An advanced method to relate ground friction measurements to aircraft braking

J. Gerthoffert* — V. Cerezo — M. Thiery*** - M. Bouteldja**** - M.T. Do****

**CEREMA-ITM, DPI*
110 Rue de Paris, 77171 Sourdun, France
jonathan.gerthoffert@cerema.fr
*** IFSTTAR, AME, EASE*
F-44344 Bouguenais, France
veronique.cerezo@ifsttar.fr
minh-tan.do@ifsttar.fr
**** Ministère de l'Environnement*
La Défense, Paris, France
DGALN/DHUP/QC
mickael.thiery@developpement-durable.gouv.fr
***** CEREMA-CE, DLL*
25, Av François Mitterrand, 69500 Bron, France
mohamed.bouteldja@cerema.fr

Water, snow or ice on runways can significantly reduce aircraft braking performances, causing increase in landing distances and risk of overrun accidents. When such conditions appear, airport operators have to assess runway surface conditions and provide pilots relevant information to estimate the required landing distance. A common method has been defined to be used worldwide. However, there is still a need for a more quantitative, reliable, robust and rapidly obtained information that could be used to complement current assessment methods. Airport operators use continuous friction measuring equipment to assess runway friction. However, these devices may not be representative of aircraft braking performances. Numerous works have been performed to correct these scale effects with empirical correlations but results were not fully conclusive. This paper deals with the prediction of aircraft braking performances on water-, ice- or snow-contaminated runways. It proposes a new method to assess aircraft braking coefficient from ground friction measurements. It is based on a physical modelling of the system made of the tire, the contaminant and the runway. This approach uses a Brush model, which was adapted to introduce the effect of water in the contact area where friction forces are generated. The model identifies a unique parameter characterizing the interaction between the tire and the runway. This paper proposes to use this parameter to relate the friction measuring device to the aircraft through a calibrated non-linear relation. This method is then implemented on previous data obtained during comparison tests and during the Joint Winter Runway Friction Measurement Program. Results show that this methodology improves the prediction of aircraft braking performances from ground friction device compared to the state of the art.

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