



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

# SAFO

Safety Alert for Operators

SAFO 15009  
DATE: 8/11/15

Flight Standards Service  
Washington, DC

[http://www.faa.gov/other\\_visit/aviation\\_industry/airline\\_operators/airline\\_safety/safo](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 warns airplane operators and pilots that the advisory data for wet runway landings may not provide a safe stopping margin under all conditions.

**Background:** Landing overruns which 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 the Federal Aviation Administration (FAA) in Federal Air Regulation (FAR) 25.109 and Advisory Circular (AC) 25-7C methods. These incidents/accidents occurred on both grooved and un-grooved or non-Porous Friction Course overlay (PFC) runways. The data indicates that applying a 15% safety margin to wet runway time-of-arrival advisory data as, recommended by SAFO 06012, may be inadequate in certain wet runway conditions.

**Discussion:** The root cause of the wet runway stopping performance shortfall is not fully understood at this time; however issues that appear to be contributors are runway conditions such as texture (polished or rubber contaminated surfaces), drainage, puddling in wheel tracks and active precipitation. Analysis of this data indicates that 30 to 40 percent of additional stopping distance may be required in certain cases where the runway is very wet, but not flooded.

For non-grooved or non-PFC runways, experience has shown that wheel braking may be degraded when the runway is very wet. If active moderate or heavy precipitation exists, the operator should consider additional conservatism in their time-of-arrival assessment.

For grooved or PFC runways, experience has shown that wheel braking is degraded when the runway is very wet. If active heavy precipitation exists; the operator should consider additional conservatism in their time-of-arrival assessment.

Possible methods of applying additional conservatism when operating on a runway which experience has shown is degraded when very wet are assuming a braking action of medium or fair when computing time-of-arrival landing performance or increasing the factor applied to the wet runway time-of-arrival landing performance data.

In some cases manufacturers have provided improved performance landing data for grooved/PFC runways. This improved performance grooved/PFC runway landing data should only be used when following any other Airplane Flight Manual (AFM) requirements and/or requirements of section 7 of AC 121-195(d)-1a, "FAR PART 121 OPERATIONAL APPROVALS OF AIRCRAFT WITH OPERATIONAL LANDING PERFORMANCE ON WET RUNWAYS" or equivalent operation specification.

Some of the wet runway braking shortfalls have occurred at US airports where Title 14 of the Code of Federal Regulations (14 CFR) 139 runway design and maintenance standards apply. Operators should be aware that the aforementioned runway design and maintenance standards may not be met in other countries. Many country's standards for design, construction and 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. Also, 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 impacting braking action.

Operators should be aware of the runway maintenance program and wet runway friction capability at the airports to which they operate. Mitigation should be considered at airports where aircraft operators have reason to suspect the runway's capability of creating good friction while very wet during active precipitation.

As stated initially the other common contributing factors for wet runway excursions are long 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, recommended uses of deceleration devices; 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 has been recently updated to address these issues and operators should review the guidance contained therein.

In 2015 a committee of manufacturers and regulators will further investigate the issues with wet runway braking performance shortfalls. Airport and aircraft operators will be included in this investigation.

**Recommended Action:** Directors of safety and directors of operations (Part 121); directors of operations (part 135, and 125), program managers, (Part 91K), and Pilots (Part 91) should take appropriate action within their operation to address the safety concerns with landing performance on wet runways discussed in this SAFO.

**Contact:** Questions or comments regarding this SAFO should be directed to the Air Transportation, New Program Implementation Branch, AFS-240 at (202) 267-8166.