



# *2005*

# *Researchers Meeting*

**September 7-8, 2005**

# Meeting Overview

## Wednesday AM – *Program Status Report*

- *Site Selection and Assessment*

## Wednesday PM – *Enhanced Construction Technology*

- *Rapid Stabilization (part 1)*

## Thursday AM – *Rapid Stabilization (part 2)*

- *2007 Final Demonstration Status*
- *2006 Program Discussion*



## 2004 Demonstration Project

2005 ERDC Research and Development Achievement Award

2005 Army R&D Achievement Award Nominee

*Construction Bulletin* (Sept. 2004)

*Site Prep Magazine* (Winter 2005)

*SAME Military Update* (Fall 2005)



# JRAC Program Work Units

Work Unit Title	PI	Funds	FY02	03	04	05	06	07	
<b>Site Selection and Assessment</b>									
Characterization and Behavior of Unbound Pavement Materials	Berney	AT40	250	216	100				
Rapid Airfield Assessment Technologies	Phillips	AT40	200	173	143				
Characterization and Behavior of Stabilized Surface Materials	Wahl	AT40			95	350	250	225	
Response of Thawing Pavement Foundations	Shoop	AT42	200	200	200	200			
Site Selection Decision-Aid Development	Baylot	DT08		315	300	300	300	100	
Pavement Structural Condition Assessment	Phillips	DT08		225	225	300	150		
Analysis of Engineering Requirements	Miller	DT08		150	150	200	200		
Material Property Prediction	Berney	DT08		82	150	200	150		
Material Property Prediction for Freeze-Thaw	Henry	DT08		100	100	100	100		
Design and Evaluation System for Contingency Airfields	Barker	DT08				250	250		
Software Development Life-Cycle	Walker	DT08		82	100	250	400	200	
<b>Enhanced Construction Technology</b>									
Rapid Repair of Paved Airfield Surfaces	Mann	AT40		173	240	250	250	200	
Evaluation of Earthmoving Technology	Hodo	DT08		232	100				
Advanced Compaction Technology	Wahl	DT08		232	150				
Assessment of Improved Pulverizer Technology	Velez-Vega	DT08		157	200	200			
Quality Assurance for Contingency Airfield Construction	Freeman	DT08		162	250	250	300		
Rapid Construction Technology Demonstration	Mann	DT08			350	150	250	500	
<b>Rapid Stabilization</b>									
Development of Stabilizers for Accelerated Curing	Newman	AT40	250	216					
C-17 Shear-Resistant Stabilizer Development	Newman	AT40			170	200	200	100	
Dust Control Technologies	Rushing	AT40			175	200	200	175	
Stabilization of Thawing Soils	R. Rollings	AT42	200	200	200	200			
Rapid MOG Enhancement Technologies	Gartrell	DT08	100	249	265	250			
Stabilization of Thawing Soils Demonstration	R. Rollings	DT08		164	375				
Demonstration of Advanced Stabilizer Technologies (C-130)	Newman	DT08		342	425	100			
Field Testing of Advanced Stabilizer Technology (C-17)	Newman	DT08				590	500		
Evaluation of Structural Requirements for Contingency Airfields	Gonzalez	DT08				200	250		
Maintenance and Repair of Stabilized Layers	Newman	DT08				225	350		
Demonstration of C-17 Stabilization Technology	Newman	DT08					500	1000	
<b>JRAC Technology Development and Integration – AT40</b>									
JRAC Technology Development and Integration – AT40	Anderton	AT40		122	140			112	
<b>JRAC Technology Development and Integration – DT08</b>									
JRAC Technology Development and Integration – DT08	Anderton	DT08		243	157	300	300	200	
Yearly Program Totals				1200	4035	4760	5265	4900	2812

# Major Accomplishments – Site Selection Demonstration for Australian theater C-17 scenario (4Q05)



**JRAC Site Selection**

**AOI/Elevation Data (required)**

- AOI: [Dropdown]
- Area of Interest: [Dropdown]
- Digital Elevation Model: N40.DT2
- Maximum Slope (%): 4

**Roads/Power Data**

**Roads**

- roadl: [Dropdown]
- Minimum Distance to Roads (m): 50
- Maximum Distance to Roads (m): 1000

**Power Lines**

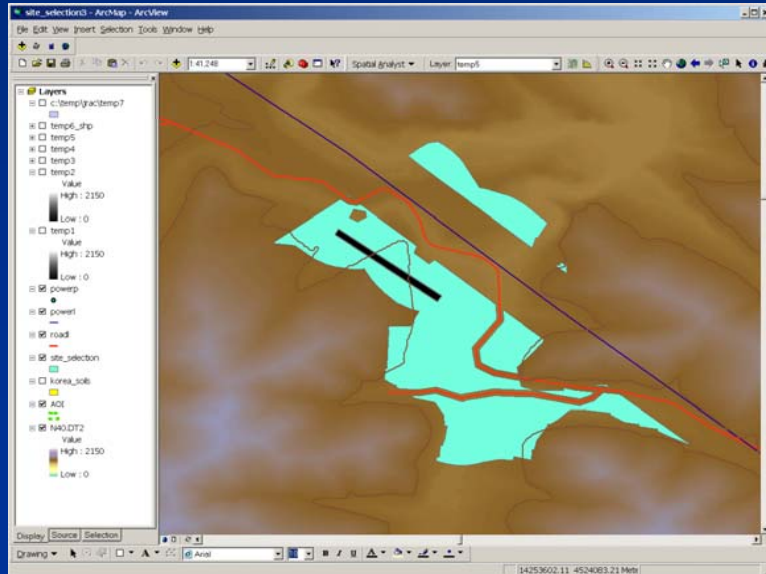
- powerl: [Dropdown]
- Minimum Distance to Power Lines (m): 500
- Power Poles: [Dropdown]
- Minimum Distance to Power Poles (m): 2000

**Water Data**

- Lakes/Reservoirs: [Dropdown]
- Aqueducts: [Dropdown]
- Linear Water Features: [Dropdown]
- Polygon Water Features: [Dropdown]
- Minimum Distance to Water (m): 50
- Maximum Distance to Water (m): 1000

**Soil/Vegetation Data**

Status Window



**JRAC Site Selection  
versus  
Current Method  
What is the value  
added?**

**Engineer Operations Asset Allocation Calculator**

**Engineer Operations GUI**

Constrained Results  Unconstrained Results

Select Operation: build\_ALZ\_MOG1\_heavy

**Scenario Inputs:**

- Earliest Start Time (hrs): 0.0
- Latest Finish Time (hrs): 200.0
- Air Temperature (Celsius): 26.0
- Percent Humidity: 100.0

**Terrain Inputs:**

- USCS Soil Type: GW
- Linear Size (ft): 4000
- Areal Size (sq ft): 60000
- Volumetric Size (cu yds): 38000

Armored:  TRUE  FALSE

Degraded Sensor:  TRUE  FALSE

- Or Enter Scenario and Terrain Files Below (Optional) -

Select Scenario File: [Text Box]

Select Terrain File: [Text Box]

Select Output File: [Text Box]

(Note: Output will be displayed on console if no output file selected.)

Compute Exit

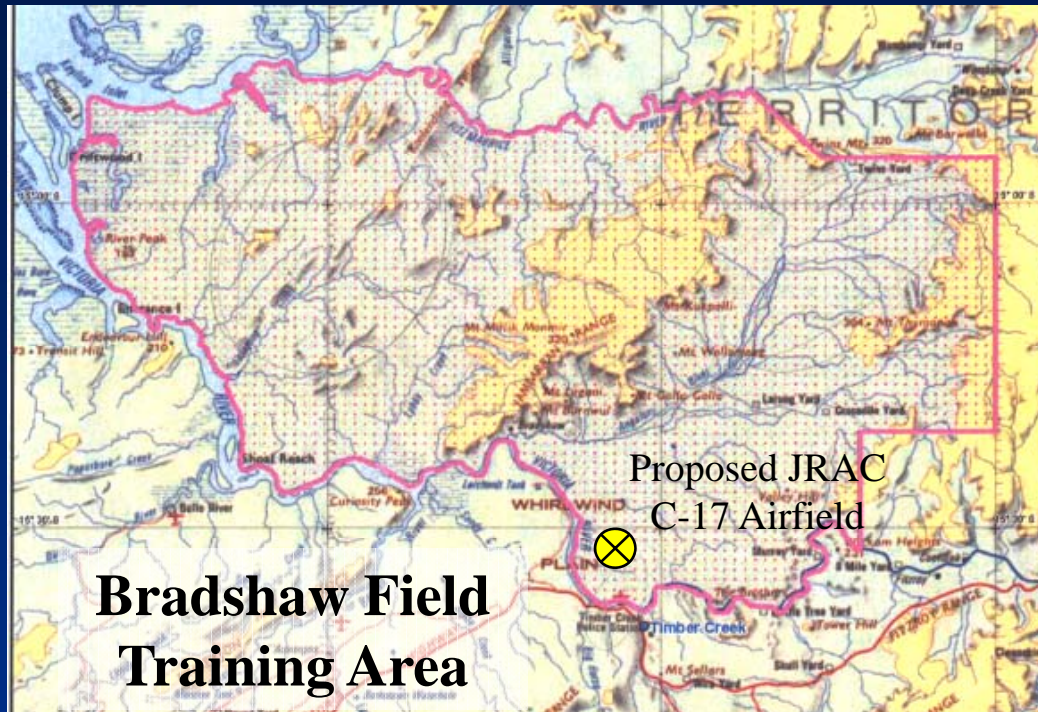
# Results/Products

JRAC-developed portable soils testing kit packaged for 412 ENCOM deployment to Iraq



**Allows field engineers to classify soil type and moisture content in 1 hour.  
Accompanying software and soils database produces construction design curves.**

# JRAC Final Demonstration Site Talisman Saber Exercise '07



- Talisman Saber is a short warning, power projection, forcible entry scenario using training areas in Australia.
- July 2004: US and Australia SECDEFs sign MOU outlining 25-yr agreement for creation of Joint Combined Training Centers in Australia.
- Talisman Saber '07 (TS07) includes plan to construct C-17 capable airfield for US Forces to deploy and train Stryker Brigade Combat Teams.

- ✓ JRAC field site visits at SWBTA and BFTA – June 2005
- ✓ TS07 Pre-Planning Meetings (Darwin) – Aug 2005
- TS07 Concept Development Conference (Honolulu) – Jan 2006
- JRAC and 412 ENCOM survey selected site – June 2006
- AU and US military engineering forces construct MOG1 C-17 airfield – Apr/May 2007
- JRAC adds MOG2 and other improvements – June 2007





# *Customer Interactions*

## **Proponents:**

**TRADOC MANSCEN – Mr. Vern Lowrey**

**HQ TRADOC – MAJ Carrera**

**TRANSCOM DPMO – Mr. Ken Foley**

**HQDA G3 – LTC Jon Jones**

**HQDA G4 – CPT Brad Eungard**

**HQDA G8 – LTC Jim Austin**

**PM Construction Equipment – LTC Carol Solesbee**

**XVIII Airborne Corps – Various Commanders and Officers**

**Joint Forces PACOM – Mr. Mark Schnabel**

**USAFAMC – Mr. Ken Hevner**

**AFCEA – Mr. Jim Greene**





# Technology Transfer/Transition

- JRAC is part of the Enable Theater Access (ETA) initiative with Rapid Port Enhancement, and an ETA Integrated Concept Team has been formed to monitor and facilitate transition and acquisition plans.
- TRADOC and TRANSCOM currently sponsoring the required transitional documents:
  - ➔ Air and Ground Lines of Communication *Initial Capabilities Document* (ICD) expected to receive HQDA approval in Sept 2005.
  - ➔ Joint Rapid Airfield Construction *Capability Production Document* (CPD) expected to receive world-wide staffing approval in 2006.
- HQDA G3 and G4 are working a 6.4/6.5 proposal for FY08/09 POM funding wedge (\$5.3M / yr). ERDC will use these transition funds to provide equipment specifications, document material NSNs, draft training documents, and provide all other technical guidance necessary to stand up JRAC capabilities as soon as FY10.
- Alternate transition funding source being considered is OSD-sponsored Technology Transfer Initiative for FY07-08.



# Publications

**Current JRAC-related publications total 30, with 6 journal articles, 15 refereed conference papers, 7 ERDC technical reports, one periodical, and one master's thesis.**

Anderton, Gary L. and Mann, Travis A., "U.S. Military's Joint Rapid Airfield Construction Program," Proceedings of the ASCE International Air Transport Conference, Orlando, FL, 2002.

Anderton, Gary L. and Gartrell, Chad A., "Airfield Pavement Matting Systems for Rapid Maximum-on-Ground (MOG) Enhancement," Proceedings of Transportation Systems 2004 Conference, Ft. Lauderdale, FL, 2004.

Anderton, Gary L. and Gartrell, Chad A., "Rapid Maximum-on-Ground (MOG) Enhancement Technologies," Technical Report ERDC/GSL TR-05-02, U.S Army Engineer Research and Development Center, 2005.

Anderton, Gary L., "Rapid Contingency Airfield Upgrade and Construction," (Submitted for publication), Military Engineer, Society of American Military Engineers, 2005.

Phillips, Lucy and Freeman, Reed, "Rapid Assessment Technologies for Evaluating Potential In-Theater Airfield Sites," Proceedings Transportation Systems 2004 Workshop, Ft. Lauderdale, FL, 2004.

Phillips, L., Rushing, J., and Newman, K., "Evaluation of Rapid Assessment Tools for Determining Strength Characteristics of Chemically Stabilized Unsurfaced Pavements." International Journal of Pavements, (Vol. 3 (1-2), January-May 2004.

Phillips, Lucy, "Field Evaluation of Rapid Airfield Assessment Technologies" Masters Thesis, Mississippi State University, MS, 2005.



# *Publications*

Phillips, Lucy, “Field Evaluation of Rapid Airfield Assessment Technologies,” Technical Report ERDC/GSL TR-05-11, U.S. Army Engineer Research and Development Center, Vicksburg MS, 2005.

Phillips, Lucy and Jersey, Sarah, “Field Evaluation of Assessment Technologies on Soil and Granular Base-Type Materials” (Abstract), Proceedings of the Fourth International Conference on Maintenance of Pavements and Technological Control (mairepav4). Belfast, Northern Ireland, August 2005.

Berney, Ernest. S., “A Partially Saturated Constitutive Theory for Compacted Fills,” Technical Report ERDC/GSL TR-04-4, U.S Army Engineer Research and Development Center, 2004.

Berney, E. S., Peters, J. F. and Smith, D. S., "The Thermodynamics of Three-Phase Partially Saturated Soil," 16th ASCE Engineering Mechanics Conference, Seattle, WA, July 16-18, 2003.

Tingle, J. S., Larson, S. L, Weiss, C. A., Newman, J. K., Peters, J. F., Tardy, B. and Berney, E. S., “Constitutive Analyses of Nontraditional Stabilization Additives,” Technical Report ERDC/GSL TR-04-5, U.S Army Engineer Research and Development Center, 2004

Berney, Ernest S. and Wahl, Ron W., “Rapid Soil Classification,” Technical Report ERDC/GSL TR-05-xx. (In publication), U.S Army Engineer Research and Development Center, 2005.

Henry, K.S., M. Zhu and R. Michalowski, “Evaluation of three frost heave models,” Proceedings of the Seventh International Conference, 10 p, Trondheim, Norway, June 27-29, 2005.

Horvli, I., E. Oiseth and K. Henry, “A review and reliability assessment of frost penetration models,” Proceedings of the Seventh International Conference, 12 p., Trondheim, Norway, June 27-29, 2005.



Newman, J. K., J. S. Tingle, R. Gill, and T. McCaffrey, "Stabilization of Silty Sands Using Polymer Emulsion," IJP - International Journal of Pavements, Vol. 4, No. 1&2, January-May 2005, pp. 1-12.

Shoop, S. A., R. Affleck, R. Haehnel, V. Janoo, "Constitutive Modeling for Thawing Frost Susceptible Soil," submitted to ASCE Journal of Geotechnical and Environmental Engineering.

Shoop, S. A., R. Affleck, "Cap Plasticity Model for Thawing Soil," Proceedings of ASCE GeoFrontiers05, Austin, TX, ASCE Special Publication, Jan. 2005.

Chiroux, R. C., W. Foster, C. Johnson, S. Shoop and R. Raper, "Three Dimensional Finite Element Analysis of Soil Interaction with a Rigid Wheel," Journal of Applied Mathematics and Computation, Vol. 162/2 p 707-722, Jan. 2004.

Janoo, V. and S. Shoop, "Influence of Spring Thaw on Pavement Rutting," UNBAR6- Pavements Unbound, Nottingham, UK, p 115-124, July 2004.

Affleck, R., S. Shoop, K. Simmons, P. Ayers, "Vehicle Rutting During Spring Thaw," ASCE Cold Regions Engineering Specialty Conference, Edmonton, Canada, May 2004.

Shoop, S. A., M. K. Kestler, J. A. Stark, C. Ryerson, and R. Affleck, "Rapid Stabilization of Thawing Soils for Enhanced Vehicle Mobility: Field Experience and Application," Journal of Terramechanics, Vol. 39, no. 4, p 181-194, 2003.

Shoop, S., R. Affleck, V. Janoo, and R. Haehnel, "Modeling Deformation of Thawing Soil Under Vehicle Loading," 3<sup>rd</sup> International Symposium on Deformation Characteristics of Geomaterials, Lyon, France, p 931-938, September 2003.

Affleck, R., and S. Shoop, "Spatial Variability of Thaw Depth," Transportation Research Board, Special Session on Spatial Variability in Geotechnical Engineering, Washington, DC, Jan. 2003.

Shoop, S., R. Haehnel, V. Janoo, and D. Harjes, "Seasonal Deterioration of Unsurfaced Roads," ASCE Cold Regions Engineering Conference, Anchorage, Alaska, p 311-322, May 2002.

Shoop, S., I. Darnell, and K. Kestler, "Analysis of Tire Models for Rolling on a Deformable Substrate," Tire Science and Technology, Vol. 30, No. 3, p 180-197, 2002.

Shoop, S. A., R. Affleck, V. Janoo, R. Haehnel, B. Barrett, "Constitutive Modeling of a Frost Susceptible Sand after Freeze-Thaw," ERDC-CRREL Technical Report, Hanover, NH.

Burton, N., P. Sullivan, M. Evens, S. Shoop, "Constitutive Modeling for A4 Silt," ERDC-CRREL LR 03-16, Hanover, NH.

Shoop, S., R. Rollings, M. Rollings, K. Henry, R. Davis, G. Anderton, "Integrating Cold Temperature Effects into Expedient Airfield Design and Construction," Published Abstract for Tri-Services Transportation Systems Workshop TS2004, Fort Lauderdale, FL, April 2004.

Shoop, S. A., R. Affleck, V. Janoo, R. Haehnel, E. Berney, D. Smith, J. Peters, "Modeling Soft Soil Behavior under Vehicle Loads," Published Abstract for 2001 Mechanics and Materials Summer Conference (MMC2001), ASCE-Engineering Mechanics Division Conference on Inelastic Behavior of Geomaterials, San Diego, CA, p 106-107, June 27-29, 2001.