

ERDC Research Projects

Greg Norwood, P.E.
FAA Working Group Meeting
15-17 April, 2013



US Army Corps of Engineers
BUILDING STRONG®



Outline

- **Introduction**
 - APB Mission and History
- **Selected Research Project Summaries**
 - Non-nuclear alternatives to measuring soil moisture-density during construction
 - Warm-mixed asphalt for airfield pavements
 - Advanced transportation infrastructure inspections
 - Joint sealant certification program
 - Airfield pavement design using geosynthetics

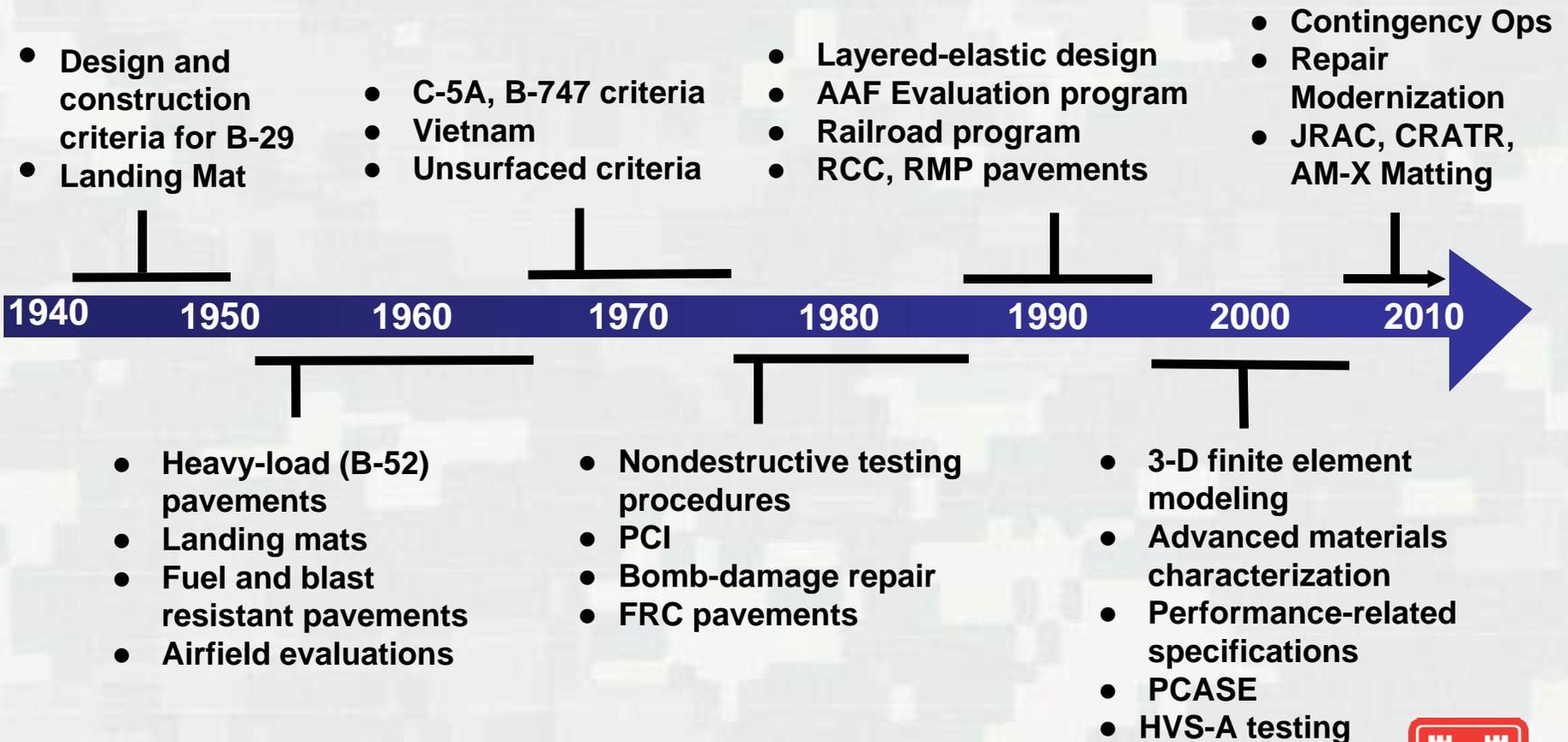


Our Mission

The Airfield and Pavements Branch provides research and development products to the Department of Defense and other U.S. Government agencies relative to pavement systems and other transportation infrastructure. ***We provide engineering and scientific solutions through innovative laboratory and field tests, computational analyses, and criteria development.*** These products and solutions are developed to make our Nation safer and economically stronger.

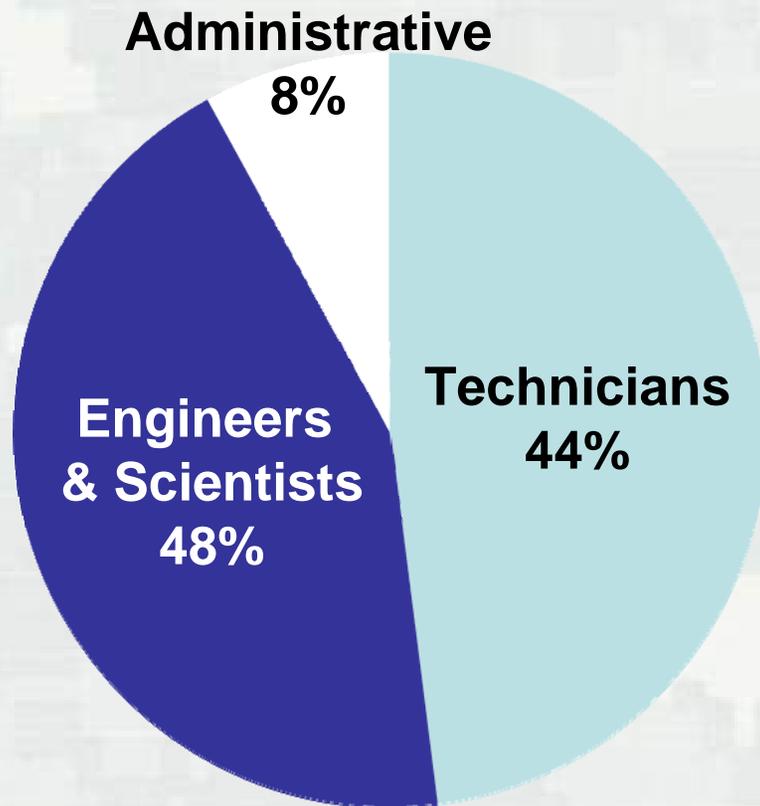


History – Airfields and Pavements Research



Our #1 Asset: Quality People

52 Personnel (39 FTE + 13 Contract)



Highly Trained Professionals

- 11 - Bachelors
- 10 - Masters
- 5 - PhD Candidates
- 7 - PhD



Non-nuclear alternatives to measuring soil moisture-density during construction

Purpose

Identify the best available commercial technology to measure field moisture-density values for quality control operations – best considering **accuracy, precision, ease-of-use and availability**

Approach

- Large-scale field study: **8 soils, 11 different density technologies** and **8 different moisture content devices**
- Laboratory study on 16 fine grained soils to improve the best candidate from large scale study
- Validation field study on SDG and CASE (from above) based on final deliverable: **4 soils, 3 density levels, 2 moisture levels** in 1-to-1 comparison with nuclear gauge/sand cone and oven moisture

Results

- **SDG & EDG** along with **CASE** (for soil and asphalt) for wet density
- **Gas stove** and **SDG/CASE/EDG** are best moisture content devices
- Analysis continues on modulus devices to establish contingency correlations



Field Microwave



Gas Stove



Soil Density Gauge (SDG)

Electrical Density Gauge (EDG)



Warm-mixed asphalt for airfield pavements

Purpose

Develop specifications for using warm-mix asphalt on airfield pavements.

Scope

Lab study using 12 WMA products

- Rutting performance
- Moisture damage performance

Field study using 3 WMAs and HMA

- Simulated high tire pressure traffic at elevated temperature
 - *F-15 E (325 psi; 32 kips)*
 - *109°F (43°C)*



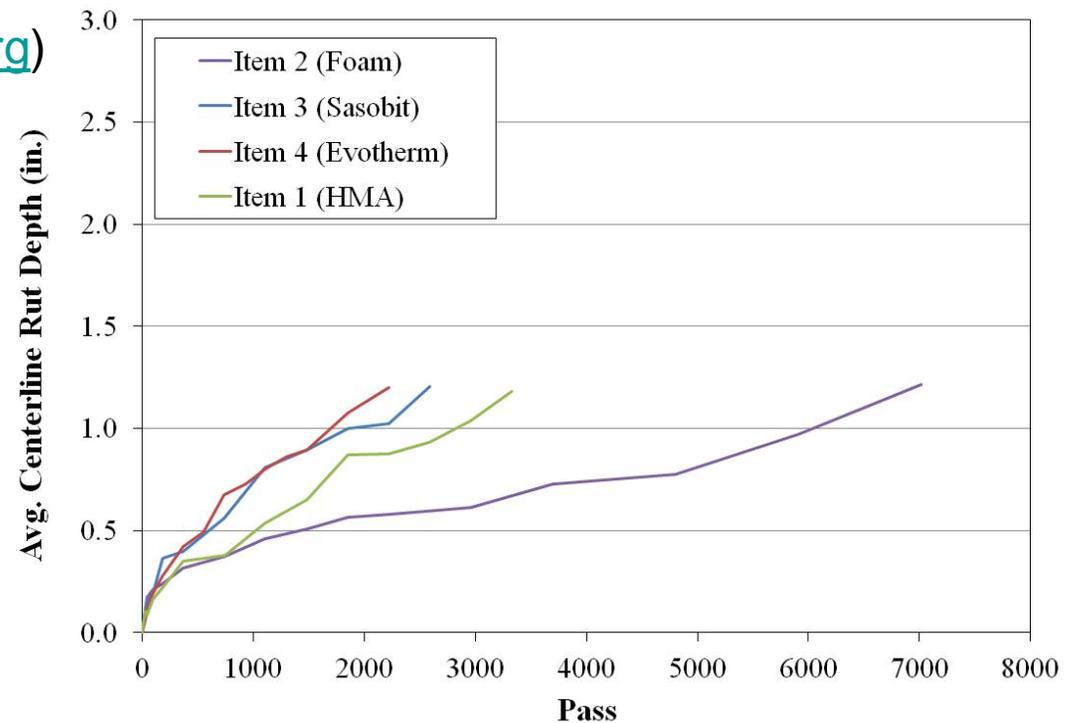
BUILDING STRONG®

Conclusions:

- ◆ WMA should be considered for airfield asphalt pavements.
 - ◆ *Similar mixture design procedure*
 - ◆ *Same construction procedures*
 - ◆ *Similar rutting performance*

Products:

- ◆ UFGS 32-12-15.16 (www.wbdg.org)
- ◆ Draft report summer 2013



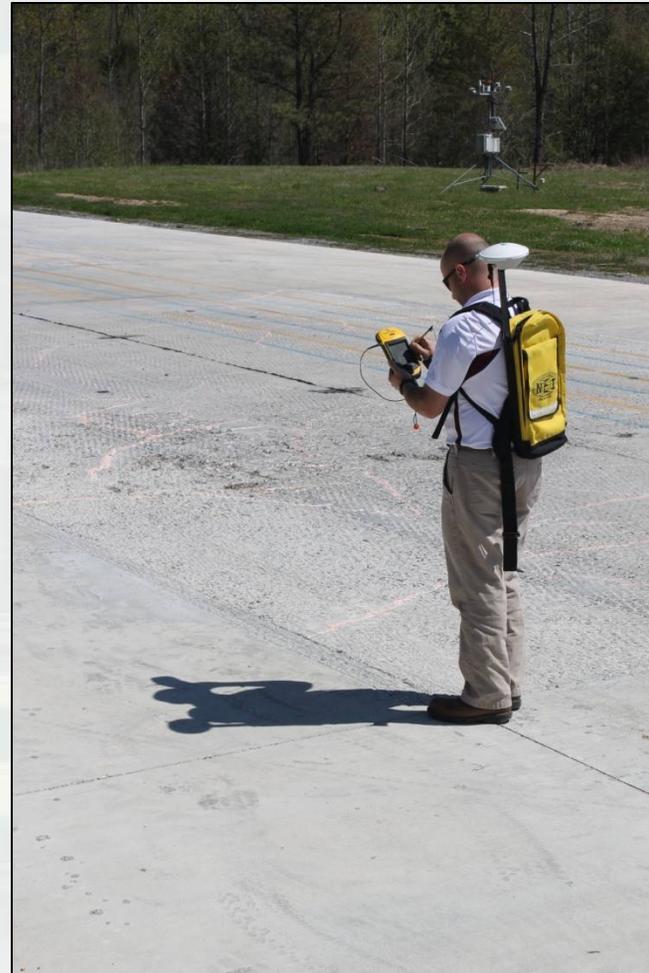
Advanced transportation infrastructure inspections

Purpose

Incorporate new technologies to expedite transportation infrastructure inspections to provide **rapid, reliable assessments** of current capacities

Approach

- Identify methods for geospatial referencing of infrastructure condition and maintenance needs
- Electronic Railroad Inspection Database System (ERIDS) validation and implementation
- Integrate expedient data collection with current platforms for analysis and classifications



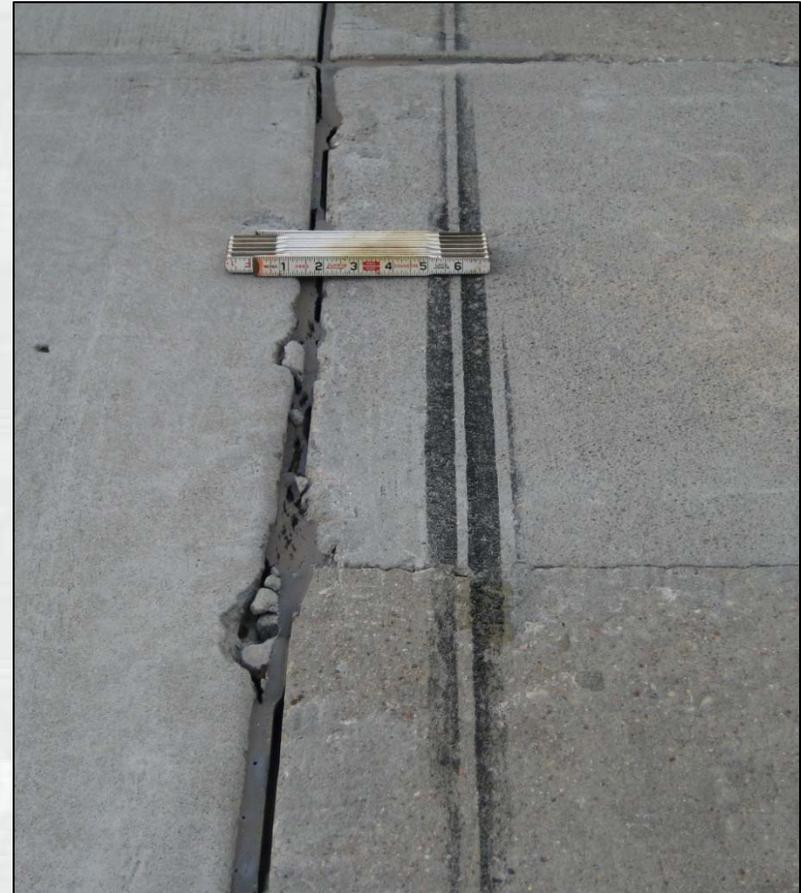
Joint sealant certification program

Problem

Recurring problems with joint sealant performance have been identified. Although most performance issues can be mitigated by proper material selection, most testing laboratories do not have equipment and trained personnel to perform current test protocol for accepting joint sealant materials.

Approach

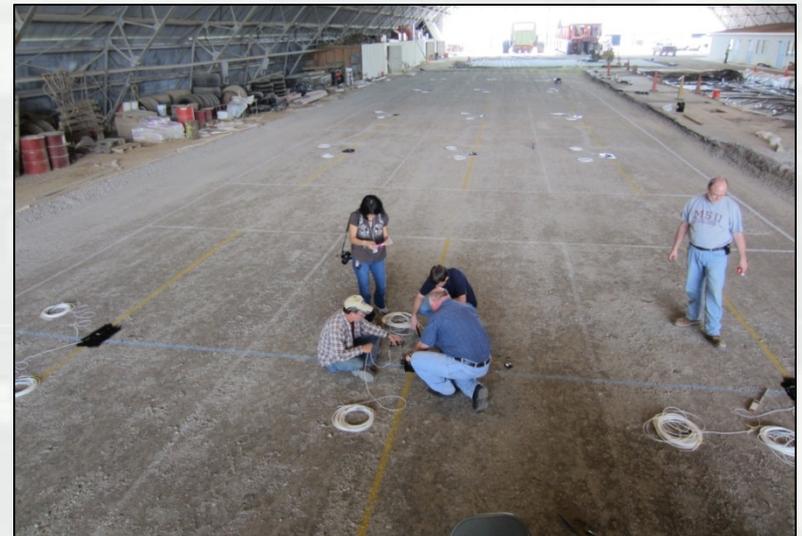
- Establish capability at ERDC to certify joint sealants for use on airfield pavements
- Review new test procedures for opportunities to increase testing efficiency
- Test commonly used joint sealants to determine if they meet current standards



Airfield Pavement Design Using Geosynthetics

Objectives

- Quantify the performance benefits of geogrid reinforced aggregate bases under aircraft loading
- Develop specifications to facilitate selection of geogrid products which will provide acceptable performance benefits,
- Develop design guidance with a method of determining the appropriate decrease in base course thickness when geogrid products are used for base reinforcement.



Instrumentation



Single Depth Deflectometers



Earth Pressure Cells



Asphalt Strain Gauges



Moisture/Temperature Probe



Pore Water Pressure Transducers



Geogrid Strain Gauges



Airfield Pavement Design Using Geosynthetics

Accelerated Pavement Testing:

- Traffic with the HVS-A
 - Flexible pavement
 - 7 different geogrid products
 - All 7 geogrids placed at the base/subgrade interface
 - 1 repeat grid placed mid-depth
 - C-17 single wheel
 - 45,000 lb wheel load, 142 psi
 - 48" wander pattern normally distributed
 - Pavement temperature of 77° F
- Evaluate
 - rut depth,
 - surface deformations
 - instrumentation response



BUILDING STRONG®

QUESTIONS?



US Army Corps of Engineers
BUILDING STRONG®

