955 in Circular 43 — *Ice and Snow on Runways*.

2.4 In 1957, the Airworthiness Committee compared two existing codes (United Kingdom and United States) and decided to adopt their common specifications. In 1961, ICAO published Circular 60 — *Operational Measures for Dealing with the Problem of Taking Off from Slush- or Water-covered Runways* to address the take-off situation. An updated version (1968) was used as the basis for guidance material for the European Joint Aviation Authorities JAR 25, now CS-25.

2.5 Commencing in 1965, the Air Navigation Commission established various study groups to assist the Secretariat on issues related to friction.

2.6 From 1972 to 1974, ICAO administered a programme, undertaken by Canada, France, Sweden, Union of Soviet Socialist Republics, United Kingdom and United States, to evaluate equipment used to measure runway braking action. From the conclusions of the reduced test data it was noted that some degree of correlation existed among the devices tested and that correlation varied widely between equipment pairs and with changes in surface texture, and that a great lack of precision was evident among the measuring devices. Friction measuring device correlation charts were developed for wet surfaces and for compacted snow or ice surfaces. The landing situation represented a challenge for the Airworthiness Committee, and three landing methods were developed and published in the *Airworthiness Technical Manual* (Doc 9051). In the early stages of development of the landing specifications, it had been hoped that a close enough correlation would be established between friction measuring devices and aircraft stopping distance to allow runway friction to be treated as an operational variable. In 1976, the Airworthiness Committee proposed a three-tier system comprising dry, normal and substandard runways. It was recognized that the operational distinction between normal and substandard wet runways posed problems which were not yet solved.

2.7 In 1981, arising from a comment on the recommendations of the AGA Divisional Meeting (AGA/81), the Air Navigation Commission agreed that the ICAO Secretariat should re-examine the criteria for the development of equipment for determining the friction characteristics of wet runways. The focus was on design and maintenance objectives which introduced, initially, a maintenance level and, later, a minimum friction level. A link to the operational aspect was sought through an aeroplane stopping distance ratio between dry and wet of two and the introduction of the term “slippery when wet”.

2.8 In 2001, the *Airworthiness Manual* (Doc 9760) was published with the objective of providing guidance on the implementation of the airworthiness and maintenance provisions of Annexes 6 and 8. Doc 9760 replaced, among other documents, Doc 9051, which contained detailed technical information referred to in Doc 9137, *Airport Services Manual*, Part 2, which was supplemented by the performance-based guidance in Circular 329 — *Assessment, Measurement and Reporting of Runway Surface Conditions*.

2.9 With respect to dissemination of information on runway surface conditions, the ICAO SNOWTAM format was developed and introduced in 1967 arising from a detailed proposal from the International Air Transport Association (IATA) in 1963. The SNOWTAM format has not gained global acceptance and has been implemented differently among

States, resulting in inconsistent information being provided to aircraft operators and pilots. Runway condition reports should be timely, accurate and consistent with the need to conduct aircraft operations that are in compliance with Annexes 6 and 8.

2.10 Numerous projects have been aimed at resolving the problem of harmonizing the various friction measuring devices and linking them to aircraft performance. The latter goal still has not been achieved largely due to the difficulty of developing a system comprising a universally agreed reference for friction measuring devices and issues associated with the repeatability and reproducibility of the fleet of friction measuring devices in use.

2.11 In view of these historical developments, it was considered timely for ICAO to develop international specifications on, *inter alia*, the functions, principles and basic technical and operational characteristics of friction measuring devices. In 2006 the Aerodromes Operations and Services Working Group, under the aegis of the Aerodromes Panel, established the ICAO Friction Task Force (FTF) with the following deliverables:

a) propose appropriate amendments to the relevant Standards and Recommended Practices (SARPs) in ICAO Annexes, primarily Annex 14, Volume I, supported by updated guidance material;

b) develop an ICAO circular on assessing, measuring and reporting runway surface conditions including state-of-the-art treatment of friction issues; and

c) propose an action plan for tasks that require future work.

The ICAO FTF formally commenced its work in 2008.

2.12 Having delivered on its first tasks, the FTF was asked to:

a) address the problem statement – runway surface conditions have contributed to many safety events and *investigations have revealed shortfalls in the accuracy and timeliness of assessment and reporting methods currently provided for in ICAO provisions and guidance material;*

b) develop provisions on the reporting of runway surface conditions in Annex 14, Volume I, and other related Annexes and Procedures for Air Navigation Services (PANS);

c) develop guidance on operational requirements for aeroplane performance; and

d) develop guidance for the assessment of runway surface conditions, including friction level and where contamination exists.

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