Standardization of Friction Testing Equipment from the ASTM Viewpoint

Presented to
EASA Workshop on Runway Friction and Aircraft Braking
March 11,12 2010
Paris France

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Overview

- Introduction to ASTM
- Background of Committee

  E17 Vehicle–Pavement Systems
- E17 – Existing Standards
- Standardization and Research Needs
- Conclusions

ASTM International

- ASTM International is one of the largest voluntary standards development organizations in the world-a trusted source for technical standards for materials, products, systems, and services.

- Standards developed at ASTM are the work of over 30,000 ASTM members. These technical experts represent producers, users, consumers, government and academia from over 120 countries.

ASTM Committee E-17 – Vehicle Pavement Systems

- E-17 was established in 1960 and will celebrate it's 60th Anniversary in December, 2010
- E-17 has 188 voluntary members from 17 countries.
- Membership includes Government representatives, Aviation authorities, Friction equipment manufacturers, Academic organizations, Consulting engineers
- Currently responsible for 70 Standards of which 19 are directly related to Runway Friction

E17 Standards

- Test equipment
- Test procedures
- Data analysis and harmonization
- Standard practices
- Standard guides
- Definitions

E17 Standards Process

- Need identified
- Standard or Guide drafted
- Balloted in a sub-committee
- Negative votes must be resolved by either withdrawal or a vote of non persuasive
- Reballot to full committee
- If affirmative then on to the books
- Renewal every 4 years

Test Equipment & Procedures

- E274 Standard Test Method for Skid Resistance of Paved Surfaces Using a Full-Scale Tire (first draft 1965)
- E303 Method of Test for Measuring Surface Frictional Properties Using the British Portable Tester (first draft 1965)

- E556 Standard Test Method for Calibrating a Wheel Force or Torque Transducer Using a Calibration Platform (User Level)
- E670 Standard Test Method for Side Force Friction on Paved Surfaces Using the Mu-Meter

Test Equipment & Procedures (Cont'd)

- E965 Standard Test Method for Measuring Pavement Macro texture Depth Using a Volumetric Technique
- E1859 Standard Test Method for Friction Coefficient Measurements Between Tire and Pavement Using a Variable Slip Technique
- E2101 Standard Test Method for Measuring the Frictional Properties of Winter Contaminated Pavement Surfaces Using an Averaging-Type Spot Measuring Decelerometer
- E2157 Standard Test Method for Measuring Pavement Macro texture Properties Using the Circular Track Meter
- E2340 Standard Test Method for Measuring the Skid Resistance of Pavements and Other Trafficked Surfaces Using a Continuous Reading, Fixed-Slip Technique

Test Tire Standards

- E501 Standard Specification for Standard Rib Tire for Pavement Skid-Resistance Tests
- E524 Standard Specification for Standard Smooth Tire for Pavement Skid-Resistance Tests
- E1551 Standard Specification for Special Purpose, Smooth-Tread Tire, Operated on Fixed Braking Slip Continuous Friction Measuring Equipment
- E1844 Standard Specification for A Size 10 x 4-5 Smooth-Tread Friction Test Tire

Data Analysis and Harmonization Standards

- E1845 Standard Practice for Calculating Pavement Macro texture Mean Profile Depth
- E2100 Standard Practice for Calculating the International Runway Friction Index
- E2666 Standard Practice for Correlations of Mu Values of Continuous Friction Measurement Equipment to Determine Maintenance Levels for Use at Airports

Why are Standards Important?

- Provide procedures that are related to sound process
- Provide consensus of the vast array of experts on a common result
- Provide the ability to compare data
- Provide the ability to get repeatable data
- Provide Agencies the ability to Independently certify equipment

Standards Under Construction

- **Standard Guide for the Evaluation, Calibration, and Correlation of E 274 Friction Measurement Systems and Equipment**

- **Similar efforts are needed for CFME to ensure machines are tested in a valid way and pavements used provide adequate range of Mu values to determine the precision and bias of CFME**

What else do we need to work on?

- We have multiple sizes and shapes of equipment
- We have a vast array of mechanical differences
- We have a vast array of water nozzle shapes and sizes
- We have a vast range of test wheel loads
- We have a wide range of data sampling rates and storage rates
- We have a wide range of Slip ratios

Trailers of all Sizes and shapes

Self Contained CFME in all Sizes and shapes

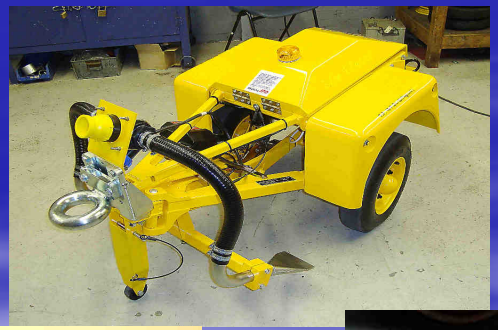
Test wheel load variations

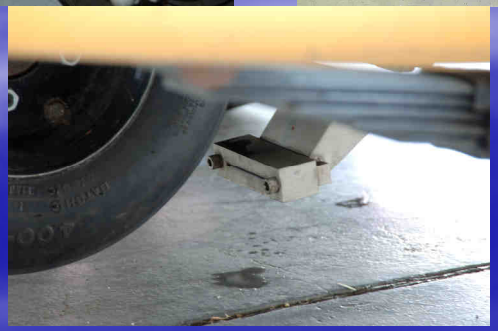
- Some units use dead weight while others use applied load
- Load ranges from 90 kgs to 140 kgs for self contained units
- Trailer units range from 21 to 80 kgs
- A standard wheel load could have a significant difference on Mu values
- Measurement of the load is a critical attribute

Water Nozzle design

- ICAO states in the Airport Services manual that “water shall be applied in such a way that the width of the water layer underneath the tire is at least as great as the test tire pavement contact width”

Nozzles Need Standardization





Standards efforts required

- Can all these nozzles provide 1.2 Liters/min per mm of wetted width?
- Can all these water systems provide water directly proportional to speed?
- Only a few systems measure water flow
- What Agency is going to check and certify?

Slip range

- Systems out there range for 12 to 20%
- Comparing 12% to 20% is difficult
- Are we looking at the optimum slip ratio?

Calibration Centers

- A standard for reference centers, their surface characteristics and their operation is almost complete.
- Lessons learned from the Federal Highway Calibration Centers are being put onto paper.
- Identifying centers, making pavements that meet the requirements is an important task and requires investment.

Research Needs

- A Research Needs statement has been submitted to the Airport Cooperative Research Program (ACRP)
- Research on nozzles, flow, slip, loading
- CFME with texture measuring capabilities
- Calibration center pavement and equipment needs

In Conclusion

- ASTM will continue to develop standards to help the airport community and the industry in general
- Work with FAA and ICAO to promote high quality equipment and procedures
- Work with CEN and ISO to coordinate standards and avoid duplication of effort or contrary standards

Thank you for your attention.

Next Meeting June 9, 10
State College, Pa

www.ASTM.org