

IMAG

- Automatic slipperiness measurement -



IMAG is compliant with the recommendations in Appendix 14 to the ICAO.

IMAG was the subject of a national accreditation of continuous measurement of adherence by Civil Aviation Technical Service / Directorate General of Civil Aviation, relating to TAC order of July 10, 2006.

IMAG is the reference instrument for the measurement of IRFI (international friction index on airport runway) standard ASTM E2100-04

Overview

IMAG is an automatic measurement device of the slipperiness of aeronautical pavement. It comes from a cooperation of Civil Aviation Technical Service / Directorate General of Civil Aviation and Paris Airports.

IMAG is covered by patent 89.16834. A measurement wheel, weighted and towed at constant speed (up to 140 km/h (87 mi/h)), is slowed down following a chosen slip rate (0% to 100%)

Using IMAG allows:

- An operational assessment of the slipperiness in winter season operating condition,
- A functional evaluation of the slipperiness off winter season (measurement on water film): Wealth management of runways and taxiways (ex: need for rubber removal).

Function

A measurement wheel placed at the center of the trailer is weighted and towed at constant speed. The system automatically maintains a variable braking. A set of sensors continuously measure the following efforts:

- **F_h**: strength of horizontal traction exerted by the measurement tire's resistance to rolling,
- **C**: the brake torque of the measurement wheel,
- **F_v**: vertical load on the measurement wheel.

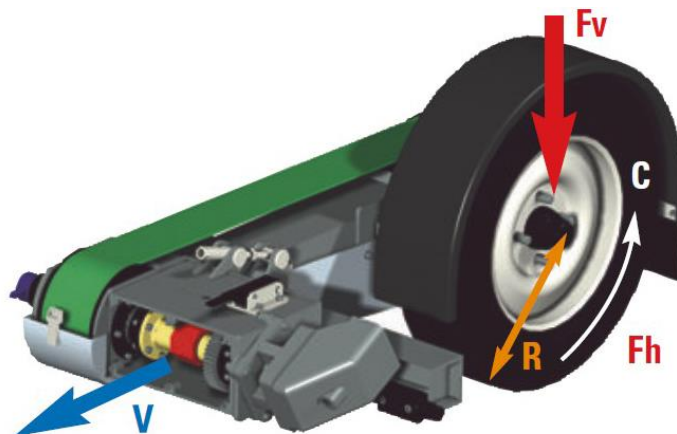
IMAG's design itself measures the F_v and C efforts, allows better analysis of the adhesion:

- The continuous measurement of F_v to take into account the wheel load shedding caused by the roughness defects of the tested roadway.
- Knowledge of C allows determining the share of F_h that comes from the friction available at the tire interface/pavement without taking into account the drag associated with the rolling resistance due to the macro texture of the surface and the possible presence of contaminant on the pavement.

Two friction parameters are thus determined:

Force $\mu = F_h/F_v$ (longitudinal drag coefficient).

μ torque = (C/R)/F_v (coefficient of friction), R being the radius of the measurement wheel.



Technical specifications

COMPOSITION

3-wheeled trailer towed by a motor vehicle.
 Support chassis with 2 support wheels equipped with a speed sensor (measuring speed and distance).
 The measurement chassis articulated on the chassis including a measurement wheel equipped with smooth tire PIARC:

- Dimensions 165 x 380 type PIARC.
- Inflation pressure: 150 kPa (21.75 psi),
- load on the measurement wheel: 175 daN (1170 lbf).

FRICION COEFFICIENT OF THE MEASUREMENT SYSTEM

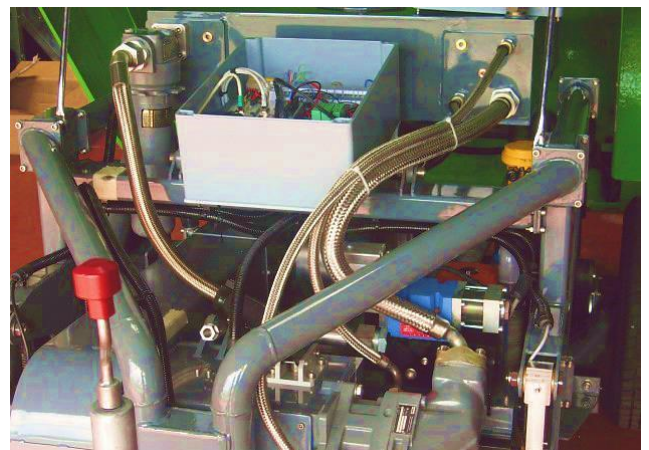
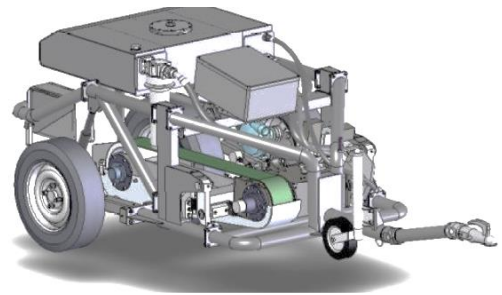
Braking the device's measurement wheel in motion, according to a variable slip rate (generally 15%). Continuous measurement of the horizontal traction on the wheel, the brake torque as well as the dynamic load on the wheel. In order to have an excellent representation of the adhesion as well as excellent fidelity of the measurement, IMAG carried out 1 measurement every 5 mm (19.7 in) or 200,000 measurements per km (124,000 per mi). The measurement signal processing and conversion in the form of two coefficients of friction: coefficient of pure friction (related to the quality of the surface only) and a friction coefficient of drag (linked to the presence of "contaminant" on the pavement): - measurement speed up to 140 km/h (89.5 mi/h), - usual speeds: 40, 65, 95 km/h, 24.8, 40.4, 59 mi/h.

OPERATIONS

Integrated control system of the elements of operation of the measurement instrument (regulation of the braking). The link between the IMAG and the microcomputer, which allows you to view real-time measurements, is performed through a wireless link. Tractor vehicle, equipped with a standard hitch, of sufficient power to quickly achieve the test speed.

ADDITIONAL EQUIPMENT

A stand-alone wetting system is to be implemented for use off-line operation (outside the winter season) of the IMAG. This system ensures a constant wetting before the measurement wheel, regardless of the speed of the vehicle.



Applications

The operation of the results of the measurements can be done in two different ways:

- In operational use (winter season), the results are given immediately after the synthetic tests manner (values by third of track in accordance with the recommendations of the ICAO, histograms) and to indicate the operating conditions of the maneuvering areas,
- In functional use (except winter), or in experimentation, a software allows the measurements to be specifically analyzed (analysis per third of track, pitch 100 m (328 ft) and curves of the friction coefficients values).

