Quality Friction Measurements

The FAA Perspective

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Presentation Areas

- Present Requirements
- State of Friction Measurement Technology, Calibration and Harmonization
- The (Possible) Way Forward for Quality Friction Measurements
“The Present”
Advisory Circular 150/5320-12, Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces
- Section 2. CFME General
- Section 3. Conducting Friction Evaluations with CFME
- Appendix 1. Qualification Process for CFME
- Appendix 3. Performance Specification for CFME
- Appendix 4. FAA Approved CFMEs
- Maintenance

“The Present”
Advisory Circular 150/5200-30, Airport Winter Safety and Operations
- Utilization of CFMEs and Decelerometers from 150/5320-12
- Operations
"The Present"

Current Performance Specifications:

- The friction Measuring Equipment shall do the following...
- The vehicle shall...
- Tire Performance Standard...

CFME Approvals based on:

- Performance at a workshop
- Third party approvals (Civilian Aviation Authorities)
- Vendor “letter” certifying compliance to FAA performance specifications
- Adherence to the Advisory Circular
“The Present”

CFME Requirements:

- Last Major Update, 1997 – 17 years
- NASA Wallops Flight Facility Workshops (No Longer held)
- Based on Reports
  - Report DOT/FAA AS-90-1
- Centered on CFME approval

“The State”

- Use of Third Parties for Approval – Cost of CFME “specialization”
- Vendors - Advances in electronics
- Friction Workshop – The Larson Institute – Penn State University – FAA Sponsorship
- CFME versus the delivery vehicle
- FAA association with ASTM
"The State"

Recognition of the following:
- Operator training (or lack of)
- Verification of water distribution (1mm)
- Verification of load calibration
- Slip verification
- Speed calibration
- Test tires (run in, storage, etc)

"The Way Forward"

- In a perfect world, any and all CFMEs will return the exact same mu reading for the same pavement tested.
- Because of the number of variables, there is an attempt to calibrate and verify all operating parameters prior to testing to obtain better results. This is the goal for the Annual Friction Workshop.
“The Way Forward”

- The basic goal is to develop objective processes administered by 3rd parties to approve the use of CFMEs under Advisory Circular 150/5320-12, Measurement, Construction, and Maintenance of Skid-Resistant Airport Pavement Surfaces.
- Though not all issues may have solutions, I believe that we are on the right track and “The Way Forward” should consist of the following:
  - Load Calibration – test wheel/tire to be placed on a load plate. Transverse and longitudinal loads to be applied to the load plate and readings to the CFME should be consistent.

Force Calibration
“The Way Forward”

- Speed Calibration – Ensure speed sensors are accurate on the equipment.
- Slip Calibration (work in progress) – Ensure slip is properly being administered.
- Water Distribution (work in progress) – Ensure that the test is receiving the required 1mm. Look for a performance metric to measure water depth and spread.
- Operator Training – Create standards for operator training and trainers.

Slip Calibration
“The Way Forward”

Performance Specifications:

- Performance Standards – Mu surface reading – use of reference equipment for correlation. Instead of using a reference CFME, use of Circular Track Meter (CT Meter) and Dynamic Friction Tester (DFT) at specified intervals for correlations.

- CFME accuracy standards – Allowable Accuracy/repeatability for each CFME (for example, 45+/− 1.5)

- How accurate to we need mu to be? Can we be accurate to +/- 5?

Performance Standards

CTM

DFT
“The Way Forward”

New Initiatives:

- Use of aircraft as a CFME – Vendors have developed software to tap into aircraft electronics to calculate aircraft braking.

- CFME that replicates an aircraft braking (anti-lock) system.

When do we realize a limitation?

- With all the CFMEs, is the best we can do is come within 5-7 mu? Is that enough?
- Do we separate the CFMEs by type (variable slip, fixed slip, and side force)?
- Is the inconsistent readings based on different marginal mu values? Is a difference of 1 mu from CFME X the same as from CFME Y?
“The End”

Thank you for your attention!

Questions?