

# **CERTIFICATION PROCESS FOR SELF-WETTING CONTINUOUS FRICTION MEASURING EQUIPMENT**

**FOR CONSTRUCTION AND MAINTENANCE  
PURPOSES ON FRENCH AIRPORTS**

Jonathan Gerthoffert, French Civil Aviation Technical Center  
[jonathan.gerthoffert@aviation-civile.gouv.fr](mailto:jonathan.gerthoffert@aviation-civile.gouv.fr)



# Overview

- **Background**
- **The reference device**
- **Testing program/protocol**
- **Analysis**
- **Discussion**



# Harmonization of friction results

- Friction is both device- and surface-dependant



- Uniform comprehension of the Minimum Friction Levels

# Background

---

- **ICAO programme for correlating equipment used in measuring runway braking action**
- **Tire/Runway Friction Workshop at NASA Wallops Flight Facility**
- **International PIARC experiment to compare and harmonize texture and skid resistance measurements**
- **Joint Winter Runway Friction Measurement Program**
  - **ASTM E2100-04**

# Certification: principles

---

- **Choosing a reference device**
- **Doing comparison tests**
- **Correlating devices to the reference device**
- **Studying the repeatability and the reproducibility of devices**

# Reference device

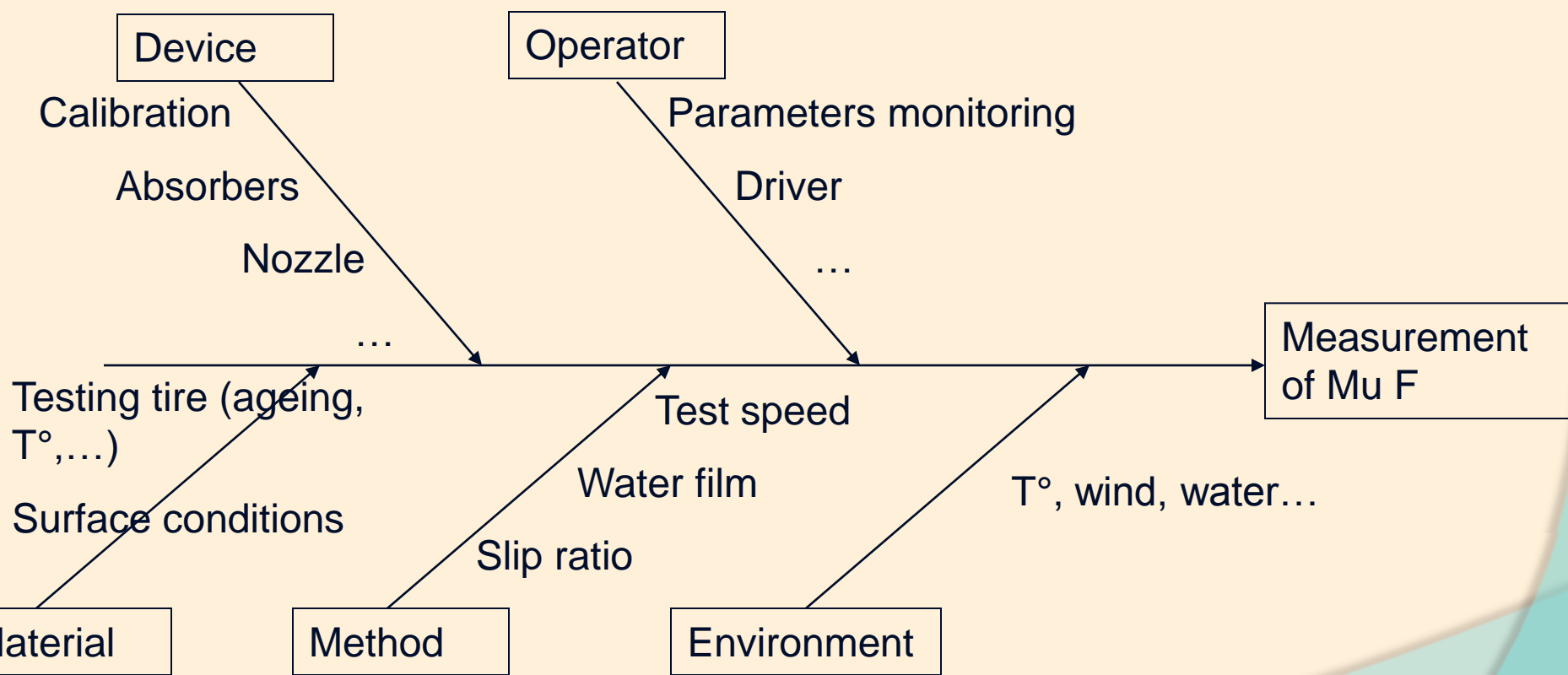
---

- **Participation to international test campaigns**
  - **Repeatable**
  - **Correlates to other devices**



# Reference device - Quality controls

- **Variability study – Guide to the expression of uncertainty in measurement, X 07-020**





# Reference device - Quality controls

---

- **New tire**
- **Tire pressure: 1.5 bar    0.1 bar**
- **Water film thickness: 1.0 mm    0.1 mm**
- **Test speed:    5 km/h**
- **Slip ratio: 15%    5 %**
- **Nozzle height: 75 mm    10 mm**
- **Horizontality of force sensors: 30 cm    2 cm**



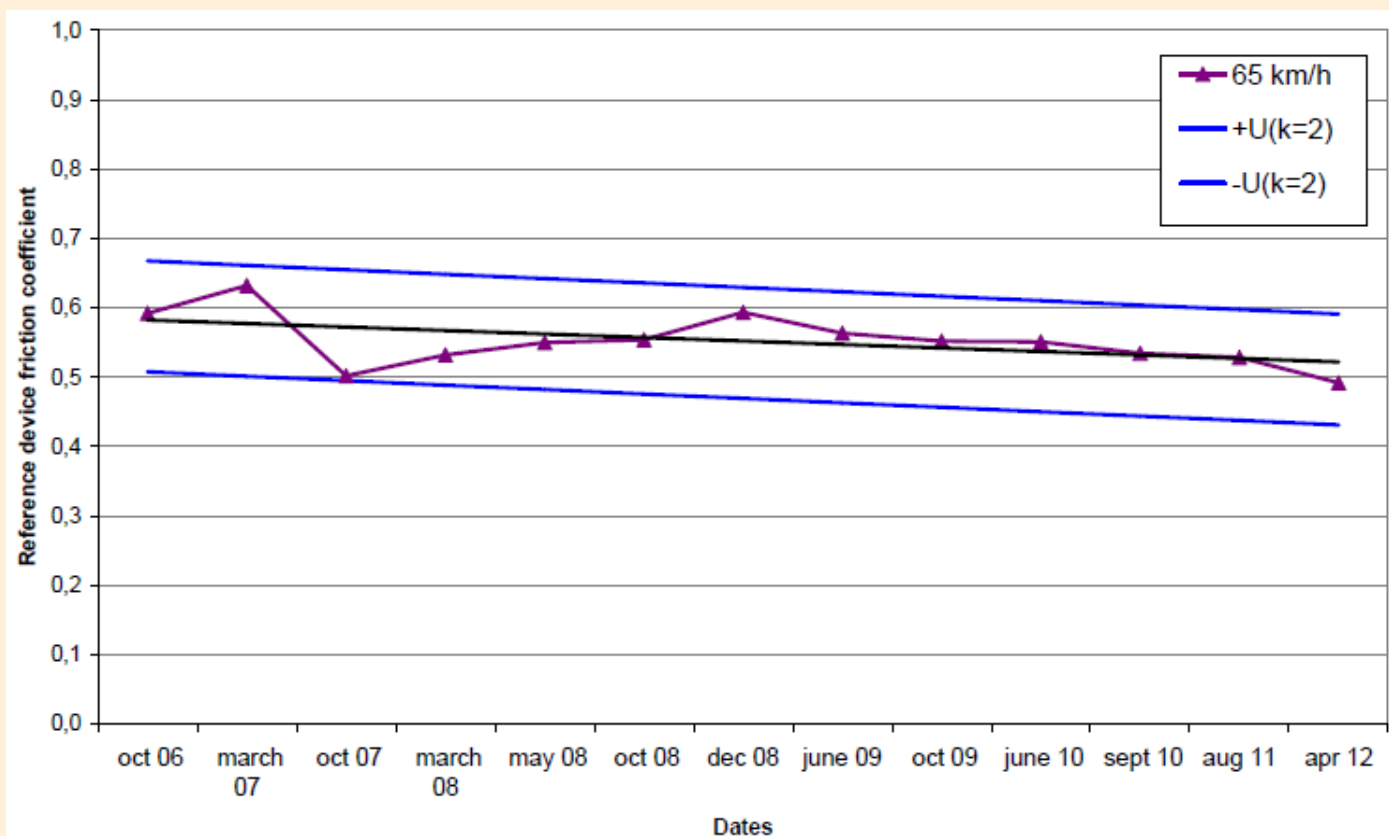
# Reference device - Quality controls

---

- **Calibrated before and after each campaign**
  - **ISO 17025 standard**
- **Only used for certification of other devices**
- **Always used with its own towing vehicle**

# Reference device - Quality controls

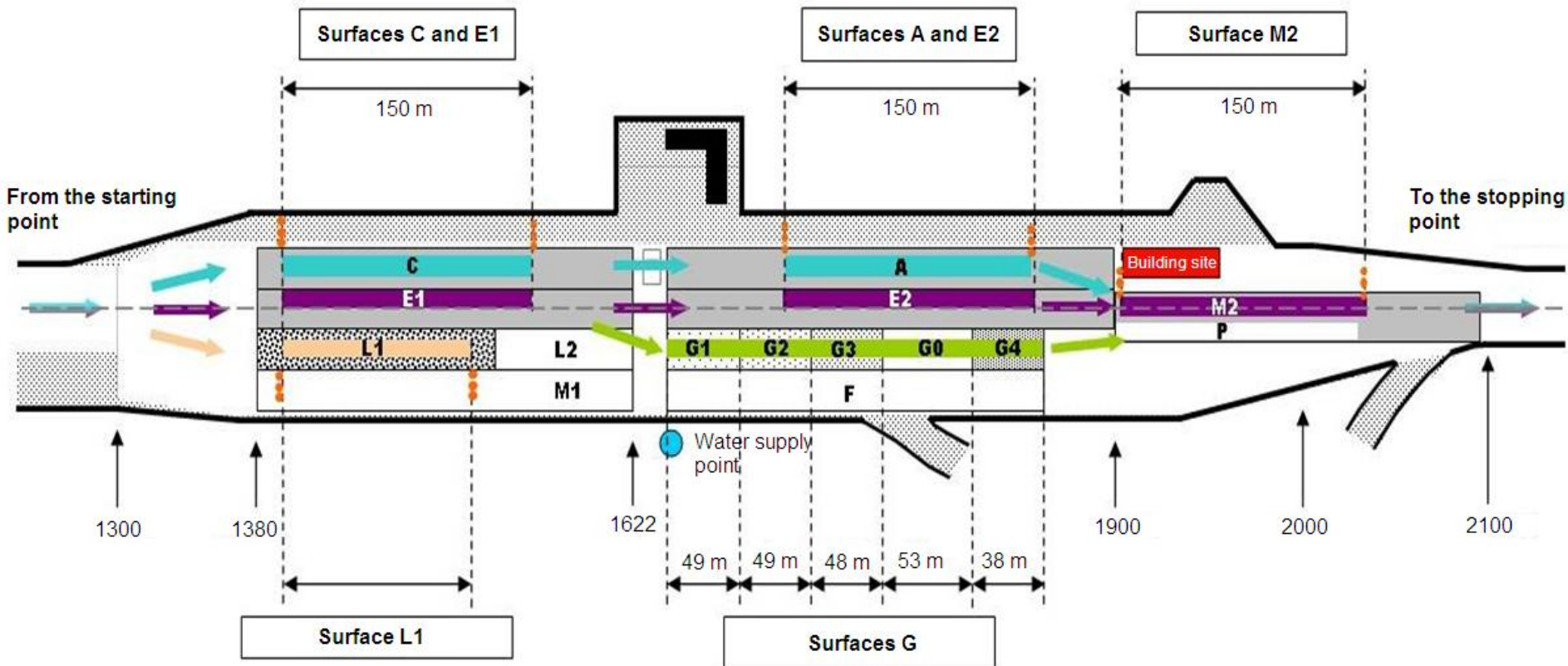
- Reference surface



# Test facility



# Friction test track





# Test surfaces

Test surface	Material
A	Porous asphalt concrete (0/6)
C	Surface dressing (0,8/1,5)
E1	Semi-granular bituminous concrete (0/10)
E2	Semi-granular bituminous concrete (0/10)
G0	Low friction asphalt concrete
G1	Slightly painted surface
G2	Painted surface +
G3	Painted surface ++
G4	Painted surface +++
L1	Epoxy
M2	Very thin bituminous concrete (0/6)



Surface E1: Semi-granular bituminous concrete (0/10)



Surface G4: Painted surface +++



Surface M2: Very thin bituminous concrete (0/6)



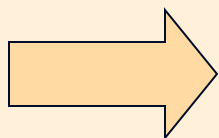
Surface G0: Asphalt "low friction"

-  **Medium to high friction level**
-  **Low friction level, around the minimum friction level of the reference device**
-  **Very low friction level**

# Testing protocol

---

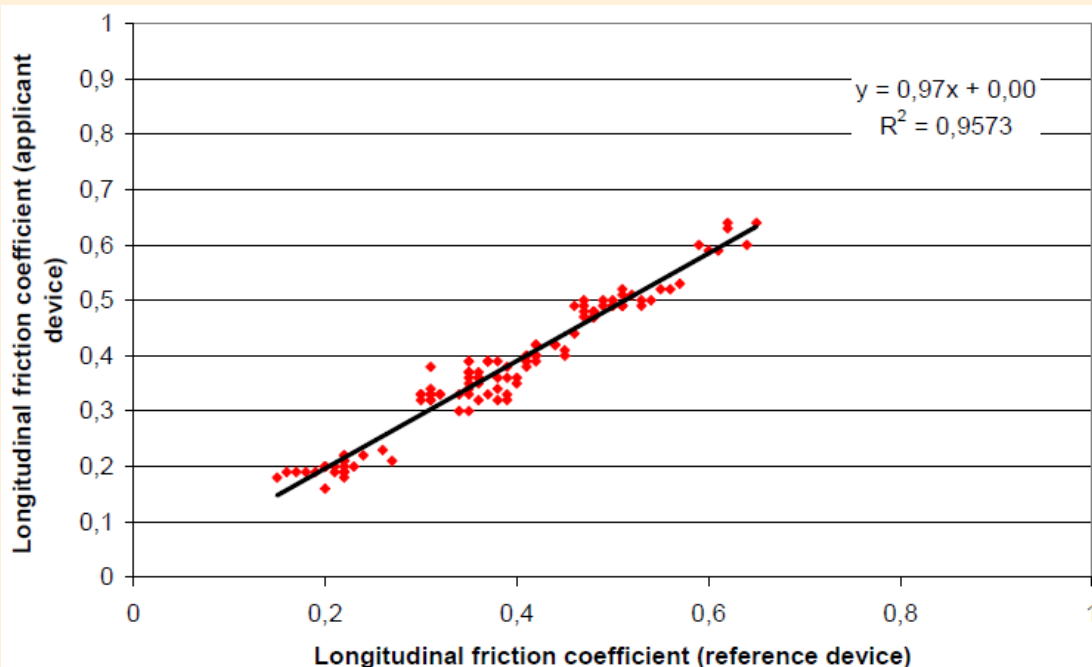
- **3 speeds: 40, 65, 95 km/h**
- **Minimum of 5 repetitions for each surface**
- **1 week of test for 5 devices**



**150 pairs of data (reference device/applicant device)**

# Analysis

- Correlation to the reference device
  - Least square methods and  $R^2 > 0,90$
- Repeatability and reproducibility
  - $R\&r < 30\%$





# Certificate

- 2 year validity period
- Identification of the device
- Correlation with the reference device
- Minimum friction levels



LIBERTÉ • ÉGALITÉ • FRATERNITÉ  
RÉPUBLIQUE FRANÇAISE  
MINISTÈRE DE L'ÉCOLOGIE, DU DÉVELOPPEMENT DURABLE,  
DES TRANSPORTS ET DU LOGEMENT

Direction générale de l'Aviation civile

Service technique de l'Aviation civile

Département Infrastructures Aéroportuaires

## CERTIFICATE OF SELF-WETTING CONTINUOUS FRICTION MEASURING EQUIPMENT

DAD/STAC/IA/SAC/PR2/XX-XXX

This certificate, established in accordance with the decree of 10 July 2006 relative to physical characteristics of civil aerodromes used by fixed wing aircraft (TAC), is delivered to:

Company name  
Address

It certifies that, the measuring device identified below:

Commercial name of the device  
Type or model  
Serial number  
Equipped with test tyre XXX

is in compliance with applicable technical and metrological requirements. The coefficients of the linear regression existing between the longitudinal friction coefficient (LFC) measured by this device and those measured by the reference device of the same type are:

LFC (measuring device of the same type) <sup>1</sup> = A LFC (certified device) + B

Range of friction values where this relationship applies is from xx to xx.

This relationship aims to adjust measures performed by the certified device in order to compare them to minimum friction values specified in table 1 of technical appendice of decree TAC. These values are reminded below:

Measuring device	Test tyre		Test speed (km/h)	Theoretical test water film thickness (mm)	Minimum friction level
	Type	Pressure (kPa)			
Measuring device of the same type	X	X	65	1.0	X
	X	X	95	1.0	X

This certificate is valid until **year Y+2 after the date of delivery**.

It cancels and replaces the certificate referenced: **reference of the previous certificate**

Delivered: **date of delivery**

Signed: The Director of Civil Aviation Technical Centre

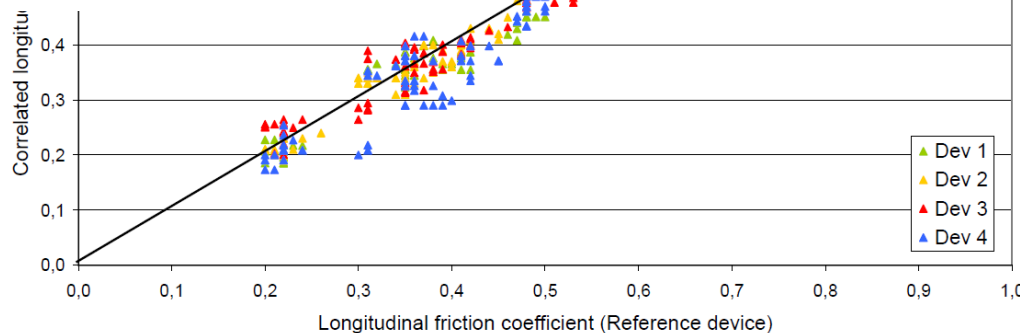
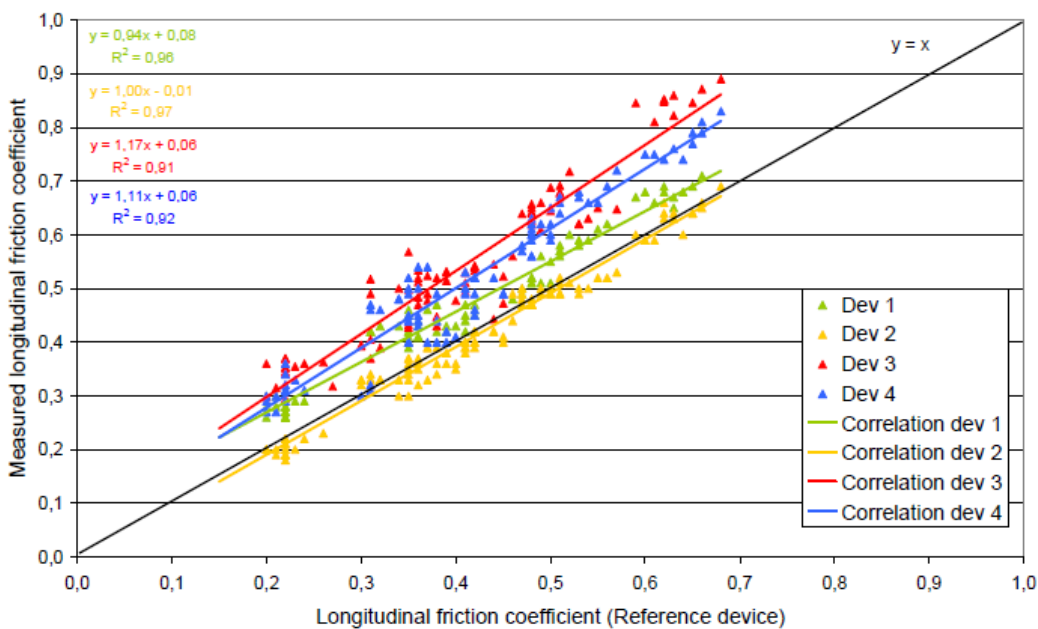
Ressources, territoires et habitat  
Énergie et climat  
Développement durable  
Prévention des risques  
Infrastructures, transports et air

Présent  
pour  
l'avenir

www.developpement-durable.gouv.fr

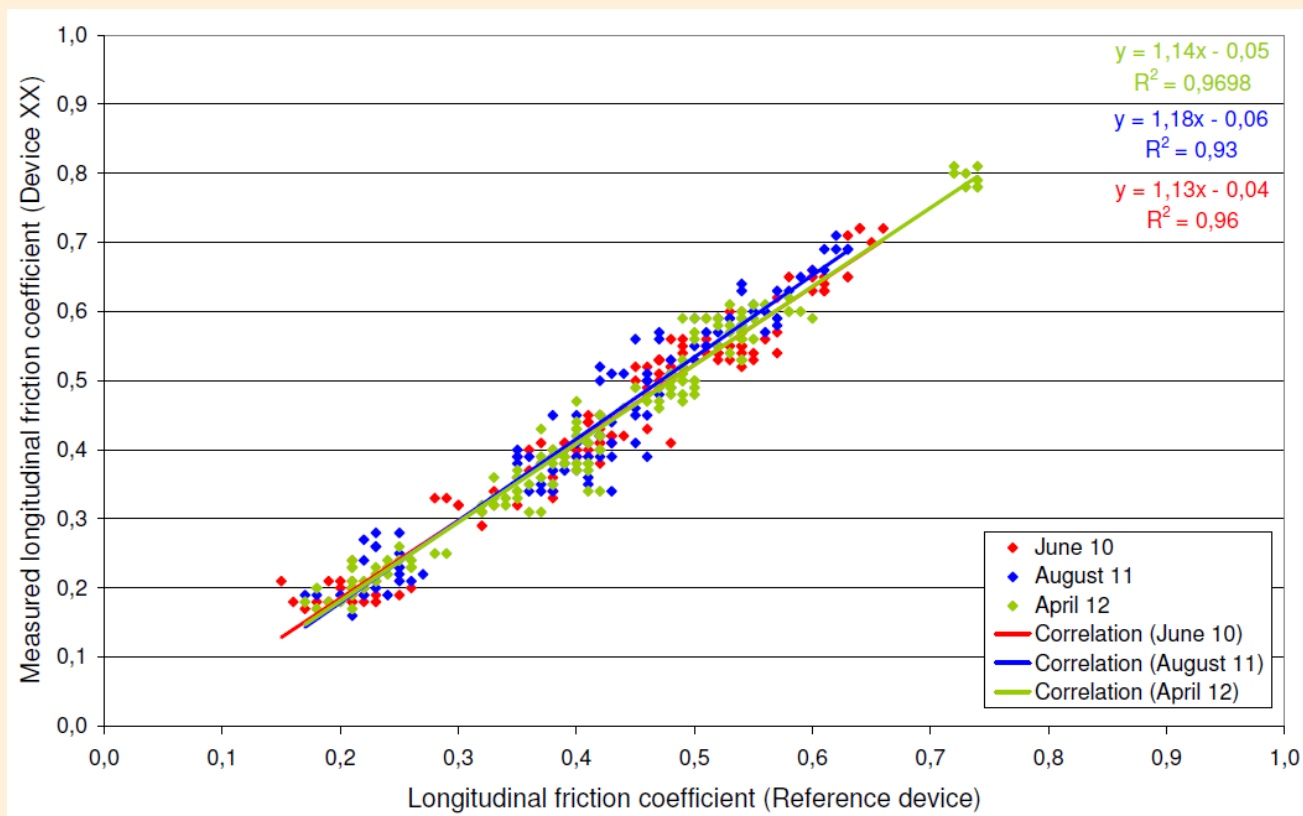
31, avenue du Maréchal Léclerc  
94811 Bonaïssi sur Mer CEDEX  
Tel: 01 49 56 80 00 - Fax: 01 49 56 82 19  
www.stac.aviation-civile.gouv.fr

# Discussion



# Discussion

- Over three years



# Achievements

---

- **Since 2006**
  - **22 devices tested**
  - **3 refused**
- **Currently, 9 devices certified**
  - **5 IMAG**
  - **2 Sarsys STFT**
  - **2 ASFT**



# Questions?

