Tire/Pavement Friction Workshop

By
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Presented at
Tenth ALACPA Airport Pavement Seminar
Mexico City, Mexico: 30 September to 4 October 2013

Outline

- Pavement survey procedures
- Lessons learned
- Runway surface condition reporting
- Space Shuttle runway evaluations
- Future events and activities
- Conclusions and recommendations

Pavement Survey Test Procedures

- Overall pavement inspection
- Test equipment checkout and calibration
- Pre-test briefing with everyone involved
- Conduct test runs and identify/document different surface conditions
- Maintain test team communication
- Reduce data and compile friction values
- Post-test briefing

Pavement Survey Parameters

- Requires properly calibrated equipment
- Speed range
- Different contaminant types
- Test tire type
- Pavement location
- Pavement characteristics

Friction Measurement Variables

- Operator
- Equipment calibration & maintenance
- Test procedures
- Test tire characteristics
- Pavement conditions
- Braking methods
- Compliance to existing standards

FAA Approved CFME's

- Airport surface friction tester (ASFT)
- Runway friction tester (RFT)
- GripTester friction tester (GT)
- Mu-Meter (Mu-m)
- Runway analyzer and recorder (RUNAR)
- BV-11 skiddometer
- Sarsys friction tester (SFT)
- Dynamic friction tester (DFT)

Lessons Learned - General

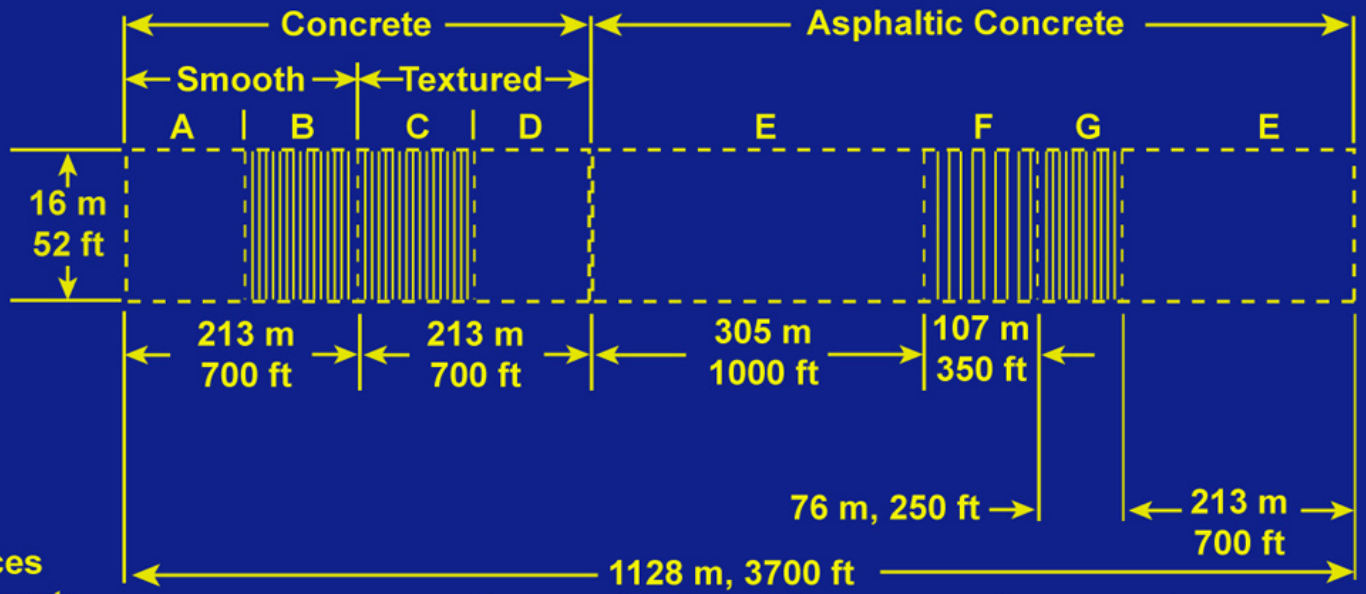
- Pre-test briefings essential
- Daily equipment calibration critical
- Rain-wet conditions could be inconsistent
- Test team communication crucial
- Measure both sides of pavement centerline

Lessons Learned - Friction Tests

- Test surface minimum length 100m
- All pavement surface condition changes need to be located and measured
- Use standard 40 mph and 1 mm water
- Acceptable data +/- 3% for given vehicle
- Data evaluation performed by vehicle operators
- If hydroplaning suspected, collect data at three different speeds

VIDEO:
NASA Ground Vehicle Studies

Schematic of NASA Wallops Runway 4/22 Test Surfaces



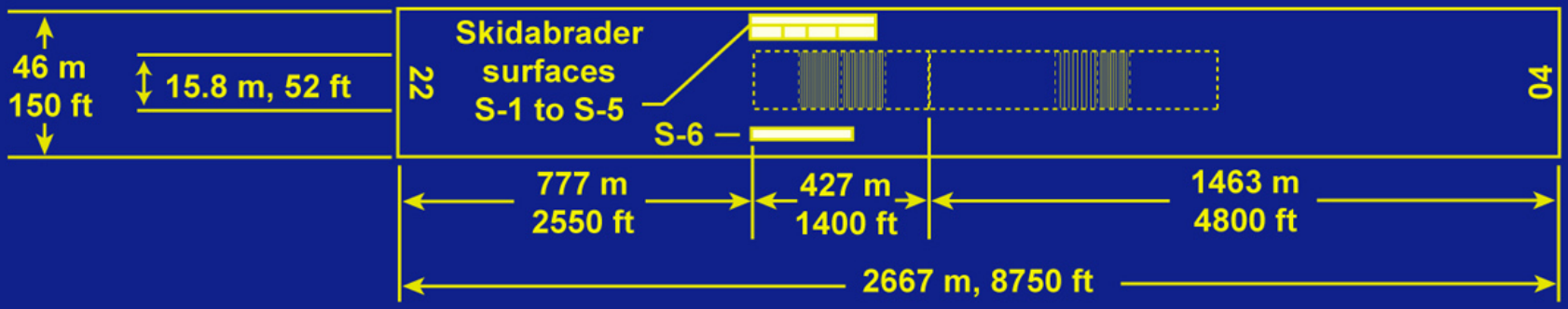
Note:

Taxiway test surfaces include small aggregate asphalt, aluminum panels, overlay treatments and micro-surfacing treatments

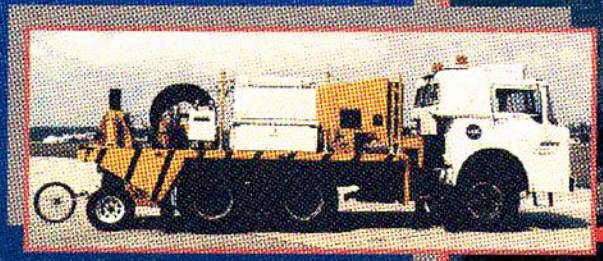
Surfaces B, C, and G transversely grooved 0.25 x 0.25 x 1.0 in.

Surface F transversely grooved 0.25 x 0.25 x 2.0 in.

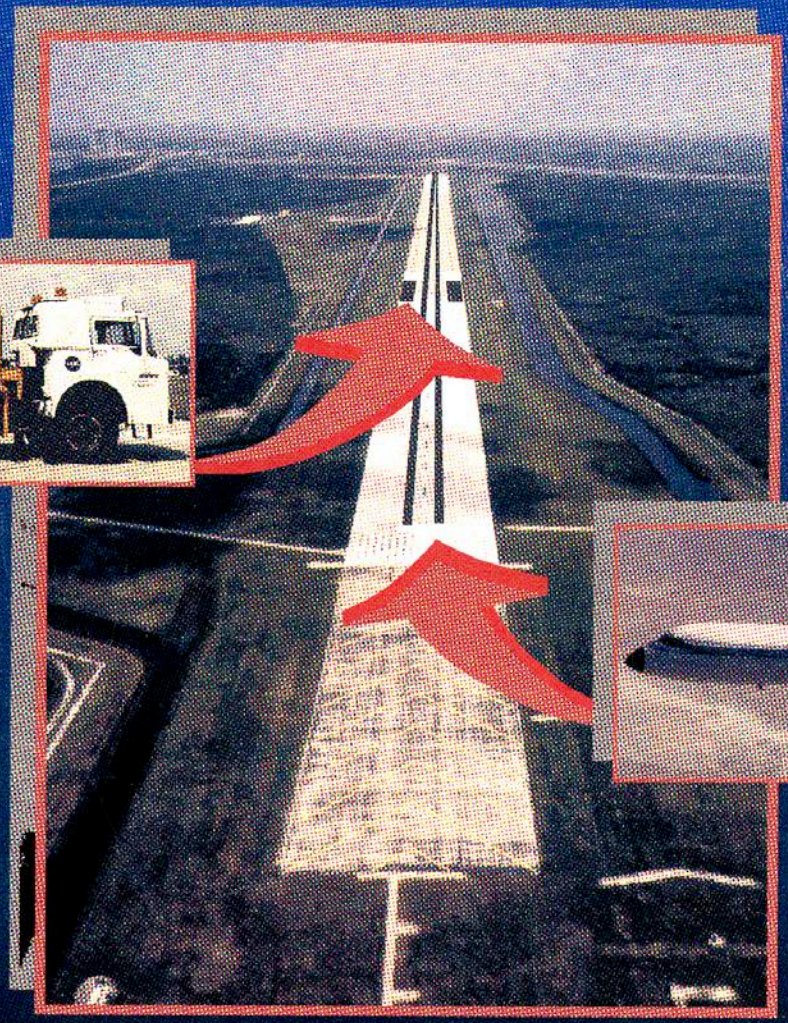
Slots cut in pavement to hold rubber belt dam material



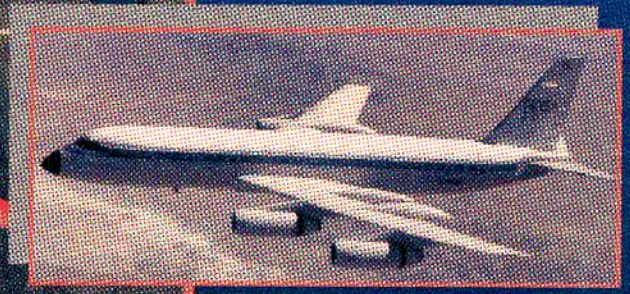
SHUTTLE LANDING FACILITY RUNWAY MODIFICATION COMPLETED SUCCESSFULLY



ALDF ITTV
Comparitive wear and friction tests on 18 surfaces



NASA LSRA
Full-scale crosswind landing simulations on 3 candidate surfaces



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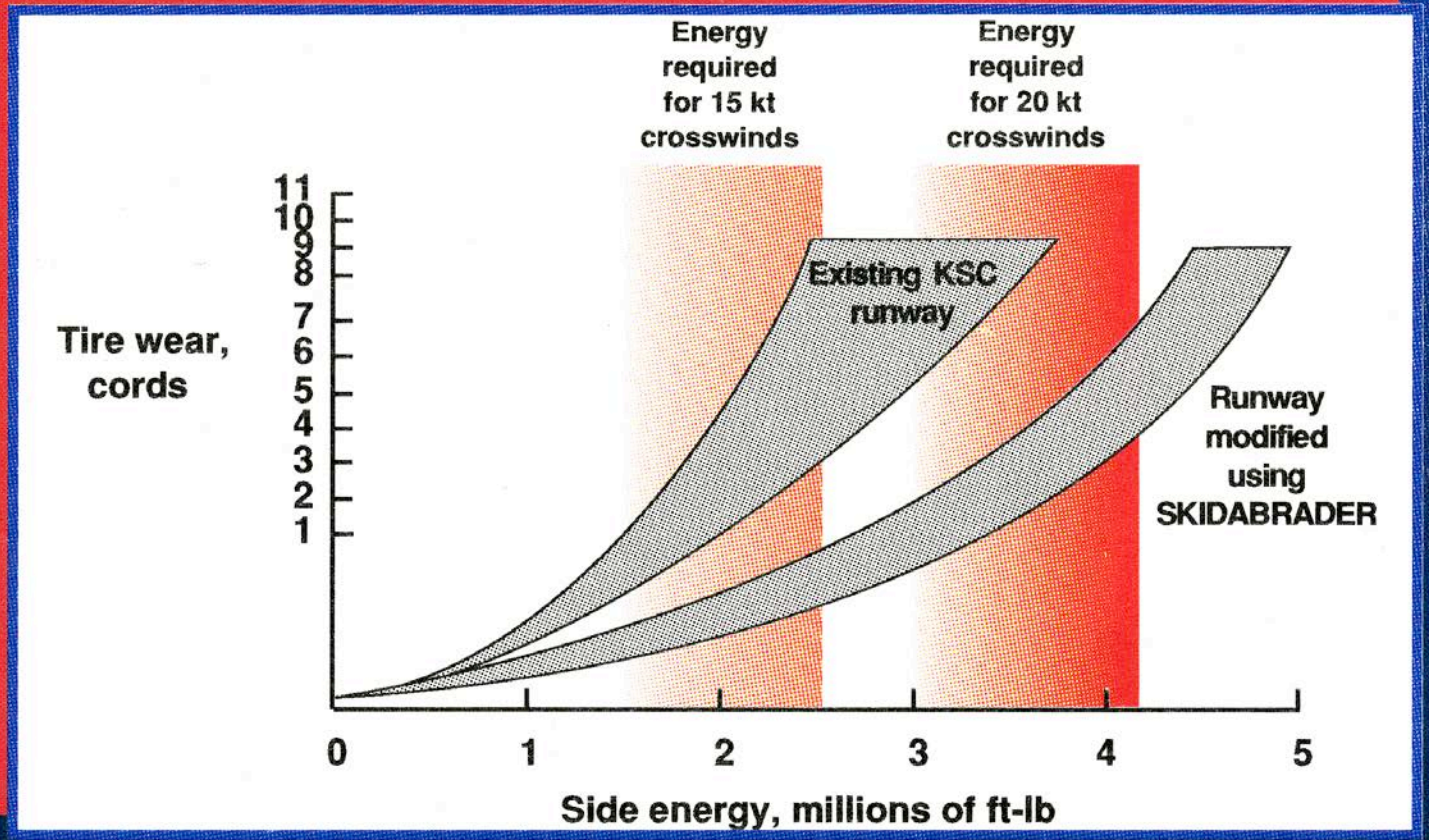

VIDEO:
NASA Shuttle Runway Performance Evaluation

Takeoff and Landing Performance Assessment – Aviation Rulemaking Committee (TALPA-ARC)

Provide advice and recommendations to:

- Establish aircraft certification and operational requirements on contaminated runways
- Identify landing distance assessment requirements including minimum landing distance safety margins
- Develop practical standards for runway surface condition reporting and minimum surface conditions for continued operations

TALPA – ARC Status

- 2009-2010: data collected from 10 airports and 2 airlines
- 2010-2011: data collected from over 20 airports and 2 airlines
- 2011-2012: data analysis shows acceptable agreement between runway condition reports and pilot reports (PIREPS)
- 2012-2013: FAA initiated collaboration with ICAO runway study group

Runway Condition Report - Data Collection Sheet

Airport

Runway

Date

Local Time (24 hr)

Initials

Flight #

Is the portion of the Runway that is being maintained MORE THAN 25% covered with a contaminant?

☐ **Yes, assign Runway Condition Codes and complete the Matrix Report** (blue box)

☐ **No, DO NOT assign Runway Condition Codes but complete all other sections of the Matrix Report if any contamination is present** (blue box)

"Matrix Report . . . ___ Rwy ___ (Airport) (Rwy #) **_/_/_** (Rwy Condition Codes) **___ (%)** (% Coverage - 10, 25, 50, 75, or 100%) **___ (inch)** (Highest Depth only for Slush, Wet Snow or Dry Snow and Standing Water [Water 1/8" or less report as WET with no depth]) _____ (Contaminant Type (Report in terms in worksheet below, Water 1/8" or less report as WET))

(Remarks to be transmitted)

(Date) (Time)"

Misc. Data

°C Outside Air Temp

Active Precip? Yes or No

Adjusted Runway Condition Codes

(ONLY if Downgrade or Upgrade Assessments Used)
Requires an explanation in the comments section below

Rwy Treatment Used?

Time Applied

☐ Sand ☐ Deicing Chem

Rwy Mu (If Applicable) Before / After

☐ Decel ☐ CFME

1st Rwy Third

- For Coverage 25% or Less, Enter Code 6
- Circle (or Mark) any contaminant below that covers more than 25% of the Rwy Third. Record the most restrictive code in the box to the right. →
- Circle (or Mark) Depth Only for: Water, Slush, Wet Snow, Dry Snow, or Any Snow OVER Compacted Snow

Dry 6 | Wet (Damp) 5 | Frost 4 | Below Min Friction Level Classification - Wet Slippery 3

Water or Slush: GREATER Than 1/8" 2 | 1/8" or LESS 5

Slush: GREATER Than 1/8" 3 | 1/8" or LESS 5

Wet Snow or Dry Snow: GREATER Than 1/8" 3 | 1/8" or LESS 5

Depth — Dry or Wet Snow OVER Compacted Snow: 1/8" or Less | 1/4" | 1/2" | 3/4" | 1" | 2" or More 3

Compacted Snow: 15°C or Colder 4 | Warmer than -15°C 3

Ice 1 | Wet Ice, Water OVER Compacted Snow, Snow OVER Ice 0

2nd Rwy Third

- For Coverage 25% or Less, Enter Code 6
- Circle (or Mark) any contaminant below that covers more than 25% of the Rwy Third. Record the most restrictive code in the box to the right. →
- Circle (or Mark) Depth Only for: Water, Slush, Wet Snow, Dry Snow, or Any Snow OVER Compacted Snow

Dry 6 | Wet (Damp) 5 | Frost 4 | Below Min Friction Level Classification - Wet Slippery 3

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Slush: GREATER Than 1/8" 3 | 1/8" or LESS 5

Wet Snow or Dry Snow: GREATER Than 1/8" 3 | 1/8" or LESS 5

Depth — Dry or Wet Snow OVER Compacted Snow: 1/8" or Less | 1/4" | 1/2" | 3/4" | 1" | 2" or More 3

Compacted Snow: 15°C or Colder 4 | Warmer than -15°C 3

Ice 1 | Wet Ice, Water OVER Compacted Snow, Snow OVER Ice 0

3rd Rwy Third

- For Coverage 25% or Less, Enter Code 6
- Circle (or Mark) any contaminant below that covers more than 25% of the Rwy Third. Record the most restrictive code in the box to the right. →
- Circle (or Mark) Depth Only for: Water, Slush, Wet Snow, Dry Snow, or Any Snow OVER Compacted Snow

Dry 6 | Wet (Damp) 5 | Frost 4 | Below Min Friction Level Classification - Wet Slippery 3

Water or Slush: GREATER Than 1/8" 2 | 1/8" or LESS 5

Slush: GREATER Than 1/8" 3 | 1/8" or LESS 5

Wet Snow or Dry Snow: GREATER Than 1/8" 3 | 1/8" or LESS 5

Depth — Dry or Wet Snow OVER Compacted Snow: 1/8" or Less | 1/4" | 1/2" | 3/4" | 1" | 2" or More 3

Compacted Snow: 15°C or Colder 4 | Warmer than -15°C 3

Ice 1 | Wet Ice, Water OVER Compacted Snow, Snow OVER Ice 0

Pilot Braking Action Reports: Aircraft Type_____ Braking Action Reported _____ Time of Report_____

Comments for Evaluation Team on Accuracy and Usability of the Matrix Reporting System _____

Use reverse side if more space is needed.

Conclusions and Recommendations

- Large friction/texture database has been established and more research projects are underway
- New standards need to be defined to properly identify CFME calibration limits, operator training, and equipment hardware/software maintenance
- Revisions to existing FAA part 139 regulation will require aviation industry and ASTM support
- US aviation organizations will continue to support ICAO efforts to improve aviation safety

Future Events and Activities

- **ASTM F09 Committee, Oct. 23, 2013, Alton, VA**
- **ASTM E17 Committee, Dec. 9-11, 2013, Jacksonville, FL**
- **TRB, Jan. 12-16, 2014, Washington, DC**
- **Airfield Summit, March 2014, Singapore**
- **4th Safer Roads Conf., May 18-21, Cheltenham, UK**
- **ASTM E17 & Friction WS, June 22-27, State College, PA**

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