Runway friction characteristics measurement and aircraft braking

by Werner Kleine-Beek, Research Project Manager, European Aviation Safety Agency. In April 2008, aeroplane operational issues fell under the European Aviation Safety Agency scope. At that time, the European Commission had clearly indicated that in the future, aerodrome operations will also be under the responsibility of EASA. This extension of the Agency's responsibilities was adopted on 7 September 2009.

In April 2008, aeroplane operational issues fell under the European Aviation Safety Agency scope. At that time, the European Commission had clearly indicated that in the future, aerodrome operations will also be under the responsibility of EASA. This extension of the Agency's responsibilities was adopted on 7 September 2009.

Instances of runway overruns and veer-offs, where ice, snow, slush or standing water patches are contributing factors, have been a constant issue for aviation. As part of the process of defining runway surface conditions, friction measurements are commonly made at present using various ground friction-measuring devices. These devices differ substantially among each other with the result that different readings are obtained from them on the same surface. This lack of harmonisation poses a potential safety hazard.

The issue of runway friction characteristics measurement is a multidisciplinary one, mainly between operations and aerodromes, but also with regard to aircraft certification. There was little doubt that the safety of aircraft operations could be enhanced if reliable, accurate and consistent methods of both assessing the braking action available on a contaminated runway and applying this assessment to aircraft performance could be devised.

Werner Kleine-Beek

joined EASA 2007 as Research Project Manager, being responsible for management of the Agency's research projects as well as coordination and interfacing with other research programmes. He started his carrier as research engineer for train traffic control systems, worked after as avionics systems certification engineer and in Aviation and Space Department of the German Federal Ministry of Transport responsible for technical issues in aviation administration, space activities, and the Ministry's research programme & research coordination.

Runway friction characteristics measurement and aircraft braking (cont'd)

However, the magnitude and possible regulatory complexity of the task should not be underestimated.

The "RuFAB" project

In 2008 the Agency launched the research project "RuFAB – Runway Friction Characteristics Measurement and Aircraft Braking". Its aim was to help identify possibilities of harmonising runway friction characteristic measurement technologies and provide a basis for improving and harmonising the implementation of current ICAO Standards and Recommended Practices (SARPS) within the EASA Member States. This could provide the opportunity for a global standardised application, and contribute to the progress of the ICAO action plan. Finally, it would prepare prerequisites to the future EASA rules for aerodrome safety.

The recommendation from the report and an EASA workshop with the relevant stakeholders consists of two types of recommendations:

- Recommendations that EASA should consider enacting, and
- Recommendations of a more general nature that would require other groups (than EASA) to action, or that would require a collaborative effort.

Examples of Recommendations that EASA should consider enacting

[1] General issues, such as taxonomies and definitions

- **The runway state** – the aviation community is trending towards a three-level definition in that a runway is either: (i) dry; (ii) wet; or (iii) contaminated. The current EASA definitions (in CS-25) employ a three-level definition, and it is recommended that EASA maintain this.

- **The definition of contaminants** – EASA CS-25 - provides a list for the purposes of aircraft certification. This list is incomplete as other contaminants also occur. It is recommended that EASA expand the list in CS-25 as appropriate.

- **Runway coverage producing contaminated conditions** – EASA CS-25 defines the criterion as being 25% coverage of the reported runway length and width. ICAO Annex 15 is one exception, and it is recommended that EASA review this variation.

- **Damp** – it is recommended that a definition for damp be retained.

- It was recognised that there should be harmonisation between the definitions used for defining aircraft performance and those used for describing the runway surface condition. A table of recommendations was produced.

- The most serious gaps in the present set of definitions are considered to be:
  Layered contaminants – a multitude of cases are possible.
  Frost – suitable definitions are generally not available.

- **Training programs for:**
  Pilots – a training program should be developed and implemented for pilots regarding how to use the information provided from runway condition reporting.

  Runway inspectors (RIs) – Certification requirements are required for runway inspectors (RIs), and for staff issuing RCRs and/or NOTAMS directly affecting aircraft operations.

[2] Functional friction assessments

There is a fundamental variation between the objectives for functional and operational friction measurements. Correlation to aircraft performance is of much more concern for operational friction measurements.

It is recommended that work related to functional friction measurements focus on developing standardised procedures, including calibration and harmonisation, for the devices, with desired correlation to aircraft as a secondary goal.

- A comprehensive set of technical specification should be developed and incorporated into civil aviation regulatory standards.

- Every friction measuring device should be tested to ensure compliance with repeatability and reproducibility requirements.

  - The use of the European Friction Index (EFI) or the equivalent IFI harmonisation model is recommended.

[3] Operational friction assessments

There is a divergence of views within the general aviation community regarding the emphasis that should be placed on observations of the runway surface condition versus ground friction measurements.

It is recommended that fundamental decisions be made by EASA regarding:

- Whether to parallel the trend (being exhibited by a large part of the aviation community) towards de-emphasising friction measurements for operational purposes.
- Updating the current runway surface condition assessment.
- A policy decision to be made by EASA to either regulate the closing of runways for maintenance when predetermined contaminant thresholds are reached, or to recognise that airports' responsibilities are limited to accurately reporting conditions with which carriers and pilots will make aircraft movement decisions.

Recommendations of a more general nature

- EASA should recommend to ICAO that the SNOWTAM form be updated. This recommendation has already been adopted by ICAO.
- Functional Friction Harmonization Trials and Development of Consistent Standards – A stepwise method for conducting a calibration and harmonisation trial has been developed. A pilot study should be done to evaluate the proposed approach.
- There is a need for high-level criteria for a friction-measuring device that is intended for use in operational correlation with aircraft performance.
- A committee should be formed to develop a performance specification for a device(s) or for technology (technologies) that would meet operational runway surface condition reporting requirements.