



**U.S. Department
of Transportation
Federal Aviation
Administration**

SAFO

Safety Alert for Operators

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Flight Standards Service
Washington, DC

http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/safo

A SAFO contains important safety information and may include recommended action. SAFO content should be especially valuable to air carriers in meeting their statutory duty to provide service with the highest possible degree of safety in the public interest. Besides the specific action recommended in a SAFO, an alternative action may be as effective in addressing the safety issue named in the SAFO.

Subject: Turbojet Braking Performance on Wet Runways.

Purpose: This SAFO cancels and replaces SAFO 15009 and warns airplane operators and pilots that the advisory data for wet runway landings may not provide a safe stopping margin especially in conditions of Moderate or Heavy Rain.

Background: Landing overruns that occur on wet runways typically involve multiple contributing factors such as long touchdown, improper use of deceleration devices, tailwind and less available friction than expected. Several recent runway-landing incidents/accidents have raised concerns with wet runway stopping performance assumptions. Analysis of the stopping data from these incidents/accidents indicates the braking coefficient of friction in each case was significantly lower than expected for a wet runway as defined by Title 14 of the Code of Federal Regulations (14 CFR) part 25 § Section 25.109 and Advisory Circular (AC) 25-7D methods.

These incidents/accidents occurred on both grooved and un-grooved runways. The data indicates that applying a 15% safety margin to wet runway time-of-arrival advisory data, as recommended by SAFO 06012 (or current guidance), may be inadequate in certain wet runway conditions. Takeoff and Landing Performance Assessment (TALPA) procedures implemented by the FAA on October 1, 2016, added new insight as to how flightcrews can evaluate runway braking performance prior to landing. TALPA defines *WET* as "Includes damp and 1/8-inch depth or less of water," while *CONTAMINATED* is "greater than 1/8-inch of water."

Discussion: These overruns have occurred on grooved and smooth runways during periods of moderate to heavy rain. Analysis of these incidents/accidents indicates that the braking coefficient of friction in each case was significantly lower than expected, and that 30 to 40 percent of additional stopping distance may be required if the runway transitions from *wet* to *contaminated* based on the rainfall intensity or reported water contamination (greater than 1/8-inch depth). For the operational in-flight landing assessment, determining whether the runway is wet or potentially contaminated is the pilot's responsibility.

The FAA recommends that airports report "Wet" conditions. However, airports are not required to report when a runway is only *wet*. Further, an airport may not be able to generate a Field Condition NOTAM (FICON) for sudden rain showers that result in water on the runway more than 1/8 of an inch in depth (*contaminated*). Rainfall intensity may be the only indication available to the pilot that the water depth

present on the runway may be excessive. The 1/8-inch threshold that separates a wet runway with a RWYCC of 5 from runway contaminated with water depth greater than 1/8-inch a RWYCC of 2 is based on possibility of dynamic hydroplaning. This can be especially true in moderate rain if the runway is not properly crowned, grooved, constructed with a porous friction course (PFC) overlay, or when water runoff becomes overwhelmed. During heavy rain events, this may be true even on a properly maintained grooved or PFC runway.

The TALPA RCAM recommends using landing performance data associated with medium to poor braking or RwyCC of 2, if greater than 1/8-inch of water is anticipated to be on the runway. When planning to land on a smooth runway under conditions of moderate or heavy rain, or when landing on a grooved or PFC runway under heavy rain, pilots should consider that the surface may be contaminated with water at depth greater than 1/8 inch and adjust their landing distance assessment accordingly. Pilots should use all available resources to determine what condition they may expect upon landing to include Air Traffic Control (ATC), FICONs (as some airports do report Wet conditions), flight visibility, and/or onboard weather radar.

Note: A Special Weather Observation (SPECI) will only be generated if a Thunderstorm begins. A SPECI is not generated when rainfall rates simply change.

Knowing ahead of time whether your aircraft can or cannot stop within the Landing Distance Available if runway conditions deteriorate to a medium to poor condition (RwyCC = 2) is critical when operating in moderate or heavy rain. Go-around, holding, or diversion may be necessary if rainfall intensity increases beyond what might be acceptable for the intended operation.

Some of the wet runway braking shortfalls have occurred at US airports where 14 CFR Part 139 runway design and maintenance standards apply. Operators should be aware that the aforementioned runway design and maintenance standards might not be met in other countries. Many countries' standards for design, construction and/or maintenance of runways are based on International Civil Aviation Organization (ICAO) Annex 14 runway design and maintenance standards, however they may lack oversight in implementation of these standards. Outside of the United States, there is often less usage of grooving or PFC overlay which, when present, will normally aid in drainage and mitigate the risk of hydroplaning during active precipitation, thus improving braking action.

Unless the pilot or operator is knowledgeable of the runway's maintenance program, and that the runway is grooved or is a PFC surface that can provide good runway friction during periods of active moderate or heavy rain, they should consider basing their time-of-arrival assessment on the above recommendations. Aircraft operators should also clarify their reporting needs to the airport operator as it relates to "Wet" runway conditions.

As stated initially, the other common contributing factors for wet runway excursions include, but are not limited to delayed touchdown, improper application of deceleration devices and tailwind landings. Aircraft operators should review their flight training programs to ensure flight crews are familiar with the assumptions used in creating the data used for the time-of-arrival assessment, such as the assumed distance from threshold to touchdown and recommended uses of deceleration devices. 14 CFR Part 121 aircraft operators should also ensure flight crews are aware of the wind assumed in the original dispatch

calculations for the flight. Advisory Circular 91-79A addresses these issues, and operators should review the guidance contained therein.

Recommended Action: Directors of Safety and Directors of Operations (Part 121); Directors of Operations (parts 135, and 125), Program Managers, (Part 91K), and Pilots (Part 91) should ensure pilots verify, prior to initiating an approach, that the aircraft can stop within the Landing Distance Available using a RwyCC of “2” whenever there is the likelihood of moderate or greater rain on a smooth runway or heavy rain on a grooved/PFC runway.

Contact: Questions or comments regarding this SAFO should be directed to the Air Transportation Division’s Air Carrier Operations Branch at (202) 267-8166.