# EASA Safety Information Bulletin

**SIB No.:** **2008-19R2**

**Issued:** **23 April 2013**

**Subject:** **Catalytic Oxidation of Aircraft Carbon Brakes due to Runway De-Icers**

**Ref. Publication:**

- Aerospace Industry Report 2011 – Society of Automotive Engineers (SAE G-12 Runway De-icing Fluids Committee - Catalytic Oxidation of Carbon Brakes Working Group) – Runway De-icing Material Effects on Aircraft Carbon Brakes;
- FAA Special Airworthiness Information Bulletin NM-08-27R1;
- SAE AIR5567A – Test Method for Catalytic Carbon Brake Disk Oxidation.

**Applicability:** All large aeroplanes equipped with carbon brakes and operated to/from airports where runway de-icers are used.

**Description:** The use of low-weight carbon brakes in modern aircraft since the 1980s and the concurrent switch to more environmental friendly organic salts runway de-icers have led to a concern that is possibly safety related and also imposes additional cost to airlines.

[…] Aircraft manufacturers have informed EASA, that these organic salts (mainly potassium formate and acetate, but other alkalis as well) are sprayed by the wheels mainly during aircraft take-off and landing runs. They remain on the underside of the aircraft and can be collected as ice and slush on the landing gear. The worst condition is the spray between wheels which drives the runway de-icers directly into the brakes and, particularly, coats the (carbon) brake rotors and stators which are also used as the pressure plates to provide braking. After landing gear retraction the ice and slush on the landing gear (now in a horizontal position) melt into the brake units where they further invade the carbon discs. The presence of the alkalis creates a catalytic condition which lowers the temperature at which oxidation occurs. This softens the carbon causing it to flake and crumble over time, reducing the life and long-term efficiency of the brakes themselves.

As a result, there is a danger of possible brake failure during high-speed aborted take-off or dragged brake during normal take off (and subsequent overheat, once airborne) or excessive vibration during any ground operation. It should be noted here that the centre of the brake unit cannot be easily inspected and this is where its stator couplings are indexed to the torque tube, mechanically linked to the axle, thus transmitting the braking torque to the wheels. If the stator couplings fail, the brake effectiveness will be diminished.

This is information only. Recommendations are not mandatory.

Many aircraft have the additional issues of Cadmium and Aluminium corrosion, corrosion in landing gear joints, and electrical wire bundle degradation, also caused or accelerated by the same de-icers, which, again, is a further unaccounted for expense. The electrical wire bundle problem is a particular concern for older aircraft, particularly those using Kapton insulation. The cable bundles tend to trap residue from runway de-icers. When this happens, the residue can absorb up to 6 times its original volume. This mixture, remaining in the cable bundles may cause more safety concern than any of the other conditions.

[…] EASA has determined that the aforementioned information may raise airworthiness concerns on aircraft under national registers (loss of one brake during a rejected take off operation is potentially catastrophic, even if no accident of this kind occurred since the introduction of environmental friendly de-icers). […] Depending on latest developments and advice from industry, a safety rule (e.g. ETSO) could be considered, if necessary. This would then be based on such latest developments.

The reason for updating the Service Information Bulletin 2008-19R1 from 12 January 2009 is to inform the aviation stakeholders about the progress made on this subject:

1) The CRD 2011-20[1] on aerodrome design and operations proposes an AMC on operations in winter conditions which recommends to avoid using chemicals which may have harmful effects on aircraft, wherever possible.
2) In May 2009 the SAE A-5 Aerospace Landing Gear Committee issued a new protocol to test the effect of runway de-icers on a preselected carbon brake material. The test method described in SAE AIR5567 is designed to assess the relative effects of runway de-icers on catalytic oxidation of carbon brakes and has been incorporated into the SAE AMS1431 and AMS1435 runway de-icer specifications in September 2010. Testing in accordance to SAE AIR5567 of the chemical compounds assessed has shown that typically formate based runway de-icers (solid or liquid) show higher percentage of carbon weight loss (i.e. more damage to carbon brake matrix leading to less structural strength) than acetate based runway de-icers.

In the meantime EASA:

- Informs aviation stakeholders by way of this Safety Information Bulletin to raise awareness of these issues;
- Will maintain its involvement in the dedicated SAE Working Group;
- Evaluates the possibility to issue in future mandatory continuing airworthiness actions (i.e. airworthiness directives) if airport measures alone are found unable to mitigate the risk.

At this time, the safety concern described in this SIB is not considered to be an unsafe condition that would warrant Airworthiness Directive (AD) action under EU 748/2012, Part 21.A.3B.

[1] This NPA was published in 2011, The CRD was published on 26 November 2012 and the Opinion was published on 05 February 2013. See EASA website under CRD's for more information.



 

**Recommendation:** This Safety Information Bulletin is for information only. Nevertheless, during each landing gear wheel removal, it is recommended to carry out a detailed visual inspection of the wheel carbon brake rotors and stators per the applicable Aircraft Maintenance Manual Section or, if not available, inspect the carbon brake rotors and stators for obvious damage, e.g. carbon chips and debris, or frayed, crushed, flaked, soft, fractured carbon or missing carbon elements.

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